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DETERGENTS | LIPIDS | CUSTOMS | HIGHER STANDARDS

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434 West Dussel Drive
Maumee, OH 43537

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Definitions

All concentrations listed as percent are weight/volume unless specifically stated.

AGGREGATION NUMBER is the molecular weight of the micelle divided by the molecular weight of the detergent.

BSA is bovine serum albumin.

CMC is the critical micelle concentration.

[ ] is the Chemical Abstracts Registry Number (CAS).

FW is the formula weight.

PERCENT ALPHA is the percent alpha isomer measured by an HPLC method developed at Anatrace.

µS is micro Siemens.

FW avg. is the approximate, estimated FW for commercial detergents.

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GENERAL INFORMATION

Detergents and Their Uses In Membrane Protein Science

Detergent Properties

Detergent Analysis

Starter Detergent Library

Detergents and Their Uses in Membrane Protein Science

Membrane protein studies have advanced significantly over the past few years. This is partly due to advances in tools and reagents used to manipulate this class of proteins. Detergents play an essential role in the extraction, purification, and manipulation of membrane proteins; their amphiphilic nature allows them to interact with hydrophobic membrane proteins to keep them water-soluble outside of their native bilayer environment. Unfortunately, solubility does not always translate to native structure and stability; a detergent that is useful for extraction may not be compatible with purification and/or biochemical studies. Furthermore, a detergent that works for one membrane protein may not be suitable for a different membrane protein. While there is not a set of "golden rules" for the uses of detergents for membrane protein applications, understanding the physical-chemical properties associated with different classes of detergents may be useful for deciding which detergent may work best for a particular application. For example, the ionic charge or degree of hydrophobicity of a detergent molecule will dictate how it will function in solution and, thus, how it will interact with membrane proteins. The purpose of this guide is to introduce the researcher to the physical and chemical properties of detergents and describe how these properties relate to detergent function.

Structure and behavior of detergents

Detergents are amphiphilic compounds with well-segregated polar and apolar domains that have measurable aqueous solubility as both aggregates and as monomers. Detergents belong to a class of compounds called surfactants, which are surface active agents that reduce interfacial surface tension in mixtures (*i.e.*, oil and water) by adsorbing to interfaces[1]. Detergents are useful in a wide variety of applications including: polyacrylamide gel electrophoresis (PAGE), membrane permiabilization, membrane dissolution, inclusion body solubilization, lipid raft preparation, and membrane protein solubilization, biochemistry, crystallization, and manipulation. Detergents are also useful as model membranes for *in vitro* studies and as vehicles for protein/DNA/drug delivery.

The ability of a detergent to participate in a specific biological/biochemical function is related to its structure; the polar hydrophilic portion of the detergent molecule is referred to as the "hydrophilic head group" while the nonpolar hydrophobic, portion is referred to as the "tail" (Figure 1A).

There are, however, a few detergents that have a bean-like molecular shape in the sense that they contain both polar and nonpolar "faces"; these include the bile acid derivatives such as CHAPS and CHAPSO (Figure 1B).

Figure of a Detergent Monomer

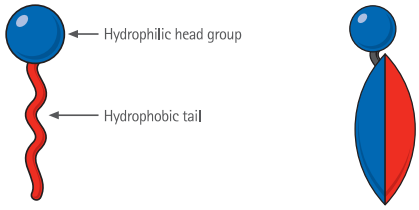

Figure 1A **Figure 1B**

Traditional detergent monomers are generally cone shaped; the hydrophilic head groups tend to occupy more molecular space than the linear alkyl chains (Figure 2A). Detergents tend to aggregate into spherical or elliptoid micelles that are water soluble (Figure 2B). While lipids also have the same general structure as detergents—a polar hydrophilic head group and a nonpolar hydrophobic tail—lipids differ from detergents in the shape of the monomers, in the type of aggregates formed in solution, and in the concentration range required for aggregation. Lipids are generally cylindrical; the area occupied by the two alkyl chains is similar to the area occupied by the polar head group (Figure 2C). Lipids have low solubility as monomers and tend to aggregate into planar bilayers that are water insoluble (Figure 2D).

Molecular Shapes of Detergents and Lipids

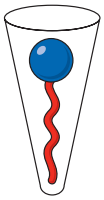

Figure 2A

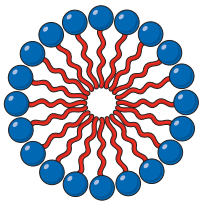

Figure 2B

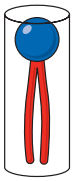

Figure 2C

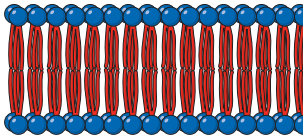

Figure 2D

Effects of the hydrophilic group on detergent function

Water solubility is provided by the hydrophilic portion of a detergent molecule. Hydrophilic groups can be categorized as ionic (cationic or anionic), nonionic, or zwitterionic. Ionic detergents, including sodium dodecyl sulfate (SDS), N-lauryl sarcosine, cetyltrimethylammoniumbromide (CTAB), and sodium cholate are effective at extracting proteins from the membrane. However, these detergents are harsh and tend to be denaturing because they efficiently disrupt both inter- and intra-molecular protein-protein interactions. SDS, for example, is commonly used as a membrane protein denaturant in quantitative protein unfolding/folding studies[2-6]. Bile acid salts (*i.e.*, sodium cholate, deoxycholic acid) are also ionic detergents; however, they tend to be more mild than straight chain ionic detergents[7].

Nonionic detergents, including maltosides, glucosides, and polyoxyethylene glycols are characterized by uncharged hydrophilic head groups. These detergents are mild and nondenaturing because they disrupt protein-lipid and lipid-lipid interactions rather than protein-protein interactions. Short chain (*i.e.*, C7-C10) nonionic detergents are typically more deactivating than longer chain (*i.e.*, C12-C14) nonionic detergents[7,8]. A majority of the detergents used in the purification and structural determination of membrane proteins (*i.e.*, lauryl maltoside, octyl glucoside) are nonionic detergents[9-11] as well as the new Neopentyl Glycol (NG) class detergents[115].

Zwitterionic detergents, including the Zwittergents, Fos-Cholines, CHAPS/CHAPSO, and amine oxides contain both a positive and negative charge in their hydrophilic head group. These compounds are electrically neutral like the nonionic detergents, but can often disrupt protein-protein interactions like the ionic detergents; therefore, they tend to be intermediate in their mildness. The zwitterionic detergent lauryldimethyl amine oxide (LDAO) has been used to study the KcsA potassium channel[12] as well as the outer membrane BtuB:TonB complex[13]. Most successful NMR-based structural studies of membrane proteins have been carried out in zwitterionic detergent solutions such as dodecylphosphocholine (*i.e.*, Fos-Choline 12)[14-16].

Effects of the hydrophobic group on detergent function

The hydrophobic portion of a detergent allows the molecule to partition into the apolar lipid bilayer during the solubilization of membrane proteins. It also masks the hydrophobic portions of the membrane proteins once they have been solubilized and, thus, prevents protein aggregation. The size of the hydrophobic tail is determined by the length of the alkyl chain, the degree of unsaturation within the chain, and whether one or two alkyl chains are present[1]. The physical characteristics of the hydrophobic group (*i.e.*, the length of the alkyl chain, the degree of branching within the chain, the presence of an aromatic nucleus, the number of polyloxyethylene units present, and the presence of fluoroalkyl units) affect the chemical properties of the detergent monomers as well as the aggregates that

they form in solution. For example, increasing the hydrophobic chain length decreases the water solubility of the detergent monomer and causes close packing of the monomers within micelles. Branching and unsaturation cause loose packing of detergent monomers in micelles. Polyoxyethylene units tend to decrease the hydrophobicity of the detergent monomer while fluoroalkyl groups increase the hydrophobic character of the detergent monomer[1].

Hydrophilic-Lipophilic Balance (HLB)

Although the hydrophilic head group and hydrophobic tail each affect the properties of the detergent molecule differently, together their total effect is known as the Hydrophilic-Lipophilic Balance (HLB). The HLB is defined by a number that ranges from 0 to 40. In general, an HLB number <10 indicates that a detergent has low solubility in water while an HLB number between 10 and 20 indicates that the detergent is readily soluble in water[17]. Examples of detergents with HLB values between 10 and 40 include: SDS (40), sodium cholate (18), Brij-35 (16.9), Tween 20 (16.7), Tween 80 (15), Triton X-100 (13.5), and Triton X-114 (12.4)[18, 19]. For simple, single-chain detergents, HLB can be determined by the following equation[20, 21]:

$$HLB = \Sigma H - \Sigma L + 7 \quad \text{(i)}$$

Where H is the contribution from the hydrophilic group and L is the contribution from the lipophilic group

In studies with the human adenosine A_3 receptor, a member of the GPCR superfamily, Berger *et al.* showed that detergents with an HLB number of 15 correlated with selective extraction of A_3 from the membrane and high activity upon purification[22]. Specifically, A_3 was successfully purified in decyl maltoside (DM), dodecyl maltoside (DDM), and HEGA®-10. Detergents with HLB numbers ranging from 12.4 to 13.5 (*i.e.*, Triton X-100) were previously shown to efficiently solubilize and maintain the stability of *B. subtilis* D-alanine carboxypeptidase and *M. luteus* phosphoacetylmuramyl pentapeptide translocase and succinate dehydrogenase[19]. Several other studies have also shown that HLB values may be useful in selecting detergents for membrane protein extraction and purification[23, 24].

The HLB has also been correlated to the detergent packing parameter which can be expressed as:

$$P = v / al \quad \text{(ii)}$$

Where v is the volume of the detergent chain, l is the length of the chain, and a is the cross-sectional area of the head group.

Packing parameters are assigned to detergent monomers and are useful for predicting the shape of the aggregate (*i.e.*, spherical or lamellar) formed by those monomers. For example, P<1/3 indicates that the detergent will likely form spherical micelles while 1/3<P<1/2 indicates that the detergent will likely form cylindrical micelles[25]. Berger *et al.* showed that as the HLB value of a detergent decreases, the packing parameter increases[22]. For example, as the hydrophobicity of a detergent increases, there is a tendency for the monomers to assemble into a more lamellar aggregate. These shapes may also influence the effects of a detergent upon a solubilized protein.

Micellization

Detergents interact with proteins and membranes as micelles. Micellization occurs when surface active compounds form non-covalent clusters in solution; this process is driven by the hydrophobic effect[1]. When a nonpolar group is introduced into an aqueous solution, the hydrogen bonding network formed by the existing water molecules is disrupted and the water molecules order themselves around the nonpolar entity to satisfy hydrogen bonds (Figure 3A). This results in an unfavorable decrease in entropy in the bulk water phase. As additional nonpolar groups are added to the solution, they self-associate, thus, reducing the total water-accessible surface of the complex relative to the monodisperse state (Figure 3B). Now, fewer water molecules are required to re-arrange around the collection of nonpolar groups. Therefore, the entropy associated with the complex is less unfavorable than for the monodisperse detergents. In short, hydrophobic association and the formation of micelles is driven by the favorable thermodynamic effect on the bulk water phase[26].

Hydrophobic Effect and Micellization

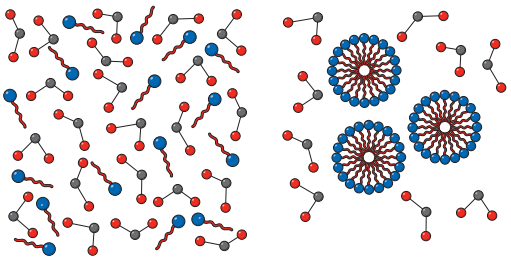

Figure 3A **Figure 3B**

Solubilization of proteins is dependent upon the formation of micelles in solution. Micelles are colloquially thought to be spherical in shape. However, it is now appreciated that they are asymmetrical and have "rough" surfaces where the alkyl tails are disorganized and transiently poke into the bulk solution (Figure 4A)[27-29].

Micelles are typically a few nanometers in diameter and have a molecular weight of less than 100 kDa. Detergent micelles are dynamic structures; detergent monomers within the micelle are in constant, rapid exchange with free detergent monomers in solution. Although the molecular details of how detergent micelles extract proteins from a membrane are still not completely understood, it is generally accepted that once a protein has been solubilized, the detergent molecules form a torus around the hydrophobic transmembrane domains (Figure 4B)[8].

Micelles and Membrane Protein Extraction

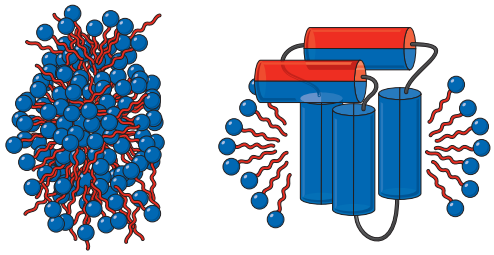

Figure 4A **Figure 4B**

The critical micelle concentration

Micellization is a critical phenomenon when considering detergent applications. Each detergent can be characterized by its critical micelle concentration (CMC); the concentration of detergent above which monomers self-assemble into non-covalent aggregates (called micelles)[1, 30, 31]. The CMC actually does not occur at a single concentration, but rather, over a narrow concentration range. When the total detergent concentration is below the CMC, detergent monomers are free in bulk solution. However, as more detergent is added above the CMC, all additional detergent monomers will go into micelles. It is important to note that when the total detergent concentration is greater than the CMC, there is a monomeric detergent concentration equal to the CMC and a micellar detergent concentration equal to: [total detergent concentration]—CMC. The CMC can be determined by a variety of methods including surface tension measurements[32] and dye (*i.e.*, anilino-1-naphthalene sulfonic acid [ANS]) binding experiments[33]. When working with membrane proteins, a general rule of thumb is to work at a detergent concentration of at least 2X CMC and at a detergent:protein weight-to-weight ratio of at least 4:1. Moreover, when solubilizing proteins from native membranes, it is advisable to work at a detergent concentration well above the CMC as well as at a 10:1 detergent:lipid mol:mol ratio. Therefore, the CMC dictates how much detergent needs to be added to various protein and membrane preparations.

(Continued on next page)

There are several physical-chemical factors that can affect the CMC of a given detergent. Generally, the CMC decreases as the hydrophobicity of the detergent increases. Other properties that directly affect the CMC are the characteristics of the hydrophobic and hydrophilic groups and solution additives such as electrolytes.

Effects of the hydrophilic group on CMC

Variations in the hydrophilic head group affect the detergent CMC. In general, detergents containing ionic head groups have a higher CMC than those containing nonionic head groups[1]. This is due to electronic repulsion between the head groups of neighboring detergent monomers within the micelles. Detergents containing zwitterionic head groups tend to have smaller CMCs than those containing ionic head groups.

Effects of the hydrophobic group on CMC

The physical characteristics of the hydrophobic group can also have varying effects on the CMC of a particular detergent. In general, the CMC decreases as the number of carbon atoms in the alkyl chain increases up to approximately 16 to 18 carbons (for straight chain alkyls)[1]. Above this point, detergents become lipid-like and do not form discrete micelles. As a rule of thumb, for ionic detergents, the addition of a single methylene group to the hydrophobic tail halves the CMC. For nonionic and zwitterionic detergents, the addition of a methylene group reduces the CMC by approximately 80% relative to the parent CMC. In general, carbon atoms on branched hydrophobic chains have about half the effect on the CMC as carbon atoms on straight chains. The addition of a phenyl ring to the hydrocarbon chain is equivalent to approximately 3.5 methylenes. A carbon-carbon double bond increases the CMC compared to the corresponding saturated compound; compounds with cis double bonds have a higher CMC than compounds with trans double bonds. When an oxygen or hydroxyl group is added to the hydrophobic group, the CMC increases. Methylene groups between these polar groups and the hydrophilic head group have approximately half the effect on the CMC as they would in the absence of the polar group. Fluorocarbons tend to have a lower CMC than hydrogenated carbons[1].

Effects of electrolytes on CMC

Electrolytes tend to reduce the CMC of detergent solutions. For example, the CMC for the anionic detergent SDS is approximately 6 mM; however, in the presence of 150 mM NaCl, the CMC is reduced to 1.4 mM[34]. A further reduction in the CMC to 0.9 mM was found upon the addition of 350 mM NaCl. Similar effects have been shown for other anionic detergents including potassium laurate and sodium decyl sulfate[34]. Reductions in CMC upon salt addition have also been shown for cationic detergents including dodecylammonium chloride, decyltrimethylammonium bromide, and cetyltrimethylammonium sulfate[34, 35]. The reduction in the CMC in the presence of electrolytes for ionic detergents is likely due to a reduction in the electronic environment surrounding the ionic head groups. Addition of electrolytes decreases the repulsion between similarly charged ionic head groups within a micelle and therefore, the detergent monomers can pack tightly and the CMC is reduced[1].

Addition of salts to solutions containing nonionic detergents also reduces CMC values. For example, the CMC of Triton X-100 in aqueous solution is 0.24 mM. In the presence of 0.5 M or 1.0 M NaCl the CMC is reduced to 0.14 mM and 0.08 mM respectively[36]. For nonyl glucoside, the CMC is reduced from 6.9 mM in aqueous solution to 2.6 mM in 1.5 M NaCl[37]. The decrease in the CMC for these uncharged detergents is likely due to the effects of electrolytes on the hydrophobic moieties. Electrolytes that are highly hydrated, (*i.e.*, Cl-) are water structure-makers; they will "salt out" hydrophobic groups and, therefore, they tend to decrease the CMC. Electrolytes that have a small charge:radius ratio (*i.e.*, SCN- and I-), are water structure breakers; they tend to "salt in" hydrophobic groups. Thus, ions may either increase or decrease the CMC of a nonionic detergent[1, 36-38].

Cloud point

The cloud point is the temperature above which a nonionic surfactant solution separates into a detergent rich phase and a detergent poor phase[1, 25, 27]. The separation is visualized as turbidity within the solution. An increase in temperature favors micelle formation; the rapid growth of micelles along with intermicellar attraction likely results in the formation of large particles that can precipitate out of solution, thus causing turbidity. This phase separation is reversible upon cooling. Nonpolar additives (*i.e.*, hydrocarbons) tend to increase the cloud point whereas polar compounds (*i.e.*, alcohols) and salts tend to decrease the cloud point[1]. A low cloud point may be useful in membrane protein purification[39-41]. For example, Triton X-114 has a cloud point that is near room temperature. This property makes it possible to carry out two-phase water/detergent extractions to separate water soluble proteins from membrane proteins[39, 42]. However only a very limited number of nonionic detergents have cloud points below 50°C.

Aggregation numbers

Another physical property of the micelle is the aggregation number; the number of detergent monomers present within a micelle[1, 25, 30]. Most detergents used for biochemical applications have aggregation numbers that range from 50 to 100[8]. Exceptions are some bile acid derivatives like CHAPS, CHAPSO, and Big CHAP which have aggregation numbers of approximately 10. Detergents with smaller aggregation numbers tend to form more spherical micelles while detergents with larger aggregation numbers tend to form elliptoid micelles. In general, aggregation numbers increase as the length of the hydrocarbon chain increases. Aggregation numbers tend to decrease as the size of the hydrophilic group increases and upon the addition of hydrocarbons and polar compounds to the detergent solution[1]. Increasing the temperature of solutions of ionic detergents also causes an increase in the aggregation number. Aggregation numbers can be determined by a variety of methods including light scattering[43], small angle neutron scattering[44], and fluorescent dye binding[45].

With knowledge of the detergent CMC and aggregation number, one can determine several important parameters including the concentration of micelles present in solution and the aggregate molecular weight of the micelle. In ideal, protein-free conditions, the concentration of micelles can be calculated as follows:

$$[\text{micelles}] = [\text{total detergent}] - [\text{CMC}] / \text{AN} \quad \text{(iii)}$$

where CMC is the critical micelle concentration and AN is the micelle aggregation number

The aggregate molecular weight (AMW) of a protein-free micelle can be calculated as follows:

$$\text{AMW} = \text{AN} \times \text{monomer molecular weight} \quad \text{(iv)}$$

where AN is the micelle aggregation number

Typical micelle aggregate molecular weights range from 20 to 100 kDa. It should be noted that determination of the aggregate molecular weight of a protein-detergent complex is more involved and is addressed later in this publication. See "Aggregate Molecular Weight of Protein/Detergent Complexes", page 12.

Detergent removal

The CMC is also important in determining which method should be used to remove excess or unwanted detergent. Detergents may interfere with certain applications and must be removed when reconstituting into liposomes[46, 47]. Detergents with high CMCs are easily removed by dialysis; detergent solutions can be diluted below their CMC so that micelles disintegrate into monomers which can easily pass through dialysis tubing over time[7]. Typically, detergent solutions are dialyzed against a large excess (*i.e.*, 200-fold) of detergent-free buffer for days with several changes of the detergent-free buffer over this time. Detergents with low CMCs are typically removed by adsorption to hydrophobic beads[48]. Detergent bound beads can

then be removed by filtration or centrifugation. Detergents can also be removed by various types of column chromatography. Gel filtration can be used to separate detergent micelles from protein-detergent complexes and free protein based on size differences. Detergents can also be removed or exchanged while Histidine-tagged proteins are bound to Nickel resin[7].

Detergents and biological membranes

Biological membranes are bilayers of phospholipid molecules; the general architecture of the bilayer is depicted below (Figure 5).

Architecture of the Lipid Bilayer

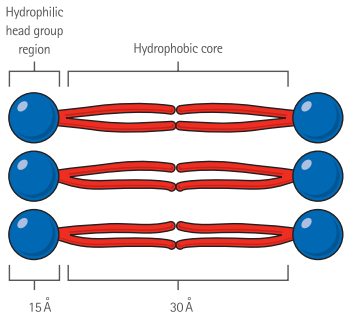

Figure 5

The tails of the lipid acyl chains orient towards each other (creating a non-polar, hydrophobic core) while the polar, phosphoester head groups contact the surrounding bulk water phase. Thus, the bilayer is divided into two distinct regions: the hydrophobic core and the hydrophilic head group region. Each "compartment" has unique properties that differentially affect the proteins that reside within the bilayer. The hydrophobic core of the bilayer, composed of phospholipid acyl chains, is approximately 30 Å thick, and provides the low dielectric environment for the solvation of hydrophobic regions of integral membrane proteins[49, 50]. This region is generally quite fluid at biologically relevant temperatures; bilayer fluidity is often necessary for protein function and lateral diffusion of proteins. The hydrophilic head group region is generally polar and charged. This region interacts with membrane proteins through Columbic forces which stabilize extra-membrane loops and interact with the polar ends of α-helices[49, 50].

Biological membranes are asymmetric with respect to lipids and proteins. For example, the composition of lipids in the different leaflets of red blood cell membranes contributes to the pliability of these cells, permitting their passage through the vasculature (outer leaflet: 76% phosphatidylcholine (PC), 82% sphingomyelin (SP), 20% phosphatidylethanolamine (PE), 0% phosphatidylserine (PS); inner leaflet: 24% PC, 18% SP, 80% PE, 100% PS. Percentages are of total lipid content.)[51]. Additionally, proteins may be preferentially located either on the inner or outer leaflet of the membrane, and in a preferred orientation. This asymmetry can be important when deciding how best to extract a membrane protein and what conditions (*i.e.*, detergents and/or lipids) are best for reconstitution for biochemical studies.

Extracting proteins from the membrane

To study membrane proteins, they must first be extracted from the membrane and maintained in a soluble, native, functional form. During the extraction process, it has been proposed that detergent monomers first partition into the bilayer.

Cooperative detergent-detergent interactions destabilize the bilayer yielding mixed lipid-detergent fragments (Figure 6A). Eventually, further detergent addition leads to bilayer dissolution and protein solubilization (Figure 6B)[8, 52].

Solubilization of Membranes

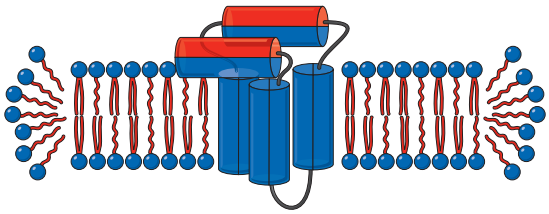

Figure 6A

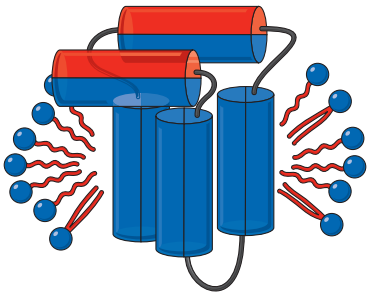

Figure 6B

There are several "degrees" to which a membrane protein can be extracted from the membrane for further study. The protein can be purified in such a way that some native lipids remain bound to the protein. This can be accomplished by using detergents that are not efficient lipid solubilizing agents and by minimizing the duration of detergent exposure during column chromatography. Alternatively, a protein can be completely stripped of native lipids by using stringent detergents. This may be important in applications where homogenous protein preparations are required. Lipids can then be added back to these preparations if necessary for protein activity and/or stability.

It should be noted that studying the membrane proteins within specialized membrane microdomains, known as lipid rafts, presents a unique problem. Lipid rafts are enriched in sphingolipids, glycerophospholipids, and cholesterol[53-55]. These domains, also called detergent-resistant membranes (DRMs), have been shown to play key roles in cell signaling and protein sorting. Historically, DRMs have been detected by their resistance to solubilization by cold Triton X-100. However, it has been shown that the characteristics of these DRMs are dependent upon the detergents used in their isolation. For example, Schuck *et al.* showed that the amounts and types of proteins and lipids associated with DRMs varied dramatically when different detergents were used to isolate the membrane domain[53]. Thus, caution should be exercised when choosing an appropriate detergent to isolate proteins from native membranes.

Working with solubilized membrane proteins

Some of the more common detergents that have been shown to be useful in membrane protein functional and structural studies are the alkyl glycosides[56-58]. For example, short chain alkyl maltosides and glucosides have been successful in the crystallization of membrane proteins[59-63] whereas longer-chain glycosides (*i.e.*, dodecyl maltoside, tetradecyl maltoside, and hexadecyl maltoside) have been shown to stabilize various oligomeric states of the G-protein coupled receptor (GPCR), rhodopsin[64]. Dodecyl maltoside, for example, has been used to crystallize the membrane protein cytochrome c oxidase from *Rhodobacter sphaeroides*[65], to study the unfolding of the 4-trans-membrane helix protein DsbB from the inner membrane of *E. coli*[66], and to study the light-induced structural changes in mammalian rhodopsin by ^{19}F NMR[67].

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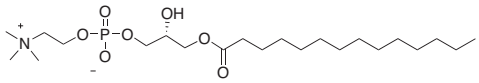
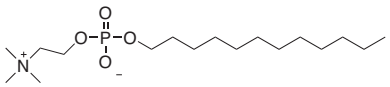
Other detergents that are finding an increasing use in membrane protein biochemistry are the lysophospholipids, Fos-Choline detergents, and short chain phospholipids (Figure 7).

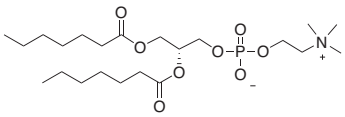
Phospholipid-like Detergents



Lysomyristoylphosphatidylcholine



Fos-Choline 12



Dihexanoylphosphatidylcholine
Figure 7

Lysophospholipids are similar to the native phospholipids in which membrane proteins are embedded; they have phospholipid-like head groups, however, their hydrophobic tails contain only a single acyl chain and they form water-soluble aggregates. Indeed, some GPCRs remain functional after extraction into lysophospholipid micelles[68-70]. Lysophospholipids have also been used in NMR structural studies of membrane proteins as well as in the purification of the cystic fibrosis transmembrane conductance regulator (CFTR)[71, 72]. As mentioned previously, the Fos-Choline detergents have been successfully used in membrane protein studies by NMR[14-16]. Short chain phospholipids such as dihexanoylphosphatidylcholine (DHPC), have been used to solubilize and reconstitute integral membrane proteins. These compounds form water-soluble micelles in solution and have been shown to maintain native protein structure and function when used in membrane protein purification protocols[73, 75]. For example, the NMR structure of the *E. coli* outer membrane protein X (OmpX) was determined in DHPC micelles[76].

Membrane proteins can also be reconstituted into detergent-lipid mixed micelles. This may be the closest representative bilayer-mimetic system. For example, bacteriorhodopsin has been refolded into several different detergent-lipid systems including CHAPS/DMPC and CHAPSO/SDS/DMPC micelles[77, 78].

Practical considerations

There are several practical issues to consider when working with detergents and membrane proteins. First, one must determine the degree of detergent purity and homogeneity required for specific applications. For example, when purifying and/or crystallizing proteins, one may choose a detergent that is both pure (*i.e.*, free of contaminating alcohols, amides, or other by-products of synthesis) and homogeneous (*i.e.*, composed of a single species). Many industrial grade detergents, including Triton and Tween, may be pure, but are heterogeneous in the composition of their polyoxyethylene chains. These detergents may be less suitable for crystallization screens, but may be sufficient for protein extraction.

Secondly, when determining the molecular weight of a solubilized membrane protein, one must consider the aggregate molecular weight of the detergent-protein complex (Figure 8). If it can be assumed that there is one protein molecule per micelle and if the protein is smaller than the micelle, then the aggregate weight of the complex is equal to the protein molecular weight plus the micelle aggregate weight. However, larger membrane proteins will tend to complex with a higher amount of detergent than is present in a free micelle alone. In this case, the detergent concentration must be sufficient to completely coat the exposed regions of the transmembrane domain.

Aggregate Molecular Weight of Protein/Detergent Complexes

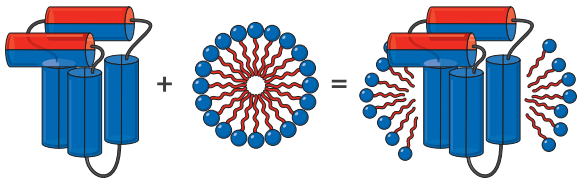


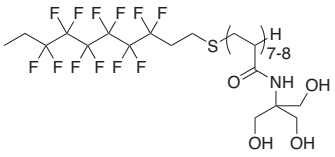
Figure 8

Similarly, it is important to note that when one is concentrating a solution of detergent-solubilized protein, the concentration of empty micelles may also increase as their molecular weight may be greater than the molecular weight cut off of a concentrator membrane. Several methods exist for determining the detergent concentration in solution including colorimetric assays[79], thin layer chromatography[80], refractive index measurements[81], light scattering measurements[81], and analytical ultracentrifugation[82, 83]. Some of these methods are useful for determining the concentration of free detergent in solution[79-81]. Others are useful for determining the amount of protein-bound detergent[79, 80, 83] or the size of a protein-detergent complex [81, 83].

Non-detergent surfactants and other novel detergents

As mentioned previously, membrane proteins can be destabilized or denatured by certain detergents including ionic detergents and short chain nonionic detergents. Hemifluorinated surfactants (Figure 9A) and amphipols (Figure 9B) are two very different non-detergent surfactants that have been used in membrane protein studies.

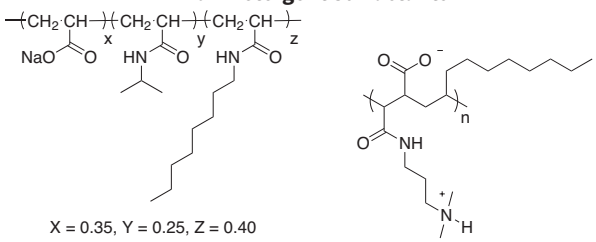
Non-Detergent Surfactants



HF-TAC

Figure 9A

Non-Detergent Surfactants



A8-35 **PMAL-C8**

Figure 9B

Hemifluorinated surfactants contain a fluorinated hydrophobic tail and a polar head group[84-86]. Fluorinated chains are unique in that they are not miscible with hydrocarbons (*i.e.*, lipids). Therefore, these compounds cannot be used to solubilize membrane proteins. One compound, HF-TAC, has been shown to maintain the solubility and stability of bacteriorhodopsin and cytochrome b_6f complex[84]. It has been suggested that HF-TAC retains protein-bound lipids better than

traditional detergents; this likely contributes to the stability of the cytochrome b_6f complex within these compounds. Other zwitterionic perfluorinated detergents are known to align in a magnetic field and may be useful as tools for NMR studies of membrane proteins[87].

Amphiphols are amphipathic polymers that wrap around membrane proteins to maintain their solubility[88]. Amphiphols are unique in that they bind proteins tightly and protein-amphipol complexes are stable for long periods of time[89]. Due to this tight binding, excess amphipol can often be removed from the bulk solution without affecting protein stability. Several membrane proteins have been studied in complexes with amphipols including the photosynthetic reaction center from *Rhodobacter sphaeroides*[90], the acetylcholine receptor[91], diacylglycerol kinase[92], OmpA, FomA, and bacteriorhodopsin[93].

Several additional novel detergent alternatives have been proposed over the past few years including lipopeptides (Figure 10A) and tripod amphiphiles (Figure 10B).

Novel Detergent Alternatives

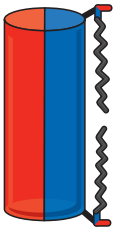


Figure 10A

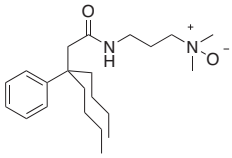


Figure 10B

Lipopeptides contain two hydrophobic alkyl chains separated by a short amphipathic peptide[94]. These compounds self assemble such that the alkyl chains effectively solubilize hydrophobic domains of membrane proteins while the small peptide forms a shell around the complex to render it water soluble. These compounds have been shown to maintain the solubility of bacteriorhodopsin, PagP, and a lac permease-cytochrome b562 fusion protein[94].

Tripod amphiphiles are unique amine oxides that have been used in the solubilization and crystallization of bacteriorhodopsin. These compounds contain three rigid chains that have been suggested to promote membrane protein crystallization[95, 96].

Model membrane systems

Several novel model membrane systems incorporating both detergents and lipids have also been used to study integral membrane proteins. Nanodiscs are self-assembling complexes that consist of a phospholipid bilayer core surrounded by an amphipathic membrane scaffold protein (MSP) (Figure 11)[97, 98]. The MSP is a 200-residue protein that is a series of linked amphipathic helices. A target protein can be incorporated into the self-assembly process and theoretically be reconstituted into a native-like environment. A single molecule of bacteriorhodopsin was successfully incorporated into these nanodiscs[97] as was heterologously expressed, functional Arabidopsis cytochrome P450 and P450 reductase[99].

Model Membrane Systems

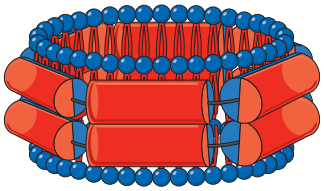


Figure 11

Bicelles are unique model membrane systems composed of both lipids and detergents that have found applications in solution and solid-state NMR[100-103] and more recently in membrane protein crystallography[104, 105]. Bicelles are prepared by mixing lipids such as dimyristoylphosphatidylcholine (DMPC) with edge-stabilizing detergents (*i.e.*, CHAPSO) or short chain lipids such as dihexanoylphosphatidylcholine (DHPC) in 4:1 to 1.5:1 lipid:detergent molar ratios. These edge stabilized planar bilayered assemblies present several advantages over traditional mixed micellar systems: (1) bicelles represent a more native-like environment for structural studies of membrane proteins; (2) the effects of membrane curvature may be less pronounced than seen in pure detergent micelles; (3) for NMR studies, bicelle aggregate sizes are sufficiently small and they can be aligned in a magnetic field; (4) for crystallization trials, bicelles are easy to manipulate and the crystals produced from them can be easily isolated and mounted for diffraction.

Detergents are indispensable when working with integral membrane proteins. By nature of their amphiphilic character, detergents are able to partition into biological membranes, extract proteins, and maintain protein solubility in solution. Detergents are useful in a wide variety of other applications as well including PAGE, inclusion body solubilization, and lipid raft preparation. Unfortunately, there is not an easy method for choosing which detergent may be best for a particular application. However, several studies have been published comparing the effects of different detergents on membrane protein solubility, activity, and structure[106-114]. These studies can be used as guides for determining which detergents may be most suitable for a particular protein or application. Different detergents display unique physical-chemical properties; the ionic charge, degree of hydrophobicity, and molecular size each contribute to the function of a detergent in solution. These properties should guide the researcher in choosing an appropriate detergent for their particular application.

Table 1: Useful equations

Application	Equation
Total detergent concentration	[CMC] + [free micellar] + [protein-associated detergent]
Micelle concentration	([total detergent] - [CMC]) / AN
Micelle aggregate molecular weight	AN X monomer MW

CMC = Critical Micelle Concentration; AN = Aggregation number; MW = Molecular Weight.

(Continued on next page)

Table 2: Reasons for detergent insolubility

Occasionally a detergent solution will precipitate upon cooling or after storage for several days or even weeks. Here are some possible reasons why this may occur:

Problem	Explanation	Solution
Microbial growth	Sugar derivatives are easily degraded by microorganisms and, therefore, are an excellent substrate for microbial growth.	Prepare solutions containing sugar-based detergents frequently, store at 4°C, and filter to prevent precipitation. EDTA can also be included at 0.2% as long as the pH is >6.0.
Presence of alcohol	Occasionally a small amount of the alcohol used to prepare alkyl glycosides may be present in the purified detergent. At low temperatures the alcohol may precipitate out of solution. The presence of alcohol may also depress the cloud point of the detergent causing phase separation to occur at a lower temperature than expected.	Check the specifications of your detergent; Anagrade® detergents contain <0.005% starting alcohol.
Kinetic effect	A detergent may "dissolve" as an aggregate at room temperature. Therefore, when it is cooled to 4°C, the aggregate precipitates out of solution; thus, the detergent was never truly dissolved.	Heat the solution to 50°C during solubilization and then cool back to room temperature. This should prevent re-precipitation at 4°C.
Supersaturation	A detergent solution that is supersaturated may appear to be fully solubilized for days. When cooled to 4°C, the detergent may precipitate.	Reduce the detergent concentration to eliminate precipitate or store at room temperature.

Table 3: Factors affecting CMC and aggregation numbers

Factors that increase CMC	• Carbon-Carbon double bonds • Polar groups within the hydrophobic tail • Ionic head groups
Factors that decrease CMC	• Increasing number of methylene groups in the alkyl chain • Phenyl rings in the alkyl chain • Fluorocarbons within the hydrophobic tail • Addition of electrolytes to solutions of ionic detergents
Factors that increase aggregation number	• Increasing number of methylene groups in the alkyl chain • Addition of counterions (for ionic detergents)
Factors that decrease aggregation number	• Increasing size of hydrophilic head group • Polar organic additives • Addition of hydrocarbons to solution

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Detergent Properties Listed Alphabetically

The detergents are arranged in alphabetical order. The conditions used to measure CMC values and aggregation numbers are located in further sections of the catalog.

Product No.	Page No.	Detergent	Type	FW	CMC mM (%)	Aggregation No.
A110MT	144	2-Aminoethyl Methane Thiosulfonate Hydrobromide (MTSEA)	C	236.2	N/A	N/A
A835	129	Amphipol A8-35	C	~ 8000.0	N/A	N/A
A340	39	Anameg®-7	N	335.4	19.5 (0.65%)	~ 92
APT020	102	Anapoe-20	N	1228.0	0.059 (0.0072%)	N/A
APB035	102	Anapoe-35	N	avg. 1198.0	0.091 (0.011%)	40
APB058	102	Anapoe-58	N	1122	0.004 (0.00045%)	N/A
APT080	103	Anapoe-80	N	avg. 1310.0	0.012 (0.0016%)	~ 58
APO106	103	Anapoe-$C_{10}E_6$	N	avg. 423.0	0.9 (0.038%)	~ 40
APO109	103	Anapoe-$C_{10}E_9$	N	avg. 555.0	1.3 (0.072%)	N/A
APO128	104	Anapoe-$C_{12}E_8$	N	avg. 539.0	0.09 (0.0048%)	~ 123
APO129	104	Anapoe-$C_{12}E_9$	N	avg. 583.0	0.05 (0.003%)	N/A
AP1210	104	Anapoe-$C_{12}E_{10}$	N	avg. 627.0	0.2 (0.013%)	N/A
APO138	105	Anapoe-$C_{13}E_8$	N	avg. 553.0	0.1 (0.0055%)	N/A
APND40	105	Anapoe-NID-P40	N	avg. 603.0	0.05-0.3	100-155
APX100	105	Anapoe-X-100	N	avg. 647.0	0.23 (0.015%)	75-165
APX114	106	Anapoe-X-114	N	avg. 536.0	0.2 (0.011%)	N/A
APX305	106	Anapoe-X-305	N	avg. 1526.0	0.65	N/A
APX405	106	Anapoe-X-405	N	avg. 1967.0	0.81 (0.16%)	N/A
AZ308	107	Anzergent 3-8, Analytical Grade	Z	279.6	390 (10.9%)	N/A
AZ310	107	Anzergent 3-10, Analytical Grade	Z	307.6	39 (1.2%)	~ 41
AZ312	107, 120	Anzergent 3-12, Analytical Grade	Z	335.5	2.8 (0.094%)	~ 55-87
AZ314	108	Anzergent 3-14, Analytical Grade	Z	363.6	0.2 (0.007%)	~ 83-130
AZ316	108	Anzergent 3-16, Analytical Grade	Z	391.7	10 - 60	~ 155
AZ318	108	Anzergent 3-18, Analytical Grade	Z	419.7	N/A	N/A
B300	109	Big Chap, Analytical Grade	N	878.1	2.9 (0.25%)	~ 10
B310	109	Big Chap, Deoxy, Analytical Grade	N	862.1	1.4 (0.12%)	~ 8-16
B518	131	BisMalt-18	N	949.1	N/A	N/A
B520	131	BisMalt-20	N	977.1	N/A	N/A
B522	131	BisMalt-22	N	1005.2	N/A	N/A
B524	132	BisMalt-24	N	1033.2	N/A	N/A
B528	132	BisMalt-28	N	1089.4	N/A	N/A
B035	112	Brij 35	N	avg. 1198.0	~ 0.091 (0.011%)	~ 40
C316	76, 112	CHAPS, Anagrade	Z	614.9	~ 8 (0.49%)	~ 10
C316S	76, 112	CHAPS, Sol-Grade®	Z	614.9	~ 8 (0.49%)	~ 10
C317	76, 113	CHAPSO, Anagrade	Z	630.9	~ 8 (0.50%)	~ 11
C408	46	C-HEGA®-8, Anagrade	N	349.5	~ 277 (9.7%)	N/A
C409	46	C-HEGA-9, Anagrade	N	363.5	~ 108 (3.9%)	N/A
C410	46	C-HEGA-10, Anagrade	N	377.5	~ 35 (1.3%)	N/A
C411	47	C-HEGA-11, Anagrade	N	391.5	~ 11.5 (0.45%)	N/A
CH220	77, 113	Chobimalt, Anagrade	N	1035.2	~ 0.004	N/A
CH200	77, 113	Cholesterol	N	386.6	N/A	N/A
CH210	77, 114	Cholesteryl Hemisuccinate Tris Salt	C	607.9	N/A	N/A
S1010S	110	Cholic Acid, Sodium Salt	I	430.6	~9.5 (0.41%)	~ 2.0-4.8
C508	78	Cyclofos-2, Anagrade	Z	293.8	~ 256 (7.5%)	N/A
C510	78	Cyclofos-3, Anagrade	Z	306.9	~ 43 (1.3%)	N/A
C512	78	Cyclofos-4, Anagrade	Z	320.9	~ 8.45 (0.45%)	N/A
C514	79	Cyclofos-5, Anagrade	Z	335	~ 4.5 (0.15%)	N/A
C516	79	Cyclofos-6, Anagrade	Z	349.2	~ 2.68 (0.094%)	N/A
C518	79	Cyclofos-7, Anagrade	N	363.3	~ 0.62 (0.022%)	N/A
C323G	31	CYGLU®-3, Anagrade	N	304.4	~ 28 (0.86%)	N/A
C324G	31	CYGLU-4, Anagrade	N	318.4	~ 1.8 (0.058%)	N/A
C321	31	CYMAL®-1, Anagrade	N	438.5	~ 340 (15%)	N/A
C322	32	CYMAL-2, Anagrade	N	452.5	~ 120 (5.4%)	N/A
C323	32	CYMAL-3, Anagrade	N	466.5	~ 34.5 (1.6%)	~ 5
C324	32	CYMAL-4, Anagrade	N	480.5	~ 7.6 (0.37%)	~ 25
C325	33	CYMAL-5, Anagrade	N	494.5	~ 2.4-5.0 (0.12%)	~ 47
NG325	33, 65	CYMAL-5 Neopentyl Glycol	N	972.5	0.058	N/A
C325S	34	CYMAL-5, Sol-Grade	N	494.5	~ 2.4-5.0 (0.12%)	~ 47

The types of detergents: A = Anionic / C = Cationic / N = Nonionic / Z = Zwitterionic

Detergent Properties Listed Alphabetically (continued)

Product No.	Page No.	Detergent	Type	FW	CMC mM (%)	Aggregation No.
C326	34	CYMAL-6, Anagrade	N	508.5	~ 0.56 (0.028%)	~ 91
C326LA	35	CYMAL-6, Anagrade	N	508.5	~ 0.56 (0.028%)	~ 91
NG326	35, 65	CYMAL-6 Neopentyl Glycol	N	1000.55	N/A	N/A
C326S	36	CYMAL-6, Sol-Grade	N	508.5	~ 0.56 (0.028%)	~ 91
C327	36	CYMAL-7, Anagrade	N	522.5	~ 0.19 (0.0099%)	~ 150
NG327	37, 65	CYMAL-7 Neopentyl Glycol	N	1028.58	N/A	N/A
C327S	37	CYMAL-7, Sol-Grade	N	522.5	~ 0.19 (0.0099%)	~ 150
D365	29	n-Decyl-N,N-Dimethylamine-N-Oxide, Anagrade	Z	201.4	~ 10.48 (0.211%)	~ 7
D352	110	n-Decyl-N,N-Dimethylglycine, Anagrade	Z	243.4	~ 19 (0.46%)	N/A
D321	39	n-Decyl-β-D-Glucopyranoside, Anagrade	N	320.4	~ 2.2 (0.070%)	N/A
NG321	39, 66	Decyl Glucose Neopentyl Glycol	N	624.41	N/A	N/A
D322HA	51	n-Decyl-α-D-Maltopyranoside, Anagrade	N	482.6	~ 1.66 (0.08%)	N/A
D322	51	n-Decyl-β-D-Maltopyranoside, Anagrade	N	482.6	~ 1.8 (0.087%)	~ 69
D322LA	51	n-Decyl-β-D-Maltopyranoside, Anagrade, Low Alpha	N	482.6	~ 1.8 (0.087%)	~ 69
D322S	52	n-Decyl-β-D-Maltopyranoside, Sol-Grade	N	482.6	~ 1.8 (0.087%)	~ 69
NG322	52, 66	Decyl Maltose Neopentyl Glycol	N	949.08	N/A	N/A
D910	52, 142	Decyl-β-D-Selenomaltoside	N	545.5	N/A	N/A
D323	68	n-Decyl-β-D-Thioglucopyranoside, Anagrade	N	336.4	~ 0.9 (0.30%)	N/A
D335	68	n-Decyl-β-D-Thiomaltopyranoside, Anagrade	N	498.6	~ 0.9 (0.045%)	~ 75
D380	110	Deoxycholic Acid, Sodium Salt, Anagrade	A	414.6	~ 6 (0.24%)	~ 22
D607	92	1,2-Diheptanoyl-sn-Glycero-3-Phosphocholine	Z	481.5	N/A	N/A
D516	92	1,2-Dihexadecanoyl-sn-Glycero-3-Phosphocholine	Z	734.039	N/A	N/A
D606	92	1,2-Dihexanoyl-sn-Glycero-3-Phosphocholine	Z	453.5	N/A	N/A
DH325	53	2,6-Dimethyl-4-Heptyl-β-D-Maltoside	N	468.5	~ 27.5 (1.2%)	N/A
D614	93	1,2-Dimyristoyl-sn-Glycero-3-[Phospho-rac-(1-Glycerol)], Sodium Salt	C	688.9	N/A	N/A
D514	93	1,2-Dimyristoyl-sn-Glycero-3-Phosphocholine	Z	677.9	N/A	N/A
D608	93	1,2-Dioctanoyl-sn-Glycero-3-Phosphocholine	Z	509.6	N/A	N/A
D518	94	1,2-Dioleoyl-sn-Glycero-3-Phosphocholine	Z	786.113	N/A	N/A
D360	29, 120	n-Dodecyl-N,N-Dimethylamine-N-Oxide, Anagrade	Z	229.4	~1-2 (0.023%)	~ 76
D360S	29	n-Dodecyl-N,N-Dimethylamine-N-Oxide, Sol-Grade	Z	229.4	~ 1-2 (0.023%)	~ 76
D350	111, 120	n-Dodecyl-N,N-Dimethylglycine, Anagrade	Z	271.4	~ 1.5 (0.041%)	N/A
D350S	111	n-Dodecyl-N,N-Dimethylglycine, Sol-Grade	Z	271.4	~ 1.5 (0.041%)	N/A
D318	40	n-Dodecyl-β-D-Glucopyranoside, Anagrade	N	348.5	~ 0.19 (0.0066%)	N/A
D310HA	53	n-Dodecyl-α-D-Maltopyranoside, Anagrade	N	510.6	~ 0.152 (0.0076%)	~ 90
D310	54	n-Dodecyl-β-D-Maltopyranoside, Anagrade	N	510.6	~ 0.17 (0.0087%)	~ 78-149
D310A	54	n-Dodecyl-β-D-Maltopyranoside, Anagrade	N	510.6	~ 0.17 (0.0087%)	~ 78-149
D310LA	55	n-Dodecyl-β-D-Maltopyranoside, Anagrade	N	510.6	~ 0.17 (0.0087%)	~ 78-149
D310S	55	n-Dodecyl-β-D-Maltopyranoside, Sol-Grade	N	510.6	~ 0.17 (0.0087%)	~ 78-149
D310T	56, 135	n-Dodecyl-d25-β-D-Maltopyranoside	N	535.8	~ 0.2	N/A
D912	56, 142	Dodecyl-β-D-Selenomaltoside	N	573.6	N/A	N/A
D342	68	n-Dodecyl-β-D-Thiomaltopyranoside, Anagrade	N	526.6	~ 0.05 (0.0026%)	~ 126
F300	81	Fos-Choline-8, Anagrade	Z	295.4	~ 114 (3.4%)	N/A
F300F	81, 139	Fos-Choline-8, Fluorinated, Anagrade	Z	529.2	2.2	N/A
F300S	81	Fos-Choline-8, Sol-Grade	Z	295.4	~ 114 (3.4%)	N/A
F302	82	Fos-Choline-9, Anagrade	Z	309.4	~ 39.5 (1.2%)	~ 5
F302S	82	Fos-Choline-9, Sol-Grade	Z	309.4	~ 39.5 (1.2%)	~ 5
F304	82	Fos-Choline-10, Anagrade	Z	323.4	~ 11 (0.35%)	~ 24
F304PDH	83, 135	Fos-Choline-10, Per Deuterated Head	Z	336.5	N/A	N/A
F304SDH	83, 135	Fos-Choline-10, Semi Deuterated Head	Z	332.5	N/A	N/A
F304S	83	Fos-Choline-10, Sol-Grade	Z	323.4	~ 11 (0.35%)	~ 24
F306	84	Fos-Choline-11, Anagrade	Z	337.4	~ 1.85 (0.062%)	~ 18
F306PDH	84, 135	Fos-Choline-11, Per Deuterated Head	Z	350.5	N/A	N/A
F306SDH	84, 136	Fos-Choline-11, Semi Deuterated Head	Z	346.5	N/A	N/A
F306S	84	Fos-Choline-11, Sol-Grade	Z	337.4	~ 1.85 (0.062%)	~ 18
F308	85, 121	Fos-Choline-12, Anagrade	Z	351.5	~ 1.5 (0.047%)	~ 54
F308D	85, 136	Fos-Choline-12, Deuterated	Z	389.8	~ 1.5 (0.047%)	~ 54
F308PDH	85, 136	Fos-Choline-12, Per Deuterated Head	Z	364.5	N/A	N/A
F308PDT	86, 137	Fos-Choline-12, Per Deuterated Tail	Z	376.6	N/A	N/A
F308SDH	86, 137	Fos-Choline-12, Semi Deuterated Head	Z	360.5	N/A	N/A
F308S	86	Fos-Choline-12, Sol-Grade	Z	351.5	~ 1.5 (0.047%)	~ 54

(Continued on next page)

Detergent Properties Listed Alphabetically (continued)

Product No.	Page No.	Detergent	Type	FW	CMC mM (%)	Aggregation No.
F310	87	Fos-Choline-13, Anagrade	Z	365.5	~ 0.75 (0.027%)	~ 87
F310S	87	Fos-Choline-13, Sol-Grade	Z	365.5	~ 0.75 (0.027%)	~ 87
F312	87	Fos-Choline-14, Anagrade	Z	379.5	~ 0.12 (0.0046%)	~ 108
F312D	88, 137	Fos-Choline-14, Deuterated	Z	421.5	~ 0.12 (0.0051%)	~ 108
F312PDH	88, 137	Fos-Choline-14, Per Deuterated Head	Z	392.6	N/A	N/A
F312SDH	88, 138	Fos-Choline-14, Semi Deuterated Head	Z	388.6	N/A	N/A
F312S	88	Fos-Choline-14, Sol-Grade	Z	379.5	~ 0.12 (0.0046%)	~ 108
F314	89	Fos-Choline-15, Anagrade	Z	393.5	~ 0.07 (0.0027%)	~ 131
F314S	89	Fos-Choline-15, Sol-Grade	Z	393.5	~ 0.07 (0.0027%)	~ 131
F316	89	Fos-Choline-16, Anagrade	Z	407.5	~ 0.013 (0.00053%)	~ 178
F316S	90	Fos-Choline-16, Sol-Grade	Z	407.5	~ 0.013 (0.00053%)	~ 178
FCI09	90	Fos-Choline-ISO-9, Anagrade	Z	309	~ 32 (0.99%)	N/A
FCI11	90	Fos-Choline-ISO-11, Anagrade	Z	337.4	~ 26.6 (0.9%)	N/A
FCU110	90	Fos-Choline-Unsat-11-10	Z	335.4	~ 6.2 (0.21%)	N/A
F208	91	Fos-Mea®-8, Anagrade	Z	267	~ 22.0 (0.59%)	N/A
F210	91	Fos-Mea-10, Anagrade	Z	295	~ 5.25 (0.15%)	N/A
F212	91	Fos-Mea-12, Anagrade	Z	323	~ 0.43 (0.014%)	N/A
GDN101	133	GDN	N	1165.31	N/A	N/A
H108	47	HEGA-8, Anagrade	N	351.5	~ 109 (3.8%)	N/A
H109	47	HEGA-9, Anagrade	N	365.5	~ 39 (1.4%)	~ 5
H110	48	HEGA-10, Anagrade	N	379.5	~ 7.0 (0.26%)	N/A
H111	48	HEGA-11, Anagrade	N	393.5	~ 1.4 (0.055%)	N/A
H300	40	n-Heptyl-β-D-Glucopyranoside, Anagrade	N	278.4	~ 70 (1.9%)	N/A
H300LA	40	n-Heptyl-β-D-Glucopyranoside, Anagrade	N	278.4	~ 70 (1.9%)	N/A
H907	41, 142	Heptyl-β-D-Selenoglucoside	N	341.3	N/A	N/A
H301	69	n-Heptyl-β-D-Thioglucopyranoside, Anagrade	N	294.4	~ 29 (0.85%)	N/A
H301LA	69	n-Heptyl-β-D-Thioglucopyranoside, Anagrade	N	294.4	~ 29 (0.85%)	~ 27
H320	56	n-Hexadecyl-β-D-Maltopyranoside, Anagrade	N	566.6	~ 0.0006 (0.00003%)	N/A
H360	114, 125	Hexaethylene Glycol Monodecyl Ether, Analytical Grade	N	422.6	0.9	~ 73
H350	114, 125	Hexaethylene Glycol Monooctyl Ether, Anagrade	N	394.5	~ 10 (0.39%)	~ 32
H305	41	n-Hexyl-β-D-Glucopyranoside, Anagrade	N	264.4	~ 250 (6.6%)	N/A
H310	57	n-Hexyl-β-D-Maltopyranoside, Anagrade	N	426.4	~ 210 (8.9%)	N/A
I1003	114	IPTG	N	238.31	N/A	N/A
L360S	30	LAPAO, Sol-Grade	Z	300.6	~ 1.56 (0.052%)	~ 126
NG318	41, 66	Lauryl Glucose Neopentyl Glycol	N	680.47	N/A	N/A
NG310	57, 67	Lauryl Maltose Neopentyl Glycol	N	1005.19	N/A	N/A
L212	95	LysoFos Choline 12, Anagrade	Z	439.5	~ 0.32	N/A
L214	95	LysoFos Choline 14, Anagrade	Z	467.6	~ 0.036	N/A
L216	95	LysoFos Choline 16, Anagrade	Z	495.6	~ 0.0032	N/A
L412	96	LysoFos Choline Ether 12, Anagrade	Z	425.5	N/A	N/A
L414	96	LysoFos Choline Ether 14, Anagrade	Z	453.6	N/A	N/A
L416	96	LysoFos Choline Ether 16, Anagrade	Z	481.7	N/A	N/A
L312	97	LysoFos Glycerol 12, Anagrade	C	450.4	N/A	N/A
L314	97	LysoFos Glycerol 14, Anagrade	C	478.5	N/A	N/A
L316	97	LysoFos Glycerol 16, Anagrade	C	506.5	N/A	N/A
M319	48	Mega-8, Anagrade	N	321.4	~ 79 (2.5%)	N/A
M325	49	Mega-9, Anagrade	N	335.5	~ 25 (0.84%)	N/A
M320	49	Mega-10, Anagrade	N	349.5	~ 6-7 (0.21%)	N/A
LCP18	140	MonoOlein	N	356.54	N/A	N/A
LCP16	140	MonoPalmitolein	N	328.49	N/A	N/A
ND195	119	NDSB-195	Z	195.3	N/A	N/A
ND201	119	NDSB-201	Z	201.2	N/A	N/A
ND211	119	NDSB-211	Z	211.3	N/A	N/A
ND221	119	NDSB-221	Z	221.3	N/A	N/A
ND256	119, 121	NDSB-256	Z	257.4	N/A	N/A
NIDP40	115	Nonidet P40 Substitute	N	avg. 603.0	~ 0.05-0.3	~ 100-155
N324	42	n-Nonyl-β-D-Glucopyranoside, Anagrade	N	306.4	~ 6.5 (0.20%)	~ 133
N324LA	42	n-Nonyl-β-D-Glucopyranoside, Anagrade	N	306.4	~ 6.5 (0.20%)	~ 133
N324S	42	n-Nonyl-β-D-Glucopyranoside, Sol-Grade	N	306.4	~ 6.5 (0.20%)	~ 133
N330	58	n-Nonyl-β-D-Maltopyranoside, Anagrade	N	468.5	~ 6 (0.28%)	~ 55

The types of detergents: A = Anionic / C = Cationic / N = Nonionic / Z = Zwitterionic

Detergent Properties Listed Alphabetically (continued)

Product No.	Page No.	Detergent	Type	FW	CMC mM (%)	Aggregation No.
N335	69	n-Nonyl-β-D-Thioglucopyranoside, Anagrade	N	322.4	~ 2.9 (0.093%)	N/A
N350	70	n-Nonyl-β-D-Thiomaltopyranoside, Anagrade	N	484.6	~ 3.2 (0.15%)	N/A
O330	115, 125	Octaethylene Glycol Monododecyl Ether, Anagrade	N	538.8	~ 0.09 (0.0048%)	~ 90-120
O330A	115, 125	Octaethylene Glycol Monododecyl Ether, Analytical Grade	N	538.8	~ 0.09 (0.0048%)	~ 90-120
O312	43	n-Octyl-β-D-Galactopyranoside, Anagrade	N	292.4	~ 29.5 (0.86%)	N/A
O311HA	43	n-Octyl-α-D-Glucopyranoside, Anagrade	N	292.4	~ 10-21 (0.3-0.6%)	N/A
O311	43	n-Octyl-β-D-Glucopyranoside, Anagrade	N	292.4	~ 18-20 (0.53%)	~ 27-100
O311S	44	n-Octyl-β-D-Glucopyranoside, Sol-Grade	N	292.4	~ 18-20 (0.53%)	~ 27-100
O311T	44, 138	n-Octyl-d17-β-D-Glucopyranoside	N	309.5	18-20	N/A
O311D	45, 138	n-Octyl-d17-β-D-Glucopyranoside-d7	N	316.5	~ 18-20	N/A
NG311	45, 67	Octyl Glucose Neopentyl Glycol	N	568.69	N/A	N/A
O310	58	n-Octyl-β-D-Maltopyranoside, Anagrade	N	454.4	~ 19.5 (0.89%)	~ 47
O310S	58	n-Octyl-β-D-Maltopyranoside, Sol-Grade	N	454.4	~ 19.5 (0.89%)	~ 47
O310F	59, 139	Octyl Maltoside, Fluorinated, Anagrade	N	688.4	~ 1.02	N/A
O908	45, 142	Octyl-β-D-Selenoglucoside	N	355.3	N/A	N/A
O918	59, 143	Octyl-β-D-Selenomaltoside	N	517.5	N/A	N/A
O314	70	n-Octyl-β-D-Thioglucopyranoside, Anagrade	N	308.4	~ 9 (0.28%)	N/A
O314LA	70	n-Octyl-β-D-Thioglucopyranoside, Anagrade	N	308.4	~ 9 (0.28%)	~ 189
O320	70	n-Octyl-β-D-Thiomaltopyranoside, Anagrade	N	470.6	~ 8.5 (0.40%)	N/A
P516	94	1-Palmitoyl-2-Oleoyl-sn-Glycero-3-Phosphocholine	Z	760.076	N/A	N/A
P416	94, 121	1-Palmitoyl-2-Oleoyl-sn-Glycero-3-Phosphoethanolamine	Z	717.996	N/A	N/A
P340	115, 126	Pentaethylene Glycol Monodecyl Ether, Anagrade	N	378.6	~ 0.81 (0.031%)	~ 73
P350	116, 126	Pentaethylene Glycol Monooctyl Ether, Anagrade	N	350.5	~ 7.1 (0.25%)	N/A
P300	116	Pluronic F-68	N	~ 8400.0	~ 17.9	N/A
P305	116	Pluronic F-127	N	~ 12600.0	~ 3.97	N/A
P5008	129	PMAL®-C8	Z	~ 18500.0	N/A	N/A
P5012	130	PMAL-C12	Z	~ 12000.0	N/A	N/A
P5016	130	PMAL-C16	Z	~ 39000-65000	N/A	N/A
P310	59	2-Propyl-1-Pentyl Maltopyranoside, Anagrade	N	455.5	~ 42.5 (1.9%)	N/A
S2000	143	L-(+)-Selenomethionine, Anagrade	N	196.1	N/A	N/A
T908	126, 143	12-Selenotetraethyleneglycol Mono Octyl Ether	N	369.4	N/A	N/A
S300	116	Sodium Dodecanoyl Sarcosine, Anagrade	A	293.4	~ 14.4 (0.42%)	N/A
S300S	117	Sodium Dodecanoyl Sarcosine, Sol-Grade	I	293.4	~ 14.4 (0.42%)	N/A
S110MT	144	Sodium (2-Sulfonatoethyl) Methanethiosulfonate (MTSES)	C	242.28	N/A	N/A
S350	60	Sucrose Monododecanoate, Anagrade	N	524.6	~ 0.3 (0.016%)	N/A
T360	30	n-Tetradecyl-N,N-Dimethylamine-N-Oxide, Anagrade	Z	257.5	~ 0.29 (0.0075%)	N/A
T305	111	n-Tetradecyl-N,N-Dimethylglycine, Anagrade	Z	299.4	~ 0.034 (0.0010%)	N/A
T315	60	n-Tetradecyl-β-D-Maltopyranoside, Anagrade	N	538.6	~ 0.01 (0.00054%)	N/A
T315S	60	n-Tetradecyl-β-D-Maltopyranoside, Sol-Grade	N	538.6	~ 0.01 (0.00054%)	N/A
T350	117, 126	Tetraethylene Glycol Monooctyl Ether, Anagrade	N	306.5	~ 8 (0.25%)	~ 82
TFA101	133	TFA	N	2148.42	N/A	N/A
T323	61	n-Tridecyl-β-D-Maltopyranoside, Anagrade	N	524.6	~ 0.033 (0.0017%)	~ 186
T323LA	61	n-Tridecyl-β-D-Maltopyranoside, Anagrade	N	524.6	~ 0.033 (0.0017%)	~ 186
T323S	61	n-Tridecyl-β-D-Maltopyranoside, Sol-Grade	N	524.6	~ 0.033 (0.0017%)	~ 186
T110MT	144	[2-(Trimethylammonium)ethyl] Methane Thiosulfonate Bromide	Z	278.24	N/A	N/A
T370	145	Tripao	Z	362.5	4.5	N/A
T385	145	Cy-Tripglu	N	665.8	1.8	N/A
T380	145	Ph-Tripglu	N	659.8	3.6	N/A
T1001	117	Triton X-100	N	avg. 647	~ 0.010-0.016 (w/v)	~ 75-165
T1002	117	Triton X-114	N	avg. 536	~ 0.009% (w/v)	N/A
T1003	118	Tween 20	N	avg. 1228	~ 0.059 (0.0072%)	N/A
T1005	118	Tween 40	N	~ 1284.0	0.027	N/A
T1004	118	Tween 80	N	avg. 1310	~ 0.012 (0.0016%)	~ 58
U300HA	62	n-Undecyl-α-D-Maltopyranoside, Anagrade	N	496.6	~ 0.58 (0.029%)	N/A
U300	62	n-Undecyl-β-D-Maltopyranoside, Anagrade	N	496.6	~ 0.59 (0.029%)	~ 71
U300LA	62	n-Undecyl-β-D-Maltopyranoside, Anagrade	N	496.6	~ 0.59 (0.029%)	~ 71
U300S	63	n-Undecyl-β-D-Maltopyranoside, Sol-Grade	N	496.6	~ 0.59 (0.029%)	~ 71
U360	30	n-Undecyl-N,N-Dimethylamine-Oxide, Anagrade	Z	215.4	~ 3.21 (0.069%)	N/A
U911	63, 143	Undecyl-β-D-Selenomaltoside	N	573.6	N/A	N/A
U342	71	n-Undecyl-β-D-Thiomaltopyranoside, Anagrade	N	512.7	~ 0.21 (0.011%)	~ 106
U310	63	ω-Undecylenyl-β-D-Maltopyranoside	N	494.6	~ 1.2 (0.059%)	N/A

Detergent Properties Listed by CMC Values

The detergents are arranged in the order of their CMC values. The conditions used to measure CMC values and aggregation numbers are located in further sections of the catalog.

Product No.	Page No.	Detergent	Type	FW	CMC mM (%)	Aggregation No.
H320	56	n-Hexadecyl-β-D-Maltopyranoside, Anagrade	N	566.6	~ 0.0006 (0.00003%)	N/A
L216	95	LysoFos Choline 16, Anagrade	Z	495.6	~ 0.0032	N/A
APB058	102	Anapoe-58	N	1122	0.004 (0.00045%)	N/A
CH220	77, 113	Chobimalt, Anagrade	N	1035.2	~ 0.004	N/A
T1002	117	Triton X-114	N	avg. 536	~ 0.009% (w/v)	N/A
T315	60	n-Tetradecyl-β-D-Maltopyranoside, Anagrade	N	538.6	~ 0.01 (0.00054%)	N/A
T315S	60	n-Tetradecyl-β-D-Maltopyranoside, Sol-Grade	N	538.6	~ 0.01 (0.00054%)	N/A
T1001	117	Triton X-100	N	avg. 647	~ 0.010-0.016 (w/v)	~ 75-165
APT080	103	Anapoe-80	N	avg. 1310.0	0.012 (0.0016%)	~ 58
T1004	118	Tween 80	N	avg. 1310	~ 0.012 (0.0016%)	~ 58
F316	89	Fos-Choline-16, Anagrade	Z	407.5	~ 0.013 (0.00053%)	~ 178
F316S	90	Fos-Choline-16, Sol-Grade	Z	407.5	~ 0.013 (0.00053%)	~ 178
T1005	118	Tween 40	N	~ 1284.0	0.027	N/A
T323	61	n-Tridecyl-β-D-Maltopyranoside, Anagrade	N	524.6	~ 0.033 (0.0017%)	~ 186
T323LA	61	n-Tridecyl-β-D-Maltopyranoside, Anagrade	N	524.6	~ 0.033 (0.0017%)	~ 186
T323S	61	n-Tridecyl-β-D-Maltopyranoside, Sol-Grade	N	524.6	~ 0.033 (0.0017%)	~ 186
T305	111	n-Tetradecyl-N,N-Dimethylglycine, Anagrade	Z	299.4	~ 0.034 (0.0010%)	N/A
L214	95	LysoFos Choline 14, Anagrade	Z	467.6	~ 0.036	N/A
APO129	104	Anapoe-$C_{12}E_9$	N	avg. 583.0	0.05 (0.003%)	N/A
D342	68	n-Dodecyl-β-D-Thiomaltopyranoside, Anagrade	N	526.6	~ 0.05 (0.0026%)	~ 126
APND40	105	Anapoe-NID-P40	N	avg. 603.0	0.05-0.3	100-155
NIDP40	115	Nonidet P40 Substitute	N	avg. 603.0	~ 0.05-0.3	~ 100-155
NG325	33, 65	CYMAL-5 Neopentyl Glycol	N	972.5	0.058	N/A
APT020	102	Anapoe-20	N	1228	0.059 (0.0072%)	N/A
T1003	118	Tween 20	N	avg. 1228	~ 0.059 (0.0072%)	N/A
F314	89	Fos-Choline-15, Anagrade	Z	393.5	~ 0.07 (0.0027%)	~ 131
F314S	89	Fos-Choline-15, Sol-Grade	Z	393.5	~ 0.07 (0.0027%)	~ 131
APO128	104	Anapoe-$C_{12}E_8$	N	avg. 539.0	0.09 (0.0048%)	~ 123
O330	115, 125	Octaethylene Glycol Monododecyl Ether, Anagrade	N	538.8	~ 0.09 (0.0048%)	~ 90-120
O330A	115, 125	Octaethylene Glycol Monododecyl Ether, Analytical Grade	N	538.8	~ 0.09 (0.0048%)	~ 90-120
APB035	102	Anapoe-35	N	avg. 1198.0	0.091 (0.011%)	40
B035	112	Brij 35	N	avg. 1198.0	~ 0.091 (0.011%)	~ 40
APO138	105	Anapoe-$C_{13}E_8$	N	avg. 553.0	0.1 (0.0055%)	N/A
F312	87	Fos-Choline-14, Anagrade	Z	379.5	~ 0.12 (0.0046%)	~ 108
F312D	88, 137	Fos-Choline-14, Deuterated	Z	421.5	~ 0.12 (0.0051%)	~ 108
F312S	88	Fos-Choline-14, Sol-Grade	Z	379.5	~ 0.12 (0.0046%)	~ 108
D310HA	53	n-Dodecyl-α-D-Maltopyranoside, Anagrade	N	510.6	~ 0.152 (0.0076%)	~ 90
D310	54	n-Dodecyl-β-D-Maltopyranoside, Anagrade	N	510.6	~ 0.17 (0.0087%)	~ 78-149
D310A	54	n-Dodecyl-β-D-Maltopyranoside, Anagrade	N	510.6	~ 0.17 (0.0087%)	~ 78-149
D310LA	55	n-Dodecyl-β-D-Maltopyranoside, Anagrade	N	510.6	~ 0.17 (0.0087%)	~ 78-149
D310S	55	n-Dodecyl-β-D-Maltopyranoside, Sol-Grade	N	510.6	~ 0.17 (0.0087%)	~ 78-149
C327	36	CYMAL-7, Anagrade	N	522.5	~ 0.19 (0.0099%)	~ 150
C327S	37	CYMAL-7, Sol-Grade	N	522.5	~ 0.19 (0.0099%)	~ 150
D318	40	n-Dodecyl-β-D-Glucopyranoside, Anagrade	N	348.5	~ 0.19 (0.0066%)	N/A
AP1210	104	Anapoe-$C_{12}E_{10}$	N	avg. 627.0	0.2 (0.013%)	N/A
APX114	106	Anapoe-X-114	N	avg. 536.0	0.2 (0.011%)	N/A
AZ314	108	Anzergent 3-14, Analytical Grade	Z	363.6	0.2 (0.007%)	~ 83-130
D310T	56, 135	n-Dodecyl-d25-β-D-Maltopyranoside	N	535.8	~ 0.2	N/A
U342	71	n-Undecyl-β-D-Thiomaltopyranoside, Anagrade	N	512.7	~ 0.21 (0.011%)	~ 106
APX100	105	Anapoe-X-100	N	avg. 647.0	0.23 (0.015%)	75-165
T360	30	n-Tetradecyl-N,N-Dimethylamine-N-Oxide, Anagrade	Z	257.5	~ 0.29 (0.0075%)	N/A
S350	60	Sucrose Monododecanoate, Anagrade	N	524.6	~ 0.3 (0.016%)	N/A
L212	95	LysoFos Choline 12, Anagrade	Z	439.5	~ 0.32	N/A
F212	91	Fos-Mea-12, Anagrade	Z	323	~ 0.43 (0.014%)	N/A
C326	34	CYMAL-6, Anagrade	N	508.5	~ 0.56 (0.028%)	~ 91
C326LA	35	CYMAL-6, Anagrade	N	508.5	~ 0.56 (0.028%)	~ 91
C326S	36	CYMAL-6, Sol-Grade	N	508.5	~ 0.56 (0.028%)	~ 91
U300HA	62	n-Undecyl-α-D-Maltopyranoside, Anagrade	N	496.6	~ 0.58 (0.029%)	N/A

The types of detergents: A = Anionic / C = Cationic / N = Nonionic / Z = Zwitterionic

Detergent Properties Listed by CMC Values (continued)

Product No.	Page No.	Detergent	Type	FW	CMC mM (%)	Aggregation No.
U300	62	n-Undecyl-β-D-Maltopyranoside, Anagrade	N	496.6	~ 0.59 (0.029%)	~ 71
U300LA	62	n-Undecyl-β-D-Maltopyranoside, Anagrade	N	496.6	~ 0.59 (0.029%)	~ 71
U300S	63	n-Undecyl-β-D-Maltopyranoside, Sol-Grade	N	496.6	~ 0.59 (0.029%)	~ 71
C518	79	Cyclofos-7, Anagrade	N	363.3	~ 0.62 (0.022%)	N/A
APX305	106	Anapoe-X-305	N	avg. 1526.0	0.65	N/A
F310	87	Fos-Choline-13, Anagrade	Z	365.5	~ 0.75 (0.027%)	~ 87
F310S	87	Fos-Choline-13, Sol-Grade	Z	365.5	~ 0.75 (0.027%)	~ 87
APX405	106	Anapoe-X-405	N	avg. 1967.0	0.81 (0.16%)	N/A
P340	115, 126	Pentaethylene Glycol Monodecyl Ether, Anagrade	N	378.6	~ 0.81 (0.031%)	~ 73
APO106	103	Anapoe-$C_{10}E_6$	N	avg. 423.0	0.9 (0.038%)	~ 40
D323	68	n-Decyl-β-D-Thioglucopyranoside, Anagrade	N	336.4	~ 0.9 (0.30%)	N/A
D335	68	n-Decyl-β-D-Thiomaltopyranoside, Anagrade	N	498.6	~ 0.9 (0.045%)	~ 75
H360	114, 125	Hexaethylene Glycol Monodecyl Ether, Analytical Grade	N	422.6	0.9	~ 73
D360	29, 120	n-Dodecyl-N,N-Dimethylamine-N-Oxide, Anagrade	Z	229.4	~1-2 (0.023%)	~ 76
D360S	29	n-Dodecyl-N,N-Dimethylamine-N-Oxide, Sol-Grade	Z	229.4	~ 1-2 (0.023%)	~ 76
O310F	59, 139	Octyl Maltoside, Fluorinated, Anagrade	N	688.4	~ 1.02	N/A
U310	63	ω-Undecylenyl-β-D-Maltopyranoside	N	494.6	~ 1.2 (0.059%)	N/A
APO109	103	Anapoe-$C_{10}E_9$	N	avg. 555.0	1.3 (0.072%)	N/A
B310	109	Big Chap, Deoxy, Analytical Grade	N	862.1	1.4 (0.12%)	~ 8-16
H111	48	HEGA-11, Anagrade	N	393.5	~ 1.4 (0.055%)	N/A
D350	111, 120	n-Dodecyl-N,N-Dimethylglycine, Anagrade	Z	271.4	~ 1.5 (0.041%)	N/A
F308	85, 121	Fos-Choline-12, Anagrade	Z	351.5	~ 1.5 (0.047%)	~ 54
F308D	85, 136	Fos-Choline-12, Deuterated	Z	389.8	~ 1.5 (0.047%)	~ 54
F308S	86	Fos-Choline-12, Sol-Grade	Z	351.5	~ 1.5 (0.047%)	~ 54
D350S	111	n-Dodecyl-N,N-Dimethylglycine, Sol-Grade	Z	271.4	~ 1.5 (0.041%)	N/A
L360S	30	LAPAO, Sol-Grade	Z	300.6	~ 1.56 (0.052%)	~ 126
D322HA	51	n-Decyl-α-D-Maltopyranoside, Anagrade	N	482.6	~ 1.66 (0.08%)	N/A
T385	145	Cy-Tripglu	N	665.8	1.8	N/A
C324G	31	CYGLU-4, Anagrade	N	318.4	~ 1.8 (0.058%)	N/A
D322	51	n-Decyl-β-D-Maltopyranoside, Anagrade	N	482.6	~ 1.8 (0.087%)	~ 69
D322LA	51	n-Decyl-β-D-Maltopyranoside, Anagrade, Low Alpha	N	482.6	~ 1.8 (0.087%)	~ 69
D322S	52	n-Decyl-β-D-Maltopyranoside, Sol-Grade	N	482.6	~ 1.8 (0.087%)	~ 69
F306	84	Fos-Choline-11, Anagrade	Z	337.4	~ 1.85 (0.062%)	~ 18
F306S	84	Fos-Choline-11, Sol-Grade	Z	337.4	~ 1.85 (0.062%)	~ 18
D321	39	n-Decyl-β-D-Glucopyranoside, Anagrade	N	320.4	~ 2.2 (0.070%)	N/A
F300F	81, 139	Fos-Choline-8, Fluorinated, Anagrade	Z	529.2	2.2	N/A
C325	33	CYMAL-5, Anagrade	N	494.5	~ 2.4-5.0 (0.12%)	~ 47
C325S	34	CYMAL-5, Sol-Grade	N	494.5	~ 2.4-5.0 (0.12%)	~ 47
C516	79	Cyclofos-6, Anagrade	Z	349.2	~ 2.68 (0.094%)	N/A
AZ312	107, 120	Anzergent 3-12, Analytical Grade	Z	335.5	2.8 (0.094%)	~ 55-87
B300	109	Big Chap, Analytical Grade	N	878.1	2.9 (0.25%)	~ 10
N335	69	n-Nonyl-β-D-Thioglucopyranoside, Anagrade	N	322.4	~ 2.9 (0.093%)	N/A
N350	70	n-Nonyl-β-D-Thiomaltopyranoside, Anagrade	N	484.6	~ 3.2 (0.15%)	N/A
U360	30	n-Undecyl-N,N-Dimethylamine-Oxide, Anagrade	Z	215.4	~ 3.21 (0.069%)	N/A
T380	145	Ph-Tripglu	N	659.8	3.6	N/A
P305	116	Pluronic F-127	N	~ 12600.0	~ 3.97	N/A
C514	79	Cyclofos-5, Anagrade	Z	335	~ 4.5 (0.15%)	N/A
T370	145	Tripao	Z	362.5	4.5	N/A
F210	91	Fos-Mea-10, Anagrade	Z	295	~ 5.25 (0.15%)	N/A
D380	110	Deoxycholic Acid, Sodium Salt, Anagrade	A	414.6	~ 6 (0.24%)	~ 22
N330	58	n-Nonyl-β-D-Maltopyranoside, Anagrade	N	468.5	~ 6 (0.28%)	~ 55
M320	49	Mega-10, Anagrade	N	349.5	~ 6-7 (0.21%)	N/A
FCU110	90	Fos-Choline-Unsat-11-10	Z	335.4	~ 6.2 (0.21%)	N/A
N324	42	n-Nonyl-β-D-Glucopyranoside, Anagrade	N	306.4	~ 6.5 (0.20%)	~ 133
N324LA	42	n-Nonyl-β-D-Glucopyranoside, Anagrade	N	306.4	~ 6.5 (0.20%)	~ 133
N324S	42	n-Nonyl-β-D-Glucopyranoside, Sol-Grade	N	306.4	~ 6.5 (0.20%)	~ 133
H110	48	HEGA-10, Anagrade	N	379.5	~ 7.0 (0.26%)	N/A
P350	116, 126	Pentaethylene Glycol Monooctyl Ether, Anagrade	N	350.5	~ 7.1 (0.25%)	N/A
C324	32	CYMAL-4, Anagrade	N	480.5	~ 7.6 (0.37%)	~ 25
C316	76, 112	CHAPS, Anagrade	Z	614.9	~ 8 (0.49%)	~ 10

(Continued on next page)

Detergent Properties Listed by CMC Values (continued)

Product No.	Page No.	Detergent	Type	FW	CMC mM (%)	Aggregation No.
C316S	76, 112	CHAPS, Sol-Grade	Z	614.9	~ 8 (0.49%)	~ 10
C317	76, 113	CHAPSO, Anagrade	Z	630.9	~ 8 (0.50%)	~ 11
T350	117, 126	Tetraethylene Glycol Monooctyl Ether, Anagrade	N	306.5	~ 8 (0.25%)	~ 82
C512	78	Cyclofos-4, Anagrade	Z	320.9	~ 8.45 (0.45%)	N/A
O320	70	n-Octyl-β-D-Thiomaltopyranoside, Anagrade	N	470.6	~ 8.5 (0.40%)	N/A
O314	70	n-Octyl-β-D-Thioglucopyranoside, Anagrade	N	308.4	~ 9 (0.28%)	N/A
O314LA	70	n-Octyl-β-D-Thioglucopyranoside, Anagrade	N	308.4	~ 9 (0.28%)	~ 189
S1010S	110	Cholic Acid, Sodium Salt	I	430.6	~9.5 (0.41%)	~ 2.0-4.8
H350	114, 125	Hexaethylene Glycol Monooctyl Ether, Anagrade	N	394.5	~ 10 (0.39%)	~ 32
O311HA	43	n-Octyl-α-D-Glucopyranoside, Anagrade	N	292.4	~ 10-21 (0.3-0.6%)	N/A
AZ316	108	Anzergent 3-16, Analytical Grade	Z	391.7	10-60	~ 155
D365	29	n-Decyl-N,N-Dimethylamine-N-Oxide, Anagrade	Z	201.4	~ 10.48 (0.211%)	~ 7
F304	82	Fos-Choline-10, Anagrade	Z	323.4	~ 11 (0.35%)	~ 24
F304S	83	Fos-Choline-10, Sol-Grade	Z	323.4	~ 11 (0.35%)	~ 24
C411	47	C-HEGA-11, Anagrade	N	391.5	~ 11.5 (0.45%)	N/A
S300	116	Sodium Dodecanoyl Sarcosine, Anagrade	A	293.4	~ 14.4 (0.42%)	N/A
S300S	117	Sodium Dodecanoyl Sarcosine, Sol-Grade	I	293.4	~ 14.4 (0.42%)	N/A
P300	116	Pluronic F-68	N	~ 8400.0	~ 17.9	N/A
O311T	44, 138	n-Octyl-d17–β–D-Glucopyranoside	N	309.5	18-20	N/A
O311	43	n-Octyl-β-D-Glucopyranoside, Anagrade	N	292.4	~ 18-20 (0.53%)	~ 27-100
O311S	44	n-Octyl-β-D-Glucopyranoside, Sol-Grade	N	292.4	~ 18-20 (0.53%)	~ 27-100
O311D	45, 138	n-Octyl-d17-β-D-Glucopyranoside-d7	N	316.5	~ 18-20	N/A
D352	110	n-Decyl-N,N-Dimethylglycine, Anagrade	Z	243.4	~ 19 (0.46%)	N/A
A340	39	Anameg-7	N	335.4	19.5 (0.65%)	~ 92
O310	58	n-Octyl-β-D-Maltopyranoside, Anagrade	N	454.4	~ 19.5 (0.89%)	~ 47
O310S	58	n-Octyl-β-D-Maltopyranoside, Sol-Grade	N	454.4	~ 19.5 (0.89%)	~ 47
F208	91	Fos-Mea-8, Anagrade	Z	267	~ 22.0 (0.59%)	N/A
M325	49	Mega-9, Anagrade	N	335.5	~ 25 (0.84%)	N/A
FCI11	90	Fos-Choline-ISO-11, Anagrade	Z	337.4	~ 26.6 (0.9%)	N/A
DH325	53	2,6-Dimethyl-4-Heptyl-β-D-Maltoside	N	468.5	~ 27.5 (1.2%)	N/A
C323G	31	CYGLU-3, Anagrade	N	304.4	~ 28 (0.86%)	N/A
H301	69	n-Heptyl-β-D-Thioglucopyranoside, Anagrade	N	294.4	~ 29 (0.85%)	N/A
H301LA	69	n-Heptyl-β-D-Thioglucopyranoside, Anagrade	N	294.4	~ 29 (0.85%)	~ 27
O312	43	n-Octyl-β-D-Galactopyranoside, Anagrade	N	292.4	~ 29.5 (0.86%)	N/A
FCI09	90	Fos-Choline-ISO-9, Anagrade	Z	309	~ 32 (0.99%)	N/A
C323	32	CYMAL-3, Anagrade	N	466.5	~ 34.5 (1.6%)	~ 5
C410	46	C-HEGA-10, Anagrade	N	377.5	~ 35 (1.3%)	N/A
AZ310	107	Anzergent 3-10, Analytical Grade	Z	307.6	39 (1.2%)	~ 41
H109	47	HEGA-9, Anagrade	N	365.5	~ 39 (1.4%)	~ 5
F302	82	Fos-Choline-9, Anagrade	Z	309.4	~ 39.5 (1.2%)	~ 5
F302S	82	Fos-Choline-9, Sol-Grade	Z	309.4	~ 39.5 (1.2%)	~ 5
P310	59	2-Propyl-1-Pentyl Maltopyranoside, Anagrade	N	455.5	~ 42.5 (1.9%)	N/A
C510	78	Cyclofos-3, Anagrade	Z	306.9	~ 43 (1.3%)	N/A
H300	40	n-Heptyl-β-D-Glucopyranoside, Anagrade	N	278.4	~ 70 (1.9%)	N/A
H300LA	40	n-Heptyl-β-D-Glucopyranoside, Anagrade	N	278.4	~ 70 (1.9%)	N/A
M319	48	Mega-8, Anagrade	N	321.4	~ 79 (2.5%)	N/A
C409	46	C-HEGA-9, Anagrade	N	363.5	~ 108 (3.9%)	N/A
H108	47	HEGA-8, Anagrade	N	351.5	~ 109 (3.8%)	N/A
F300	81	Fos-Choline-8, Anagrade	Z	295.4	~ 114 (3.4%)	N/A
F300S	81	Fos-Choline-8, Sol-Grade	Z	295.4	~ 114 (3.4%)	N/A
C322	32	CYMAL-2, Anagrade	N	452.5	~ 120 (5.4%)	N/A
H310	57	n-Hexyl-β-D-Maltopyranoside, Anagrade	N	426.4	~ 210 (8.9%)	N/A
H305	41	n-Hexyl-β-D-Glucopyranoside, Anagrade	N	264.4	~ 250 (6.6%)	N/A
C508	78	Cyclofos-2, Anagrade	Z	293.8	~ 256 (7.5%)	N/A
C408	46	C-HEGA-8, Anagrade	N	349.5	~ 277 (9.7%)	N/A
C321	31	CYMAL-1, Anagrade	N	438.5	~ 340 (15%)	N/A
AZ308	107	Anzergent 3-8, Analytical Grade	Z	279.6	390 (10.9%)	N/A
ND195	119	NDSB-195	Z	195.3	N/A	N/A
ND201	119	NDSB-201	Z	201.2	N/A	N/A
ND211	119	NDSB-211	Z	211.3	N/A	N/A

The types of detergents: A = Anionic / C = Cationic / N = Nonionic / Z = Zwitterionic

Detergent Properties Listed by CMC Values (continued)

Product No.	Page No.	Detergent	Type	FW	CMC mM (%)	Aggregation No.
ND221	119	NDSB-221	Z	221.3	N/A	N/A
ND256	119, 121	NDSB-256	Z	257.4	N/A	N/A
A110MT	144	2-Aminoethyl Methane Thiosulfonate Hydrobromide (MTSEA)	C	236.2	N/A	N/A
A835	129	Amphipol A8-35	C	~ 8000.0	N/A	N/A
AZ318	108	Anzergent 3-18, Analytical Grade	Z	419.7	N/A	N/A
B518	131	BisMalt-18	N	949.1	N/A	N/A
B520	131	BisMalt-20	N	977.1	N/A	N/A
B522	131	BisMalt-22	N	1005.2	N/A	N/A
B524	132	BisMalt-24	N	1033.2	N/A	N/A
B528	132	BisMalt-28	N	1089.4	N/A	N/A
CH200	77, 113	Cholesterol	N	386.6	N/A	N/A
CH210	77, 114	Cholesteryl Hemisuccinate Tris Salt	C	607.9	N/A	N/A
NG326	35, 65	CYMAL-6 Neopentyl Glycol	N	1000.55	N/A	N/A
NG327	37, 65	CYMAL-7 Neopentyl Glycol	N	1028.58	N/A	N/A
NG321	39, 66	Decyl Glucose Neopentyl Glycol	N	624.41	N/A	N/A
NG322	52, 66	Decyl Maltose Neopentyl Glycol	N	949.08	N/A	N/A
D910	52, 142	Decyl-β-D-Selenomaltoside	N	545.5	N/A	N/A
D607	92	1,2-Diheptanoyl-sn-Glycero-3-Phosphocholine	Z	481.5	N/A	N/A
D516	92	1,2-Dihexadecanoyl-sn-Glycero-3-Phosphocholine	Z	734.039	N/A	N/A
D606	92	1,2-Dihexanoyl-sn-Glycero-3-Phosphocholine	Z	453.5	N/A	N/A
D614	93	1,2-Dimyristoyl-sn-Glycero-3-[Phospho-rac-(1-Glycerol)], Sodium Salt	C	688.9	N/A	N/A
D514	93	1,2-Dimyristoyl-sn-Glycero-3-Phosphocholine	Z	677.9	N/A	N/A
D608	93	1,2-Dioctanoyl-sn-Glycero-3-Phosphocholine	Z	509.6	N/A	N/A
D518	94	1,2-Dioleoyl-sn-Glycero-3-Phosphocholine	Z	786.113	N/A	N/A
D912	56, 142	Dodecyl-β-D-Selenomaltoside	N	573.6	N/A	N/A
F304PDH	83, 135	Fos-Choline-10, Per Deuterated Head	Z	336.5	N/A	N/A
F304SDH	83, 135	Fos-Choline-10, Semi Deuterated Head	Z	332.5	N/A	N/A
F306PDH	84, 135	Fos-Choline-11, Per Deuterated Head	Z	350.5	N/A	N/A
F306SDH	84, 136	Fos-Choline-11, Semi Deuterated Head	Z	346.5	N/A	N/A
F308PDH	85, 136	Fos-Choline-12, Per Deuterated Head	Z	364.5	N/A	N/A
F308PDT	86, 137	Fos-Choline-12, Per Deuterated Tail	Z	376.6	N/A	N/A
F308SDH	86, 137	Fos-Choline-12, Semi Deuterated Head	Z	360.5	N/A	N/A
F312PDH	88, 137	Fos-Choline-14, Per Deuterated Head	Z	392.6	N/A	N/A
F312SDH	88, 138	Fos-Choline-14, Semi Deuterated Head	Z	388.6	N/A	N/A
GDN101	133	GDN	N	1165.31	N/A	N/A
H907	41, 142	Heptyl-β-D-Selenoglucoside	N	341.3	N/A	N/A
I1003	114	IPTG	N	238.31	N/A	N/A
NG318	41, 66	Lauryl Glucose Neopentyl Glycol	N	680.47	N/A	N/A
NG310	57, 67	Lauryl Maltose Neopentyl Glycol	N	1005.19	N/A	N/A
L412	96	LysoFos Choline Ether 12, Anagrade	Z	425.5	N/A	N/A
L414	96	LysoFos Choline Ether 14, Anagrade	Z	453.6	N/A	N/A
L416	96	LysoFos Choline Ether 16, Anagrade	Z	481.7	N/A	N/A
L312	97	LysoFos Glycerol 12, Anagrade	C	450.4	N/A	N/A
L314	97	LysoFos Glycerol 14, Anagrade	C	478.5	N/A	N/A
L316	97	LysoFos Glycerol 16, Anagrade	C	506.5	N/A	N/A
LCP18	140	MonoOlein	N	356.54	N/A	N/A
LCP16	140	MonoPalmitolein	N	328.49	N/A	N/A
NG311	45, 67	Octyl Glucose Neopentyl Glycol	N	568.69	N/A	N/A
O908	45, 142	Octyl-β-D-Selenoglucoside	N	355.3	N/A	N/A
O918	59, 143	Octyl-β-D-Selenomaltoside	N	517.5	N/A	N/A
P516	94	1-Palmitoyl-2-Oleoyl-sn-Glycero-3-Phosphocholine	Z	760.076	N/A	N/A
P416	94, 121	1-Palmitoyl-2-Oleoyl-sn-Glycero-3-Phosphoethanolamine	Z	717.996	N/A	N/A
P5008	129	PMAL-C8	Z	~ 18500.0	N/A	N/A
P5012	130	PMAL-C12	Z	~ 12000.0	N/A	N/A
P5016	130	PMAL-C16	Z	~ 39000-65000	N/A	N/A
S2000	143	L-(+)-Selenomethionine, Anagrade	N	196.1	N/A	N/A
T908	126, 143	12-Selenotetraethyleneglycol Mono Octyl Ether	N	369.4	N/A	N/A
S110MT	144	Sodium (2-Sulfonatoethyl) Methanethiosulfonate (MTSES)	C	242.28	N/A	N/A
TFA101	133	TFA	N	2148.42	N/A	N/A
T110MT	144	[2-(Trimethylammonium)ethyl] Methane Thiosulfonate Bromide	Z	278.24	N/A	N/A
U911	63, 143	Undecyl-β-D-Selenomaltoside	N	573.6	N/A	N/A

Detergent Analysis

Each lot of Anatrace detergent is analyzed so that you can be assured of the highest consistent quality available anywhere. Our Anagrade detergents are purified to be greater than 99% pure as measured by HPLC and to be low in UV absorbing or fluorescent impurities.

We are pleased to list below the analytical procedures used to evaluate our detergents. Should you have any questions about these procedures, please feel free to contact us.

Measurement of Purity (HPLC)
Anagrade detergents are greater than 99% pure and Sol-Grade detergents are greater than 97% pure as determined by HPLC. The column used is a standard C18 column (4.6 mm x 250 mm) in conjunction with a light scattering detector. An eluant of either acetonitrile/water or methanol/water is acceptable. The ratio will vary depending on the hydrophobicity of the detergent. Some examples are given below:

Detergent	Acetonitrile/water	Methanol/water
n-Heptyl–β–D-Glucopyranoside	25/75	45/55
n-Nonyl–β–D-Glucopyranoside	35/65	55/45
n-Hexyl–β–D-Maltopyranoside	20/80	40/60
n-Octyl–β–D-Maltopyranoside	30/70	55/45
n-Nonyl–β–D-Maltopyranoside	35/65	60/40
n-Dodecyl–β–D-Maltopyranoside	45/55	75/25
n-Tridecyl–β–D-Maltopyranoside	60/40	80/20
n-Hexadecyl–β–D-Maltopyranoside	70/30	90/10
Fos-Choline-10	45/55	65/35
Fos-Choline-12	45/55	75/25
Fos-Choline-14	45/55	85/15
CYMAL-3	35/65	65/35
CYMAL-5	45/55	70/30

Some impurities may be less than one percent and still affect the properties of a detergent lot. Therefore, the following tests are also performed to insure that you receive the highest quality detergent available.

Absorbance
The absorbance of the detergent solution (1% w/v) in water is measured in the UV region. Glucosides and maltosides should have low absorbance throughout this region.

Fluorescence
The fluorescence of the detergent solution (0.1% w/v) in water is compared to a standard BSA solution unless otherwise stated. The excitation wavelength is 280 nm and the emission is measured at 345 nm.

Conductance
The conductance of the detergent solution (10% w/v) in water is routinely measured. For those detergents which are nonionic or zwitterionic, a detergent solution should have conductance nearly the same as deionized water.

Solubility in water:
The solubility of the detergent solution in water is routinely tested. Many of the impurities in detergent preparations are not soluble in water; the cloudiness of a detergent solution at a concentration where it is known to be soluble indicates the presence of an insoluble impurity.

Measurement of pH
The pH of the detergent solution is routinely measured. The pH should be neutral for detergents that are either nonionic or zwitterionic.

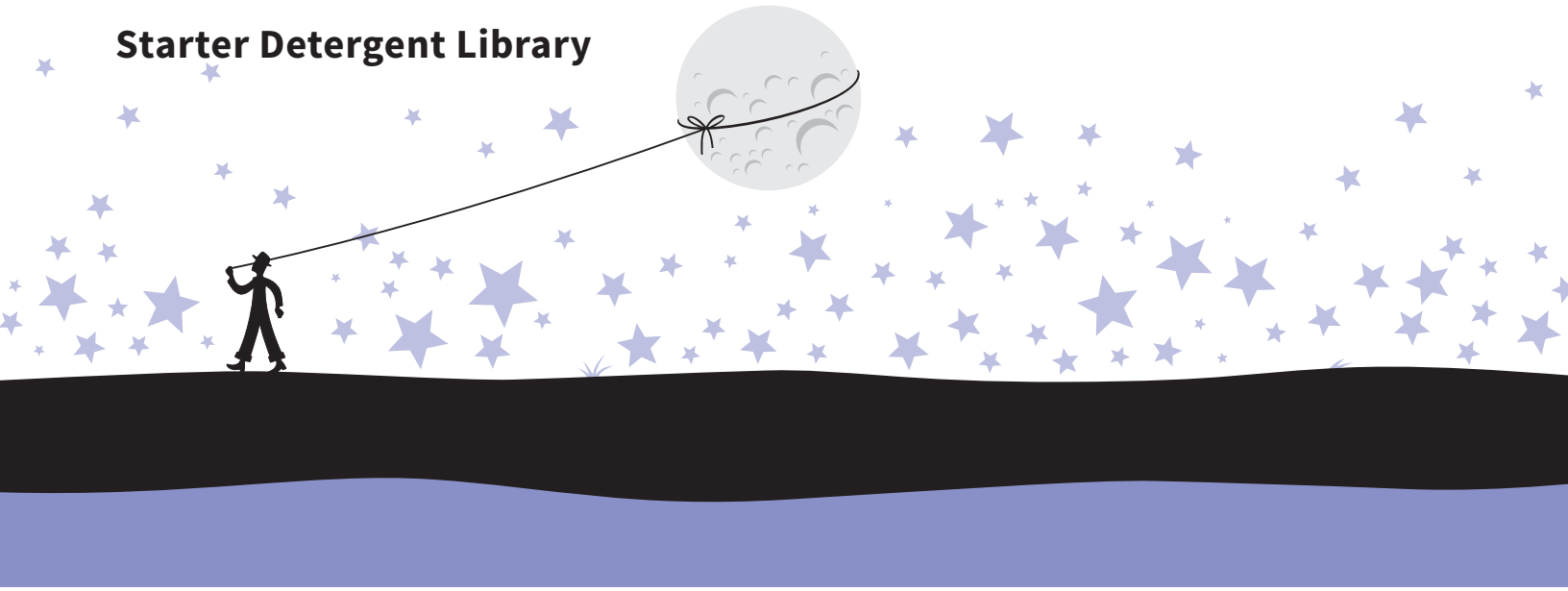
Alcohol contamination
Glucoside and maltoside detergents are prepared from the corresponding hydrophobic alcohol. Trace amounts of this alcohol in the detergent lot can cause cloudiness in a detergent solution. Therefore, we measure the amount of alcohol in each lot of detergent by HPLC.

Alpha isomer
Glucoside and maltoside detergents have two isomeric forms, α and β. Each β detergent is analyzed for the percent α isomer present by HPLC.

Lot analysis, shipping and storage
Every lot of Anatrace detergent will be shipped with a certificate of analysis listing the results of the appropriate tests described above.

Anapoe detergents should be stored refrigerated in the dark. All other detergents should be stored frozen and kept dry. Warm to room temperature before opening the container.

Starter Detergent Library



Often detergent work begins with screening for best fit. Whether you work with insoluble, unstable macromolecules, biological complexes, or membrane proteins, detergent screening is often one of your most costly projects in terms of time and money.

In membrane protein three dimensional structural determination, close to 60% of known structures have been solved using only five detergents[1].

- n-Dodecyl-β-D-Maltopyranoside—DDM [pg. 54]
- n-Decyl-β-D-Maltopyranoside—DM [pg. 51]
- n-Nonyl-β-D-Glucopyranoside—NG [pg. 42]
- n-Octyl-β-D-Glucopyranoside—OG [pg. 43]
- n-Dodecyl-N,N-Dimethylamine-N-Oxide—LDAO [pgs. 29 and 120]

These detergents represent a good starting point but potentially are on the list more because of their extensive use than their specific utility. Approximately 45 other detergents are often overlooked for their specific utility and account for the remaining half of the known structures.

Finding the right detergent requires a methodological approach. Anatrace is known to offer the broadest selection of detergents. For over a decade, our team has collaborated with the membrane protein structural biology community to offer every key detergent and all possible derivatives.

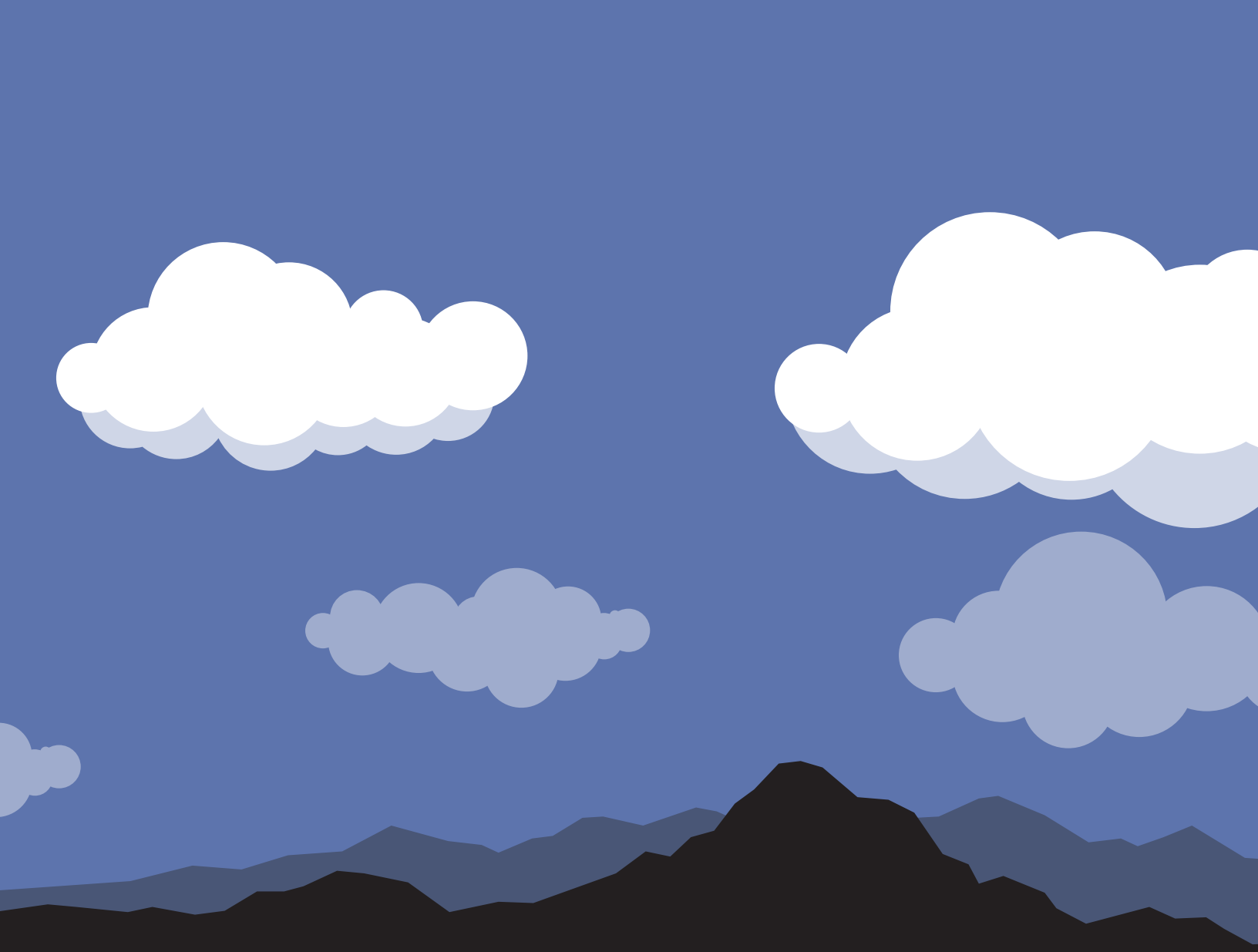
Funding and time usually dictate how many detergents a lab can screen. In addition to the detergents listed above, a good starting library should include the following additional detergents:

- Lauryl Maltose Neopentyl Glycol—LMNG [pgs. 57 and 67]
- CHAPS [pgs. 76 and 112]
- Fos-Choline-12 [pgs. 85 and 121]
- n-Octyl-β-D-Thioglucopyranoside [pg. 70]
- n-Nonyl-β-D-Maltopyranoside [pg. 58]
- CYMAL-5 [pg. 33]
- Cholesteryl Hemisuccinate [pgs. 77 and 114] + DDM [pg. 54]
- Octyl Glucose Neopentyl Glycol—OGNG [pgs. 45 and 67]

Reference:

1. Vergis, J. M., Purdy, M. D., and Wiener, M. C. (2010) *Anal Biochem.* **407**(1), 1-11.

DETERGENTS



Amine Oxides

CYMALs

Glucosides

HEGAs and Megas

Maltosides

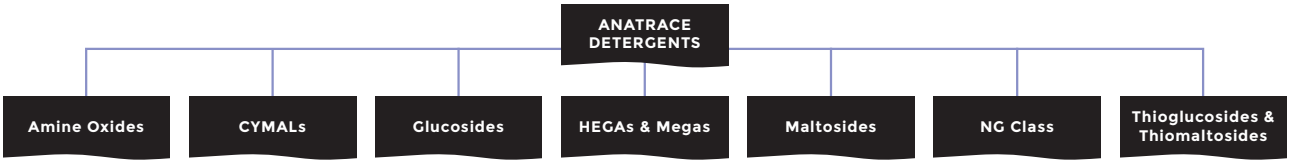
NG Class

Thioglucosides and Thiomaltosides

DETERGENTS

Anatrace® has been the leader in supplying high-purity detergents to research facilities, academic institutions, and industrial customers since the late 1980s. Since the launch of our first detergent, Dodecyl Maltoside (DDM), our portfolio has grown into the largest in the industry—with more than 50 unique detergents. Anatrace detergents have a wide variety of applications including membrane protein extraction, solubilization, purification, manipulation, and structural determination by X-ray crystallography or NMR.

Our detergents are grouped into seven broad categories:



In addition to offering highly purified maltosides and glucosides, Anatrace also tailors these popular molecules into useful derivatives to meet your specific needs including Anagrade® and Sol-Grade®, Low or High Alpha anomer, as well as Deuterium, NG Class, Sulfur, and Selenium forms.

Anatrace also takes pride in helping scientists unravel once unsolvable challenges by providing custom synthesis services and expert analytical work to aid your research and development team. Contact our chemists to help you develop specialized solutions tailored to meet your unique specifications, allowing your experiments to reach for new heights.

n-Decyl-N,N-Dimethylamine-N-Oxide, Anagrade

[Decyldimethylamine-N-Oxide / DDAO]

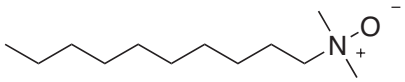
D365 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 201.4 [2605-79-0] $C_{12}H_{27}NO$
CMC (H_2O): ~ 10.48 mM[1] (0.211%)
Aggregation number (H_2O): ~ 7
dn/dc: 0.1805 ml/gm

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 100 µS
Peroxide: < 500 µM
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.06
260 nm: < 0.08

Storage:
Store at -20°C.

Reference:
1. Anatrace measurement.



n-Dodecyl-N,N-Dimethylamine-N-Oxide, Anagrade

[Lauryldimethylamine-N-Oxide / LDAO / DDAO / N,N-Dimethyl-1-Dodecanamine-N-Oxide]

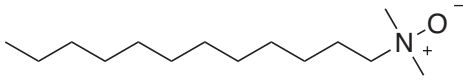
D360 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 229.4 [1643-20-5] $C_{14}H_{31}NO$
CMC (H_2O): ~ 1-2 mM[5] (0.023%)
CMC (0.1 M NaCl): ~ 0.14 mM[5]
Aggregation number (H_2O): ~ 76[6]
dn/dc (H_2O): 0.1381 ml/gm[7]
Micelle size: 17 kDa, 21.5 kDa[5,8]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 6-8.5
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 100 µS
Peroxide: < 500 µM
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.06
260 nm: < 0.08

References:

1. Michel, H. (1982) *J. Mol. Biol.* **158**, 567-572.
2. Malkin, R. (1975) *Arch. Biochem. Biophys.* **169**, 77-83.
3. Reithmeier, A. F., *et al.* (1993) *Biochem.* **32**, 1172-1179.
4. Dawkins, D. J., *et al.* (1991) in *Crystallization of Membrane Proteins* (Hartmut Michel, Ed.) 125-137, CRC Press, Boca Raton.
5. Herrmann, K. W. (1962) *J. Phys. Chem.* **66**, 292.
6. Herrmann, K. W. (1966) *J. Colloid Interface Sci.* **22**, 352.
7. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
8. Strop, P. and Brunger, A. T. (2005) *Protein Sci.* **14**, 2207-2211.



n-Dodecyl-N,N-Dimethylamine-N-Oxide, Sol-Grade

[Lauryldimethylamine-N-Oxide / LDAO / DDAO / N,N-Dimethyl-1-Dodecanamine-N-Oxide]

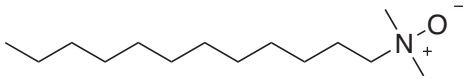
D360S 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 229.4 [1643-20-5] $C_{14}H_{31}NO$
CMC (H_2O): ~ 1-2 mM[5] (0.023%)
CMC (0.1 M NaCl): ~ 0.14 mM[5]
Aggregation number (H_2O): ~76[6]
dn/dc (H_2O): 0.1381 ml/gm[7]
Micelle size: 17 kDa, 21.5 kDa[5,8]

Product Specifications:
Appearance: White solid
Purity: ≥ 95% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 500 µS
Peroxide: < 500 µM
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.1
260 nm: < 0.2

References:

1. Michel, H. (1982) *J. Mol. Biol.* **158**, 567-572.
2. Malkin, R. (1975) *Arch. Biochem. Biophys.* **169**, 77-83.
3. Reithmeier, A. F., *et al.* (1993) *Biochem.* **32**, 1172-1179.
4. Dawkins, D. J., *et al.* (1991) in *Crystallization of Membrane Proteins* (Hartmut Michel, Ed.) 125-137, CRC Press, Boca Raton.
5. Herrmann, K. W. (1962) *J. Phys. Chem.* **66**, 292.
6. Herrmann, K. W. (1966) *J. Colloid Interface Sci.* **22**, 352.
7. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
8. Strop, P. and Brunger, A. T. (2005) *Protein Sci.* **14**, 2207-2211.



Amine Oxides

LAPAO, Sol-Grade

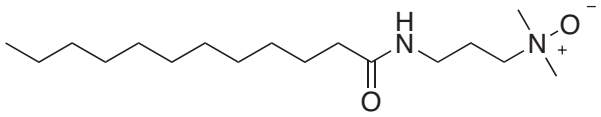
[3-Dodecylamido-N,N'-Dimethylpropyl Amine Oxide / 3-Laurylamido-N,N'-Dimethylpropyl Amine Oxide]

L360S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 300.6 [61792-31-2] $C_{17}H_{36}N_2O_2$
CMC (H_2O): ~ 1.56 mM (0.052%)[1]
Aggregation number (H_2O): ~ 126

Product Specifications:
Purity: ≥ 95% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.2
280 nm: < 0.3
260 nm: < 0.4

Reference:
1. Dahout-Gonzalez, C., Brandolin, G., and Pebay-Peyroula. E. (2003) *Acta. Cryst.* **D59**, 2353-2355.



n-Tetradecyl-N,N-Dimethylamine-N-Oxide, Anagrade

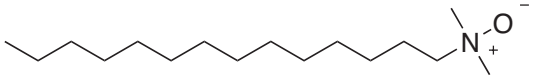
[TDAO / N,N-Dimethyl-1-Tetradecanamine-N-Oxide]

T360	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 257.5 [3332-27-2] $C_{16}H_{35}NO$
CMC (H_2O): ~ 0.29 mM[1] (0.0075%)
CMC (0.1 M NaCl): ~ 0.024 mM[1]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 1%
Conductance (1% solution in water): < 100 µS
Peroxide: < 600 µM
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.06
260 nm: < 0.08

Reference:
1. Anatrace measurement.



n-Undecyl-N,N-Dimethylamine-Oxide, Anagrade

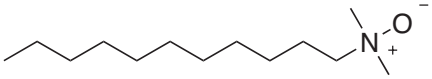
[Undecyldimethylamine-N-Oxide / UDAO / N,N-Dimethyl-1-Undecamine-N-Oxide]

U360	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 215.4 [15178-71-9] $C_{13}H_{29}NO$
CMC (H_2O): ~ 3.21 mM[1] (0.069%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 200 µS
Peroxide: < 500 µM
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.06
260 nm: < 0.08

Reference:
1. Anatrace measurement.



CYGLU®-3, Anagrade

[3-Cyclohexyl-1-Propyl–β–D-Glucoside]

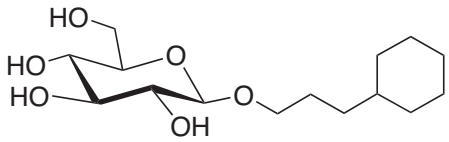
C323G 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 304.4 [869541-00-4] $C_{15}H_{28}O_6$
CMC (H_2O): ~ 28 mM[1] (0.86%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 4 α (HPLC)
Percent cyclohexylpropanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

Reference:
1. Anatrace measurement.



CYGLU-4, Anagrade

[4-Cyclohexyl-1-Butyl–β–D-Glucoside]

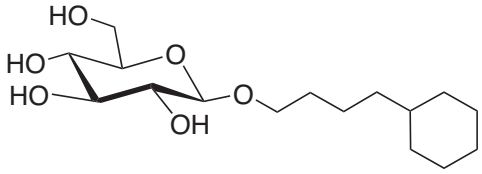
C324G 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 318.4 [869542-54-1] $C_{16}H_{30}O_2$
CMC (H_2O): ~ 1.8 mM[1] (0.058%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 4 α (HPLC)
Percent (cyclohexylbutanol): < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 0.1%
Conductance (0.1% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 0.1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.08

Reference:
1. Anatrace measurement.



CYMAL®-1, Anagrade

[Cyclohexyl-Methyl–β–D-Maltoside[1]]

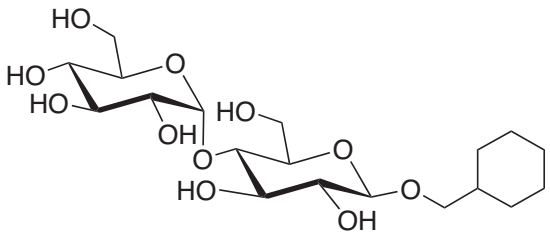
C321 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 438.5 [26080-64-6] $C_{19}H_{34}O_{11}$
CMC (H_2O): ~ 340 mM[2] (15%)
CMC (0.15 M NaCl): ~ 360 mM[2]

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 4 α (HPLC)
Percent cyclohexylmethanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

References:
1. US Patent 5,674,987 and US Patent 5,763,586.
2. Anatrace measurement.



CYMALs

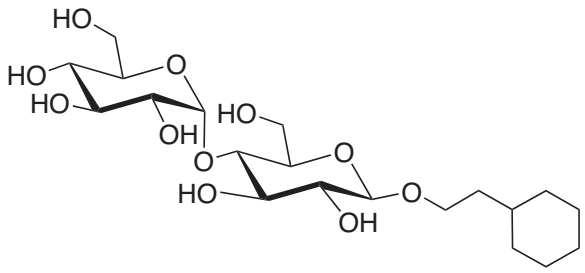
CYMAL-2, Anagrade

[2-Cyclohexyl-1-Ethyl–β–D-Maltoside[1]]

C322 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 452.5 [260804-65-7] $C_{20}H_{36}O_{11}$
CMC (H_2O): ~ 120 mM[2] (5.4%)
CMC (0.15 M NaCl): ~ 104 mM[2]

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 4 α (HPLC)
Percent cyclohexylethanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



References:
1. US Patent 5,674,987 and US Patent 5,763,586.
2. Anatrace measurement.

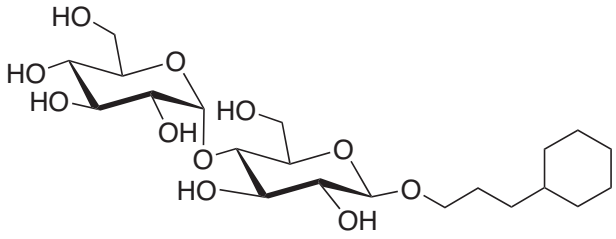
CYMAL-3, Anagrade

[3-Cyclohexyl-1-Propyl–β–D-Maltoside[1]]

C323 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 466.5 [181135-58-0] $C_{21}H_{38}O_{11}$
CMC (H_2O): ~ 34.5 mM[2] (1.6%)
CMC (0.15 M NaCl): ~ 29 mM[2]
Aggregation Number: ~ 5
dn/dc: 0.1561 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 4 α (HPLC)
Percent cyclohexylpropanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



References:
1. US Patent 5,674,987 and US Patent 5,763,586.
2. Anatrace measurement.

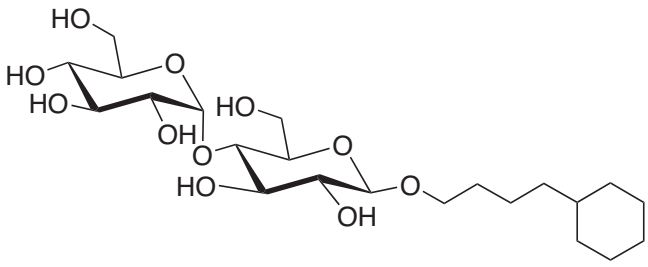
CYMAL-4, Anagrade

[4-Cyclohexyl-1-Butyl–β–D-Maltoside[1]]

C324 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 480.5 [181135-57-9] $C_{22}H_{40}O_{11}$
CMC (H_2O): ~ 7.6 mM[2] (0.37%)
CMC (0.15 M NaCl): ~ 7.3 mM[2]
Aggregation number (H_2O): ~ 25[2]
dn/dc: 0.1317 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 4 α (HPLC)
Percent cyclohexylbutanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



References:
1. US Patent 5,674,987 and US Patent 5,763,586.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.

CYMAL-5, Anagrade

[5-Cyclohexyl-1-Pentyl-β-D-Maltoside[1]]

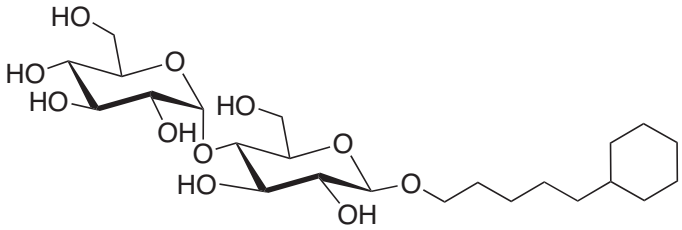
C325	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 494.5 [250692-65-0] $C_{23}H_{42}O_{11}$
CMC (H_2O): ~ 2.4-5.0 mM[2] (0.12%)
CMC (0.15 M NaCl): ~ 2.0 mM[2]
Aggregation number (H_2O): ~ 47[2]
dn/dc: 0.1521 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 4 α (HPLC)
Percent cyclohexylpentanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

References:

1. US Patent 5,763,586.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Askolin, S., Turkenburg, J. P., Tenkanen, M., *et al.* (2004) *Acta Crystallogr. D Biol. Crystallogr.* **60**, 1903-1905.
4. Katayama, H., Tabata, T., Ishihama, Y., *et al.* (2004) *Rapid Commun. Mass Spectrom.* **18**, 2388-2394.
5. Dorjsuren, D., Badralmaa, Y., Mikovits, J., *et al.* (2003) *Protein Expr. Purif.* **29**, 42-50.
6. Wester, M. R., Johnson, E. F., Marques-Soares, C., Dansette, P. M., Mansuy, D., and Stout, C. D. (2003) *Biochemistry* **42**, 6370-6379.



CYMAL-5 Neopentyl Glycol

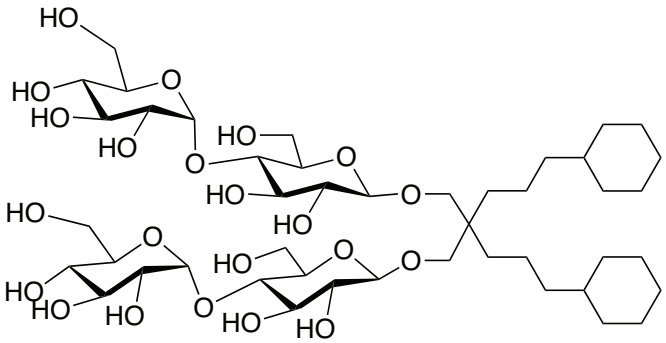
[2,2-bis(3'-Cyclohexylpropyl) Propane-1,3-bis-β-D-Maltopyranoside) / CYMAL-5-NG]

NG325	500 mg
	1 gm
	5 gm

Chemical Properties:
FW: 972.5 $C_{45}H_{80}O_{22}$

Product Specifications:
Purity: ≥ 98 % (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 5%
Conductance (5% solution in water): < 100 µS
Absorbance of a 1% solution in water:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



CYMAL-5, Sol-Grade

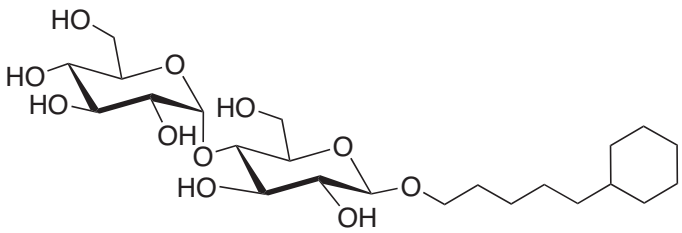
[5-Cyclohexyl-1-Pentyl–β–D-Maltoside[1]]

C325S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 494.5 [250692-65-0] $C_{23}H_{42}O_{11}$
CMC (H_2O): ~ 2.4-5.0 mM[2] (0.12%)
CMC (0.15 M NaCl): ~ 2.0 mM[2]
Aggregation number (H_2O): ~ 47[2]
dn/dc: 0.1521 ml/gm

Product Specifications:
Purity (β + α): ≥ 98% by HPLC analysis
Percent anomer: < 10 α (HPLC)
Percent cyclohexylpentanol: < 0.05 (HPLC)
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1
225 nm: < 0.2

References:
1. US Patent 5,763,586.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Askolin, S., Turkenburg, J. P., Tenkanen, M., *et al.* (2004) *Acta Crystallogr. D Biol. Crystallogr.* **60**, 1903-1905.
4. Katayama, H., Tabata, T., Ishihama, Y., *et al.* (2004) *Rapid Commun. Mass Spectrom.* **18**, 2388-2394.
5. Dorjsuren, D., Badralmaa, Y., Mikovits, J., *et al.* (2003) *Protein Expr. Purif.* **29**, 42-50.
6. Wester, M. R., Johnson, E. F., Marques-Soares, C., Dansette, P. M., Mansuy, D., and Stout, C. D. (2003) *Biochemistry* **42**, 6370-6379.



CYMAL-6, Anagrade

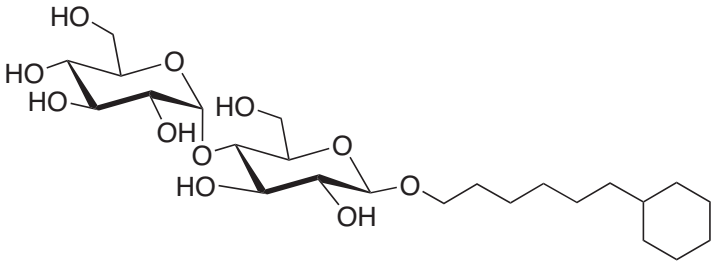
[6-Cyclohexyl-1-Hexyl–β–D-Maltoside[1]]

C326	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 508.5 [228579-27-9] $C_{24}H_{44}O_{11}$
CMC (H_2O): ~ 0.56 mM[2] (0.028%)
Aggregation number (H_2O): ~ 91[2]
dn/dc: 0.1488 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 4 α (HPLC)
Percent cyclohexylhexanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

References:
1. US Patent 5,674,987 and US Patent 5,763,586.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Nukaga, M., Abe, T., Venkatesan, A. M., Mansour, T. S., Bonomo, R. A., and Knox, J. R. (2003) *Biochemistry* **42**, 13152-13159.
4. Guan, R. J., Xiang, Y., Wang, M., *et al.* (2001) *Acta Crystallogr. D Biol. Crystallogr.* **57**, 1313-1315.
5. Ostermeier, C., Harrenga, A., ErmLer, U. and Michel, H. (1997) *Proc. Natl. Acad. Sci. USA* **94**, 10547-10553.



CYMAL-6, Anagrade

[6-Cyclohexyl-1-Hexyl-β-D-Maltoside[1] (Low alpha)]

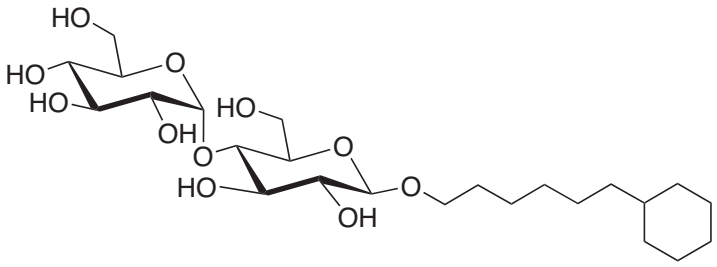
C326LA	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 508.5 [228579-27-9] $C_{24}H_{44}O_{11}$
CMC (H_2O): ~ 0.56 mM[2] (0.028%)
Aggregation number (H_2O): ~ 91[2]
dn/dc: 0.1488 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 0.5 α (HPLC)
Percent cyclohexylhexanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

References:

1. US Patent 5,674,987 and US Patent 5,763,586.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Nukaga, M., Abe, T., Venkatesan, A. M., Mansour, T. S., Bonomo, R. A., and Knox, J. R. (2003) *Biochemistry* **42**, 13152-13159.
4. Guan, R. J., Xiang, Y., Wang, M., *et al.* (2001) *Acta Crystallogr. D Biol. Crystallogr.* **57**, 1313-1315.
5. Ostermeier, C., Harrenga, A., ErmLer, U. and Michel, H. (1997) *Proc. Natl. Acad. Sci. USA* **94**, 10547-10553.



CYMAL-6 Neopentyl Glycol

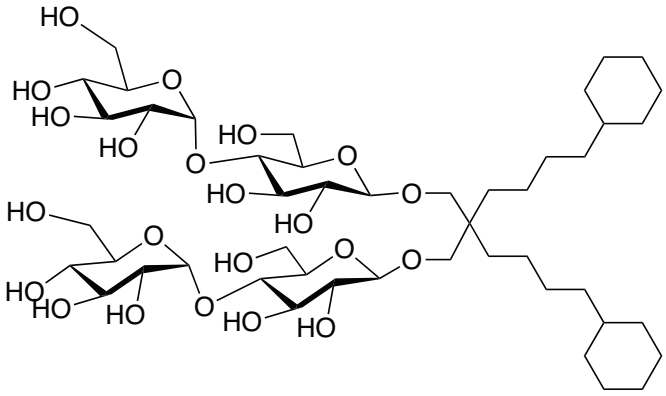
[2,2-bis(3'-Cyclohexylbutyl) Propane-1,3-bis-β-D-Maltopyranoside / CYMAL-6-NG]

NG326	500 mg
	1 gm
	5 gm

Chemical Properties:
FW: 1000.55 $C_{47}H_{84}O_{22}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 5%
Conductance (5% solution in water): < 100 µS
Absorbance of a 1% solution in water:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



CYMAL-6, Sol-Grade

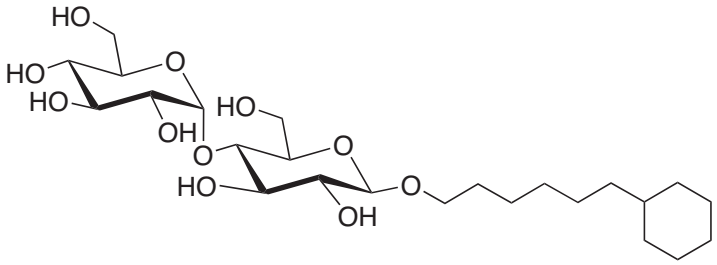
[6-Cyclohexyl-1-Hexyl–β–D-Maltoside[1]]

C326S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 508.5 [228579-27-9] $C_{24}H_{44}O_{11}$
CMC (H_2O): ~ 0.56 mM[2] (0.028%)
Aggregation number (H_2O): ~ 91[2]
dn/dc: 0.1488 ml/gm

Product Specifications:
Purity (β + α): ≥ 98% by HPLC analysis
Percent anomer: < 10 α (HPLC)
Percent cyclohexylhexanol: < 0.05 (HPLC)
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1
225 nm: < 0.2

References:
1. US Patent 5,674,987 and US Patent 5,763,586.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Nukaga, M., Abe, T., Venkatesan, A. M., Mansour, T. S., Bonomo, R. A., and Knox, J. R. (2003) *Biochemistry* **42**, 13152-13159.
4. Guan, R. J., Xiang, Y., Wang, M., *et al.* (2001) *Acta Crystallogr. D Biol. Crystallogr.* **57**, 1313-1315.
5. Ostermeier, C., Harrenga, A., ErmLer, U. and Michel, H. (1997) *Proc. Natl. Acad. Sci. USA* **94**, 10547-10553.



CYMAL-7, Anagrade

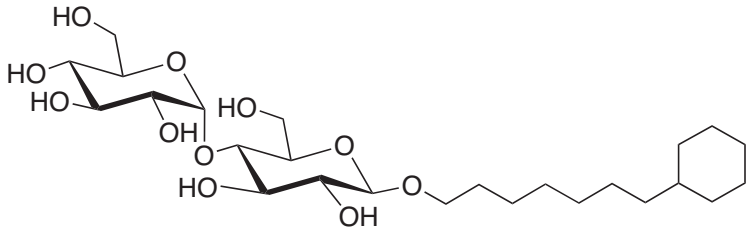
[7-Cyclohexyl-1-Heptyl–β–D-Maltoside[1]]

C327	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 522.5 [349477-49-2] $C_{25}H_{46}O_{11}$
CMC (H_2O): ~ 0.19 mM[2] (0.0099%)
Aggregation number (H_2O): ~ 150[2]
dn/dc: 0.1328 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 4 α (HPLC)
Percent cyclohexylheptanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

References:
1. US Patent 5,763,586.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Babcock, G. J., Farzan, M., and Sodroski, J. (2003) *J. Biol. Chem.* **278**, 3378-3385.



CYMAL-7 Neopentyl Glycol

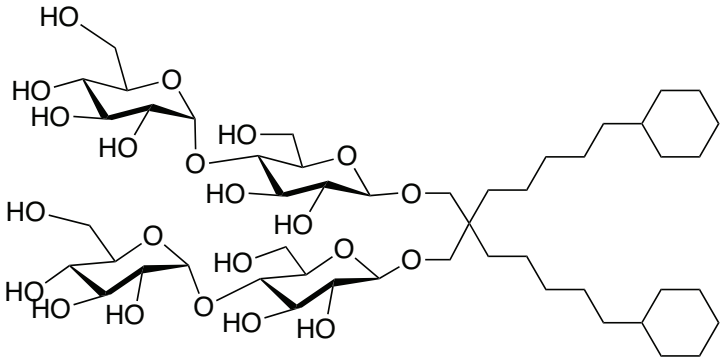
[2,2-bis(3'-Cyclohexylpentyl) Propane-1,3-bis-β-D-Maltopyranoside / CYMAL-7-NG]

NG327	500 mg
	1 gm
	5 gm

Chemical Properties:
FW: 1028.58 $C_{49}H_{88}O_{22}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 5%
Conductance (5% solution in water): < 100 µS
Absorbance of a 1% solution in water:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



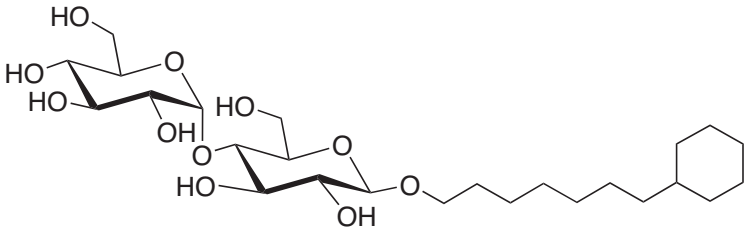
CYMAL-7, Sol-Grade

[7-Cyclohexyl-1-Heptyl–β–D-Maltoside[1]]

C327S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 522.5 [349477-49-2] $C_{25}H_{46}O_{11}$
CMC (H_2O): ~ 0.19 mM[2] (0.0099%)
Aggregation number (H_2O): ~ 150[2]
dn/dc: 0.1328 ml/gm

Product Specifications:
Purity (β + α): ≥ 98% by HPLC analysis
Percent anomer: < 10 α (HPLC)
Percent cyclohexylheptanol: < 0.05 (HPLC)
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1
225 nm: < 0.2



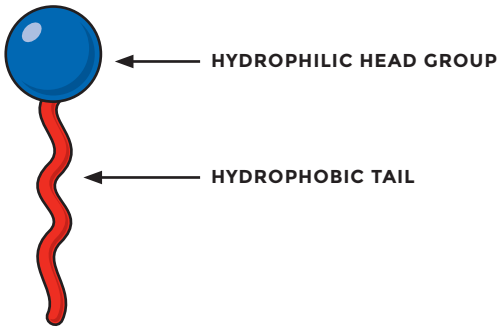
References:

1. US Patent 5,763,586.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Babcock, G. J., Farzan, M., and Sodroski, J. (2003) *J. Biol. Chem.* **278**, 3378-3385.

Glucosides

Often the first choice and, coincidentally, the most popular detergents for membrane protein work are non-ionic, sugar-based detergents, mostly derived from maltose or glucose. These detergents are mild and non-denaturing because they disrupt protein-lipid and lipid-lipid interactions rather than protein-protein interactions. The sugar serves as a polar head group with a non-polar alkyl chain attached. The hydrophilic head groups offer ample strength to extract proteins while still providing the capability to stabilize proteins in solution and promote crystal growth. These detergents are also well chronicled for their ability to stabilize other large macromolecules as well.

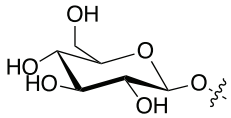
Membrane proteins and macromolecules are naturally found in a wide-range of chemical environments. When removed, there isn't one easy method for choosing which detergent may be best suited for a particular application. Anatrace offers a broad suite of glucoside detergents of varying alkyl chain lengths to help you screen for the best fit. The most popular are Octyl Glucoside and Nonyl Glucoside.



These micelle-producing detergents are perfect for both protein extraction and maintaining solubility and stability in aqueous environments. Glucoside detergents have a long track record of crystallizing membrane proteins for x-ray crystallization studies or creating the necessary stable tertiary structure for NMR work. Anatrace detergents are the most cited detergents in journal articles pertaining to structure and function of membrane proteins.

We know your number one priority is making discoveries and publishing great work. Anatrace makes it easier to reach those heights.

HEAD GROUP



Glucoside

CARBON CHAIN LENGTH NAME	NUMBER	GLUCOSIDE
Hexyl	6	H305
Octyl	8	O311
Nonyl	9	N324
Decyl	10	D321
Undecylenyl	11	Custom–Please inquire.
Dodecyl	12	D318
Tridecyl	13	Custom–Please inquire.
Tetradecyl	14	Custom–Please inquire.
Hexadecyl	16	H305
2,6-Dimethyl-4-Heptyl		Custom–Please inquire.
2-Propyl-1-Pentyl		Custom–Please inquire.

Anameg®-7, Anagrade

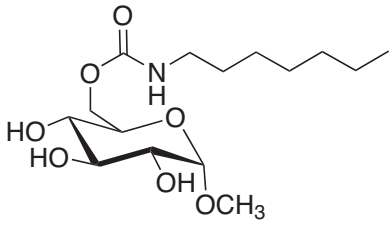
[Methyl-6-O-(N-Heptylcarbamoyl)–α–D-Glucopyranoside / HECAMEG / 6-O-(N-Heptylcarbamoyl)-Methyl–α–D-Glucopyranoside]

A340	1 gm
	5 gm

Chemical Properties:
FW: 335.4 [115457-83-5] $C_{15}H_{29}NO_7$
CMC (H_2O): ~ 19.5 mM[1] (0.65%)
Aggregation number (H_2O): ~ 92

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 0-5°C: ≥ 10%
Conductance (10% solution in water): < 80 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.03
280 nm: < 0.05
260 nm: < 0.07
225 nm: < 0.1

Reference:
1. Plusquellec, D., Chevalier, G., Talibart, R. and Wroblewski, H. (1989) *Anal. Biochem.* **179**, 145-153.



n-Decyl–β–D-Glucopyranoside, Anagrade

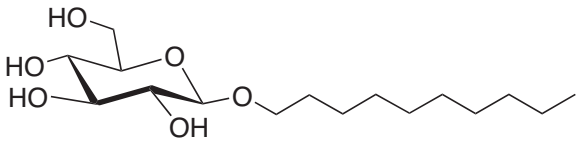
[n-Decyl–β–D-Glucoside]

D321	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 320.4 [58846-77-8] $C_{16}H_{32}O_6$
CMC (H_2O): ~ 2.2 mM[1] (0.070%)
CMC (0.01 M PO_4 Buffer): ~ 2.3 mM[2]

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
For molar volume check reference 3.
Percent anomer: < 2 α (HPLC)
Percent decanol: < 0.005 (HPLC)
pH (0.03% solution in water): 5-8
Solubility in water at 20°C: ≥ 0.1%
Conductance (0.1% solution in water): < 20 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 0.1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

References:
1. Helenius, A., McCaslin, D. R., Fries, E. and Tanford, C. (1979) *Methods Enzymol.* **56**, 734-749.
2. Brito, R. M. M. and Vaz, W. L. C. (1986) *Anal. Biochem.* **152**, 250-255.
3. Brown, G. M., Dubreuil, P., Ichhaporia, F. M. and Desnoyers, J. E. (1970) *Canadian J. Chem.* **48**, 2525-2531.



Decyl Glucose Neopentyl Glycol

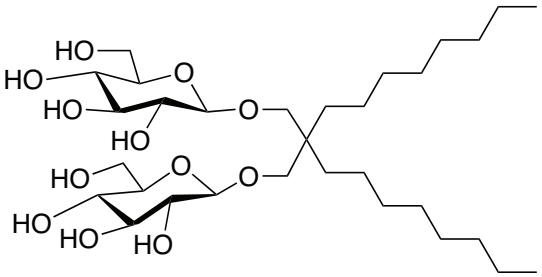
[2,2-Dioctylpropane-1,3-bis-β-D-Glucopyranoside / DG NG]

NG321	500 mg
	1 gm
	5 gm

Chemical Properties:
FW: 624.41 $C_{35}H_{68}O_{12}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
Solubility: Practically insoluble in water
Absorbance of a 1% solution in methanol:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



Glucosides

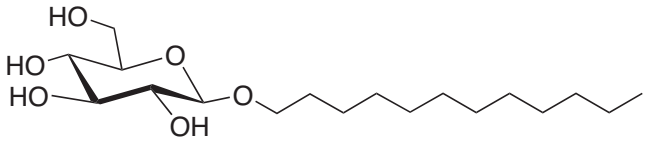
n-Dodecyl–β–D-Glucopyranoside, Anagrade

[n-Dodecyl–β–D-Glucoside]

D318	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 348.5 [59122-55-3] $C_{18}H_{36}O_6$
CMC (H_2O): ~ 0.19 mM[1] (0.0066%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
For molar volume check reference 2.
Percent anomer: < 2 α (HPLC)
Percent dodecanol: < 0.005 (HPLC)
pH (0.005% solution in water): 5-8
Solubility: Practically insoluble in water
Conductance (0.005% solution in water): < 10 µS
Percent fluorescence due to a 0.005% solution in water at 345 nm: < 10
Absorbance of a 0.005% solution in water:
340 nm: < 0.06
280 nm: < 0.06
260 nm: < 0.06
225 nm: < 0.2



References:
1. Helenius, A., McCaslin, D. R., Fries, E. and Tanford, C. (1979) *Methods Enzymol.* **56**, 734-749.
2. Brown, G. M., Dubreuil, P., Ichhaporia, F. M. and Desnoyers, J. E. (1970) *Canadian J. Chem.* **48**, 2525-2531.

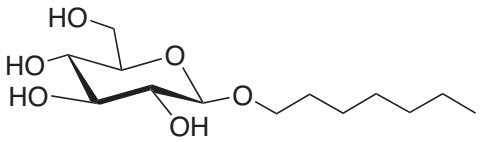
n-Heptyl–β–D-Glucopyranoside, Anagrade

[n-Heptyl–β–D-Glucoside]

H300	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 278.4 [78617-12-6] $C_{13}H_{26}O_6$
CMC (H_2O): ~ 70 mM[1] (1.9%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent heptanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



Reference:
1. Anatrace measurement.

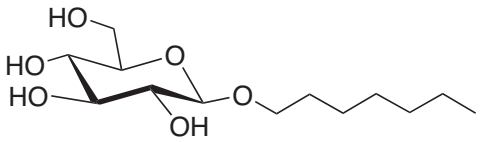
n-Heptyl–β–D-Glucopyranoside, Anagrade

[n-Heptyl–β–D-Glucoside (Low alpha)]

H300LA	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 278.4 [78617-12-6] $C_{13}H_{26}O_6$
CMC (H_2O): ~ 70 mM[1] (1.9%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 0.1 α (HPLC)
Percent heptanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



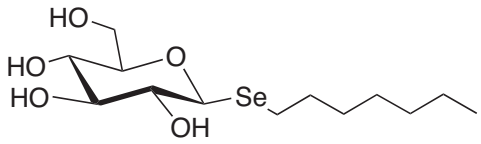
Reference:
1. Anatrace measurement.

Heptyl–β–D-Selenoglucoside

H907	500 mg 1 gm

Chemical Properties:
FW: 341.3 $C_{13}H_{26}O_5Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 20°C: ≥ 1%
Conductance (1% solution in water): < 100 µS



n-Hexyl–β–D-Glucopyranoside, Anagrade

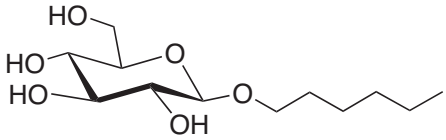
[n-Hexyl–β–D-Glucoside]

H305	1 gm 5 gm 25 gm

Chemical Properties:
FW: 264.4 [59080-45-4] $C_{12}H_{24}O_6$
CMC (H_2O): ~ 250 mM(1) (6.6%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
For molar volume check reference 2.
Percent anomer: < 2 α (HPLC)
Percent hexanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

References:
1. Anatrace measurement.
2. Brown, G. M., Dubreuil, P., Ichhaporia, F. M. and Desnoyers, J. E. (1970) *Canadian J. Chem.* **48**, 2525-2531.



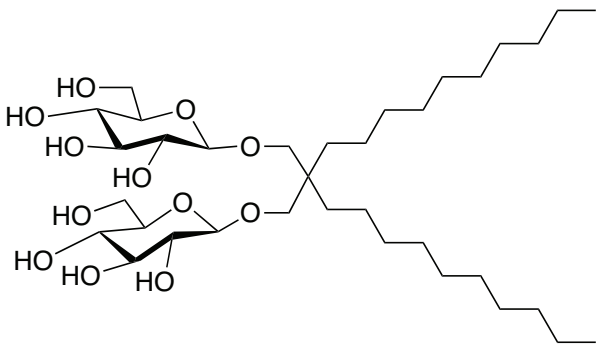
Lauryl Glucose Neopentyl Glycol

[2,2-Didecylpropane-1,3-bis-β-D-Glucopyranoside / LG NG]

NG318	500 mg 1 gm 5 gm

Chemical Properties:
FW: 680.47 $C_{31}H_{60}O_{12}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
Solubility: Practically insoluble in water
Absorbance of a 1% solution in methanol:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15



Glucosides

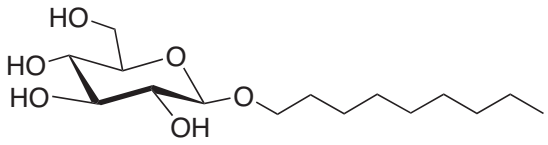
n-Nonyl–β–D-Glucopyranoside, Anagrade

[n-Nonyl–β–D-Glucoside]

N324	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 306.4 [69984-73-2] $C_{15}H_{30}O_6$
CMC (H_2O): ~ 6.5 mM[1] (0.20%)
CMC (0.15 M NaCl): ~ 6 mM[2]
CMC (1 M NaCl): ~ 3.5 mM[1]
Aggregation Number: ~ 133
dn/dc: 0.1504 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent nonanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



References:
1. Anatrace measurement.
2. Zer, H., Vink, M., Shochat, S. *et al.* (2003) *Biochemistry* **42**, 728-738.
3. Ostermeier, C., Harrenga, A., ErmLer, U. and Michel, H. (1997) *Proc. Natl. Acad. Sci. USA* **94**, 10547-10553.
4. Mechref, Y. and Rassi, Z. E. (1997) *J. Chromatography* **757**, 263-273.
5. DeGrip, W. J. and Bovee-Geurts, P. H. M. (1979) *Chem. Phys. Lipids* **23**, 312-325.

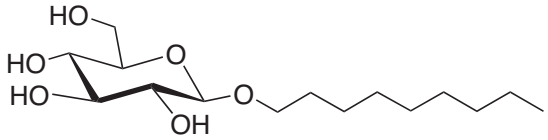
n-Nonyl–β–D-Glucopyranoside, Anagrade

[n-Nonyl–β–D-Glucoside (Low alpha)]

N324LA	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 306.4 [69984-73-2] $C_{15}H_{30}O_6$
CMC (H_2O): ~ 6.5 mM[1] (0.20%)
CMC (0.15 M NaCl): ~ 6 mM[2]
CMC (1 M NaCl): ~ 3.5 mM[1]
Aggregation Number: ~ 133
dn/dc: 0.1504 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 0.4 α (HPLC)
Percent nonanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



References:
1. Anatrace measurement.
2. Zer, H., Vink, M., Shochat, S. *et al.* (2003) *Biochemistry* **42**, 728-738.
3. Ostermeier, C., Harrenga, A., ErmLer, U. and Michel, H. (1997) *Proc. Natl. Acad. Sci. USA* **94**, 10547-10553.
4. Mechref, Y. and Rassi, Z. E. (1997) *J. Chromatography* **757**, 263-273.
5. DeGrip, W. J. and Bovee-Geurts, P. H. M. (1979) *Chem. Phys. Lipids* **23**, 312-325.

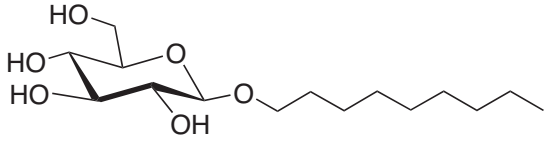
n-Nonyl–β–D-Glucopyranoside, Sol-Grade

[n-Nonyl–β–D-Glucoside]

N324S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 306.4 [69984-73-2] $C_{15}H_{30}O_6$
CMC (H_2O): ~ 6.5 mM[1] (0.20%)
CMC (0.15 M NaCl): ~ 6 mM[2]
CMC (1 M NaCl): ~ 3.5 mM[1]
Aggregation Number: ~ 133
dn/dc: 0.1504 ml/gm

Product Specifications:
Purity (β + α): ≥ 97% by HPLC analysis
Percent anomer: < 5 α (HPLC)
Percent nonanol: < 0.05 (HPLC)
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1
225 nm: < 0.2



References:
1. Anatrace measurement.
2. Zer, H., Vink, M., Shochat, S. *et al.* (2003) *Biochemistry* **42**, 728-738.
3. Ostermeier, C., Harrenga, A., ErmLer, U. and Michel, H. (1997) *Proc. Natl. Acad. Sci. USA* **94**, 10547-10553.
4. Mechref, Y. and Rassi, Z. E. (1997) *J. Chromatography* **757**, 263-273.
5. DeGrip, W. J. and Bovee-Geurts, P. H. M. (1979) *Chem. Phys. Lipids* **23**, 312-325.

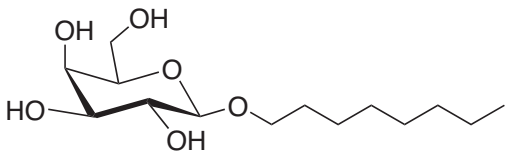
n-Octyl–β–D-Galactopyranoside, Anagrade

[n-Octyl–β–D-Galactoside]

O312	1 gm
	5 gm

Chemical Properties:
FW: 292.4 [40427-75-6] $C_{14}H_{28}O_6$
CMC (H_2O): ~ 29.5 mM[1] (0.86%)

Product Specifications:
Purit (β + α) y: ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent octanol: < 0.005 (HPLC)
pH (0.5% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 0.5%
Conductance (0.5% solution in water): < 10 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 0.5% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



Reference:
1. Stevenson, D. E., Stanley, R. A. and Furneaux, R. H. (1993) *Biotech. Bioeng.* **42**, 657-666.

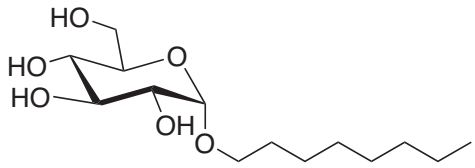
n-Octyl–α–D-Glucopyranoside, Anagrade

[n-Octyl–α–D-Glucoside / α-OG / Octyl Glucoside (High alpha)]

O311HA	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 292.4 [29781-80-4] $C_{14}H_{28}O_6$
CMC (H_2O): ~ 10-21 mM (0.3-0.6%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: > 98 α (HPLC)
Percent octanol: < 0.005 (HPLC)
pH (0.1% solution in water): 5-8
Solubility in water at 20°C: ≥ 0.1%
Note: Heating may be required to dissolve detergent.
Conductance (0.1% solution in water): < 50 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 0.1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



n-Octyl–β–D-Glucopyranoside, Anagrade

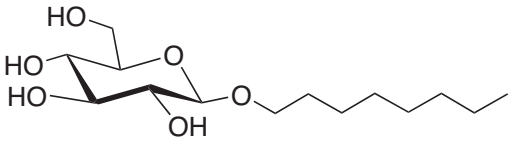
[n-Octyl–β–D-Glucoside / OG / Octyl Glucoside]

O311	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 292.4 [29836-26-8] $C_{14}H_{28}O_6$
CMC (H_2O): ~ 18-20 mM[1] (0.53%)
CMC (0.1 M NaCl): ~ 23.4 mM[2]
Aggregation number (H_2O): ~ 27-100[1]
dn/dc: 0.1159 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
For molar volume check reference 4.
Percent anomer: < 2 α (HPLC)
Percent octanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

References:
1. Lorber, B., Bishop, J. B. and DeLucas, L. J. (1990) *Biochim. Biophys. Acta* **1023**, 254-265.
2. Chattopadhyay, A. and London, E. (1984) *Anal. Biochem.* **139**, 408-412.
3. Womack, M. D., Kendall, D. A. and MacDonald, R. C. (1983) *Biochim. Biophys. Acta* **733**, 210-215.
4. Brown, G. M., Dubreuil, P., Ichhaporia, F. M. and Desnoyers, J. E. (1970) *Canadian J. Chem.* **48**, 2525-2531.
5. Conlan, S. and Bayley, H. (2003) *Biochem.* **42**, 9453-9465.
6. Fanucci, G. E., Lee, J. Y., and Cafiso, D. S. (2003) *Biochemistry* **42**, 13106-13112.



Glucosides

n-Octyl–β–D-Glucopyranoside, Sol-Grade

[n-Octyl–β–D-Glucoside / OG / Octyl Glucoside]

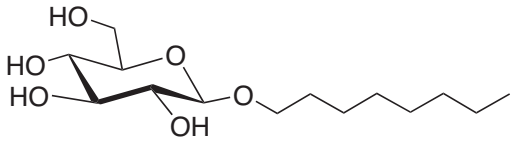
0311S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 292.4 [29836-26-8] $C_{14}H_{28}O_6$
CMC (H_2O): ~ 18-20 mM[1] (0.53%)
CMC (0.1 M NaCl): ~ 23.4 mM[2]
Aggregation number (H_2O): ~ 27-100[1]
dn/dc: 0.1159 ml/gm

Product Specifications:
Purity (β + α): ≥ 97% by HPLC analysis
Percent anomer: < 5 α (HPLC)
Percent octanol: < 0.05 (HPLC)
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1
225 nm: < 0.2

References:

1. Lorber, B., Bishop, J. B. and DeLucas, L. J. (1990) *Biochim. Biophys. Acta* **1023**, 254-265.
2. Chattopadhyay, A. and London, E. (1984) *Anal. Biochem.* **139**, 408-412.
3. Womack, M. D., Kendall, D. A. and MacDonald, R. C. (1983) *Biochim. Biophys. Acta* **733**, 210-215.
4. Brown, G. M., Dubreuil, P., Ichhaporia, F. M. and Desnoyers, J. E. (1970) *Canadian J. Chem.* **48**, 2525-2531.
5. Conlan, S. and Bayley, H. (2003) *Biochem.* **42**, 9453-9465.
6. Fanucci, G. E., Lee, J. Y., and Cafiso, D. S. (2003) *Biochemistry* **42**, 13106-13112.



n-Octyl-d17-β-D-Glucopyranoside

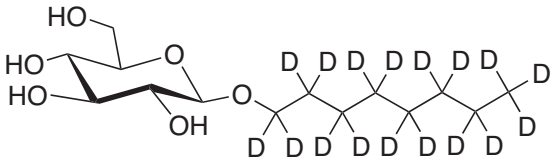
[n-Octyl-d17-β-D-Glucoside, Tail Deuterated / Tail Deuterated OG/ Octyl Glucoside]

0311T	100 mg
	250 mg
	500 mg

Chemical Properties:
FW: 309.5 [129522-81-2] $C_{14}D_{17}H_{11}O_6$
CMC (H_2O): ~ 18-20 mM[1] (0.53%)

Product Specifications:
Purity (β + α): ≥ 97% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent octanol: < 0.05 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.15
260 nm: < 0.15
225 nm: < 0.5

Reference:
1. CMC value for the undeuterated compound.



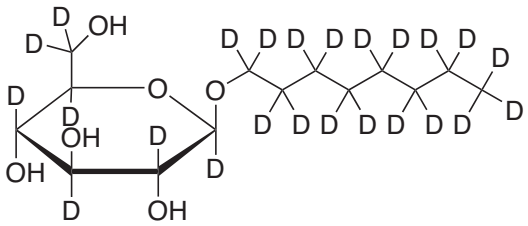
n-Octyl-d17–β–D-Glucopyranoside-d7

[n-Octyl-d17–β–D-Glucoside-d7 / Deuterated OG / Octyl Glucoside]

O311D	100 mg
	250 mg
	500 mg

Chemical Properties:
FW: 316.5 [869666-57-9] $C_{14}D_{24}H_4O_6$
CMC (H_2O): ~ 18-20 mM(1)

Product Specifications:
Purity (β + α): ≥ 97% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent octanol: < 0.05 (HPLC)
Conductance (1% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.15
260 nm: < 0.15
225 nm: < 0.5



Reference:
1. CMC value for the undeuterated compound.

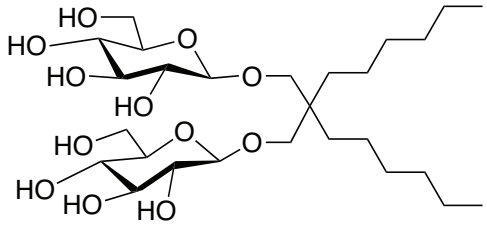
Octyl Glucose Neopentyl Glycol

[2,2-Dihexylpropane-1,3-bis-β-D-Glucopyranoside / OGNG / MNG-OG]

NG311	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 568.69 $C_{27}H_{52}O_{12}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Absorbance of a 1% solution in water:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15



Storage:
Store at -20°C.

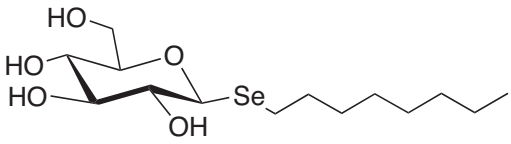
Octyl-β-D-Selenoglucoside

[Selenium Glucoside]

O908	500 mg
	1 gm

Chemical Properties:
FW: 355.3 $C_{14}H_{28}O_5Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis
pH (0.1% solution in water): 5-9
Solubility in water at 20°C: ≥ 0.1%
Conductance (0.1% solution in water): < 100 µS



HEGAs and Megas

C-HEGA®-8, Anagrade

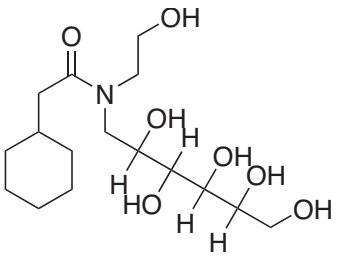
[Cyclohexylethanoyl-N-Hydroxyethylglucamide]

C408 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 349.5 [603111-75-7] $C_{16}H_{31}NO_7$
CMC (H_2O): ~ 277 mM[1] (9.7%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



C-HEGA-9, Anagrade

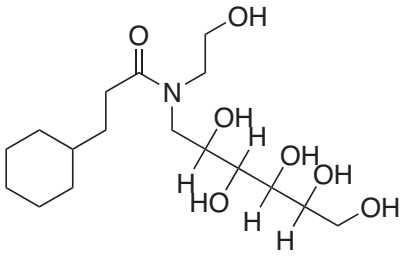
[Cyclohexylpropanoyl-N-Hydroxyethylglucamide]

C409 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 363.5 [864434-14-0] $C_{17}H_{33}NO_7$
CMC (H_2O): ~ 108 mM[1] (3.9%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



C-HEGA-10, Anagrade

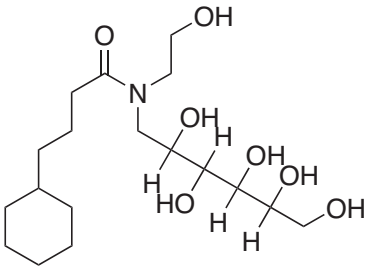
[Cyclohexylbutanoyl-N-Hydroxyethylglucamide]

C410 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 377.5 [864434-15-1] $C_{18}H_{35}NO_7$
CMC (H_2O): ~ 35 mM[1] (1.3%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

References:
1. Anatrace measurement.
2. Choudhury, D., Thompson, A., Stojanoff, V., *et al.* (1999) *Science* **285**, 1061-1066.



C-HEGA-11, Anagrade

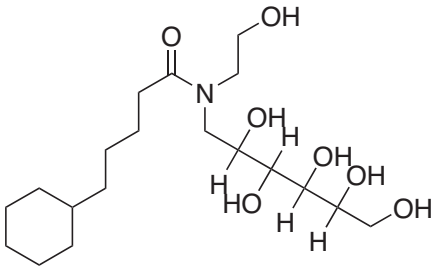
[Cyclohexylpentanoyl-N-Hydroxyethylglucamide]

C411 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 391.5 [864434-16-2] $C_{19}H_{37}NO_7$
CMC (H_2O): ~ 11.5 mM[1] (0.45%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 10%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



HEGA®-8, Anagrade

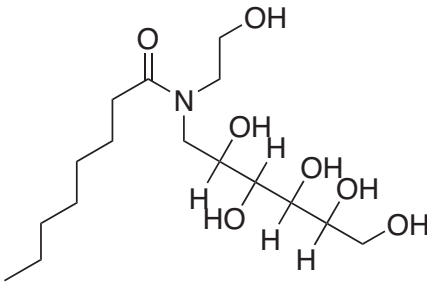
[Octanoyl-N-Hydroxyethylglucamide]

H108 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 351.5 [869652-63-1] $C_{16}H_{33}NO_7$
CMC (H_2O): ~ 109 mM[1] (3.8%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



HEGA-9, Anagrade

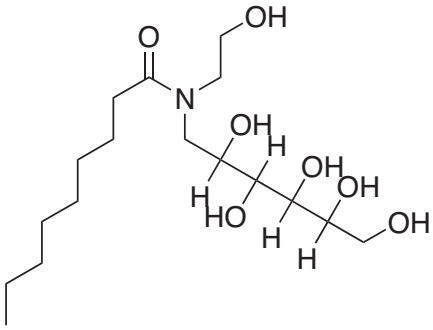
[Nonanoyl-N-Hydroxyethylglucamide]

H109 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 365.5 [869653-90-7] $C_{17}H_{35}NO_7$
CMC (H_2O): ~ 39 mM[1] (1.4%)
Aggregation number: ~ 5
dn/dc: ~ 0.1481 ml/gm

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



HEGAs and Megas

HEGA-10, Anagrade

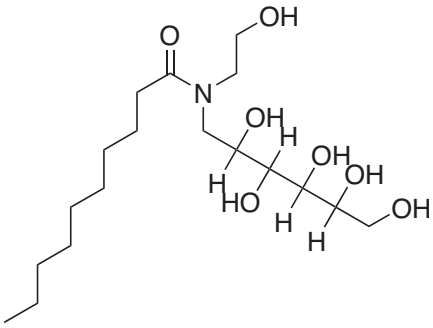
[Decanoyl-N-Hydroxyethylglucamide]

H110	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 379.5 [139361-84-5] $C_{18}H_{37}NO_7$
CMC (H_2O): ~ 7.0 mM[1] (0.26%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 10%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1
Note: Heating may be required to dissolve the detergent.

References:
1. Anatrace measurement.
2. Cortes, D. M. and Perozo, E. (1997) *Biochem.* **36**, 10343-10352.



HEGA-11, Anagrade

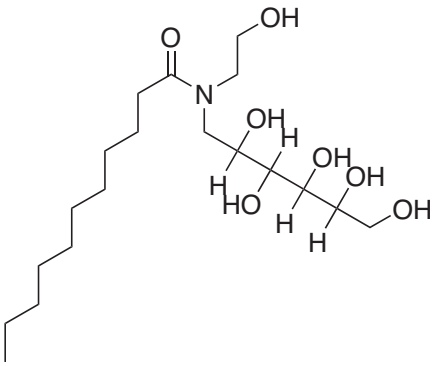
[Undecanoyl-N-Hydroxyethylglucamide]

H111	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 393.5 [869654-10-4] $C_{19}H_{39}NO_7$
CMC (H_2O): ~ 1.4 mM[1] (0.055%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (0.5% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 0.5%
Conductance (0.5% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 0.5% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1
NOTE: Heating may be required to dissolve the detergent.

Reference:
1. Anatrace measurement.



Mega-8, Anagrade

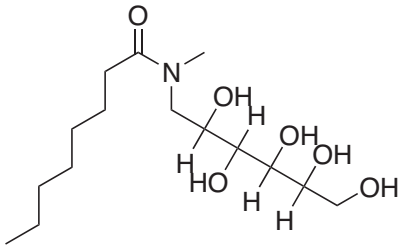
[Octanoyl-N-Methylglucamide]

M319	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 321.4 [85316-98-9] $C_{15}H_{31}NO_6$
CMC (H_2O): ~ 79 mM[1,2] (2.5%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 80 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

References:
1. Anatrace measurement.
2. Mine, Y., Fukunaga, K., Maruoka, N., *et al.* (2000) *J. Biosci. Bioeng.* **90**, 631-636.
3. Hanatani, M., *et al.* (1984) *J. Biochem.* **95**, 1349-1353.
4. Hildreth, J. E. K. (1982) *Biochem. J.* **207**, 363.



Mega-9, Anagrade

(Nonanoyl-N-Methylglucamide)

M325	1 gm
	5 gm
	25 gm

Chemical Properties:

FW: 335.5 [85261-19-4] $C_{16}H_{33}NO_6$

CMC (H_2O): ~ 25 mM[1,2] (0.84%)

Product Specifications:

Purity: ≥ 99% by HPLC analysis

pH (1% solution in water): 5-8

Solubility in water at 5°C: ≥ 5%

Conductance (5% solution in water): < 80 µS

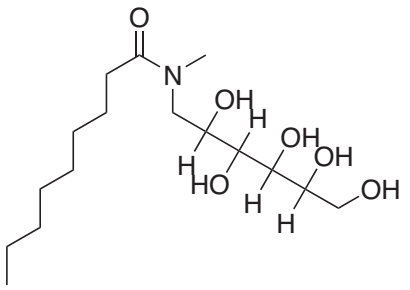
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:

340 nm: < 0.05

280 nm: < 0.08

260 nm: < 0.1



References:

1. Anatrace measurement.
2. Hanatani, M., *et al.* (1984) *J. Biochem.* **95**, 1349-1353.
3. Hildreth, J. E. K. (1982) *Biochem. J.* **207**, 363.

Mega-10, Anagrade

[Decanoyl-N-Methylglucamide]

M320	1 gm
	5 gm
	25 gm

Chemical Properties:

FW: 349.5 [85261-20-7] $C_{17}H_{35}NO_6$

CMC (H_2O): ~ 6-7 mM[1,4] (0.21%)

Product Specifications:

Purity: ≥ 99% by HPLC analysis

pH (0.3% solution in water): 5-8

Solubility in water at 0-5°C: ≥ 0.3%

Conductance (0.3% solution in water): < 40 µS

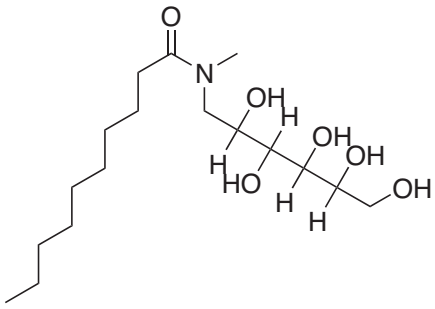
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 0.3% solution in water:

340 nm: < 0.05

280 nm: < 0.08

260 nm: < 0.1



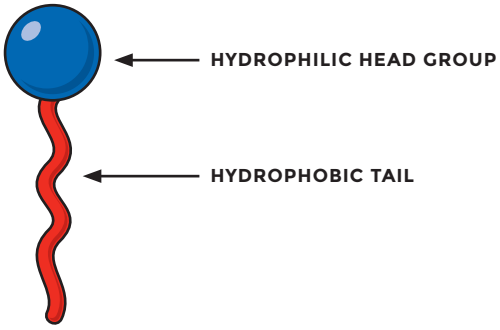
References:

1. Anatrace measurement.
2. Churchward, M. A., Butt, R. H., Lang, J. C., *et al.* (2005) *Proteome Sci.* **3**, 5.
3. Hierrezuelo, J. M., Aguiar, J., Ruiz, C. C. (2004) *Langmuir* **20**, 10419-10426.
4. Hanatani, M., *et al.* (1984) *J. Biochem.* **95**, 1349-1353.
5. Hildreth, J. E. K. (1982) *Biochem. J.* **207**, 363.

Maltosides

Dodecyl Maltoside is usually the first choice for working with membrane proteins and G protein-coupled receptors (GPCRs). Otherwise known as DDM, the detergent is part of the most popular family of detergents. Alkyl glycoside detergents are mostly derived from maltose or glucose. These detergents are mild and non-denaturing because they disrupt protein-lipid and lipid-lipid interactions rather than protein-protein interactions. The sugar serves as a polar head group with a non-polar alkyl chain attached. The hydrophilic head groups offer ample strength to extract proteins while still providing the capability to stabilize proteins in solution and promote crystal growth. These detergents are also well chronicled for their ability to stabilize other large macromolecules as well.

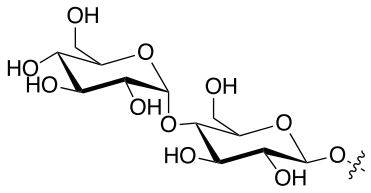
Membrane proteins and macromolecules are naturally found in a wide-range of chemical environments. When removed, there isn't one easy method for choosing which detergent may be best suited for a particular application. Anatrace offers a broad suite of maltoside detergents of varying alkyl chain lengths to help you screen for the best fit. In addition to DDM, Decyl Maltoside is a very popular choice.



These micelle-producing detergents are perfect for both protein extraction and maintaining solubility and stability in aqueous environments. Maltoside detergents have a long track record of crystallizing membrane proteins for x-ray crystallization studies or creating the necessary stable tertiary structure for NMR work. Anatrace detergents are the most cited detergents in journal articles pertaining to structure and function of membrane proteins.

Anatrace standards: High purity, consistency, and broad selection—so you can set your lab's standards higher.

HEAD GROUP



Maltoside

CARBON CHAIN LENGTH NAME	NUMBER	MALTOSIDE
Hexyl	6	H310
Octyl	8	O310
Nonyl	9	N330
Decyl	10	D322
Undecylenyl	11	U310
Dodecyl	12	D310
Tridecyl	13	T323
Tetradecyl	14	T315
Hexadecyl	16	H310
2,6-Dimethyl-4-Heptyl		DH325
2-Propyl-1-Pentyl		P310

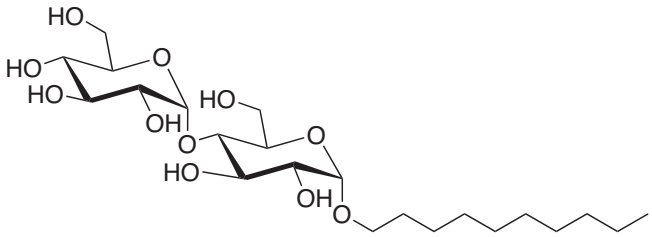
n-Decyl–α–D-Maltopyranoside, Anagrade

*[n-Decyl–**α**–D-Maltoside / Decyl Maltoside / DM] (High alpha)*

D322HA 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 482.6 [168037-12-5] $C_{22}H_{42}O_{11}$
CMC (H_2O): 1.66 mM (0.08%)

Product Specifications:
Purity (**β** + **α**): ≥ 99% by HPLC analysis
Percent anomer: > 94 **α** (HPLC)
Percent decanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.10
260 nm: < 0.15
225 nm: < 0.25



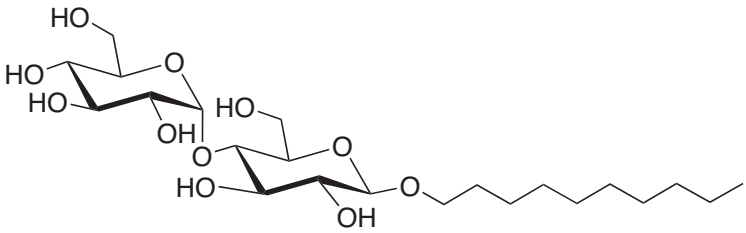
n-Decyl–β–D-Maltopyranoside, Anagrade

*[n-Decyl–**β**–D-Maltoside / Decyl Maltoside / DM]*

D322 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 482.6 [82494-09-5] $C_{22}H_{42}O_{11}$
CMC (H_2O): ~ 1.8 mM[1] (0.087%)
CMC (0.15 M NaCl): ~ 1.8 mM[2]
Aggregation number (H_2O): ~ 69[2]
dn/dc: 0.1473 ml/gm

Product Specifications:
Purity (**β** + **α**): ≥ 99% by HPLC analysis
For molar volume check reference 3.
Percent anomer: < 2 **α** (HPLC)
Percent decanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



References:

1. Alpes, H., Apell, H.-J., Knoll, G., Plattner, H. and Riek, R. (1988) *Biochim. Biophys. Acta* **946**, 379-388.
2. Anatrace measurement in collaboration with Professor R. M. Garavito (Michigan State University).
3. Brown, G. M., Dubreuil, P., Ichhaporia, F. M. and Desnoyers, J. E. (1970) *Canadian J. Chem.* **48**, 2525-2531.

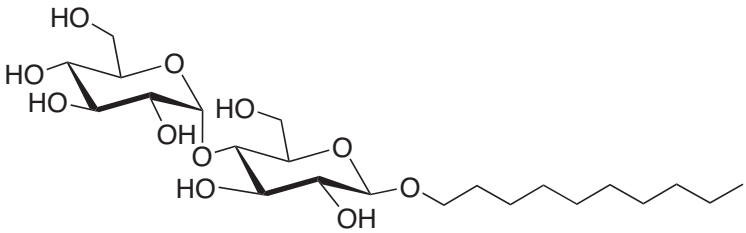
n-Decyl–β–D-Maltopyranoside, Anagrade

*[n-Decyl–**β**–D-Maltoside / Decyl Maltoside / DM (Low alpha)]*

D322LA 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 482.6 [82494-09-5] $C_{22}H_{42}O_{11}$
CMC (H_2O): ~ 1.8 mM[1] (0.087%)
CMC (0.15 M NaCl): ~ 1.8 mM[2]
Aggregation number (H_2O): ~ 69[2]
dn/dc: 0.1473 ml/gm

Product Specifications:
Purity (**β** + **α**): ≥ 99% by HPLC analysis
For molar volume check reference 3.
Percent anomer: < 0.2 **α** (HPLC)
Percent decanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



References:

1. Alpes, H., Apell, H.-J., Knoll, G., Plattner, H. and Riek, R. (1988) *Biochim. Biophys. Acta* **946**, 379-388.
2. Anatrace measurement in collaboration with Professor R. M. Garavito (Michigan State University).
3. Brown, G. M., Dubreuil, P., Ichhaporia, F. M. and Desnoyers, J. E. (1970) *Canadian J. Chem.* **48**, 2525-2531.

Maltosides

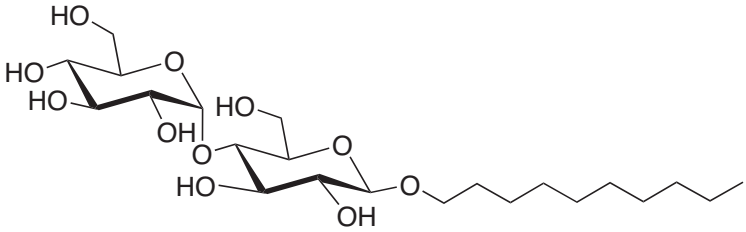
n-Decyl–β–D-Maltopyranoside, Sol-Grade

[n-Decyl–β–D-Maltoside / Decyl Maltoside / DM]

D322S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 482.6 [82494-09-5] $C_{22}H_{42}O_{11}$
CMC (H_2O): ~ 1.8 mM[1] (0.087%)
CMC (0.15 M NaCl): ~ 1.8 mM[2]
Aggregation number (H_2O): ~ 69[2]
dn/dc: 0.1473 ml/gm

Product Specifications:
Purity (β + α): ≥ 97% by HPLC analysis
Percent anomer: < 5 α (HPLC)
Percent decanol: < 0.05 (HPLC)
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1
225 nm: < 0.2



References:

1. Alpes, H., Apell, H.-J., Knoll, G., Plattner, H. and Riek, R. (1988) *Biochim. Biophys. Acta* **946**, 379-388.
2. Anatrace measurement in collaboration with Professor R. M. Garavito (Michigan State University).
3. Brown, G. M., Dubreuil, P., Ichhaporia, F. M. and Desnoyers, J. E. (1970) *Canadian J. Chem.* **48**, 2525-2531.

Decyl Maltose Neopentyl Glycol

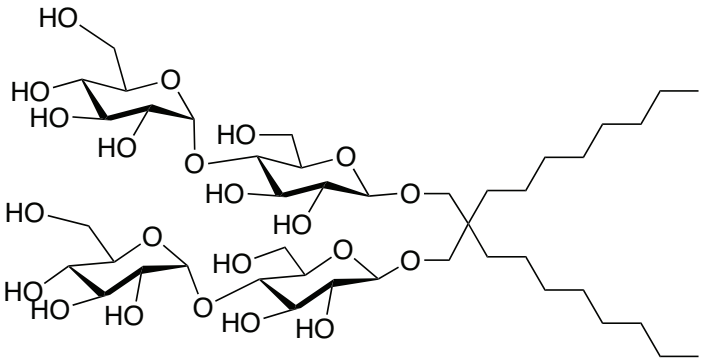
[2,2-Dioctylpropane-1,3-bis-β-D-Maltopyranoside / DMNG / MNG - DM]

NG322	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 949.08 $C_{43}H_{80}O_{22}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Absorbance of a 1% solution in water:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



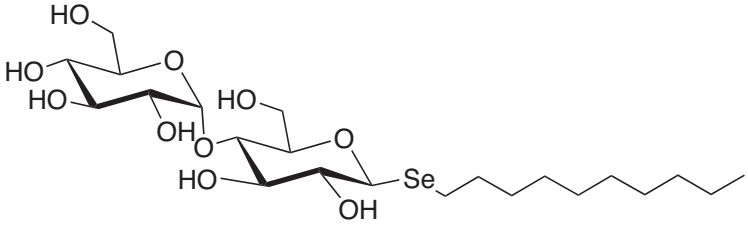
Decyl-β-D-Selenomaltoside

[Decyl Selenomaltoside]

D910	500 mg
	1 gm

Chemical Properties:
FW: 545.5 $C_{22}H_{42}O_{10}Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 20°C: ≥ 1%
Conductance (1% solution in water): < 100 µS

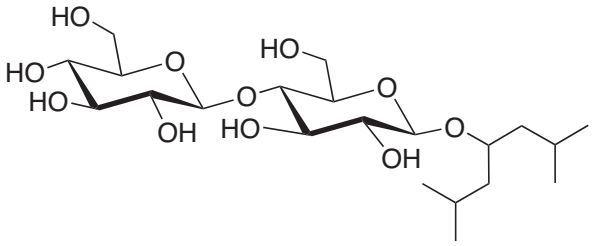


2,6-Dimethyl-4-Heptyl–β–D-Maltopyranoside, Anagrade

DH325	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 468.5 [869638-31-3] $C_{21}H_{40}O_{11}$
CMC (H_2O): ~ 27.5 mM[1] (1.2%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 15 α (HPLC)
Percent (2-6-dimethyl-4-heptanol): < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



Reference:
1. Anatrace measurement.

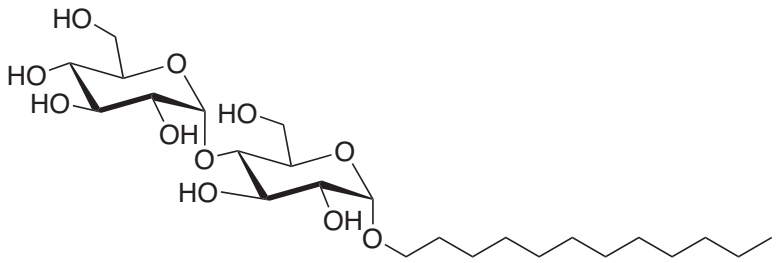
n-Dodecyl–α–D-Maltopyranoside, Anagrade

[n-Dodecyl–α–D-Maltoside / Lauryl Maltoside / Dodecyl 4-O-α-D-Glucopyranosyl-α-D-Glucopyranoside / DDM / LM (High alpha)]

D310HA	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 510.6 [116183-64-3] $C_{24}H_{46}O_{11}$
CMC (H_2O): ~ 0.152 mM (0.0076%)
Aggregation number (H_2O): ~ 90[1]

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: > 94 α (HPLC)
Percent dodecanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.10
260 nm: < 0.15
225 nm: < 0.25



Reference:
1. VanAken, T., Foxall-VanAken, S., Castleman, S. and Ferguson-Miller, S. (1986) *Methods Enzymol.* **125**, 27-35.

n-Dodecyl–β–D-Maltopyranoside, Anagrade

[n-Dodecyl–β–D-Maltoside / Lauryl Maltoside / Dodecyl 4-O–α–D-Glucopyranosyl–β–D-Glucopyranoside / DDM / LM]

D310	1 gm
	5 gm
	25 gm

Chemical Properties:

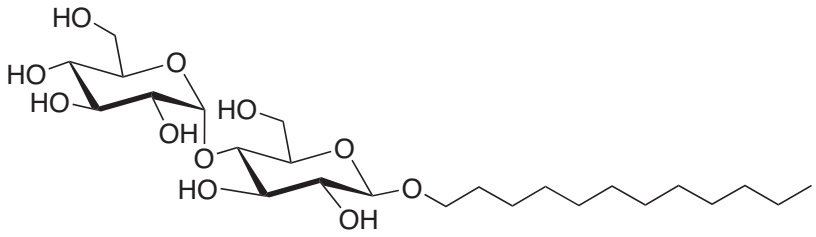
FW: 510.6 [69227-93-6] $C_{24}H_{46}O_{11}$
CMC (H_2O): ~ 0.17 mM[1] (0.0087%)
CMC (0.2 M NaCl): ~ 0.12 mM[2]
Aggregation number (H_2O): ~ 78-149[1-2]
dn/dc: 0.1435 ml/gm[4]
Micelle size: 72 kDa[5]

Product Specifications:

Purity (β + α): ≥ 99% by HPLC analysis
For molar volume check reference 3.
Percent anomer: < 2 α (HPLC)
Percent dodecanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

References:

1. VanAken, T., Foxall-VanAken, S., Castleman, S. and Ferguson-Miller, S. (1986) *Methods Enzymol.* **125**, 27-35.
2. Anatrace measurement in collaboration with Professor R. M. Garavito (Michigan State University).
3. Brown, G. M., Dubreuil, P., Ichhaporia, F. M. and Desnoyers, J. E. (1970) *Canadian J. Chem.* **48**, 2525-2531.
4. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
5. Strop, P. and Brunger, A. T. (2005) *Protein Sci.* **14**, 2207-2211.



n-Dodecyl–β–D-Maltopyranoside, Anagrade

[n-Dodecyl–β–D-Maltoside / Lauryl Maltoside / Dodecyl 4-O–α–D-Glucopyranosyl–β–D-Glucopyranoside / DDM / LM]
(Contains up to 15% alpha isomer)

D310A	1 gm
	5 gm
	25 gm

Chemical Properties:

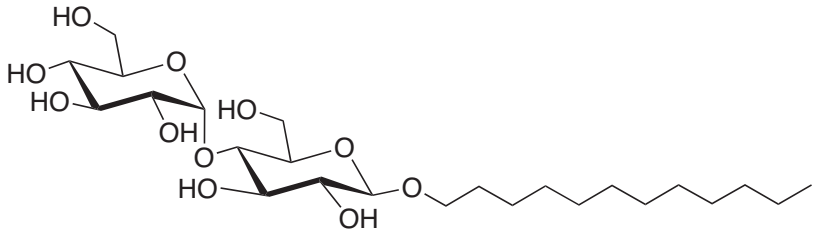
FW: 510.6 [69227-93-6] $C_{24}H_{46}O_{11}$
CMC (H_2O): ~ 0.17 mM[1] (0.0087%)
CMC (0.2 M NaCl): ~ 0.12 mM[2]
Aggregation number (H_2O): ~ 78-149[1-2]
dn/dc: 0.1435 ml/gm[4]
Micelle size: 72 kDa[5]

Product Specifications:

Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 15 α (HPLC)
Percent dodecanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

References:

1. VanAken, T., Foxall-VanAken, S., Castleman, S. and Ferguson-Miller, S. (1986) *Methods Enzymol.* **125**, 27-35.
2. Anatrace measurement in collaboration with Professor R. M. Garavito (Michigan State University).
3. Brown, G. M., Dubreuil, P., Ichhaporia, F. M. and Desnoyers, J. E. (1970) *Canadian J. Chem.* **48**, 2525-2531.
4. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
5. Strop, P. and Brunger, A. T. (2005) *Protein Sci.* **14**, 2207-2211.



n-Dodecyl–β–D-Maltopyranoside, Anagrade

*[n-Dodecyl–**β**–D-Maltoside / Lauryl Maltoside / Dodecyl 4-O–**α**–D-Glucopyranosyl–**β**–D-Glucopyranoside / DDM / LM (Low alpha)]*

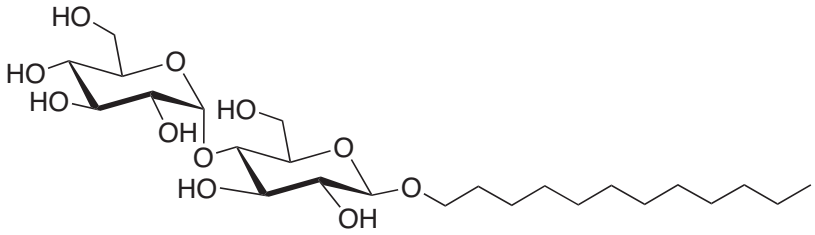
D310LA	1 gm
	5 gm
	25 gm

Chemical Properties:

FW: 510.6 [69227-93-6] $C_{24}H_{46}O_{11}$
CMC (H_2O): ~ 0.17 mM[1] (0.0087%)
CMC (0.2 M NaCl): ~ 0.12 mM[2]
Aggregation number (H_2O): ~ 78-149[1-2]
dn/dc: 0.1435 ml/gm

Product Specifications:

Purity (**β** + **α**): ≥ 99% by HPLC analysis
Percent anomer: < 0.2 **α** (HPLC)
Percent dodecanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



References:

1. VanAken, T., Foxall-VanAken, S., Castleman, S. and Ferguson-Miller, S. (1986) *Methods Enzymol.* **125**, 27-35.
2. Anatrace measurement in collaboration with Professor R. M. Garavito (Michigan State University).
3. Brown, G. M., Dubreuil, P., Ichhaporia, F. M. and Desnoyers, J. E. (1970) *Canadian J. Chem.* **48**, 2525-2531.
4. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
5. Strop, P. and Brunger, A. T. (2005) *Protein Sci.* **14**, 2207-2211.

n-Dodecyl–β–D-Maltopyranoside, Sol-Grade

*[n-Dodecyl–**β**–D-Maltoside / Lauryl Maltoside / Dodecyl 4-O–**α**–D-Glucopyranosyl–**β**–D-Glucopyranoside / DDM / LM]*

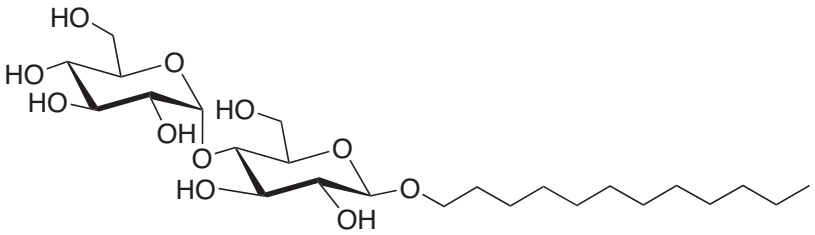
D310S	1 gm
	5 gm
	25 gm

Chemical Properties:

FW: 510.6 [69227-93-6] $C_{24}H_{46}O_{11}$
CMC (H_2O): ~ 0.17 mM[1] (0.0087%)
CMC (0.2 M NaCl): ~ 0.12 mM[2]
Aggregation number (H_2O): ~ 78-149[2]
dn/dc: 0.1435 ml/gm[4]
Micelle size: 72 kDa[5]

Product Specifications:

Purity (**β** + **α**): ≥ 98% by HPLC analysis
Percent anomer: < 5 **α** (HPLC)
Percent dodecanol: < 0.05 (HPLC)
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1
225 nm: < 0.2



References:

1. VanAken, T., Foxall-VanAken, S., Castleman, S. and Ferguson-Miller, S. (1986) *Methods Enzymol.* **125**, 27-35.
2. Anatrace measurement in collaboration with Professor R. M. Garavito (Michigan State University).
3. Brown, G. M., Dubreuil, P., Ichhaporia, F. M. and Desnoyers, J. E. (1970) *Canadian J. Chem.* **48**, 2525-2531.
4. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
5. Strop, P. and Brunger, A. T. (2005) *Protein Sci.* **14**, 2207-2211.

Maltosides

n-Dodecyl-d25–β–D-Maltopyranoside

[n-Dodecyl-d25–β–D-Maltoside, Lauryl Maltoside, Tail Deuterated / Lauryl Maltoside / DDM / LM]

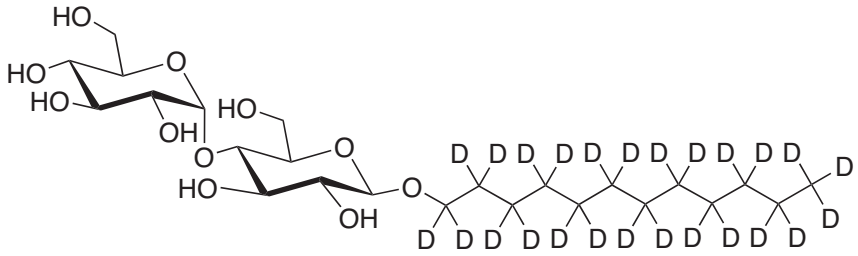
D310T	100 mg
	250 mg
	500 mg

Chemical Properties:
FW: 535.8 [849110-74-3] $C_{24}D_{25}H_{21}O_{11}$
CMC (H_2O): ~ 0.2 mM[1]

Product Specifications:
Purity (β + α): ≥ 97% by HPLC analysis
Percent anomer: < 15 α (HPLC)
Percent dodecanol: < 0.05 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.25
260 nm: < 0.25
225 nm: < 0.8

Reference:
1. CMC value for the undeuterated compound.



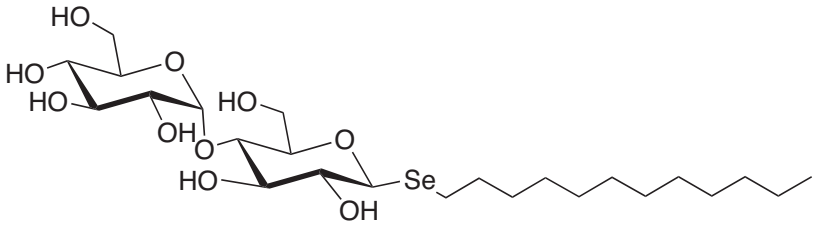
Dodecyl-β-D-Selenomaltoside

[Selenium Maltoside]

D912	500 mg
	1 gm

Chemical Properties:
FW: 573.6 $C_{24}H_{46}O_{10}Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 20°C: ≥ 1%
Conductance (1% solution in water): < 100 µS



n-Hexadecyl–β–D-Maltopyranoside, Anagrade

[n-Hexadecyl–β–D-Maltoside]

H320	1 gm
	5 gm
	25 gm

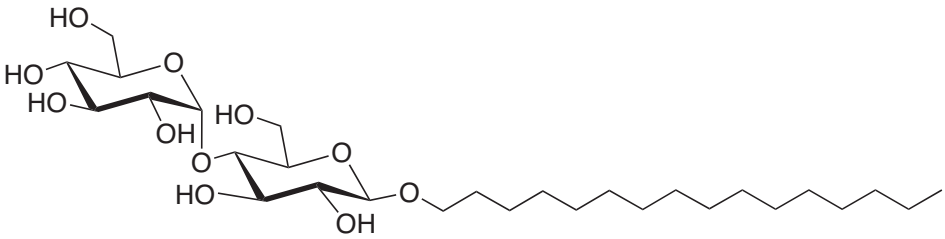
Chemical Properties:
FW: 566.6 [98064-96-1] $C_{28}H_{54}O_{11}$
CMC (H_2O): ~ 0.0006 mM[1] (0.00003%)

Product Specifications:
Purity (β + α): ≥ 97% by HPLC analysis
Percent anomer: < 5 α (HPLC)
Percent hexadecanol: < 0.01 (HPLC)
pH (0.1% solution in water): 5-8
Solubility in water at 40°C: ≥ 1%
Conductance (0.1% solution in water): < 80 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.15
225 nm: < 0.3

Note: Heating may be required to dissolve detergent.

Reference:
1. Anatrace estimate.



n-Hexyl–β–D-Maltopyranoside, Anagrade

[n-Hexyl–β–D-Maltoside]

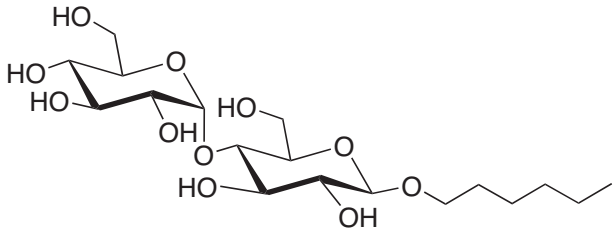
H310	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 426.4 [870287-95-9] $C_{18}H_{34}O_{11}$
CMC (H_2O): ~ 210 mM(1) (8.9%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent hexanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

Reference:
1. Anatrace estimate.



Lauryl Maltose Neopentyl Glycol

[2,2-Didecylpropane-1,3-bis-β-D-Maltopyranoside / LMNG / MNG – DDM]

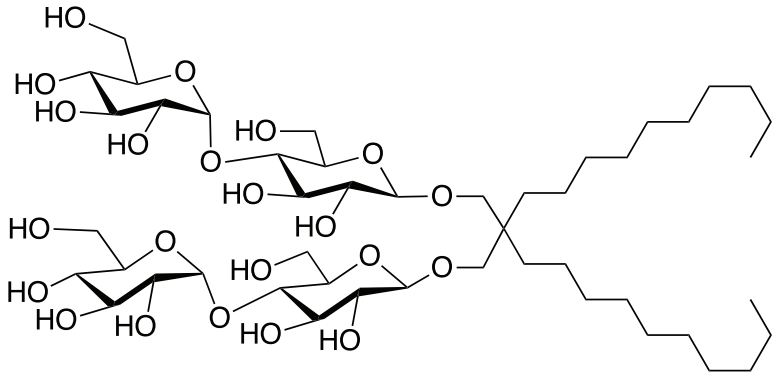
NG310	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 1005.19 $C_{47}H_{88}O_{22}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 5%
Conductance (5% solution in water): < 100 µS

Absorbance of a 1% solution in water:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



Maltosides

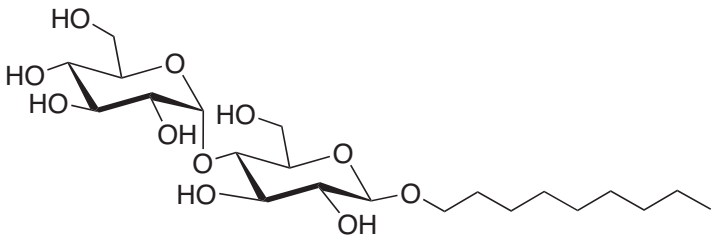
n-Nonyl–β–D-Maltopyranoside, Anagrade

[n-Nonyl–β–D-Maltoside]

N330 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 468.5 [106402-05-5] $C_{21}H_{40}O_{11}$
CMC (H_2O): ~ 6 mM[1] (0.28%)
Aggregation number (100 mM NaCl, 20 mM HEPES pH 7.5): ~ 55[2]
dn/dc: 0.1377 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent nonanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



References:
1. Anatrace measurement.
2. Anatrace measurement in collaboration with Professor R. M. Garavito (Michigan State University).

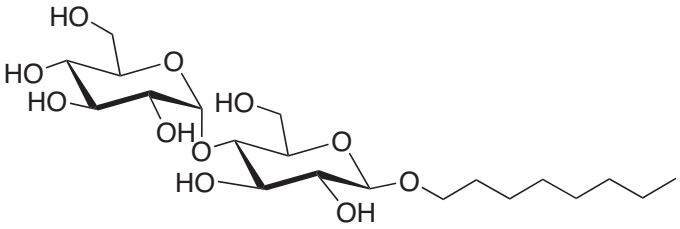
n-Octyl–β–D-Maltopyranoside, Anagrade

[n-Octyl–β–D-Maltoside / OM]

O310 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 454.4 [82494-08-4] $C_{20}H_{38}O_{11}$
CMC (100 mM NaCl, 20 mM HEPES pH 7.5): ~ 19.5 mM[1] (0.89%)
Aggregation number (100 mM NaCl, 20 mM HEPES pH 7.5): ~ 47[1]
dn/dc: 0.1392 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent octanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1



Reference:
1. Anatrace measurement in collaboration with Professor R. M. Garavito (Michigan State University).

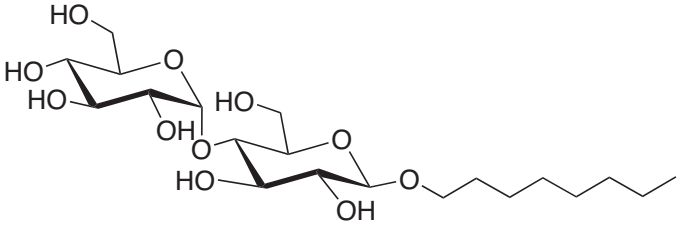
n-Octyl–β–D-Maltopyranoside, Sol-Grade

[n-Octyl–β–D-Maltoside]

O310S 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 454.4 [82494-08-4] $C_{20}H_{38}O_{11}$
CMC (100 mM NaCl, 20 mM HEPES pH 7.5): ~ 19.5 mM[1] (0.89%)
Aggregation number (100 mM NaCl, 20 mM HEPES pH 7.5): ~ 47[1]
dn/dc: 0.1392 ml/gm

Product Specifications:
Purity (β + α): ≥ 98% by HPLC analysis
Percent anomer: < 5 α (HPLC)
Percent octanol: < 0.05 (HPLC)
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1
225 nm: < 0.2



Reference:
1. Anatrace measurement in collaboration with Professor R. M. Garavito (Michigan State University).

Octyl Maltoside, Fluorinated, Anagrade

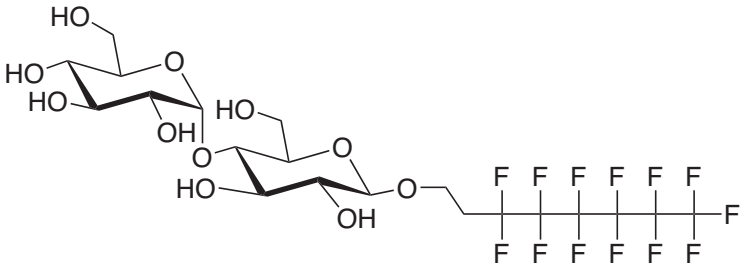
[1H, 1H, 2H, 2H-Perfluorooctyl)-β-D-Maltopyranoside / FOM]

O310F	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 688.4 $C_{20}H_{25}F_{13}O_{11}$
CMC (H_2O): 1.02 mM(1)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 100 µS
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1

Reference:
1. Greiner, J., Manfredi, A. and Riess, J. G. (1989) *New J. Chem.* **13**, 247-254.



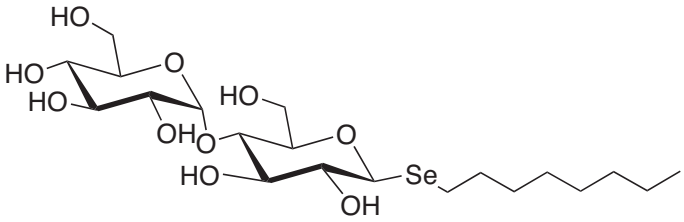
Octyl-β-D-Selenomaltoside

[Selenium Maltoside]

O918	500 mg
	1 gm

Chemical Properties:
FW: 517.5 $C_{20}H_{38}O_{10}Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 20°C: ≥ 1%
Conductance (1% solution in water): < 100 µS



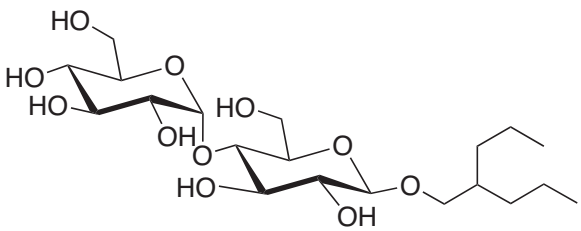
2-Propyl-1-Pentyl–β–D-Maltopyranoside, Anagrade

P310	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 455.5 [869668-28-0] $C_{20}H_{39}O_{11}$
CMC (H_2O): ~ 42.5 mM(1) (1.9%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 10 α (HPLC)
Percent (2-propyl-1-pentanol): < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

Reference:
1. Anatrace measurement.



Maltosides

Sucrose Monododecanoate, Anagrade

[β-D-Fructopyranosyl–α–D-Glucopyranoside Monododecanoate / Lauroyl Sucrose / Dodecanoyl Sucrose]

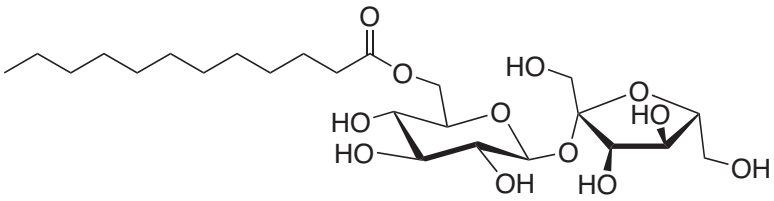
S350	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 524.6 [25339-99-5] $C_{24}H_{44}O_{12}$
CMC (H_2O): ~ 0.3 mM[1] (0.016%)

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.04
280 nm: < 0.08
260 nm: < 0.10

Note:
Sucrose monododecanoate (S350) contains three different isomers which differ in the location of the ester linkage. Esterification takes place at each of the primary alcohols in the sucrose molecule.



References:

1. Makino, H., *et al.* (1983) *Agric. Biol. Chem.* **4**, 319.
2. Ostermeier, C., Harrenga, A., ErmLer, U. and Michel, H. (1997) *Proc. Natl. Acad. Sci. USA* **94**, 10547-10553.

n-Tetradecyl–β–D-Maltopyranoside, Anagrade

[n-Tetradecyl–β–D-Maltoside / Tetradecyl 4-O–α–D-Glucopyranosyl–β–D-Glucopyranoside]

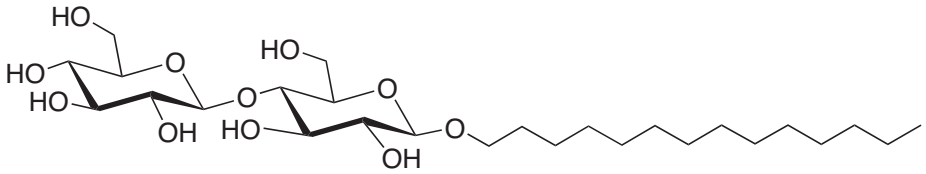
T315	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 538.6 [18449-82-6] $C_{26}H_{50}O_{11}$
CMC (H_2O): ~ 0.01 mM[1] (0.00054%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent tetradecanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.04
280 nm: < 0.06
260 nm: < 0.1
225 nm: < 0.2

Reference:
1. Anatrace measurement.



n-Tetradecyl–β–D-Maltopyranoside, Sol-Grade

[n-Tetradecyl–β–D-Maltoside / Tetradecyl 4-O–α–D-Glucopyranosyl–β–D-Glucopyranoside]

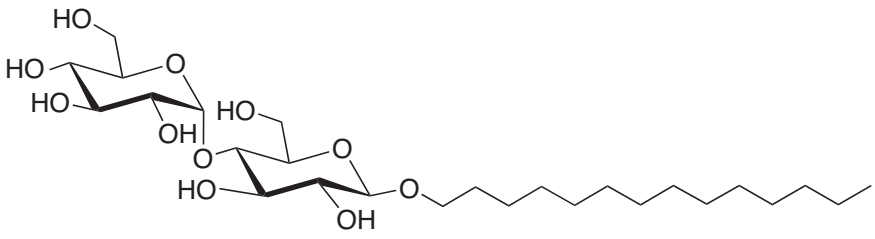
T315S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 538.6 [18449-82-6] $C_{26}H_{50}O_{11}$
CMC (H_2O): ~ 0.01 mM[1] (0.00054%)

Product Specifications:
Purity (β + α): ≥ 98% by HPLC analysis
Percent anomer: < 5 α (HPLC)
Percent tetradecanol: < 0.05 (HPLC)
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS

Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1
225 nm: < 0.2

Reference:
1. Anatrace measurement.



n-Tridecyl–β–D-Maltopyranoside, Anagrade

[n-Tridecyl–β–D-Maltoside]

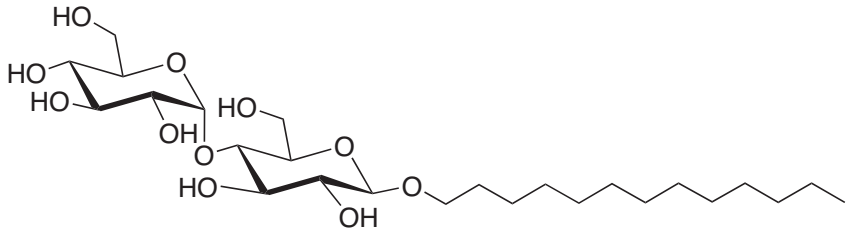
T323	500 mg
	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 524.6 [93911-12-7] $C_{25}H_{48}O_{11}$
CMC (H_2O): ~ 0.033 mM[1] (0.0017%)
CMC (0.15 mM NaCl): ~ 0.024 mM[1] (0.0013%)
Aggregation number (100 mM NaCl, 20 mM HEPES pH 7.5): ~ 186[2]
dn/dc: 0.1404 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent tridecanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.04
280 nm: < 0.06
260 nm: < 0.1
225 nm: < 0.2

References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.



n-Tridecyl–β–D-Maltopyranoside, Anagrade

[n-Tridecyl-β-D-Maltoside (Low alpha)]

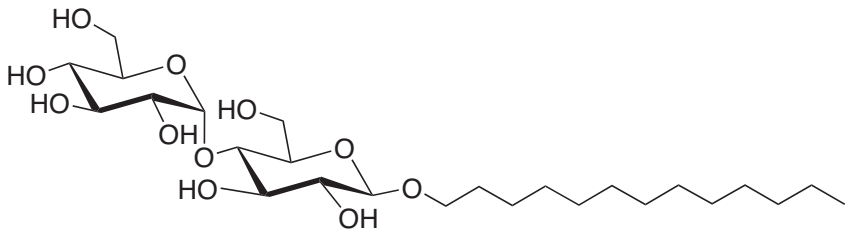
T323LA	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 524.6 [93911-12-7] $C_{25}H_{48}O_{11}$
CMC (H_2O): ~ 0.033 mM[1] (0.0017%)
CMC (0.15 mM NaCl): ~ 0.024 mM[1] (0.0013%)
Aggregation number (100 mM NaCl, 20 mM HEPES pH 7.5): ~ 186[2]
dn/dc: 0.1404 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 0.2 α (HPLC)
Percent tridecanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.04
280 nm: < 0.06
260 nm: < 0.1
225 nm: < 0.2

References:
See T323 for references.



n-Tridecyl–β–D-Maltopyranoside, Sol-Grade

[n-Tridecyl–β–D-Maltoside]

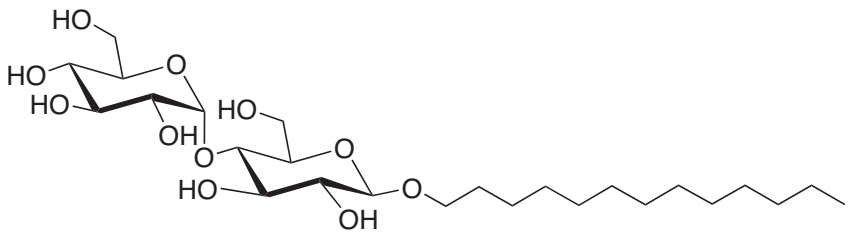
T323S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 524.6 [93911-12-7] $C_{25}H_{48}O_{11}$
CMC (H_2O): ~ 0.033 mM[1] (0.0017%)
CMC (0.15 mM NaCl): ~ 0.024 mM[1] (0.0013%)
Aggregation number (100 mM NaCl, 20 mM HEPES pH 7.5): ~ 186[2]
dn/dc: 0.1404 ml/gm

Product Specifications:
Purity (β + α): ≥ 97% by HPLC analysis
Percent anomer: < 5 α (HPLC)
Percent tridecanol: < 0.05 (HPLC)
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS

Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1
225 nm: < 0.2

References:
See T323 for references.



n-Undecyl–α–D-Maltopyranoside, Anagrade

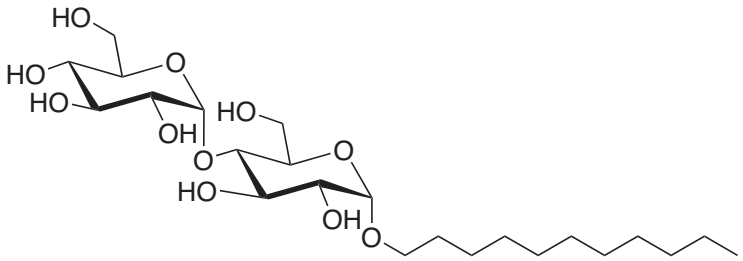
[n-Undecyl–α–D-Maltoside / UM (High alpha)]

U300HA	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 496.6 [168037-13-6] $C_{23}H_{44}O_{11}$
CMC (H_2O): ~ 0.58 mM[1] (0.029%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: > 94 α (HPLC)
Percent undecanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.10
260 nm: < 0.15
225 nm: < 0.25

Reference:
1. Anatrace measurement.



n-Undecyl–β–D-Maltopyranoside, Anagrade

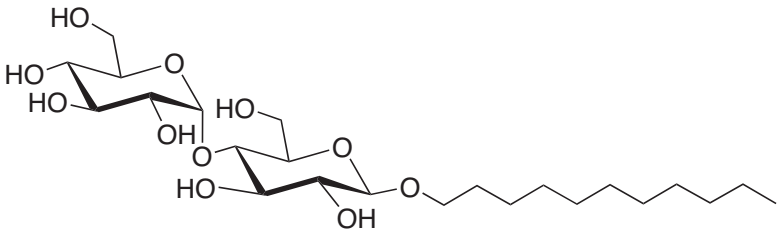
[n-Undecyl–β–D-Maltoside / UM]

U300	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 496.6 [253678-67-0] $C_{23}H_{44}O_{11}$
CMC (H_2O): ~ 0.59 mM[1] (0.029%)
Aggregation number (100 mM NaCl, 20 mM HEPES pH 7.5): ~ 71[2]
dn/dc: 0.1506 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent undecanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Ostermeier, C., Harrenga, A., ErmLer, U., and Michel, H. (1997) *Proc. Natl. Acad. Sci. USA* **94**, 10547-10553.
4. Zhang, H., Kurisu, G., Smith, J. L., and Cramer, W. A. (2003) *PNAS* **100**, *No. 9*, 5160-5163.



n-Undecyl–β–D-Maltopyranoside, Anagrade

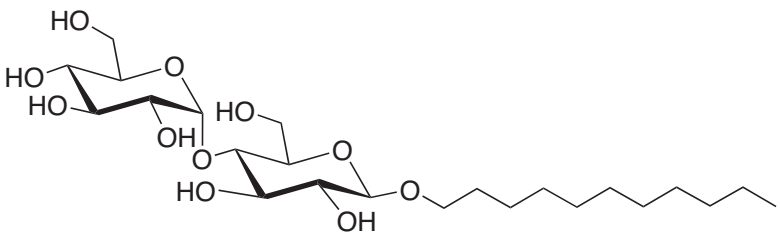
[n-Undecyl–β–D-Maltoside / UM (Low alpha)]

U300LA	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 496.6 [253678-67-0] $C_{23}H_{44}O_{11}$
CMC (H_2O): ~ 0.59 mM[1] (0.029%)
Aggregation number (100 mM NaCl, 20 mM HEPES pH 7.5): ~ 71[2]
dn/dc: 0.1506 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 0.2 α (HPLC)
Percent undecanol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1

References:
See U300 for references.



n-Undecyl–β–D-Maltopyranoside, Sol-Grade

[n-Undecyl–β–D-Maltoside / UM]

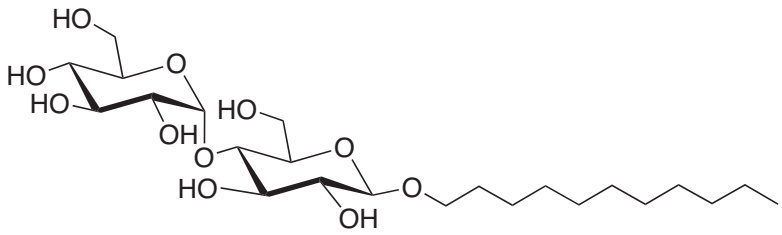
U300S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 496.6 [253678-67-0] $C_{23}H_{44}O_{11}$
CMC (H_2O): ~ 0.59 mM[1] (0.029%)
Aggregation number (100 mM NaCl, 20 mM HEPES pH 7.5): ~ 71[2]
dn/dc: 0.1506 ml/gm

Product Specifications:
Purity (β + α): ≥ 97% by HPLC analysis
Percent anomer: < 5 α (HPLC)
Percent undecanol: < 0.05 (HPLC)
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1
225 nm: < 0.2

References:

1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Ostermeier, C., Harrenga, A., ErmLer, U., and Michel, H. (1997) *Proc. Natl. Acad. Sci. USA* **94**, 10547-10553.
4. Zhang, H., Kurisu, G., Smith, J. L., and Cramer, W. A. (2003) *PNAS* **100**, *No. 9*, 5160-5163.

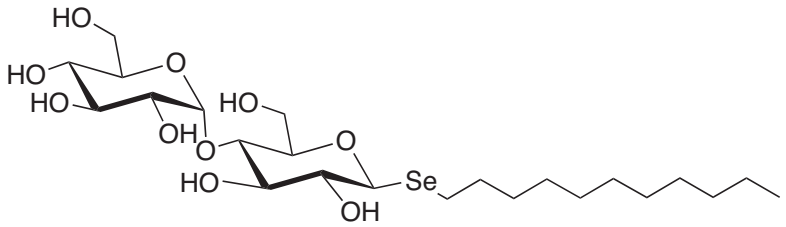


Undecyl-β-D-Selenomaltoside

U911	500 mg
	1 gm

Chemical Properties:
FW: 573.6 $C_{23}H_{44}O_{10}Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 20°C: ≥ 1%
Conductance (1% solution in water): < 100 µS



ω–Undecylenyl–β–D-Maltopyranoside, Anagrade

[ω–Undecylenyl–β–D-Maltoside]

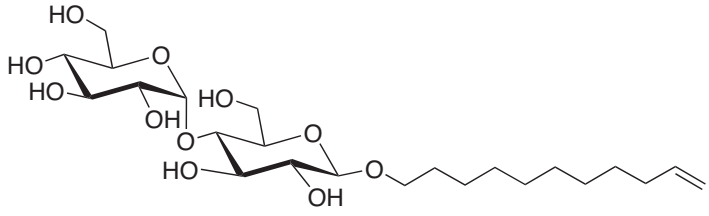
U310	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 494.6 $C_{23}H_{42}O_{11}$
CMC (H_2O): ~ 1.2 mM[1] (0.059%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent ω–undecylenyl alcohol: < 0.005 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06

References:

1. Anatrace measurement.
2. Anatrace measurement in collaboration with Professor R. M. Garavito (Michigan State University).
3. Ostermeier, C., Harrenga, A., ErmLer, U. and Michel, H. (1997) *Proc. Natl. Acad. Sci. USA* **94**, 10547-10553.



NG Class

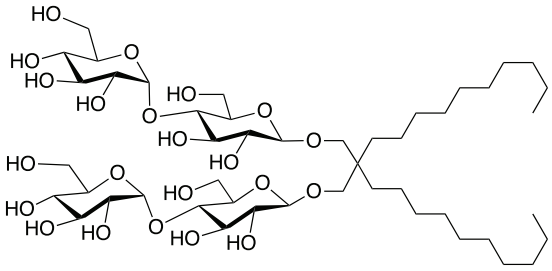
Conventional detergents like DDM, DM, and OG have been indispensable for labs studying membrane proteins for over 20 years. Now Anatrace offers an alternative that could improve protein structural stability and increase the likelihood of crystallization. The Anatrace NG class detergents are modeled after the most popular alkyl glycoside detergents. Architecturally, the difference lies where the carbon attaches to the ether linkage. The design converts the carbon from a standard, secondary bonding configuration to a quaternary configuration with two sugar head groups and two alkyl chains bonded to it.

This distinctive design gives the Anatrace NG detergents unique benefits and characteristics compared to conventional derivatives like DDM, DM, and OG:

★ Lower CMC values
★ Increased protein stability after dilution below CMV values
★ Stabilization of the first ligand bound GPCR leading to its structure

As with other detergents, our NG class detergent performance will vary with each membrane protein. To see which works the best for your research, we recommend you run parallel experiments with your current conventional detergent and the corresponding new Anatrace NG detergent. Simply use the same concentration and protocol, and then compare the results.

FIG. 1. LAURYL MALTOSE NEOPENTYL GLYCOL



New NG with two hydrophilic heads and two lipophilic tails built around a central quaternary carbon.

PROD. NO.	DESCRIPTION	COMPARABLE CONVENTIONAL DETERGENT
NG310	Lauryl Maltose Neopentyl Gycol	Dodecyl Maltoside (Prod. No. D310)
NG311	Octyl Glucose Neopentyl Glycol	Octyl Glucoside (Prod. No. O311)
NG318	Lauryl Glucose Neopentyl Glycol	Dodecyl Glucoside, Anagrade (Prod. No. D318)
NG321	Decyl Glucose Neopentyl Glycol	Decyl Glucoside, Anagrade (Prod. No. D321)
NG322	Decyl Maltose Neopentyl Gycol	Decyl Maltoside (Prod. No. D322)
NG325	CYMAL-5 Neopentyl Glycol	CYMAL-5, Anagrade (Prod. No. C325)
NG326	CYMAL-6 Neopentyl Glycol	CYMAL-6, Anagrade (Prod. No. C326)
NG327	CYMAL-7 Neopentyl Glycol	CYMAL-7, Anagrade (Prod. No. C327)

CYMAL-5 Neopentyl Glycol

[2,2-bis(3'-Cyclohexylpropyl) Propane-1,3-bis-β-D-Maltopyranoside / CYMAL-5-NG]

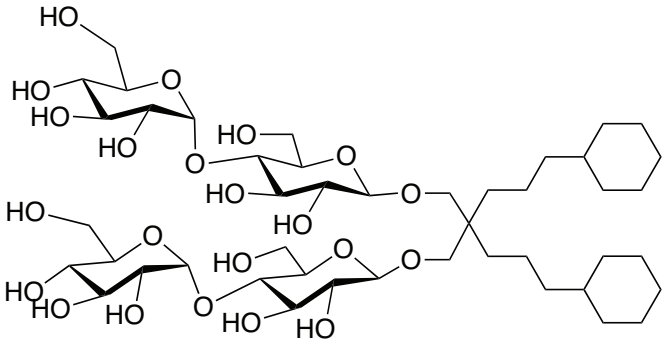
NG325 500 mg, 1 gm, 5 gm

Chemical Properties:
FW: 972.5 $C_{45}H_{80}O_{22}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 5%
Conductance (5% solution in water): < 100 µS

Absorbance of a 1% solution in water:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



CYMAL-6 Neopentyl Glycol

[2,2-bis(3'-Cyclohexylbutyl) Propane-1,3-bis-β-D-Maltopyranoside / CYMAL-6-NG]

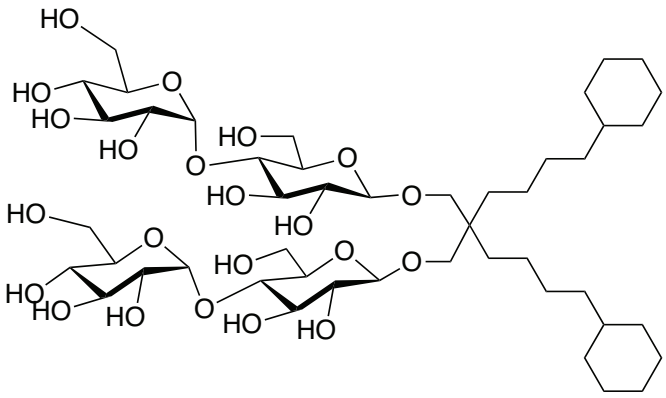
NG326 500 mg, 1 gm, 5 gm

Chemical Properties:
FW: 1000.55 $C_{47}H_{84}O_{22}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 5%
Conductance (5% solution in water): < 100 µS

Absorbance of a 1% solution in water:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



CYMAL-7 Neopentyl Glycol

[2,2-bis(3'-Cyclohexylpentyl) Propane-1,3-bis-β-D-Maltopyranoside / CYMAL-7-NG]

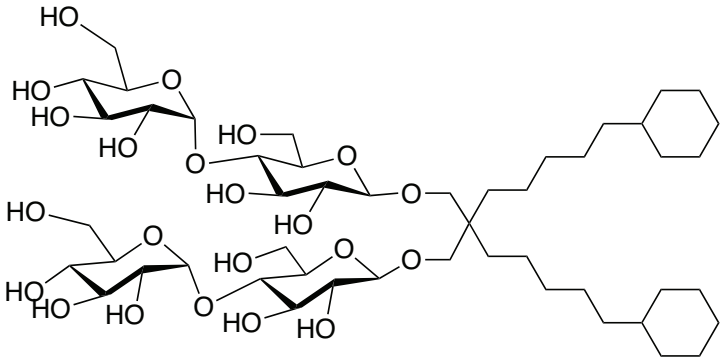
NG327 500 mg, 1 gm, 5 gm

Chemical Properties:
FW: 1028.58 $C_{49}H_{88}O_{22}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 5%
Conductance (5% solution in water): < 100 µS

Absorbance of a 1% solution in water:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



NG Class

Decyl Glucose Neopentyl Glycol

[2,2-Dioctylpropane-1,3-bis-β-D-Glucopyranoside / DG NG]

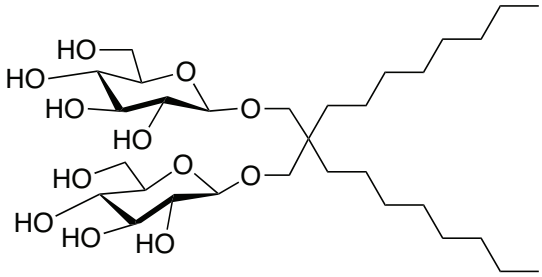
NG321	500 mg 1 gm 5 gm

Chemical Properties:
FW: 624.41 $C_{35}H_{68}O_{12}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
Solubility: Practically insoluble in water

Absorbance of a 1% solution in methanol:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



Decyl Maltose Neopentyl Glycol

[2,2-Dioctylpropane-1,3-bis-β-D-Maltopyranoside / DMNG / MNG - DM]

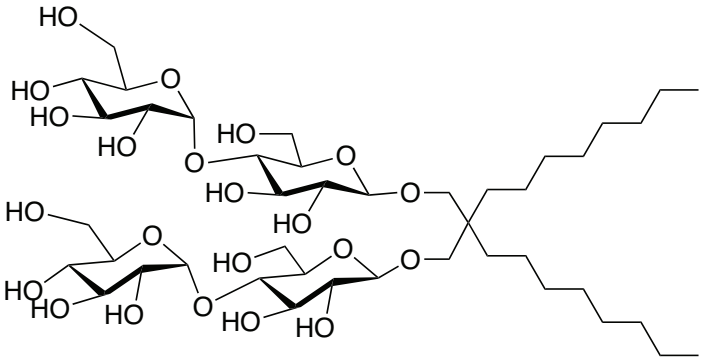
NG322	1 gm 5 gm 25 gm

Chemical Properties:
FW: 949.08 $C_{43}H_{80}O_{22}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS

Absorbance of a 1% solution in water:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



Lauryl Glucose Neopentyl Glycol

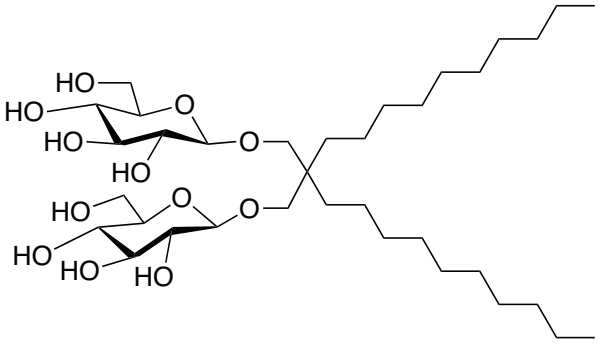
[2,2-Didecylpropane-1,3-bis-β-D-Glucopyranoside / LG NG]

NG318	500 mg 1 gm 5 gm

Chemical Properties:
FW: 680.47 $C_{31}H_{60}O_{12}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
Solubility: Practically insoluble in water

Absorbance of a 1% solution in methanol:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15



Lauryl Maltose Neopentyl Glycol

[2,2-Didecylpropane-1,3-bis-β-D-Maltopyranoside / LMNG / MNG – DDM]

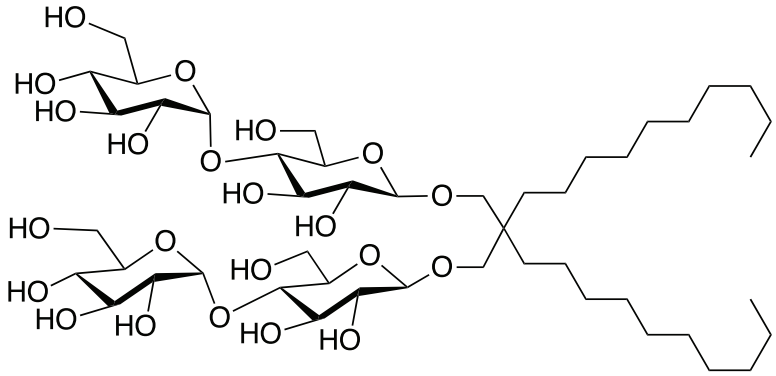
NG310	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 1005.19 $C_{47}H_{88}O_{22}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 5%
Conductance (5% solution in water): < 100 µS

Absorbance of a 1% solution in water:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



Octyl Glucose Neopentyl Glycol

[2,2-Dihexylpropane-1,3-bis-β-D-Glucopyranoside / OGNG / MNG-OG]

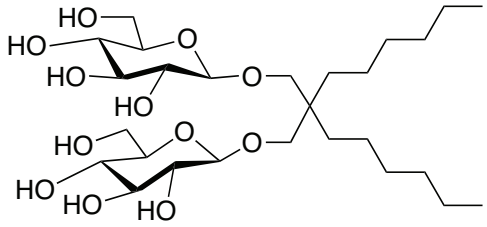
NG311	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 568.69 $C_{27}H_{52}O_{12}$

Product Specifications:
Purity: ≥ 98% (all anomers) by HPLC analysis
Percent anomer: ≤ 4% anomers other than 1,3-bis-β (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 100 µS

Absorbance of a 1% solution in water:
340 nm: 0.1
280 nm: 0.12
260 nm: 0.15

Storage:
Store at -20°C.



Thioglucosides and Thiomaltosides

n-Decyl–β–D-Thioglucopyranoside, Anagrade

[n-Decyl–β–D-Thioglucoside / DTG / Decyl Thioglucoside]

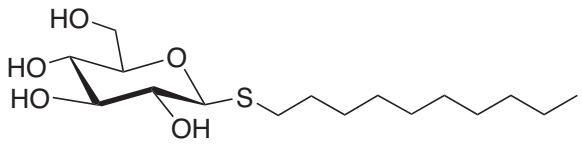
D323	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 336.4 [98854-16-1] $C_{16}H_{32}O_5S$
CMC (water/methanol)[1]: ~ 0.9 mM[2] (0.30%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
pH (1% solution[1]): 5-8
Solubility: ≥ 1% (at 20°C)[1]
Conductance (1% solution[1]): < 40 µS
Percent fluorescence due to a 0.1% solution[1] at 345 nm: < 10
Absorbance of a 1% solution[1]:
340 nm: < 0.05
280 nm: < 0.15
260 nm: < 0.2

Note:
n-Decyl–β–D-Thioglucopyranoside is insoluble in water.

References:
1. Solvent: (1:1) v/v methanol:water.
2. Anatrace measurement.



n-Decyl–β–D-Thiomaltopyranoside, Anagrade

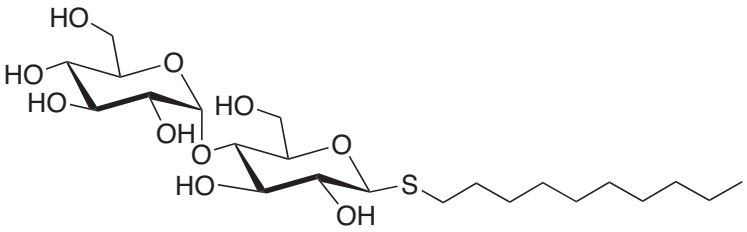
[n-Decyl–β–D-Thiomaltoside / DTM / Decyl Thiomaltoside]

D335	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 498.6 [14565-56-4] $C_{22}H_{42}O_{10}S$
CMC (H_2O): ~ 0.9 mM[1] (0.045%)
Aggregation number (H_2O): ~ 75[2]

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.15
260 nm: < 0.2

References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Mechref, Y. and Rassi, Z. E., (1997) *J. Chromatography* **757**, 263-273.



n-Dodecyl–β–D-Thiomaltopyranoside, Anagrade

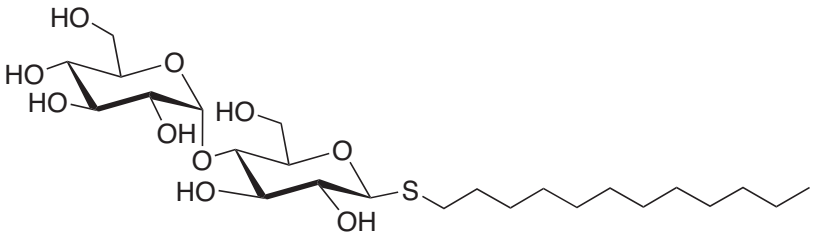
[n-Dodecyl–β–D-Thiomaltoside / LTM / Lauryl Thiomaltoside]

D342	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 526.6 [148565-58-6] $C_{24}H_{46}O_{10}S$
CMC (H_2O): ~ 0.05 mM[1] (0.0026%)
Aggregation number (H_2O): ~ 126[2]
dn/dc: 0.1588 ml/gm

Product Specifications:
Purity (β + α): ≥ 98% by HPLC analysis
Percent anomer: < 2 α (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.15
260 nm: < 0.2

References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Mechref, Y. and Rassi, Z. E. (1997) *J. Chromatography* **757**, 263-273.



n-Heptyl–β–D-Thioglucopyranoside, Anagrade

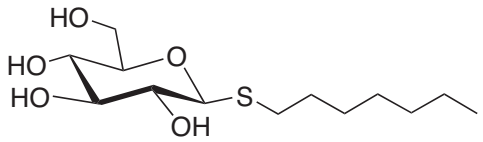
[n-Heptyl–β–D-Thioglucoside]

H301	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 294.4 [85618-20-8] $C_{13}H_{26}O_5S$
CMC (H_2O): ~ 29 mM[1] (0.85%)
Aggregation Number: ~ 27
dn/dc: 0.1316 ml/gm

Product Specifications:
Appearance: Product is a gummy solid
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 10%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.25

Reference:
1. Anatrace measurement.



n-Heptyl–β–D-Thioglucopyranoside, Anagrade

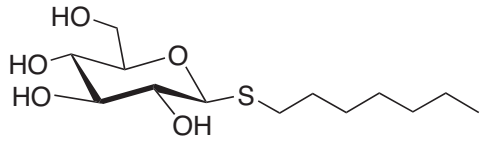
[n-Heptyl–β–D-Thioglucoside (Low alpha)]

H301LA	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 294.4 [85618-20-8] $C_{13}H_{26}O_5S$
CMC (H_2O): ~ 29 mM[1] (0.85%)
Aggregation Number: ~ 27
dn/dc: 0.1316 ml/gm

Product Specifications:
Appearance: Product is a gummy solid
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 0.1 α (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 10%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.25

Reference:
1. Anatrace measurement.



n-Nonyl–β–D-Thioglucopyranoside, Anagrade

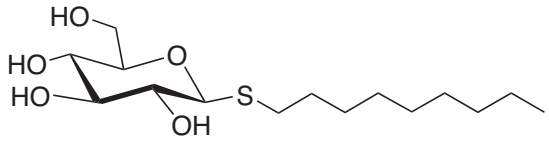
[n-Nonyl–β–D-Thioglucoside]

N335	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 322.4 [98854-15-0] $C_{15}H_{30}O_5S$
CMC (water:methanol[1]): ~ 2.9 mM[2] (0.093%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
pH (0.05% solution[1]): 5-8
Solubility at 0-5°C[1]: ≥ 0.05%
Conductance (0.05% solution[1]): < 40 µS
Percent fluorescence due to a 0.05% solution[1] at 345 nm: < 10
Absorbance of a 0.05% solution[1]:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.25

References:
1. Solvent: (1:1) v/v methanol:water.
2. Anatrace measurement.



Thioglucosides and Thiomaltosides

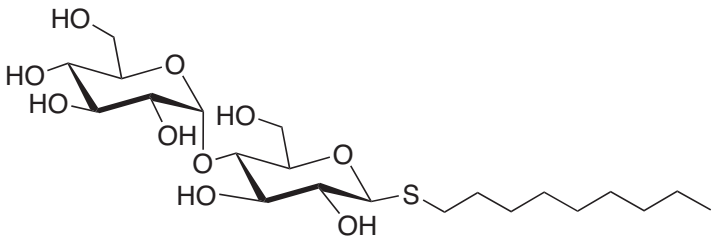
n-Nonyl–β–D-Thiomaltopyranoside, Anagrade

[n-Nonyl–β–D-Thiomaltoside / NTM]

N350	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 484.6 [148565-55-3] $C_{21}H_{40}O_{10}S$
CMC (H_2O): ~ 3.2 mM[1] (0.15%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.15
260 nm: < 0.2



References:

1. Anatrace measurement.
2. Mechref, Y. and Rassi, Z. E. (1997) *J. Chromatography* **757**, 263-273.

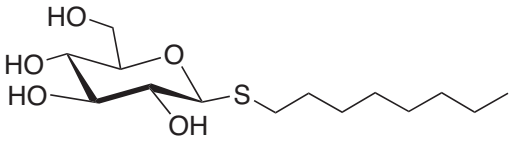
n-Octyl–β–D-Thioglucopyranoside, Anagrade

[n-Octyl–β–D-Thioglucoside / OTG]

O314	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 308.4 [85618-21-9] $C_{14}H_{28}O_5S$
CMC (H_2O): ~ 9 mM[1] (0.28%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
pH (0.5% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 0.8%
Conductance (0.5% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.25



References:

1. Saito, S. and Tsuchiya, T. (1984) *Biochem. J.* **222**, 829-832.
2. Wenk, M. R. and Seelig, J. (1997) *Biophys. J.* **73**, 2565-2574.

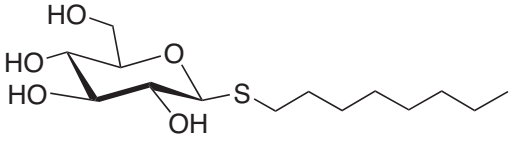
n-Octyl–β–D-Thioglucopyranoside, Anagrade

[n-Octyl–β–D-Thioglucoside (Low alpha)]

O314LA	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 308.4 [85618-21-9] $C_{14}H_{28}O_5S$
CMC (H_2O): ~ 9 mM[1] (0.28%)
Aggregation Number: ~ 189
dn/dc: 0.1562 ml/gm

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 0.1 α (HPLC)
pH (0.5% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 0.8%
Conductance (0.5% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.25



References:

1. Saito, S. and Tsuchiya, T. (1984) *Biochem. J.* **222**, 829-832.
2. Wenk, M. R. and Seelig, J. (1997) *Biophys. J.* **73**, 2565-2574.

n-Octyl–β–D-Thiomaltopyranoside, Anagrade

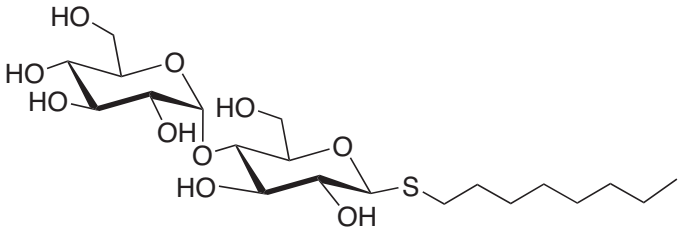
[n-Octyl–β–D-Thiomaltoside / OTM]

O320	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 470.6 [148616-91-5] $C_{20}H_{38}O_{10}S$
CMC (H_2O): ~ 8.5 mM[1] (0.40%)

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 α (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%

Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.15
260 nm: < 0.2



References:
1. Anatrace measurement.
2. Mechref, Y. and Rassi, Z. E. (1997) *J. Chromatography* **757**, 263-273.

n-Undecyl–β–D-Thiomaltopyranoside, Anagrade

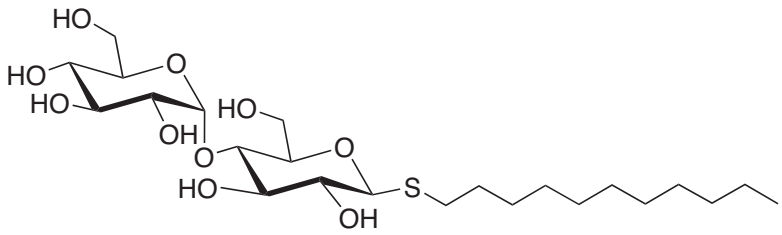
[n-Undecyl–β–D-Thiomaltoside]

U342	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 512.7 [148565-57-5] $C_{23}H_{44}O_{10}S$
CMC (H_2O): ~ 0.21 mM[1] (0.011%)
Aggregation number (H_2O): ~ 106[2]
dn/dc: 0.1569 ml/gm

Product Specifications:
Purity (β + α): ≥ 98% by HPLC analysis
Percent anomer: < 2 α (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%

Conductance (10% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.15
260 nm: < 0.2



References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Mechref, Y. and Rassi, Z. E., (1997) *J. Chromatography* **757**, 263-273.

LIPIDS

Cholesterols

Cyclofos

Fos-Cholines

Fos-Meas

Lipids

LysoFos

LIPIDS

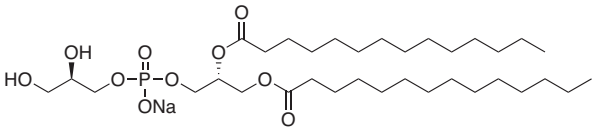
Whether you are working with membrane-bound proteins or trying to find ways to stabilize macromolecules, lipids have become valuable tools. While lipids also have the same general structure as detergents—a polar hydrophilic head group and a nonpolar hydrophobic tail—lipids differ from detergents in the shape of the monomers, in the type of aggregates formed in solution, and in the concentration range required for aggregation. Anatrace phospholipid analogs offer lipid alternatives for all of your membrane protein applications.

Anatrace's products include:

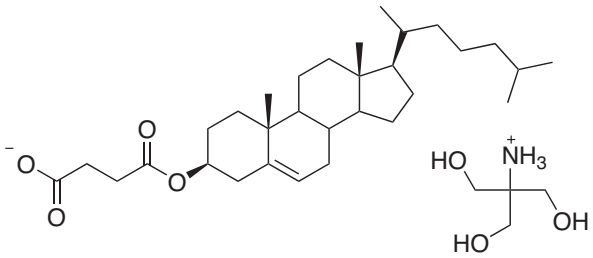
- ★ Fos-Choline® Detergents
- ★ Short Chain Lipids, or PCs, PGs, and PEs
- ★ Cholesterols
- ★ Cyclofos™ Detergents
- ★ Fos-Mea® Detergents
- ★ Lysofos® Detergents

Our Fos-Choline line of lipid-like surfactants range in tail groups with chain lengths from 8 (Octyl) to 16 (Hexadecyl) carbons and is highly effective at increasing solubilization yields. This line also features specialty deuterated versions for improved NMR analysis. For detergent screening, try our most popular Fos-Choline collections (FC-12, FC-13, and FC-14) to maximize the probability of finding the best fit for your molecule.

D614 DMPG



CH210 CHOLESTERYL HEMISUCCINATE



Cholesterol-based surfactants have become highly sought after. Anatrace responded to customer demand with our water-soluble cholesterol derivatives, β–Chobimalt and Cholesteryl Hemisuccinate, which have been instrumental in crystallizing membrane proteins with Lauryl Maltose Neopentyl Glycol (NG310) and/or MonoOlein (LCP18).

If your work requires true lipids, we recommend trying one of our recently introduced lipids. Choose from 9 different lipids including DMPC (D514), POPE (P416), DHPC (D606/7), and POPC (P516).

From functional studies of membrane proteins to industrial applications, our ever-expanding line of lipids and lipid-like surfactants will help you take the art of stabilizing molecules to new elevations and improve your results.

β-Chobimalt

β-Chobimalt is a novel, water-soluble cholesterol derivative produced and offered exclusively by Anatrace. Specifically, β-Chobimalt is comprised of two maltosyl units via α 1→6 β linkage in conjunction with a β linkage directly to cholesterol. The resulting cholesterol analog has significant water solubility and can be classified as a non-ionic detergent.

Cholesterol α-D-Glucopryanosyl-(1→4)-β-D-Glucopyranosyl-(1→6)-α-D-Glucopyranosyl-(1→4)-β -D-glucyopryanoside

Benefits of using β-Chobimalt

Cholesterol is a key component of eukaryotic cell membranes and plays a critical role in membrane organization, fluidity and function[1,2]. In cholesterol-rich lipid raft (also called detergent-resistant membranes, DRM), numerous membrane proteins and important membrane activities, including those involved in signal transduction, are found[3].

In addition to the effect of cholesterol on membrane structure and function, the interaction of membrane proteins with cholesterol have been reported[4]. Many membrane proteins, such as G-protein coupled receptors (GPCRs)[3], cholesterol binding proteins (NPC1 and NPC2)[5], and amyloid precursor protein (APP)[4] require cholesterol binding to have their proper biological function.

Recently, the structural studies by NMR on APP indicate a new binding pocket of cholesterol in transmembrane c-terminal domain when β-Chobimalt was added in protein-detergent micelles[4]. Further studies revealed that APP may serve as a cholesterol sensor that is linked to mechanisms for suppressing cellular cholesterol uptake[4].

Although cholesterol analogs, *e.g.* cholesterol sulfate and hemisuccinate, were made commercially available in an effort to increase the effective solubility, laboratory tests indicate that these analogs are very difficult to dissolve alone in aqueous solution or even in a solution containing detergent micelles[4]. By contrast, β-Chobimalt is readily water-soluble, due to the innovative chemical design.

Our laboratory tests show that the aqueous solubility of β-Chobimalt is as much as 10%, superior to all current commercial cholesterol analogs.

β-Chobimalt is a water-soluble cholesterol derivative that mimics native cholesterol function in cell membrane systems[6]. This specificity will enable researchers to better understand the role of cholesterol in cell membranes and other membrane proteins.

References:

1. Simons, K. *et al.* (2000) *Science* **290**,1721-6.
2. Mouritsen, O. G. *et. al.* (2004) *Lipids* **39**,1101-13.
3. Thomas, J. *et. al.* (2006) *Progress in Lipid Research* **45**, 295-333.
4. Beel, A. J. *et. al.* (2008) *Biochemistry* **47**, 9428-9446.
5. Liu, J. P. *et. al.* (2009) *Molecular and Cellular Endocrinology* **303**, 1-6.
6. Howell, S., Mittal, R., Huang, L., Travis, B., Breyer, R. M. and Sanders, C. R. (2010) *Biochemistry* **49**, 9572-9583.

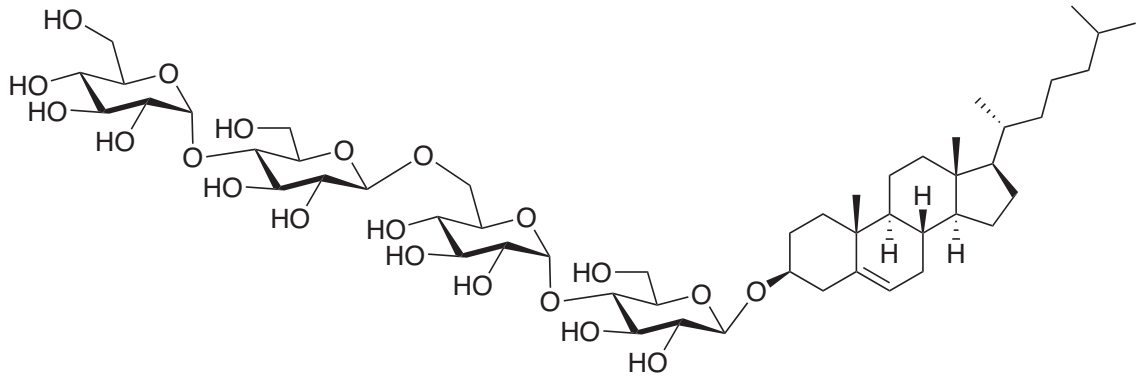


Figure 1. Chemical structure of β-Chobimalt

Cholesterols

CHAPS, Anagrade

[3-[(3-Cholamidopropyl)-Dimethylammonio]-1-Propane Sulfonate] • N,N-Dimethyl-3-Sulfo-N-[3-[[3α,5β,7α,12α)-3,7,12-Trihydroxy-24-Oxocholan-24-yl] Amino]propyl]-1-Propanaminium Hydroxide, Inner Salt]

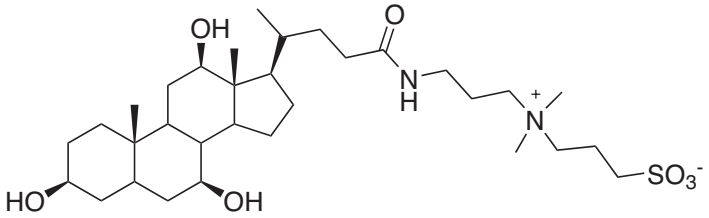
C316	1 gm
	5 gm
	10 gm
	25 gm

Chemical Properties:
FW: 614.9 [75621-03-3] $C_{32}H_{58}N_2O_7S$
CMC (H_2O): ~ 8 mM[1] (0.49%)
Aggregation number (H_2O): ~ 10[2]
dn/dc (H_2O): 0.1323 ml/gm[3]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 0.5 M
Conductance (0.5 M solution in water): < 50 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06

References:

1. Hjelmeland, L. M., Nebert, D. W. and Osborne, Jr., J. C. (1983) *Anal. Biochem.* **130**, 72-82.
2. Womack, M. D., Kendall, D. A. and MacDonald, R. C. (1983) *Biochim. Biophys. Acta* **733**, 210-215.
3. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
4. Bellis, S. L., Kass-Simon, G. and Rhoads, D. E. (1992) *Biochem.* **31**, 9838-9843.



CHAPS, Sol-Grade

[3-[(3-Cholamidopropyl)-Dimethylammonio]-1-Propane Sulfonate] • N,N-Dimethyl-3-Sulfo-N-[3-[[3α,5β,7α,12α)-3,7,12-Trihydroxy-24-Oxocholan-24-yl] Amino]propyl]-1-Propanaminium Hydroxide, Inner Salt]

C316S	5 gm
	25 gm
	100 gm

Chemical Properties:
FW: 614.9 [75621-03-3] $C_{32}H_{58}N_2O_7S$
CMC (H_2O): ~ 8 mM[1] (0.49%)
Aggregation number (H_2O): ~ 10[2]
dn/dc (H_2O): 0.1323 ml/gm[3]

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 0.5 M
Conductance (0.5 M solution in water): < 200 µS
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.2

See C316 for structure.

References:

1. Hjelmeland, L. M., Nebert, D. W. and Osborne, Jr., J. C. (1983) *Anal. Biochem.* **130**, 72-82.
2. Womack, M. D., Kendall, D. A. and MacDonald, R. C. (1983) *Biochim. Biophys. Acta* **733**, 210-215.
3. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
4. Bellis, S. L., Kass-Simon, G. and Rhoads, D. E. (1992) *Biochem.* **31**, 9838-9843.

CHAPSO, Anagrade

[3-[(3-Cholamidopropyl)dimethylammonio]-2-Hydroxy-1-Propanesulfonate]

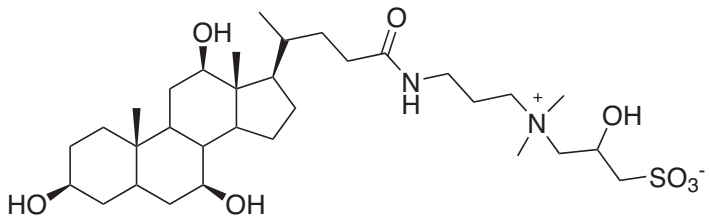
C317	1 gm
	5 gm
	5 x 10 ml
	25 gm

Chemical Properties:
FW: 630.9 [82473-24-3] $C_{32}H_{58}N_2O_8S$
CMC (H_2O): ~ 8 mM[1] (0.50%)
Aggregation number (H_2O): ~ 11[1]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 0.5 M
Conductance (0.5 M solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06

References:

1. Hjelmeland, L. M., Nebert, D. W. and Osborne, Jr., J. C. (1983) *Anal. Biochem.* **130**, 72-82.
2. Cladera, J., Rigaud, J., Villaverde, J. and Dunach, M. (1997) *Eur. J. Biochem.* **243**, 798-804.
3. Sanders, C. R. II and Prestegard, J. H. (1990) *Biophys. J.* **58**, 447-460.



Chobimalt, Anagrade

[Cholestrol α-D-Glucopryanosyl-(1→4)-β-D-Glucopyranosyl-(1→6)-α-D-Gluco-pyranosyl-(1→4)-β-D-Glucyopryanoside]

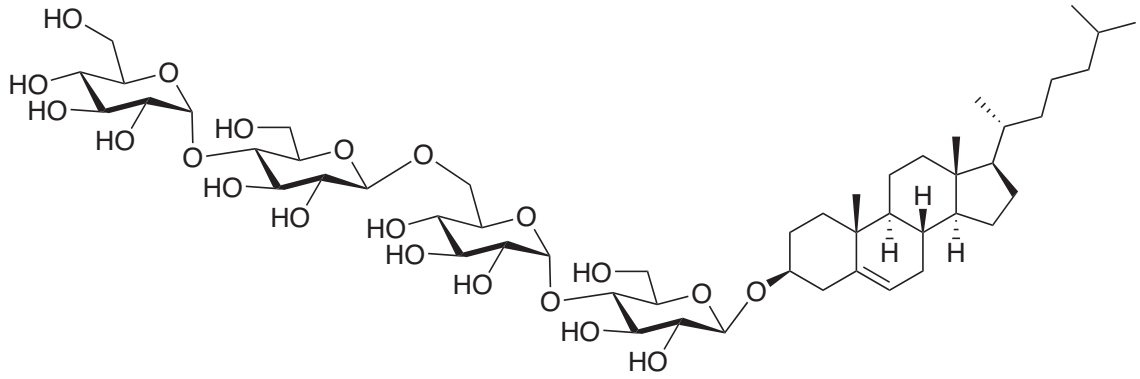
CH220	100 mg
	250 mg
	500 mg

Chemical Properties:
FW: 1035.2 $C_{51}H_{86}O_{21}$
CMC (H_2O): 0.004 mM[1]

Product Specifications:
Appearance: White powder
Purity: > 99.0% by HPLC analysis
Solubility in water: Up to 20%

Storage:
Store at -20°C.

Reference:
1. Howell, S., Mittal, R., Huang, L., Travis, B., Breyer, R. M. and Sanders, C. R. (2010) *Biochemistry* **49**, 9572-9583.



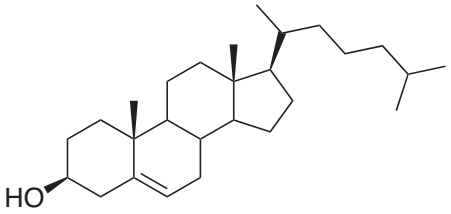
Cholesterol

[3β-Hydroxy-5-Cholestene / 5-Cholesten-3β-ol]

CH200	50 gm
	250 gm
	1 kg

Chemical Properties:
FW: 386.6 [57-88-5] $C_{27}H_{46}O$

Product Specifications:
Melting point: 147-150°C
Loss on drying: < 0.3%
Residue on ignition: < 0.1%
Solubility in alcohol: 1%
Identity: IR spectrum conforms to specification



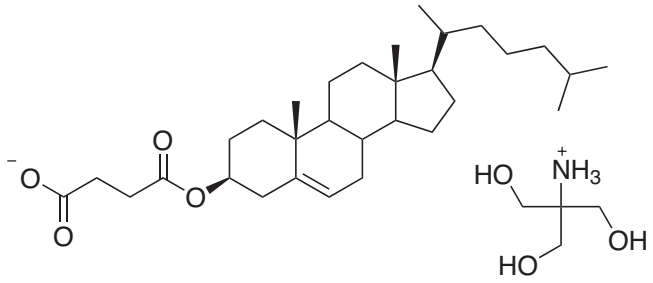
Cholesteryl Hemisuccinate Tris Salt

CH210	1 gm
	5 gm
	25 gm
	100 gm

Chemical Properties:
FW: 607.9 [102601-49-0] $C_{31}H_{50}O_4 \cdot C_4H_{11}NO_3$

Product Specifications:
Appearance: White powder
Solubility (6% water solution of CHAPS): 1.2%
Identity: IR spectrum conforms to specification
DSC conforms to standard
Water soluble cholesterol standard[1]

References:
1. Klein, B., Kleinman, N. B. and Foreman, J. A. (1974) *Clin. Chem.* **20**, 482-485.
2. Weiss, H. M. and Grisshammer, R. (2002) *Eur. J. Biochem.* **269**, 82-92.
3. Tucker, J. and Grisshammer, R. (1996) *Biochem. J.* **317**, 891-899.
4. Brown, P. J. and Schonbrunn, A. (1993) *J. Biol. Chem.* **268**, No. 9, 6668-6676.



Cyclofos

Cyclofos-2, Anagrade

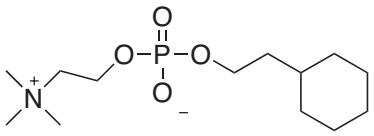
[2-Cyclohexyl-1-Ethylphosphocholine]

C508 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 293.8 [823796-65-2] $C_{13}H_{28}NO_4P$
CMC (H_2O): ~ 256 mM[1] (7.5%)

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



Cyclofos-3, Anagrade

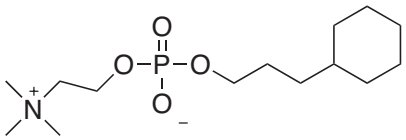
[3-Cyclohexyl-1-Propylphosphocholine]

C510 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 306.9 [823796-66-3] $C_{14}H_{30}NO_4P$
CMC (H_2O): ~ 43 mM[1] (1.3%)

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



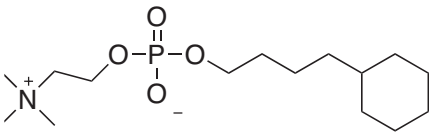
Cyclofos-4, Anagrade

[4-Cyclohexyl-1-Butylphosphocholine]

C512 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 320.9 [675126-15-5] $C_{13}H_{28}NO_4P$
CMC (H_2O): ~ 8.45 mM (0.45%)

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1



Cyclofos-5, Anagrade

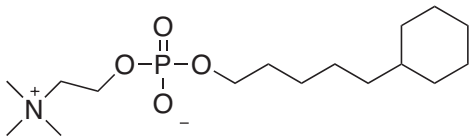
[5-Cyclohexyl-1-Pentylphosphocholine]

C514 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 335.0 [657393-64-1] $C_{13}H_{28}NO_4P$
CMC (H_2O): ~ 4.5 mM (0.15%)

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1



Cyclofos-6, Anagrade

[6-Cyclohexyl-1-Hexylphosphocholine]

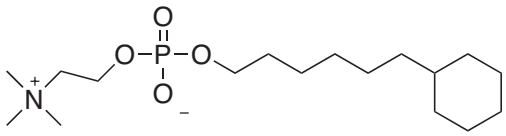
C516 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 349.2 [657393-65-2] $C_{13}H_{28}NO_4P$
CMC (H_2O): ~ 2.68 mM[1] (0.094%)

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 500 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



Cyclofos-7, Anagrade

[7-Cyclohexyl-1-Heptylphosphocholine]

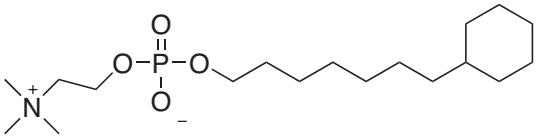
C518 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 363.3 [657393-66-3] $C_{13}H_{28}NO_4P$
CMC (H_2O): ~ 0.62 mM[1] (0.022%)

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 500 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



Fos-Cholines

Lipids are commonly used by researchers to stabilize membrane proteins. However, the common challenge with working with lipids is their high cost and lack of solubility in water.

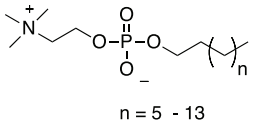
Anatrace scientists answered the challenge and developed innovative Anatrace Fos-Cholines. This class of lipid-like surfactants has the basic properties of lipids—namely their ability to stabilize membrane proteins—combined with the characteristics of a water-soluble molecule. Anatrace offers several modified derivatives of popular Fos-Cholines. These modified derivatives enhance stability and solubility outside of the native lipid bi-layer. This way you can be sure that the stabilizer is firmly attached to your protein.

The Fos-Choline detergents have been successfully used in membrane protein studies by NMR[1-3]. Short chain phospholipids such as dihexanoylphosphatidylcholine (DHPC), have been used to solubilize and reconstitute integral membrane proteins. These compounds form water-soluble micelles in solution and have been shown to maintain native protein structure and function when used in membrane protein purification protocols[4-6].

Fos-Cholines employ charged amine and phosphate groups in combination with an alkyl chain to produce a zwitterionic surfactant. This unique architecture is water-soluble and capable of both stabilizing and keeping membrane proteins soluble in aqueous solutions. This surfactant also produces micelles and is able to extract membrane proteins from cellular membranes.

Anatrace innovates so you can too.

FIG. 1. FOS-CHOLINE



n = 5, octyl phoscholine
n = 6, nonyl phoscholine
n = 7, decyl phoscholine
n = 8, undecyl phoscholine
n = 9, dodecyl phoscholine
n =10, tridecyl phoscholine
n = 11, tetredecyl phoscholine
n = 13, hexadecylphoscholine

ROOT	PRODUCTS	ANAGRADE	SOL-GRADE	DEUTERATED
F300	Fos-Choline-8	√	√	
F302	Fos-Choline-9	√	√	
F304	Fos-Choline-10	√	√	√
F306	Fos-Choline-11	√	√	√
F308	Fos-Choline-12	√	√	√
F310	Fos-Choline-13	√	√	

References:

1. Evanics, F., *et al.* (2006) *J. Am. Chem. Soc.*, **128**, 8256-8264.
2. Hwang, P.M., *et al.* (2002) *Proc Natl Acad Sci USA*, **99**, 13560-13565.
3. Oxenoid, K. and Chou, J. J. (2005) *Proc Natl Acad Sci USA*, **102**, 10870-10875.
4. Hauser, H. (2000) *Biochim Biophys Acta* **1508**, 164-181.
5. Fernandez, C., *et al.* (2001) *FEBS Lett.* **504**, 173-178.
6. Mandal, A., *et al.*(2006) *Biochim Biophys Acta.* **1760**, 20-31.

Fos-Choline-8, Anagrade

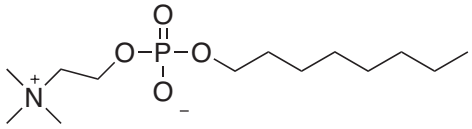
[n-Octyl Phosphocholine]

F300 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 295.4 [53255-89-3] $C_{13}H_{30}NO_4P$
CMC (H_2O): ~ 114 mM(1) (3.4%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1

References:
1. Anatrace measurement.
2. Vinogradova, O., Sonnichsen, F., and Sanders, C. R. (1998) *J. Biomol. NMR* **11**, 381-386.



Fos-Choline-8, Fluorinated, Anagrade

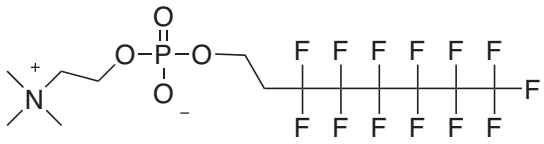
[(1H, 1H, 2H, 2H-Perfluorooctyl)phosphocholine]

F300F 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 529.2 $C_{13}H_{17}F_{13}NO_4P$
CMC (H_2O): 2.2 mM(1)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 200 µS
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Krafft, M-P., Giulieri, F., and Riess, J. G. (1993) *Angew Chem. Intl.* **32**, 741-743.



Fos-Choline-8, Sol-Grade

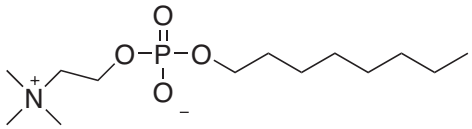
[n-Octyl Phosphocholine]

F300S 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 295.4 [53255-89-3] $C_{13}H_{30}NO_4P$
CMC (H_2O): ~ 114 mM(1) (3.4%)

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

References:
1. Anatrace measurement.
2. Vinogradova, O., Sonnichsen, F., and Sanders, C. R. (1998) *J. Biomol. NMR* **11**, 381-386.



Fos-Cholines

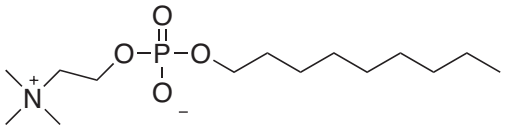
Fos-Choline-9, Anagrade

[n-Nonyl Phosphocholine]

F302 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 309.4 [253678-64-7] $C_{14}H_{32}NO_4P$
CMC (H_2O): ~ 39.5 mM[1] (1.2%)
Aggregation number (H_2O): ~ 5[2]
Specific volume (H_2O): 0.1416 ml/gm[2]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1



References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.

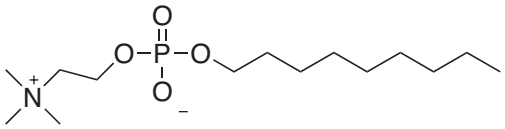
Fos-Choline-9, Sol-Grade

[n-Nonyl Phosphocholine]

F302S 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 309.4 [253678-64-7] $C_{14}H_{32}NO_4P$
CMC (H_2O): ~ 39.5 mM[1] (1.2%)
Aggregation number (H_2O): ~ 5[2]
Specific volume (H_2O): 0.1416 ml/gm[2]
dn/dc: 0.1416 ml/gm

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.

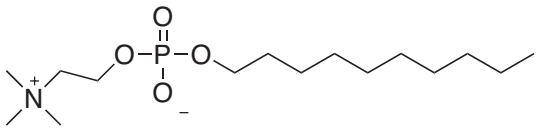
Fos-Choline-10, Anagrade

[n-Decyl Phosphocholine]

F304 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 323.4 [70504-28-8] $C_{15}H_{34}NO_4P$
CMC (H_2O): ~ 11 mM[1] (0.35%)
Aggregation number (H_2O): ~ 24[2]
dn/dc (H_2O): 0.1347 ml/gm[2]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1



References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Cortes, D. M. and Perozo, E. (1997) *Biochem.* **36**, 10343-10352.

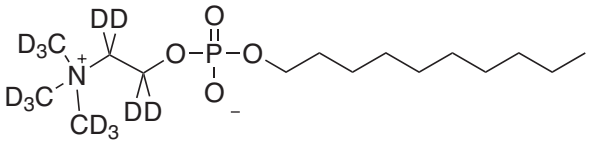
Fos-Choline-10, Per Deuterated Head

[n-Decyl Phosphocholine-d13]

F304PDH	100 mg
	500 mg
	1 gm

Chemical Properties:
FW: 336.5 $C_{15}H_{21}D_{13}NO_4P$

Product Specifications:
Appearance: White solid
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



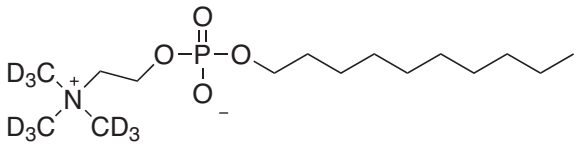
Fos-Choline-10, Semi Deuterated Head

[n-Decyl Phosphocholine-d9]

F304SDH	100 mg
	500 mg
	1 gm

Chemical Properties:
FW: 332.5 $C_{15}H_{25}D_9NO_4P$

Product Specifications:
Appearance: White solid
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Fos-Choline-10, Sol-Grade

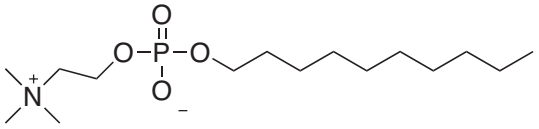
[n-Decyl Phosphocholine]

F304S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 323.4 [70504-28-8] $C_{15}H_{34}NO_4P$
CMC (H_2O): ~ 11 mM[1] (0.35%)
Aggregation number (H_2O): ~ 24[2]
dn/dc (H_2O): 0.1347 ml/gm[2]

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Cortes, D. M. and Perozo, E. (1997) *Biochem.* **36**, 10343-10352.



Fos-Cholines

Fos-Choline-11, Anagrade

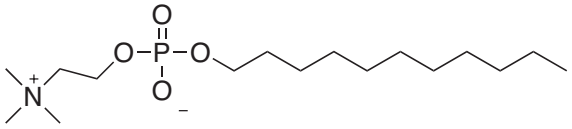
[n-Undecyl Phosphocholine]

F306	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 337.4 [253678-65-8] $C_{16}H_{36}NO_4P$
CMC (H_2O): ~ 1.85 mM[1] (0.062%)
Aggregation number (H_2O): ~ 18[2]
dn/dc (H_2O): 0.1387 ml/gm[2]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1

References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.



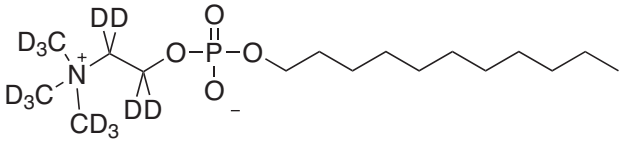
Fos-Choline-11, Per Deuterated Head

[n-Undecyl Phosphocholine-d13]

F306PDH	100 mg
	500 mg
	1 gm

Chemical Properties:
FW: 350.5 $C_{16}H_{23}D_{13}NO_4P$

Product Specifications:
Appearance: White solid
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



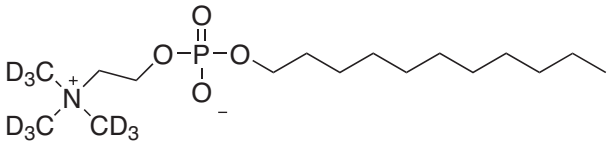
Fos-Choline-11, Semi Deuterated Head

[n-Undecyl Phosphocholine-d9]

F306SDH	100 mg
	500 mg
	1 gm

Chemical Properties:
FW: 346.5 $C_{16}H_{27}D_9NO_4P$

Product Specifications:
Appearance: White solid
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Fos-Choline-11, Sol-Grade

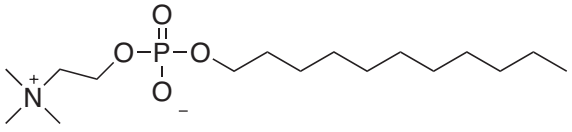
[n-Undecyl Phosphocholine]

F306S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 337.4 [253678-65-8] $C_{16}H_{36}NO_4P$
CMC (H_2O): ~ 1.85 mM[1] (0.062%)
Aggregation number (H_2O): ~ 18[2]
dn/dc (H_2O): 0.1387 ml/gm[2]

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

References:
See F306 for references.



Fos-Choline-12, Anagrade

[n-Dodecyl Phosphocholine]

F308	1 gm
	5 gm
	25 gm

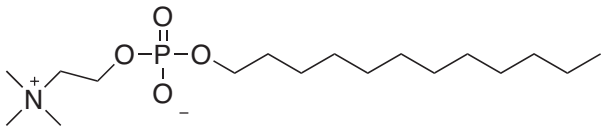
Chemical Properties:
FW: 351.5 [29557-51-5] $C_{17}H_{38}NO_4P$
CMC (H_2O): ~ 1.5 mM[1] (0.047%)
Aggregation number (H_2O): ~ 54[6]
dn/dc (H_2O): 0.1398 ml/gm[6]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1

References:

1. Anatrace measurement.
2. Fares, C., Libich, D. S., and Harauz, G. (2006) *FEBS J.* **273**, 601-614.
3. Brunecky, R., Lee, S., Rzepecki, P. W., *et al.* (2005) *Biochemistry* **44**, 16064-16071.
4. Oxenoid, K. and Chou, J. J. (2005) *Proc. Natl. Acad. Sci. USA* **102**, 10870-10875.
5. Uteng, M., Hauge, H. H., Markwick, P. R. L., FimLand, G., Mantzilas, D., Nissen-Meyer, J., and Muhle-Goll, C. (2003) *Biochem.* **42**, 11417-11426.
6. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
7. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.



Fos-Choline-12, Deuterated

[n-Dodecyl Phosphocholine-d38]

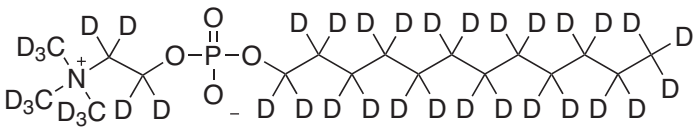
F308D	100 mg
	500 mg
	1 gm

Chemical Properties:
FW: 389.8 [130890-78-7] $C_{17}D_{38}NO_4P$
CMC (H_2O): ~ 1.5 mM[1] (0.047%)
Aggregation number (H_2O): ~ 54[2]
dn/dc (H_2O): 0.1398 ml/gm[8]

Product Specifications:
Purity: ≥ 90% by HPLC analysis
pH (1% solution in water): 4-9

References:

1. Anatrace measurement—CMC value for the undeuterated compound.
2. Aggregation number for the undeuterated compound.
3. Fares, C., Libich, D. S., and Harauz, G. (2006) *FEBS J.* **273**, 601-614.
4. Brunecky, R., Lee, S., Rzepecki, P. W., *et al.* (2005) *Biochemistry* **44**, 16064-16071.
5. Oxenoid, K. and Chou, J. J. (2005) *Proc. Natl. Acad. Sci. USA* **102**, 10870-10875.
6. Uteng, M., Hauge, H. H., Markwick, P. R. L., FimLand, G., Mantzilas, D., Nissen-Meyer, J., and Muhle-Goll, C. (2003) *Biochem.* **42**, 11417-11426.
7. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.
8. dn/dc for the undeuterated compound.



Fos-Choline-12, Per Deuterated Head

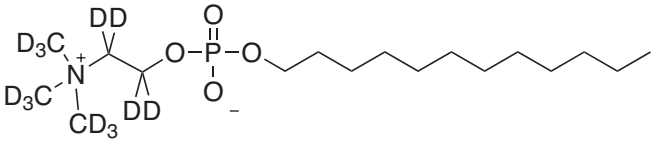
[n-Dodecyl Phosphocholine-d13]

F308PDH	100 mg
	500 mg
	1 gm

Chemical Properties:
FW: 364.5 $C_{17}H_{25}D_{23}NO_4P$

Product Specifications:
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Fos-Cholines

Fos-Choline-12, Per Deuterated Tail

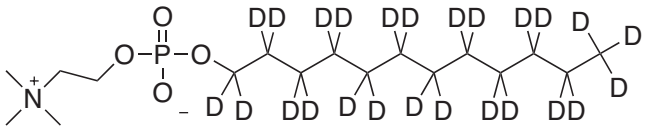
[n-Dodecyl Phosphocholine-d25]

F308PDT	100 mg
	500 mg
	1 gm

Chemical Properties:
FW: 376.6 $C_{17}H_{13}D_{25}NO_4P$

Product Specifications:
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Fos-Choline-12, Semi Deuterated Head

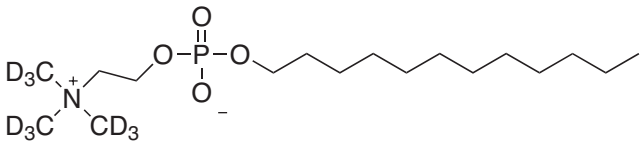
[n-Dodecyl Phosphocholine-d9]

F308SDH	100 mg
	500 mg
	1 gm

Chemical Properties:
FW: 360.5 $C_{17}H_{29}D_9NO_4P$

Product Specifications:
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Fos-Choline-12, Sol-Grade

[n-Dodecyl Phosphocholine]

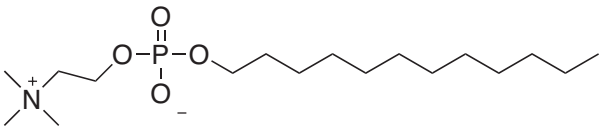
F308S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 351.5 [29557-51-5] $C_{17}H_{38}NO_4P$
CMC (H_2O): ~ 1.5 mM[1] (0.047%)
Aggregation number (H_2O): ~ 54[6]
dn/dc (H_2O): 0.1398 ml/gm[6]

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

References:

1. Anatrace measurement.
2. Fares, C., Libich, D. S., and Harauz, G. (2006) *FEBS J.* **273**, 601-614.
3. Brunecky, R., Lee, S., Rzepecki, P. W., *et al.* (2005) *Biochemistry* **44**, 16064-16071.
4. Oxenoid, K. and Chou, J. J. (2005) *Proc. Natl. Acad. Sci. USA* **102**, 10870-10875.
5. Uteng, M., Hauge, H. H., Markwick, P. R. L., FimLand, G., Mantzilas, D., Nissen-Meyer, J., and Muhle-Goll, C. (2003) *Biochem.* **42**, 11417-11426.
6. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
7. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.



Fos-Choline-13, Anagrade

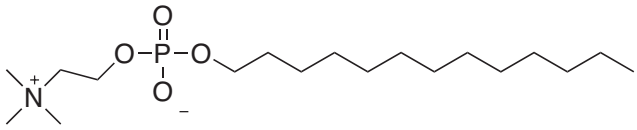
[n-Tridecyl Phosphocholine]

F310	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 365.5 [85775-42-4] $C_{18}H_{40}NO_4P$
CMC (H_2O): ~ 0.75 mM[1] (0.027%)
Aggregation number (H_2O): ~ 87[2]
dn/dc (H_2O): 0.1426 ml/gm[2]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1

References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.



Fos-Choline-13, Sol-Grade

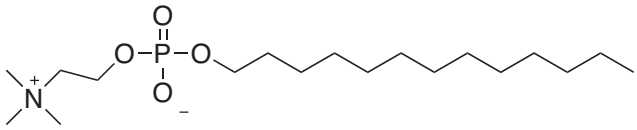
[n-Tridecyl Phosphocholine]

F310S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 365.5 [85775-42-4] $C_{18}H_{40}NO_4P$
CMC (H_2O): ~ 0.75 mM[1] (0.027%)
Aggregation number (H_2O): ~ 87[2]
dn/dc (H_2O): 0.1426 ml/gm[2]

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.



Fos-Choline-14, Anagrade

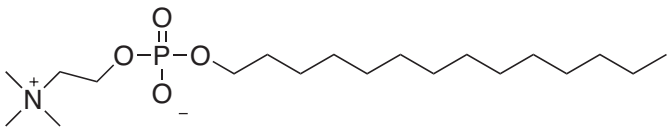
[n-Tetradecyl Phosphocholine]

F312	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 379.5 [77733-28-9] $C_{19}H_{42}NO_4P$
CMC (H_2O): ~ 0.12 mM[1] (0.0046%)
Aggregation number (H_2O): ~ 108[2]
dn/dc (H_2O): 0.1416 ml/gm[2]
Micelle size: 47 kDa[3]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1

References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
3. Strop, P. and Brunger, A. T. (2005) *Protein Sci.* **14**, 2207-2211.
4. Zeisig, R., Ress, A., Fichtner, I., and Walther, W. (2003) *Cancer Gene Ther.* **10**, 302-311.



Fos-Cholines

Fos-Choline-14, Deuterated

[n-Tetradecyl Phosphocholine-d42]

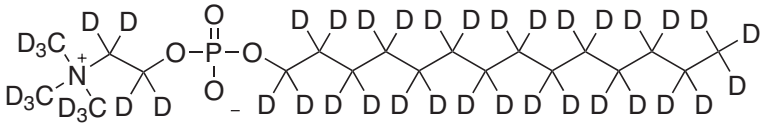
F312D 100 mg, 500 mg, 1 gm

Chemical Properties:
FW: 421.5 [869638-98-2] $C_{19}D_{42}NO_4P$
CMC (H_2O): ~ 0.12 mM[1] (0.0051%)
Aggregation number (H_2O): ~ 108[2]
dn/dc (H_2O): 0.1416 ml/gm[3]

Product Specifications:
Purity: ≥ 90% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: > 1%

References:

1. Anatrace measurement—CMC value for the undeuterated compound.
2. Aggregation number for the undeuterated compound.
3. dn/dc for the undeuterated compound.
4. Strop, P. and Brunger, A. T. (2005) *Protein Sci.* **14**, 2207-2211.
5. Zeisig, R., Ress, A., Fichtner, I., and Walther, W. (2003) *Cancer Gene Ther.* **10**, 302-311.



Fos-Choline-14, Per Deuterated Head

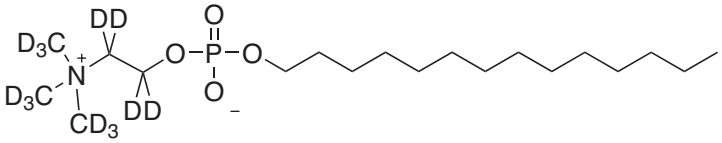
[n-Tetradecyl Phosphocholine-d13]

F312PDH 100 mg, 500 mg, 1 gm

Chemical Properties:
FW: 392.6 $C_{19}H_{29}D_{13}NO_4P$

Product Specifications:
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Fos-Choline-14, Semi Deuterated Head

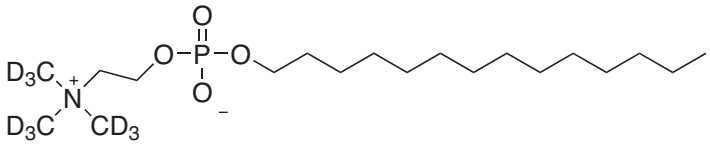
[n-Tetradecyl Phosphocholine-d9]

F312SDH 100 mg, 500 mg, 1 gm

Chemical Properties:
FW: 388.6 $C_{19}H_{33}D_9NO_4P$

Product Specifications:
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Fos-Choline-14, Sol-Grade

[n-Tetradecyl Phosphocholine]

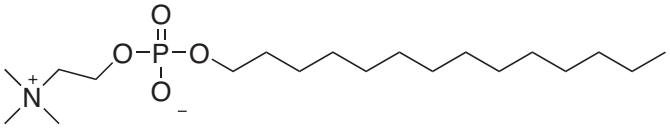
F312S 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 379.5 [77733-28-9] $C_{19}H_{42}NO_4P$
CMC (H_2O): ~ 0.12 mM[1] (0.0046%)
Aggregation number (H_2O): ~ 108[2]
dn/dc (H_2O): 0.1416 ml/gm[2]
Micelle size: 47 kDa[3]

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 500 µS

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

References:
See F312 for references.



Fos-Choline-15, Anagrade

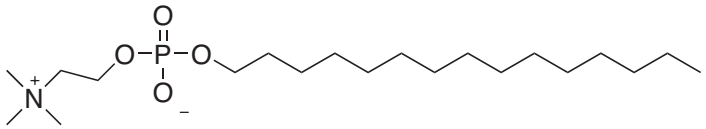
[n-Pentadecyl Phosphocholine]

F314 1 gm
5 gm
25 gm

Chemical Properties:
FW: 393.5 [146801-07-2] $C_{20}H_{44}NO_4P$
CMC (H_2O): ~ 0.07 mM[1] (0.0027%)
Aggregation number (H_2O): ~ 131[2]
dn/dc (H_2O): 0.1374 ml/gm[2]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1

References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.



Fos-Choline-15, Sol-Grade

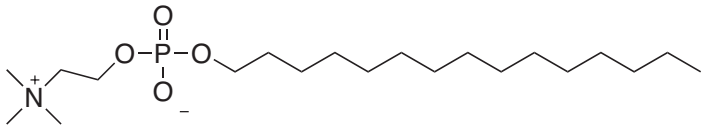
[n-Pentadecyl Phosphocholine]

F314S 1 gm
5 gm
25 gm

Chemical Properties:
FW: 393.5 [146801-07-2] $C_{20}H_{44}NO_4P$
CMC (H_2O): ~ 0.07 mM[1] (0.0027%)
Aggregation number (H_2O): ~ 131[2]
dn/dc (H_2O): 0.1374 ml/gm[2]

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.



Fos-Choline-16, Anagrade

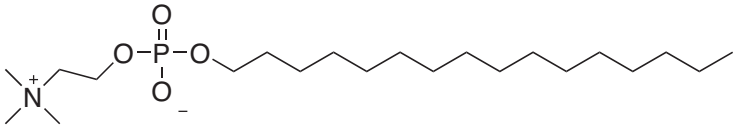
[n-Hexadecyl Phosphocholine]

F316 1 gm
5 gm
25 gm

Chemical Properties:
FW: 407.5 [58066-85-6] $C_{21}H_{46}NO_4P$
CMC (H_2O): ~ 0.013 mM[1] (0.00053%)
Aggregation number (H_2O): ~ 178[2]
dn/dc (H_2O): 0.1327 ml/gm[2]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1

References:
1. Anatrace measurement.
2. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.



Fos-Cholines

Fos-Choline-16, Sol-Grade

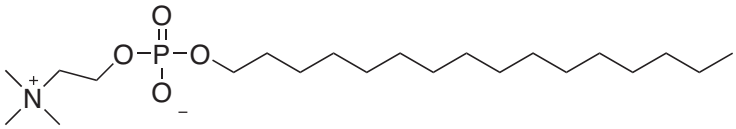
[n-Hexadecyl Phosphocholine]

F316S 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 407.5 [58066-85-6] $C_{21}H_{46}NO_4P$
CMC (H_2O): ~ 0.013 mM[1] (0.00053%)
Aggregation number (H_2O): ~ 178[2]
dn/dc (H_2O): 0.1327 ml/gm[2]

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

References:
See F316 for references.



Fos-Choline-ISO-9, Anagrade

[2,6-Dimethyl-4-Heptyl Phosphocholine]

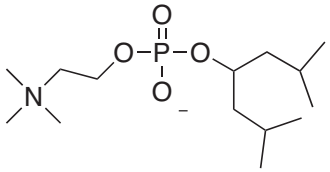
FCI09 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 309.0 [869646-90-2] $C_{14}H_{32}NO_4P$
CMC (H_2O): ~ 32 mM[1] (0.99%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 300 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.10

Reference:
1. Anatrace measurement.

Note:
This product is a mixture of closely related dimethylheptylphosphocholines. The major component is 2,6-Dimethyl-4-heptylphosphocholine (95-99%) and the minor component is 4,6-Dimethyl-4-heptylphosphocholine (0-5%).



Fos-Choline-ISO-11, Anagrade

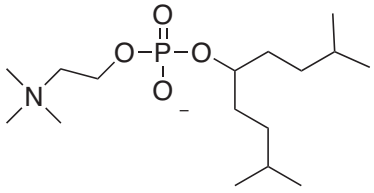
[2,8-Dimethyl-5-Nonyl Phosphocholine]

FCI11 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 337.4 [869647-65-4] $C_{16}H_{36}NO_4P$
CMC (H_2O): ~ 26.6 mM[1] (0.9%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



Fos-Choline-Unsat-11-10, Anagrade

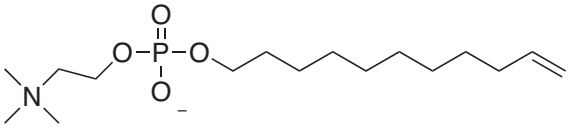
[10-Undecylenyl-1-Phosphocholine]

FCU110 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 335.4 [121045-77-0] $C_{16}H_{34}NO_4P$
CMC (H_2O): ~ 6.2 mM[1] (0.21%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



Fos-Mea-8, Anagrade

[Octylphospho-N-Methylethanolamine]

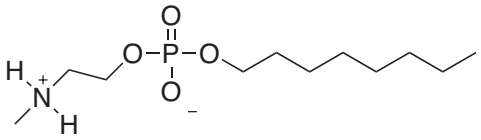
F208 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 267.0 [104702-33-2] $C_{11}H_{26}NO_4P$
CMC (H_2O): ~ 22.0 mM[1] (0.59%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 1%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



Fos-Mea-10, Anagrade

[Decylphospho-N-Methylethanolamine]

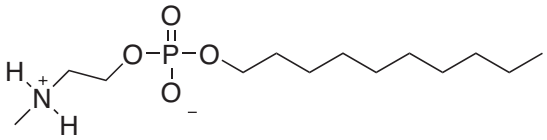
F210 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 295.0 [557788-85-9] $C_{13}H_{30}NO_4P$
CMC (H_2O): ~ 5.25 mM[1] (0.15%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 3-8
Solubility in water at 20°C: ≥ 1%
Conductance (1% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



Fos-Mea-12, Anagrade

[Dodecylphospho-N-Methyl-ethanolamine]

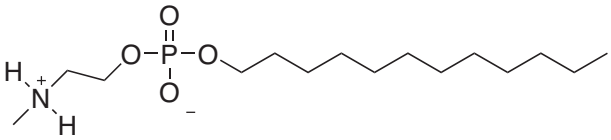
F212 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 323.0 [129274-39-1] $C_{15}H_{34}NO_4P$
CMC (H_2O): ~ 0.43 mM[1] (0.014%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (0.01% solution in water): 3-8
Solubility in water at 20°C: ≥ 0.01%
Conductance (0.01% solution in water): < 200 µS
Percent fluorescence due to a 0.01% solution in water at 345 nm: < 10

Absorbance of a 0.01% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



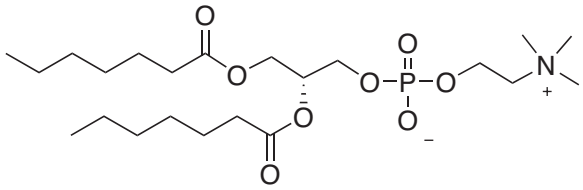
1,2-Diheptanoyl-sn-Glycero-3-Phosphocholine

[Phosphocholine Lipid / DHPC / diC7PC]

D607 250 mg, 500 mg, 1 gm

Chemical Properties:
FW: 481.5 $C_{22}H_{44}NO_8P$

Product Specifications:
Appearance: White solid
Purity: ≥ 99% by HPLC analysis
Solubility: Methanol, Chloroform
Identity: NMR and MS conform to specification



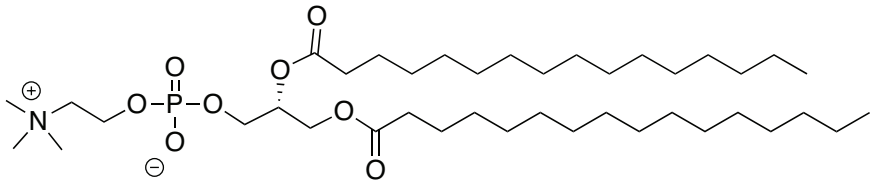
1,2-Dihexadecanoyl-sn-Glycero-3-Phosphocholine

[DPPC]

D516 250 mg, 1 gm

Chemical Properties:
FW: 734.039 [63-89-8] $C_{40}H_{80}NO_8P$

Product Specifications:
Solubility: Methanol, Chloroform



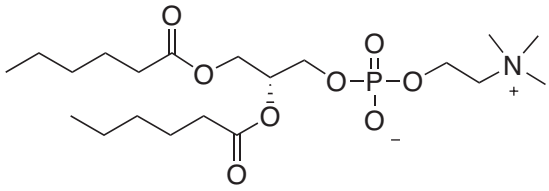
1,2-Dihexanoyl-sn-Glycero-3-Phosphocholine

[Phosphocholine Lipid / DHPC / diC6PC]

D606 250 mg, 500 mg, 1 gm

Chemical Properties:
FW: 453.5 [34506-67-7] $C_{20}H_{40}NO_8P$

Product Specifications:
Appearance: White solid
Purity: ≥ 99% by HPLC analysis
Solubility: Methanol, Chloroform
Identity: NMR and MS conform to specification



1,2-Dimyristoyl-sn-Glycero-3-[Phospho-rac-(1-Glycerol)] (Sodium Salt)

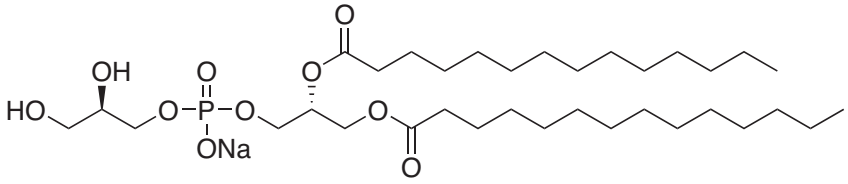
[DMPG]

D614 200 mg, 500 mg, 1 gm

Chemical Properties:
FW: 688.9 $C_{34}H_{66}NaO_{10}P$

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility: Water: > 1%
MeOH soluble with heat

Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1



1,2-Dimyristoyl-sn-Glycero-3-Phosphocholine

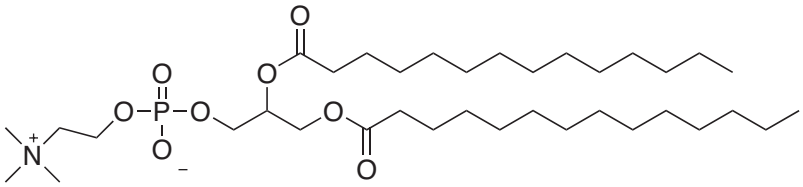
[DMPC]

D514 200 mg, 500 mg, 1 gm

Chemical Properties:
FW: 677.9 $C_{36}H_{72}NO_8P$

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in methanol): 5-8
Solubility: Methanol: > 20%
Practically insoluble in water
Conductance (1% solution in methanol):
< 200 µS

Absorbance of a 1% solution in methanol:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1



1,2-Dioctanoyl-sn-Glycero-3-Phosphocholine

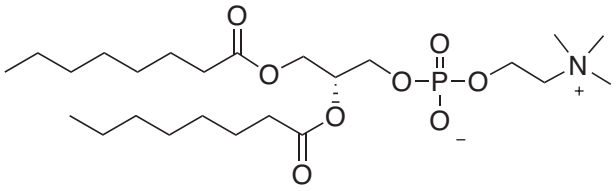
[Phosphocholine Lipid / diC8PC]

D608 250 mg, 500 mg, 1 gm

Chemical Properties:
FW: 509.6 [19191-91-4] $C_{24}H_{48}NO_8P$

Product Specifications:
Appearance: White solid
Purity: ≥ 99% by HPLC analysis

Solubility: Methanol, Chloroform
Identity: NMR and MS conform to specification

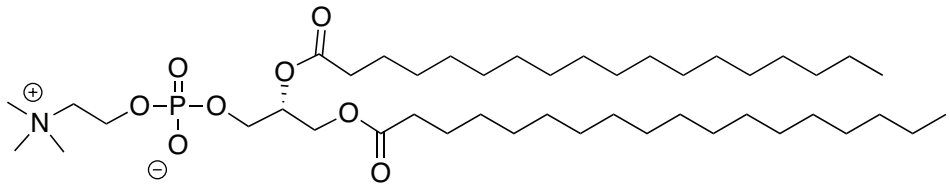


1,2-Dioleoyl-sn-Glycero-3-Phosphocholine

[DOPC]
D518 250 mg, 1 gm

Chemical Properties:
FW: 786.113 [56648-95-4] $C_{44}H_{84}NO_8P$

Product Specifications:
Appearance: White solid
Solubility: Methanol, Chloroform

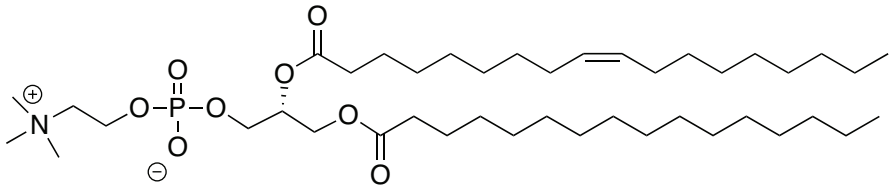


1-Palmitoyl-2-Oleoyl-sn-Glycero-3-Phosphocholine

[POPC]
P516 250 mg, 1 gm

Chemical Properties:
FW: 760.076 [159701-20-9] $C_{42}H_{82}NO_8P$

Product Specifications:
Appearance: White solid
Solubility: Methanol, Chloroform

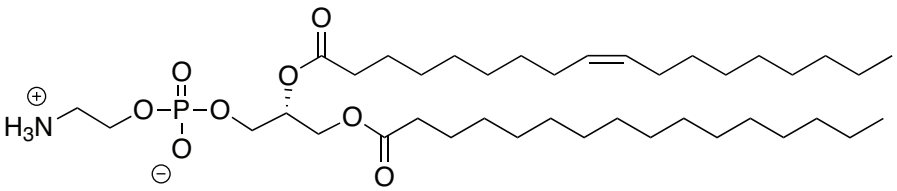


1-Palmitoyl-2-Oleoyl-sn-Glycero-3-Phosphoethanolamine

[POPE/1-Hexadecanoyl-2-(9Z-Octadecenoyl)-sn-Glycero-3-Phosphoethanolamine]
P416 250 mg, 1 gm

Chemical Properties:
FW: 717.996 [26662-94-2] $C_{39}H_{76}NO_8P$

Product Specifications:
Appearance: White solid
Solubility: Methanol, Chloroform



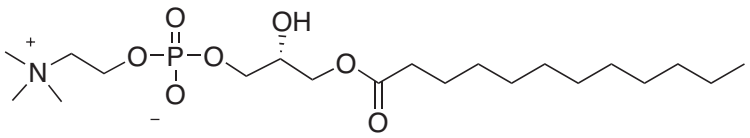
LysoFos Choline 12, Anagrade

[1-Lauroyl-2-Hydroxy-sn-Glycero-3-Phosphocholine / 1- Dodecanoyl-2-Hydroxy-sn-Glycero-3-Phosphocholine / 12:0 LysoPC]

L212 0.5 gm, 1 gm

Chemical Properties:
FW: 439.5 [20559-18-6] $C_{20}H_{42}NO_7P$
CMC (H_2O): ~ 0.32 mM(1)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C for 4 hours: > 10%
Conductance (10% solution in water): < 200 µS
Absorbance of a 1% solution in water:
340 nm: < 0.04
280 nm: < 0.1
260 nm: < 0.12



Reference:
1. Stafford, R. E., Fanni, T., and Dennis, E. A. (1989) *Biochemistry* **28**, 5113-5120.

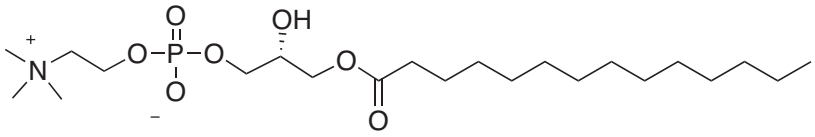
LysoFos Choline 14, Anagrade

[1-Myristoyl-2-Hydroxy-sn-Glycero-3-Phosphocholine / LMPC / 14:0 LysoPC]

L214 0.5 gm, 1 gm

Chemical Properties:
FW: 467.6 [20559-16-4] $C_{22}H_{46}NO_7P$
CMC (H_2O): ~ 0.036 mM(1)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C for 4 hours: > 10%
Conductance (10% solution in water): < 200 µS
Absorbance of a 1% solution in water:
340 nm: < 0.04
280 nm: < 0.1
260 nm: < 0.12



Reference:
1. Stafford, R. E., Fanni, T., and Dennis, E. A. (1989) *Biochemistry* **28**, 5113-5120.

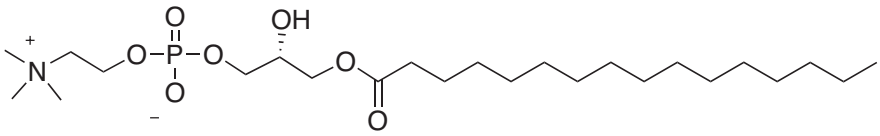
LysoFos Choline 16, Anagrade

[1-Palmitoyl-2-Hydroxy-sn-Glycero-3-Phosphocholine / 16:0 LysoPC]

L216 0.5 gm, 1 gm

Chemical Properties:
FW: 495.6 [17364-16-8] $C_{24}H_{50}NO_7P$
CMC (H_2O): ~ 0.0032 mM(1)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C for 4 hours: > 10%
Conductance (10% solution in water): < 200 µS
Absorbance of a 1% solution in water:
340 nm: < 0.04
280 nm: < 0.1
260 nm: < 0.12



Reference:
1. Stafford, R. E., Fanni, T., and Dennis, E. A. (1989) *Biochemistry* **28**, 5113-5120.

LysoFos

LysoFos Choline Ether 12, Anagrade

[1-Dodecyl-2-Hydroxy-sn-Glycero-3-Phosphocholine]

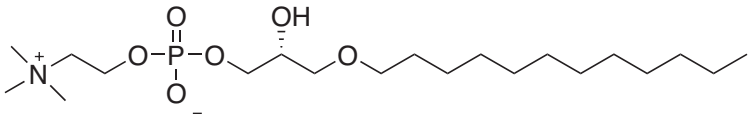
L412 0.5 gm, 1 gm

Chemical Properties:
FW: 425.5 $C_{20}H_{44}O_6PNa$

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: > 10%
Conductance (10% solution in water): < 200 µS

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

Storage:
Store at -20°C.



LysoFos Choline Ether 14, Anagrade

[1-Tertadecyl-2-Hydroxy-sn-Glycero-3-Phosphocholine]

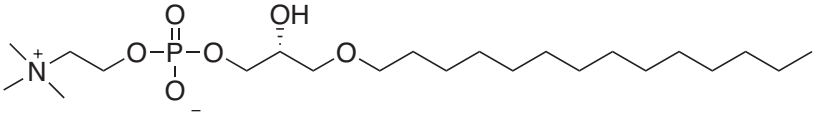
L414 0.5 gm, 1 gm

Chemical Properties:
FW: 453.6 $C_{22}H_{48}O_6PNa$

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: > 10%
Conductance (10% solution in water): < 200 µS

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

Storage:
Store at -20°C.



LysoFos Choline Ether 16, Anagrade

[1-Heaxadecyl-2-Hydroxy-sn-Glycero-3-Phosphocholine]

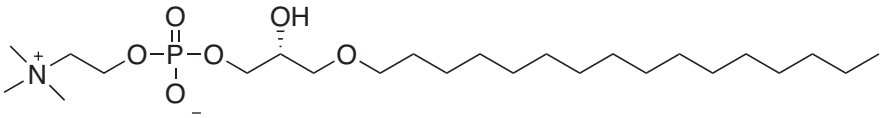
L416 0.5 gm, 1 gm

Chemical Properties:
FW: 481.7 $C_{24}H_{52}O_6PNa$

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: > 10%
Conductance (10% solution in water): < 200 µS

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

Storage:
Store at -20°C.



LysoFos Glycerol 12, Anagrade

[1-Lauroyl-2-Hydroxy-sn-Glycero-3-Phospho-(1'-rac-Glycerol) (Sodium Salt)]

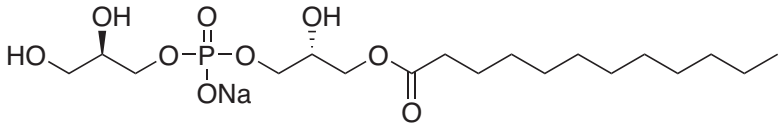
L312 0.5 gm, 1 gm

Chemical Properties:
FW: 450.4 $C_{18}H_{36}O_9PNa$

Product Specifications:
Purity: ≥ 95% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: > 10%

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

Storage:
Store at -20°C.



LysoFos Glycerol 14, Anagrade

[1-Myristoyl-2-Hydroxy-sn-Glycero-3-Phospho-(1'-rac-Glycerol) (Sodium Salt)]

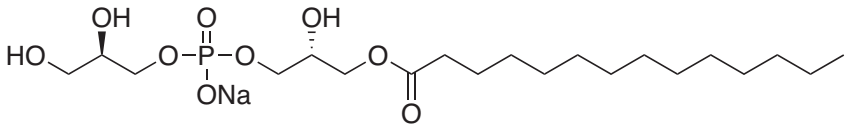
L314 0.5 gm, 1 gm

Chemical Properties:
FW: 478.5 $C_{20}H_{40}O_9PNa$

Product Specifications:
Purity: ≥ 95% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: > 10%

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

Storage:
Store at -20°C.



LysoFos Glycerol 16, Anagrade

[1-Palmitol-2-Hydroxy-sn-Glycero-3-Phospho-(1'-rac-Glycerol) (Sodium Salt)]

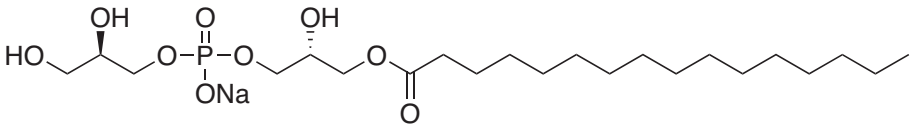
L316 0.5 gm, 1 gm

Chemical Properties:
FW: 506.5 [326495-22-1] $C_{22}H_{44}O_9PNa$

Product Specifications:
Purity: ≥ 95% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: > 10%

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

Storage:
Store at -20°C.



INDUSTRIAL DETERGENTS

Anapoe

Anzergent

Ionic

MB Reagents

NDSB

Zwitterionic

INDUSTRIAL DETERGENTS

High purity detergents, lipids, and custom chemistry are the hallmark of Anatrace. We also offer a variety of industrial grade detergents which are perfect for initial protein extraction and purification of membrane proteins, along with a host of other molecular biology applications.

CHAPS, CHAPSO, NDSB-256, and Nonidet P40 Substitute are among the most widely used of our industrial detergents. Industrial scale manufacturing offers the advantage of lower cost product but at the expense of homogeneity and purity found in other high purity Anatrace products such as Dodecyl Maltoside or Fos-Choline. Industrial detergents are a mixture of different molecular weight components that are primarily the proper derivative. These reliable detergents are commonly found in every lab and are highly suitable for standard applications.

PRODUCT NO.	DESCRIPTION
AZ314	Anzergent® 3-14, Analytical Grade
B035	Brij 35
B300	Big Chap, Analytical Grade
C316	CHAPS, Sol-Grade and Anagrade
C317	CHAPSO, Anagrade
D380	Deoxycholic Acid, Sodium Salt, Anagrade
H350	Hexaethylene Glycol Monooctyl Ether (C_8E_6), Anagrade
ND195	NDSB-195
NIDP40	Nonidet P40 Substitute
O330	Octaethylene Glycol Monododecyl Ether ($C_{12}E_8$), Analytical Grade and Anagrade
P300	Pluronic F-68
P350	Pentaethylene Glycol Monooctyl Ether (C_8E_5), Anagrade
S300	Sodium Dodecanoyl Sarcosine, Sol-Grade and Anagrade
T1001	Triton X-100
T1003	Tween 20

You can be assured that our line of industrial detergents will deliver consistent performance so there will be no surprises in your research. As a one-stop shop, we make purchasing easier so you can spend your time reaching for new heights.

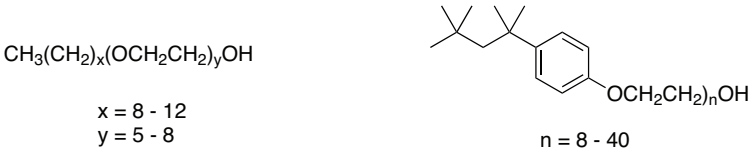
Anapoe Detergents

Polyoxyethylene detergents are available under trade names, such as Triton, Tween, Genapol, Brij, Thesit, Lubrol, etc. In addition to the numerous trade names, industrial grade detergents are often a non-specific mixture of closely related molecules. This may vary from lot-to-lot and may also contain other additives and contaminants that can result in undesirable effects during protein extraction. One such contaminant is peroxide. Light and age can accelerate peroxide formation and concentration[1].

Peroxides in biological systems will react with macromolecules such as membrane proteins and create the potential to inactivate, or even fragment, the molecule [2, 4, 6-10]. Biochemically speaking, peroxides oxidize the sulfhydryl groups in the protein tertiary structure and interfere with natural protein folding. Tween and Triton often contain hydrogen peroxide levels as high as 0.2%[5], and these levels build as the product sits on the research shelf in your lab.

To combat these problems, Anatrace Anapoe® reagents are crafted and purified using chromatography to contain less than 20 µM of equivalent peroxide, supplied as a 10% aqueous solution, and then stored under argon for stability. Anapoe detergents are prepared and enhanced so you get the functionality you need, without the side effects.

FIG. 1. C_xE_y AND TRITON DETERGENTS



COMMON POLYOXYETHYLENE DETERGENTS	ANAPOE VERSION	PRODUCT NO.
Tween 20	Anapoe-20	APT020
Brij-35	Anapoe -35	APB035
Brij-58	Anapoe -58	APB058
Tween 80	Anapoe -80	APT080
$C_{10}E_6$	Anapoe - $C_{10}E_6$	APO106
$C_{10}E_9$	Anapoe - $C_{10}E_9$	APO109
$C_{12}E_8$	Anapoe - $C_{12}E_8$	APO128
$C_{12}E_9$	ANAPOE-$C_{12}E_9$	APO129

COMMON POLYOXYETHYLENE DETERGENTS	ANAPOE VERSION	PRODUCT NO.
$C_{12}E_{10}$	Anapoe - $C_{12}E_{10}$	AP1210
$C_{13}E_8$	Anapoe -$C_{13}E_8$	APO138
Nonidet P40 Substitute	Anapoe -NID-P40	APND40
Triton X-100	Anapoe -X-100	APX100
Triton X-114	Anapoe -X-114	APX114
Triton X-305	Anapoe -X-305	APX305
Triton X-405	Anapoe -X-405	APX405

References:

1. Chang, H. W. and Bock, E. (1980) *Anal. Biochem.* **104**, 112-117.
2. Lever, M. (1977) *Anal. Biochem.* **83**, 274-284.
3. Miki, T. and Orii, Y. (1985) *Anal. Biochem.* **146**, 28-34.
4. Jaeger, J., Sorensen, K. and Wolff, J. (1994) *Biochem. Biophys. Methods* **29**, 77-81.
5. Ashani, Y. and Catravas, G. (1980) *Anal. Biochem.* **109**, 55-62.
6. Chang, H. W. (1974) *Proc. Nat. Acad. Sci. USA* **71**, 2113-2117.
7. O'Brien, R. D. and Gibson, R. E. (1975) *ABB* **169**, 458-463.
8. Chang, H. W. and Neumann, E. (1976) *Proc. Nat. Acad. Sci. USA* **73**, 3364-3368.
9. Heath, R. L. and Tappel, A. L. (1976) *Anal. Biochem.* **76**, 184-191.
10. Stutzenberger, F. J. (1992) *Anal. Biochem.* **207**, 249-254.

Anapoe

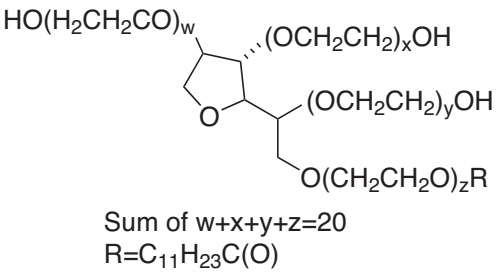
Anapoe-20

[Tween 20 / Polyoxyethylene(20)sorbitan Monolaurate / Poly(oxy-1,2-ethanediyl) Derivs., Sorbitan Monododecanoate]

APT020 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 1228.0 [9005-64-5] $C_{58}H_{114}O_{26}$
CMC (H_2O): ~ 0.059 mM[1] (0.0072%)

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.



Sum of w+x+y+z=20
$R=C_{11}H_{23}C(O)$

Reference:
1. Helenius, A., McCauslin, D. R., Fries, E. and Tanford, C. (1979) *Methods Enzymol.* **56**, 743-749.

Anapoe-35

[Brij-35 / $C_{12}E_{23}$ / α–Dodecyl–ω–Hydroxy-Poly (oxy-1,2-Ethanediyl / Polyethylene Glycol (23) Monododecyl Ether]

APB035 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 1198.0 [9002-92-0]
$(C_2H_4O)_nC_{12}H_{26}O$, n ~ 23
CMC (H_2O): ~ 0.091 mM[1] (0.011%)
Aggregation number (H_2O): ~ 40[2]

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.

References:
1. Helenius, A., McCauslin, D. R., Fries, E. and Tanford, C. (1979) *Methods Enzymol.* **56**, 743-749.
2. le Maire, M., Champeil, P. and Moller, J. V. (2000) *Biochim. Biophys. Acta* **1508**, 86-111.

$CH_3(CH_2)_{11}O(CH_2CH_2O)_{23}H$

Anapoe-58

[Brij-58 / $C_{16}E_{20}$ / α–Dodecyl–ω–Hydroxy-Poly(oxy-1,2-Ethanediyl / Polyethylene Glycol (20) Monohexadecyl Ether]

APB058 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 1122.0 [9004-95-9]
$(C_2H_4O)_nC_{16}H_{34}O$, n ~ 20
CMC (H_2O): ~ 0.004 mM[1] (0.00045%)

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.

Reference:
1. For $C_{16}E_{21}$ listed in Helenius, A., McCauslin, D. R., Fries, E. and Tanford, C. (1979) *Methods Enzymol.* **56**, 743-749.

$CH_3(CH_2)_{15}O(CH_2CH_2O)_{20}H$

Anapoe-80

[Tween 80 / Polyoxyethylene(80)sorbitan Monolaurate / Poly(oxy-1,2-ethanediyl) Derivs., (Z)-Sorbitan Mono-9-octadecanoate]

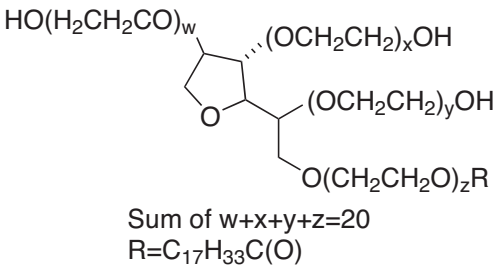
APT080 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 1310.0 [9005-65-6] $C_{64}H_{124}O_{26}$
CMC (H_2O): ~ 0.012 mM[1] (0.0016%)
Aggregation number (H_2O): ~ 58[2]

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.

References:

1. Helenius, A., McCauslin, D. R., Fries, E. and Tanford, C. (1979) *Methods Enzymol.* **56**, 743-749.
2. Black, Shaun D.: http://psyche.uthct.edu/shaun/SBlack/detergnt.html.



Sum of w+x+y+z=20
R=$C_{17}H_{33}C(O)$

Anapoe-$C_{10}E_6$

[Polyoxyethylene(6)decyl Ether / 3,6,9,12,15,18-Hexaoxaoctacosan-1-ol]

APO106 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 423.0 [5168-89-8]
$(C_2H_4O)nC_{10}H_{22}O$, n ~ 6
CMC (H_2O): ~ 0.9 mM[1] (0.038%)
Aggregation number (H_2O): ~ 40[2]

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.

References:

1. Helenius, A., McCauslin, D. R., Fries, E. and Tanford, C. (1979) *Methods Enzymol.* **56**, 743-749.
2. Black, Shaun D.: http://psyche.uthct.edu/shaun/SBlack/detergnt.html.

$CH_3(CH_2)_9O(CH_2CH_2O)_6H$

Anapoe-$C_{10}E_9$

[Polyoxyethylene(9)decyl Ether / α–Decyl–ω–Hydroxy-Poly(Oxy-1,2-Ethanediyl)]

APO109 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 555.0 [26183-52-81]
$(C_2H_4O)_nC_{10}H_{22}O$, n ~ 9
CMC (H_2O): ~ 1.3 mM[1] (0.072%)

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.

Reference:

1. Borchardt, J. K. (1996) *Lab Products Notebook 7, No.* ***10***, 20.

$CH_3(CH_2)_9O(CH_2CH_2O)_9H$

Anapoe

Anapoe-$C_{12}E_8$

[Polyoxyethylene(8)dodecyl Ether/3,6,9,12, 15,18,21,24- Octaoxahexatriacontan-1-ol]

APO128 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 539.0 [3055-98-9]
$(C_2H_4O)_nC_{12}H_{26}O$, n ~ 8
CMC (0.01 M TES, pH 7.5, 0.05 M NaCl, 0.1 mM $CaCl_2$): ~ 0.09 mM[1,2] (0.0048%)
Aggregation number (H_2O): ~ 123[3]

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.

References:

1. LeMaire, M., Kwee, S., Andersen, J. P., and Miller, J. V. (1983) *Eur. J. Biochem.,* **129**, 525-532.
2. LeMaire, M., Champeil, P., and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.
3. Black, Shaun D.: http://psyche.uthct.edu/shaun/SBlack/detergnt.html.

$CH_3(CH_2)_{11}O(CH_2CH_2O)_8H$

Anapoe-$C_{12}E_9$

[Polyoxyethylene(9)dodecyl Ether / Thesit / Polydocanol / α–Dodecyl–ω–Hydroxy-Poly (Oxy-1,2-Ethanediyl]

APO129 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 583.0 [3055-99-0]
$(C_2H_4O)_nC_{12}H_{26}O$, n ~ 9
CMC (H_2O): ~ 0.05 mM[1] (0.003%)
dn/dc (H_2O): 0.109 ml/gm[2]
Micelle size: 83 kDa[2]

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.

References:

1. Mast, R. C., and Haynes, L. V. (1975) *J. Colloid Inerface Sci.* **53**, 35.
2. Strop, P., and Brunger, A. T. (2005) *Protein Sci.* **14**, 2207-2211.
3. Rigler, P., Ulrich, W-P., Hovius, R., Ilegens, E., Pick, H., and Voegl, H. (2003) *Biochemistry* **42**, 14017-14022.

$CH_3(CH_2)_{11}O(CH_2CH_2O)_9H$

Anapoe-$C_{12}E_{10}$

[Polyoxyethylene(10)dodecyl Ether / 3,6,9,12,15,18,24,27,30-Decaoxadotetra-contan-1-ol]

AP1210 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 627.0 [6540-99-4]
$(C_2H_4O)_nC_{12}H_{26}O$, n ~ 10
CMC (H_2O): ~ 0.2 mM[1] (0.013%)

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.

Reference:

1. Mukerjee, P. and Mysels, K. J. (1971) *NSRDS-NBS* **36,** 222.

$CH_3(CH_2)_{11}O(CH_2CH_2O)_{10}H$

Anapoe-$C_{13}E_8$

[Polyoxyethylene(8)tridecyl Ether]

APO138 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 553.0 [9043-30-5]
$(C_2H_4O)_nC_{13}H_{28}O$, n ~ 8
CMC (H_2O): ~ 0.1 mM[1] (0.0055%)

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.

Reference:
1. Borchardt, J. K. (1996) *Lab Products Notebook 7, No.* ***10***, 20.

$CH_3(CH_2)_{12}O(CH_2CH_2O)_8H$

Anapoe-NID-P40

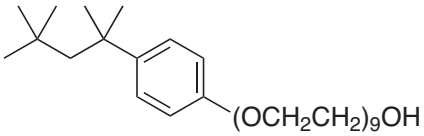
[Igepal CA-630 / (Octylphenoxy) Polyethoxyethanol / Nonidet P40 Substitute]
Chemically indistinguishable from Nonidet P40, which is no longer commercially available.

APND40 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 603.0 [2497-59-8] $C_{28}H_{50}O_8$
CMC (50 mM Na^+ solution): ~ 0.05-0.3 mM[1]
Aggregation number (H_2O): ~ 100-155[1]

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.

Reference:
1. Black, Shaun D.: http://psyche.uthct.edu/shaun/SBlack/detergnt.html.



Anapoe-X-100

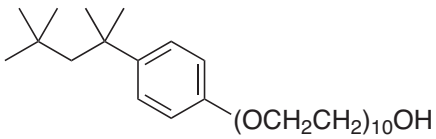
[Triton X-100 / α–[4-(1,1,3,3-Tetramethylbutyl)phenyl]–ω–Hydroxy-Poly(Oxy-1,2-Ethanediyl)]

APX100 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 647.0 [9002-93-1]
t-Oct-C_6H_4-$(OCH_2CH_2)_xOH$, x = 9-10
CMC (H_2O): ~ 0.23 mM[1-4] (0.015%) (w/v)
Aggregation number (H_2O): ~ 75-165[5]

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.

References:
1. Vendittis, E., Paumbo, G., Parlata, G. and Borchini, U. (1981) *Anal. Biochem.* **115**, 278-286.
2. Ross, S. and Oliver, J. P. (1959) *J. Phys. Chem.* **63**, 1671-1674.
3. Mankovich, A. M. (1964) *J. Amer. Oil Chem. Soc.* **41**, 449-452.
4. Rosenthal, K. S. and Koussale, F. (1983) *Anal. Chem.* **55**, 1115-1117.
5. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.



Anapoe

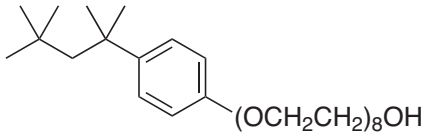
Anapoe-X-114

[Triton X-114 / α–[(1,1,3,3-Tetramethyl-butyl)Phenyl]–ω–Hydroxy-Poly(Oxy-1,2-Ethanediyl)]

APX114 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 536.0 [9036-19-5]
t-Oct-C_6H_4-$(OCH_2CH_2)_n$OH, n ~ 7-8
CMC (H_2O): ~ 0.2 mM[1] (0.011%) (w/v)

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.



Reference:
1. Rosenthal, K. S. and Koussale, F. (1983) *Anal. Chem.* **55**, 1115-1117.

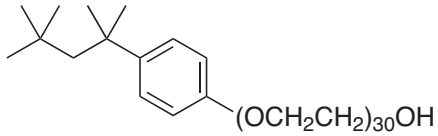
Anapoe-X-305

[Triton X-305 / α–[4-(1,1,3,3-Tetramethyl-Butyl)Phenyl]-ω–Hydroxy-Poly(Oxy-1,2-Ethanediyl)]

APX305 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 1526.0 [9002-93-1]
t-Oct-C_6H_4-$(OCH_2CH_2)_n$OH, n ~ 30
CMC (H_2O): ~ 0.65 mM[1]

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.



Reference:
1. Egan, R. W., Jones, M. A., and Lehninger, A. L. (1976) *J Biol Chem* **251**, 4442-4447.

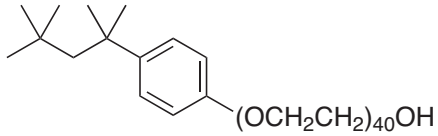
Anapoe-X-405

[Triton X-405 / α–[4-(1,1,3,3-Tetramethyl-Butyl)Phenyl]–ω–Hydroxy-Poly(Oxy-1,2-Ethanediyl)]

APX405 50 ml (50 ampules/1 ml each)
50 ml (5 ampules/10 ml each)
100 ml (10 ampules/10 ml each)
500 ml (screw cap bottle)

Chemical Properties:
FW avg.: 1967.0 [9002-93-1]
t-Oct-C_6H_4-$(OCH_2CH_2)_n$OH, n ~ 40
CMC (H_2O): ~ 0.81 mM[1] (0.16%)

Product Specifications:
Low-Oxidant
Purified industrial detergent.
Peroxide: < 20 µM
Supplied in a 10% (w/v) solution under argon gas.



Reference:
1. McPherson, A. (1999) *Crystallization of Biological Macromolecules*, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York.

Anzergent 3-8, Analytical Grade

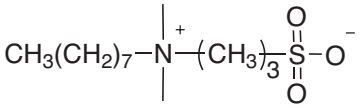
[n-Octyl-N,N-Dimethyl-3-Ammonio-1-Propanesulfonate / N,N-Dimethyl-N-(3-Sulfopropyl)-1-Octaminium Hydroxide, Inner Salt]

AZ308 5 gm, 25 gm, 100 gm

Chemical Properties:
FW: 279.6 [15178-76-4] $C_{13}H_{29}NO_3S$
CMC (H_2O): ~ 390 mM[1] (10.9%)

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 70 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1
Anzergent 3-8 is chemically identical to Zwittergent 3-8.

Reference:
1. Navarette, R. and Serrano, R. (1983) *Biochim. Biophys. Acta* **728**, 403-408.



Anzergent 3-10, Analytical Grade

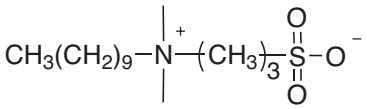
[n-Decyl-N,N-Dimethyl-3-Ammonio-1-Propanesulfonate / N,N-Dimethyl-N-(3-Sulfopropyl)-1-Decanaminium Hydroxide, Inner Salt]

AZ310 5 gm, 25 gm, 100 gm

Chemical Properties:
FW: 307.6 [15163-36-7] $C_{15}H_{33}NO_3S$
CMC (H_2O): ~ 39 mM[1] (1.2%)
Aggregation number (H_2O): ~ 41[2]

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 70 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1
Anzergent 3-10 is chemically identical to Zwittergent 3-10.

References:
1. Navarette, R. and Serrano, R. (1983) *Biochim. Biophys. Acta* **728**, 403-408.
2. Black, Shaun D.: http://psyche.uthct.edu/shaun/SBlack/detergnt.html.



Anzergent 3-12, Analytical Grade

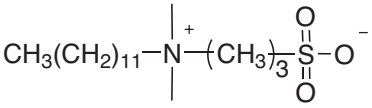
[n-Dodecyl-N,N-Dimethyl-3-Ammonio-1-Propanesulfonate / N,N-Dimethyl-1-N-(3-Sulfopropyl)-1-Dodecanaminium Hydroxide, Inner Salt]

AZ312 5 gm, 25 gm, 100 gm

Chemical Properties:
FW: 335.5 [14933-08-5] $C_{17}H_{37}NO_3S$
CMC (Solution: 20 mM Tris-HCl, pH 8.0, 0.1 M NaCl): ~ 2.8 mM[1] (0.094%)
Aggregation number (H_2O): ~ 55-87[2]

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 70 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1
Anzergent 3-12 is chemically identical to Zwittergent 3-12.

References:
1. Vulliez-LeNormand, B. and Eisele, J. (1993) *J. Anal. Biochem.* **208**, 241-243.
2. LeMaire, M., Champeil, P., and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.



Anzergent

Anzergent 3-14, Analytical Grade

[n-Tetradecyl-N,N-Dimethyl-3-Ammonio-1-Propanesulfonate / Dimethyl (3-Sulfopropyl)Tetradecyl-Ammonium Hydroxide, Inner Salt]

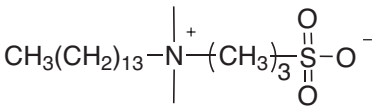
AZ314 5 gm, 25 gm, 100 gm

Chemical Properties:
FW: 363.6 [14933-09-6] $C_{19}H_{41}NO_3S$
CMC (H_2O): ~ 0.16 mM[1]
CMC (Solution: 10 mM Phosphate, pH 7.5): ~ 0.2 mM[2] (0.007%)
Aggregation number (H_2O): ~ 83-130[3]

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 70 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1
Anzergent 3-14 is chemically identical to Zwittergent 3-14.

References:

1. Anatrace measurement.
2. Brito, R. M. M. and Vaz, W. L. C. (1986) *Anal. Biochem.* **152**, 250-255.
3. LeMaire, M., Champeil, P., and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.



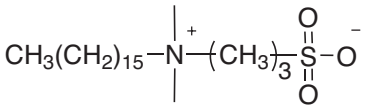
Anzergent 3-16, Analytical Grade

[n-Hexadecyl-N,N-Dimethyl-3-Ammonio-1-Propanesulfonate]

AZ316 5 gm, 25 gm, 100 gm

Chemical Properties:
FW: 391.7 [2281-11-0] $C_{21}H_{45}NO_3S$
CMC (H_2O): 10-60 mM
Aggregation number (H_2O): ~ 155

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 70 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1
Anzergent 3-16 is chemically identical to Zwittergent 3-16.



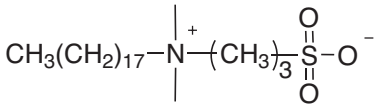
Anzergent 3-18, Analytical Grade

[n-Octadecyl-N,N-Dimethyl-3-Ammonio-1-Propanesulfonate]

AZ318 5 gm, 25 gm, 100 gm

Chemical Properties:
FW: 419.7 [13177-41-8] $C_{23}H_{49}NO_3S$

Product Specifications:
Appearance: White powder
Purity: ≥ 98% [Assay (from C)]
Identity: IR spectrum conforms to specification
Conductance: < 50 µOhms/cm (0.05 M solution in water)
Moisture (KF): < 2.0%
Residue on Ignition: < 0.1%
Anzergent 3-18 is chemically identical to Zwittergent 3-18.



Big Chap, Analytical Grade

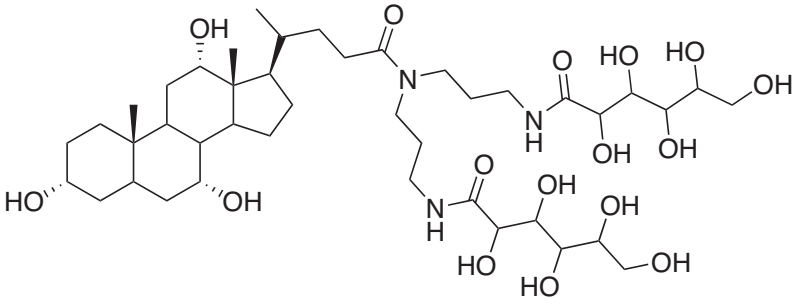
[N,N'-bis-(3-D-Gluconamidopropyl) Cholamide]

B300	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 878.1 [86303-22-2] $C_{42}H_{75}N_3O_{16}$
CMC (H_2O): ~ 2.9 mM[1] (0.25%)
Aggregation number (H_2O): ~ 10[1]

Product Specifications:
Purity: ≥ 95% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.30
260 nm: < 0.40

Reference:
1. Hjelmeland, L. M., Klee, W. A. and Osborne, J. C. (1983) *Anal. Biochem.* **130**, 485-490.



Big Chap, Deoxy, Analytical Grade

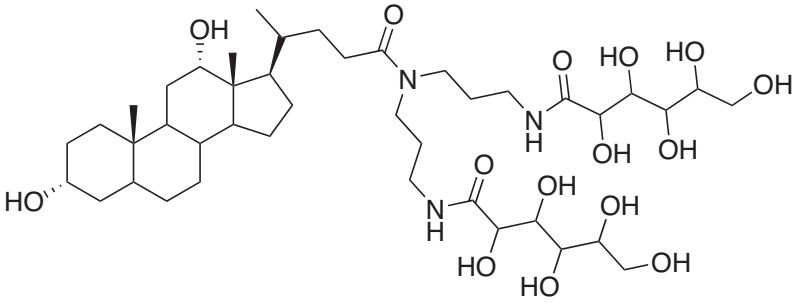
[N,N'-bis-(3-D-Gluconamidopropyl) Deoxycholamide]

B310	1 gm
	5 gm

Chemical Properties:
FW: 862.1 [86303-23-3] $C_{42}H_{75}N_3O_{15}$
CMC (H_2O): ~ 1.4 mM[1] (0.12%)
Aggregation number (H_2O): ~ 8-16[1]

Product Specifications:
Purity: ≥ 95% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.30
260 nm: < 0.40

Reference:
1. Hjelmeland, L. M., Klee, W. A. and Osborne, J. C. (1983) *Anal. Biochem.* **130**, 485-490.



Cholic Acid, Sodium Salt

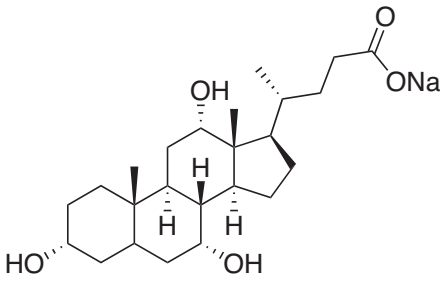
[3α,7α,12α–Trihydroxy-5β-Cholan-24-Oic Acid, Monosodium Salt / Sodium Cholate]

S1010S 10 gm, 25 gm, 100 gm, 500 gm

Chemical Properties:
FW: 430.6 [361-09-1] $C_{24}H_{39}O_5Na$
CMC (pH 9.0): ~ 9.5 mM[1] (0.41%)
CMC (pH 7.5): ~ 14 mM[2] (0.60%)
Aggregation number (H_2O): ~ 2.0-4.8[3]

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 40%
Absorbance of a 1% solution in water:
400 nm: < 0.02
340 nm: < 0.08
280 nm: < 0.12
260 nm: < 0.2

References:
1. Brito, R. M. M and Vaz, W. L. C. (1986) *Anal. Biochem* **152**, 250-255.
2. Vendittis, E., Paumbo, G., Parlata, G. and Borchini, U. (1981) *Anal. Biochem.* **115**, 278-286.
3. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.
4. Iwaki, M., Giotta, L., Akinsiku, A. O., Schagger, H., Fisher, N., Breton, J., and Rich, P. R. (2003) *Biochem.* **42**, 11109-11119.



n-Decyl-N,N-Dimethylglycine, Anagrade

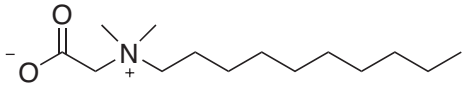
Decyl Dimethylglycine

D352 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 243.4 [2644-45-3] $C_{14}H_{29}O_2N$
CMC (H_2O): ~ 19 mM[1] (0.46%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 80 µS
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Anatrace measurement.



Deoxycholic Acid, Sodium Salt, Anagrade

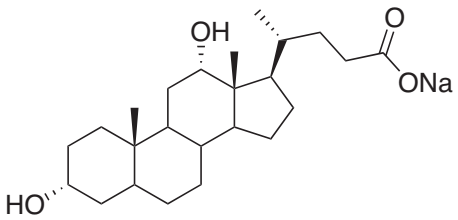
[3α,12α–Dihydroxy-5β-Cholan-24-oic Acid, Monosodium Salt]

D380 5 gm, 25 gm, 100 gm

Chemical Properties:
FW: 414.6 [302-95-4] $C_{24}H_{39}O_4Na$
CMC (H_2O): ~ 6 mM[1] (0.24%)
Aggregation number (H_2O): ~ 22[2]

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 20°C: ≥ 5%
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.2

References:
1. Anatrace measurement.
2. Black, Shaun D.: http://psyche.uthct.edu/shaun/SBlack/detergnt.html .



n-Dodecyl-N,N-Dimethylglycine, Anagrade

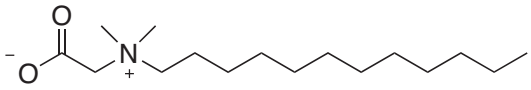
[Lauryl Dimethylglycine]
(Major component of the industrial detergent, Empigen BB)

D350	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 271.4 [683-10-3] $C_{16}H_{33}O_2N$
CMC (H_2O): ~ 1.5 mM[1] (0.041%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 80 µS

Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1



n-Dodecyl-N,N-Dimethylglycine, Sol-Grade

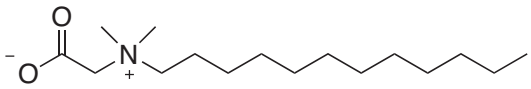
[Lauryl Dimethylglycine]
(Major component of the industrial detergent, Empigen BB)

D350S	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 271.4 [683-10-3] $C_{16}H_{33}O_2N$
CMC (H_2O): ~ 1.5 mM[1] (0.041%)

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 500 µS

Absorbance of a 1% solution in water:
340 nm: < 0.2
280 nm: < 0.4
260 nm: < 0.8



n-Tetradecyl-N,N-Dimethylglycine, Anagrade

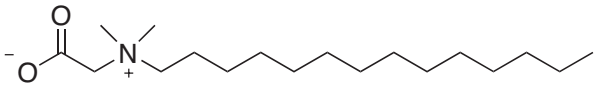
T305	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 299.4 [2601-33-4] $C_{18}H_{37}NO_2$
CMC (H_2O): ~ 0.034 mM[1] (0.0010%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.10

Reference:
1. Anatrace measurement.



Brij 35

Peroxide-free version–see APB035, pg. 102

[$C_{12}E_{23}$• α-Dodecyl-ω-Hydroxy-Poly(Oxy-1,2-Ethanediyl) • Polyethylene Glycol (23) Monododecyl Ether]

B035	100 gm
	500 gm
	1 kg
	5 kg

Chemical Properties:
FW: avg. 1198.0 [9002-92-0]
$(C_2H_4O)_nC_{12}H_{26}O$, n ~ 23
CMC: ~ 0.091 mM (0.011%)
Aggregation Number: ~ 40

Product Specifications:
Appearance: White waxy solid
Acid number: ≤ 5.0
Hydroxyl number: 40-60
Moisture: ≤ 3.0%
Flash Point: ≥ 300°F
Pour Point: Approx. 33°C
Specific Gravity (25°C): Approx. 1.05
Detergent for Stein-Moore chromatography.

$$CH_3(CH_2)_{11}O(CH_2CH_2O)_{23}H$$

CHAPS, Anagrade

[3-[(3-Cholamidopropyl)-Dimethylammonio]-1-Propane Sulfonate] / N,N-Dimethyl-3-Sulfo-N-[3-[(3α,5β,7α,12α)-3,7,12-Trihydroxy-24-Oxocholan-24-yl] Amino]propyl]-1-Propanaminium Hydroxide, Inner Salt]

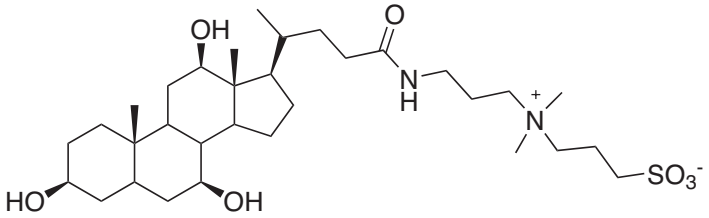
C316	1 gm
	5 gm
	10 gm
	25 gm

Chemical Properties:
FW: 614.9 [75621-03-3] $C_{32}H_{58}N_2O_7S$
CMC (H_2O): ~ 8 mM[1] (0.49%)
Aggregation number (H_2O): ~ 10[2]
dn/dc (H_2O): 0.1323 ml/gm[3]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 0.5 M
Conductance (0.5 M solution in water): < 50 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06

References:

1. Hjelmeland, L. M., Nebert, D. W. and Osborne, Jr., J. C. (1983) *Anal. Biochem.* **130**, 72-82.
2. Womack, M. D., Kendall, D. A. and MacDonald, R. C. (1983) *Biochim. Biophys. Acta* **733**, 210-215.
3. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
4. Bellis, S. L., Kass-Simon, G. and Rhoads, D. E. (1992) *Biochem.* **31**, 9838-9843.



CHAPS, Sol-Grade

[3-[(3-Cholamidopropyl)-Dimethylammonio]-1-Propane Sulfonate] / N,N-Dimethyl-3-Sulfo-N-[3-[(3α,5β,7α,12α)-3,7,12-Trihydroxy-24-Oxocholan-24-yl] Amino]propyl]-1-Propanaminium Hydroxide, Inner Salt]

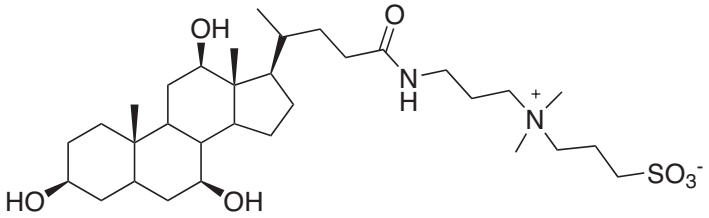
C316S	5 gm
	25 gm
	100 gm

Chemical Properties:
FW: 614.9 [75621-03-3] $C_{32}H_{58}N_2O_7S$
CMC (H_2O): ~ 8 mM[1] (0.49%)
Aggregation number (H_2O): ~ 10[2]
dn/dc (H_2O): 0.1323 ml/gm[3]

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 0.5 M
Conductance (0.5 M solution in water): < 200 µS
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.2

References:

1. Hjelmeland, L. M., Nebert, D. W. and Osborne, Jr., J. C. (1983) *Anal. Biochem.* **130**, 72-82.
2. Womack, M. D., Kendall, D. A. and MacDonald, R. C. (1983) *Biochim. Biophys. Acta* **733**, 210-215.
3. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
4. Bellis, S. L., Kass-Simon, G. and Rhoads, D. E. (1992) *Biochem.* **31**, 9838-9843.



CHAPSO, Anagrade

[3-[(3-Cholamidopropyl)dimethylammonio]-2-Hydroxy-1-Propanesulfonate]

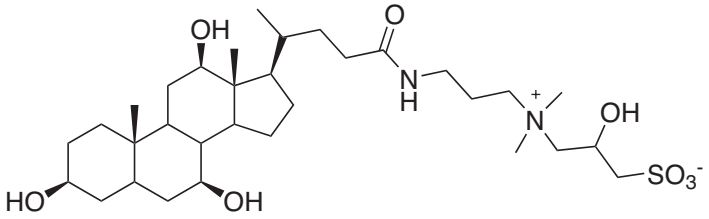
C317	1 gm
	5 gm
	5 x 10 ml
	25 gm

Chemical Properties:
FW: 630.9 [82473-24-3] $C_{32}H_{58}N_2O_8S$
CMC (H_2O): ~ 8 mM[1] (0.50%)
Aggregation number (H_2O): ~ 11[1]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 0.5 M
Conductance (0.5 M solution in water): < 100 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06

References:

1. Hjelmeland, L. M., Nebert, D. W. and Osborne, Jr., J. C. (1983) *Anal. Biochem.* **130**, 72-82.
2. Cladera, J., Rigaud, J., Villaverde, J. and Dunach, M. (1997) *Eur. J. Biochem.* **243**, 798-804.
3. Sanders, C. R. II and Prestegard, J. H. (1990) *Biophys. J.* **58**, 447-460.



Chobimalt, Anagrade

[Cholestrol α-D-Glucopryanosyl-(1→4)-β-D-Glucopyranosyl-(1→6)-α-D-Glucopyranosyl-(1→4)-β-D-Glucyopryanoside]

CH220	100 mg
	250 mg
	500 mg

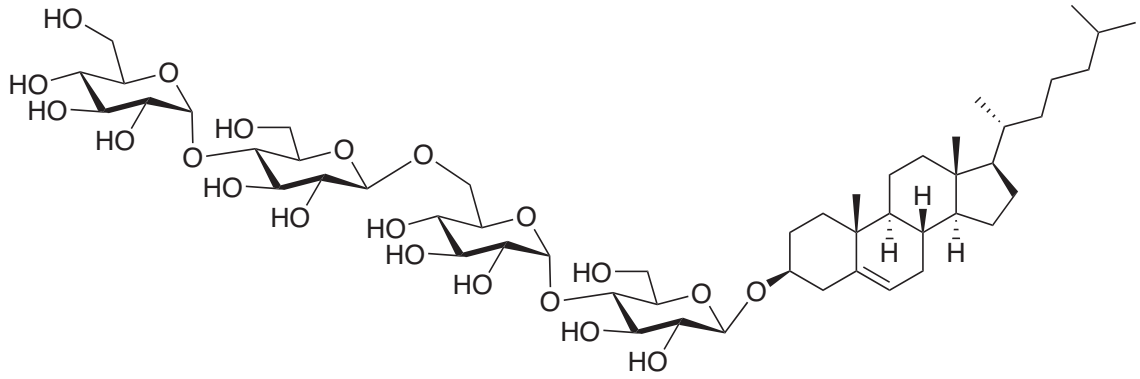
Chemical Properties:
FW: 1035.2 $C_{51}H_{86}O_{21}$
CMC (H_2O): 0.004 mM[1]

Product Specifications:
Appearance: White powder
Purity: > 99.0% by HPLC analysis
Solubility in water: Up to 20%

Storage:
Store at -20°C.

Reference:

1. Howell, S., Mittal, R., Huang, L., Travis, B., Breyer, R. M. and Sanders, C. R. (2010) *Biochemistry* **49**, 9572-9583.



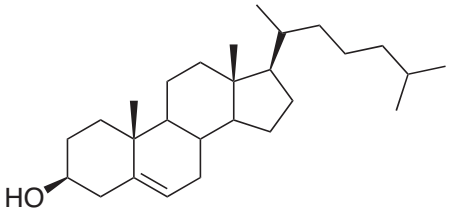
Cholesterol

[3β-Hydroxy-5-Cholestene / 5-Cholesten-3β-ol]

CH200	50 gm
	250 gm
	1 kg

Chemical Properties:
FW: 386.6 [57-88-5] $C_{27}H_{46}O$

Product Specifications:
Melting point: 147-150°C
Loss on drying: < 0.3%
Residue on ignition: < 0.1%
Solubility in alcohol: 1%
Identity: IR spectrum conforms to specification



Cholesteryl Hemisuccinate Tris Salt

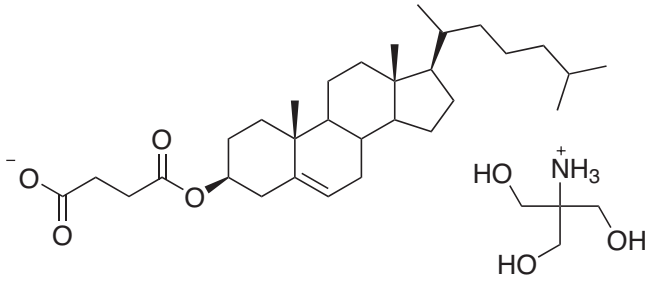
CH210 1 gm, 5 gm, 25 gm, 100 gm

Chemical Properties:
FW: 607.9 [102601-49-0] $C_{31}H_{50}O_4 \cdot C_4H_{11}NO_3$

Product Specifications:
Appearance: White powder
Solubility (6% water solution of CHAPS): 1.2%
Identity: IR spectrum conforms to specification
DSC conforms to standard
Water soluble cholesterol standard(1)

References:

1. Klein, B., Kleinman, N. B. and Foreman, J. A. (1974) *Clin. Chem.* **20**, 482-485.
2. Weiss, H. M. and Grisshammer, R. (2002) *Eur. J. Biochem.* **269**, 82-92.
3. Tucker, J. and Grisshammer, R. (1996) *Biochem. J.* **317**, 891-899.
4. Brown, P. J. and Schonbrunn, A. (1993) *J. Biol. Chem.* **268**, No. 9, 6668-6676.



Hexaethylene Glycol Monodecyl Ether, Analytical Grade

Peroxide-free version–see APO106, pg. 103

[$C_{10}E_6$ / Decyl Hexaethylene Glycol Ether / Decyl Hexaglycol]

H360 4 ml (1 ampule), 10 ml (1 ampule)

Chemical Properties:
FW: 422.6 [5168-89-8] $C_{22}H_{46}O_7$
CMC (H_2O): ~ 0.9 mM(1)
Aggregation number (H_2O): ~ 73(1)
Supplied as a 25% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 3-7
Conductance (10% solution in water): < 100 µS
Peroxide: < 500 µM

Reference:

1. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.

$CH_3(CH_2)_9O(CH_2CH_2O)_6H$

Hexaethylene Glycol Monooctyl Ether, Anagrade

[C_8E_6]

H350 2 ml (1 ampule), 10 ml (1 ampule), 50 ml (5 ampules)

Chemical Properties:
FW: 394.5 [4440-54-4] $C_{20}H_{42}O_7$
CMC (H_2O): ~ 10 mM(1) (0.39%)
Aggregation number (H_2O): ~ 32(1)
Supplied as a 50% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Conductance (10% solution in water): < 50 µS
Peroxide: < 500 µM

Reference:

1. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.

$CH_3(CH_2)_7O(CH_2CH_2O)_6H$

IPTG

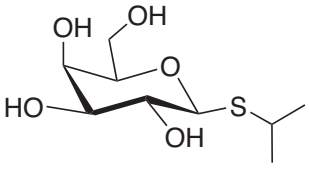
[Isopropyl-β-D-Thiogalactopyranoside]

I1003 5 gm, 25 gm, 100 gm

Chemical Properties:
FW: 238.31 [367-93-1] $C_9H_{18}O_5S$

Product Specifications:
Appearance: White solid; Dioxane-free by HPLC
Purity: ≥ 99% by HPLC analysis
Conductance (10% solution in water): < 200 µS

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.1
260 nm: < 0.2



Nonidet P40 Substitute

Peroxide-free version–see APND40, pg. 105

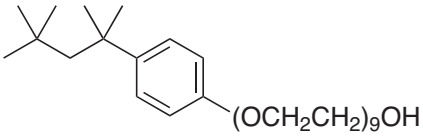
[Igepal CA-630 / (Octylphenoxy) Polyethoxyethanol]

NIDP40 500 ml
1 lt

Chemical Properties:
FW avg.: 603.0 [2497-59-8] $C_{32}H_{58}O_{10}$
CMC (50 mM Na^+): ~ 0.05-0.3 mM[1]
Aggregation number (H_2O): ~ 100-155[1]
Density: 1.060 + 0.005

Product Specifications:
Appearance: Clear, slightly yellow-green viscous liquid.
Chemically indistinguishable from Nonidet P40, which is no longer commercially available.

Reference:
1. Black, Shaun D.: http://psyche.uthct.edu/shaun/SBlack/detergnt.html.



Octaethylene Glycol Monododecyl Ether, Anagrade

Peroxide-free version–see APO128, pg. 104

[$C_{12}E_8$ / Dodecyl Octaethylene Glycol Ether / Dodecyl Octaglycol / 3,6,9,12,15,18,21,24-) Octaoxahexatriacontan-1-Ol]

O330 4 ml (1 ampule)
20 ml (2 ampules)
100 ml (10 ampules)

Chemical Properties:
FW: 538.8 [3055-98-9] $C_{28}H_{58}O_9$
CMC (0.01 M TES, pH 7.5, 0.05 M NaCl, 0.1 mM $CaCl_2$): ~ 0.09 mM[1,2] (0.0048%)

Aggregation number (0.01 M TES, pH 7.5, 0.05 M NaCl, 0.1 mM $CaCl_2$): ~ 90-120[2]
Supplied as a 25% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 3-7
Solubility: > 25% at room temperature
Conductance (10% solution in water): < 100 µS
Peroxide: < 500 µM

References:
1. LeMaire, M., Kwee, S., Andersen, J. P. and Miller, J. V. (1983) *Eur. J. Biochem.* **129**, 525-532.
2. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.

$CH_3(CH_2)_{11}O(CH_2CH_2O)_8H$

Octaethylene Glycol Monododecyl Ether, Analytical Grade

Peroxide-free version–see APO128, pg. 104

[$C_{12}E_8$ / Dodecyl Octaethylene Glycol Ether / Dodecyl Octaglycol / 3,6,9,12,15,18,21,24-Octaoxahexatriacontan-1-Ol]

O330A 4 ml (1 ampule)
20 ml (2 ampules)
100 ml (10 ampules)

Chemical Properties:
FW: 538.8 [3055-98-9] $C_{28}H_{58}O_9$
CMC (0.01 M TES, pH 7.5, 0.05 M NaCl, 0.1 mM $CaCl_2$): ~ 0.09 mM[1,2] (0.0048%)

Aggregation number (0.01 M TES, pH 7.5, 0.05 M NaCl, 0.1 mM $CaCl_2$): ~ 90-120[2]
Supplied as a 25% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 3-7
Solubility: > 25% at room temperature
Conductance (10% solution in water): < 500 µS
Peroxide: < 500 µM

Note:
May contain organic peroxides.

References:
1. LeMaire, M., Kwee, S., Andersen, J. P. and Miller, J. V. (1983) *Eur. J. Biochem.* **129**, 525-532.
2. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.

$CH_3(CH_2)_{11}O(CH_2CH_2O)_8H$

Pentaethylene Glycol Monodecyl Ether, Anagrade

[$C_{10}E_5$ / Decyl Pentaethylene Glycol Ether / Decylpentaglycol / 3,6,9,12,15-Pentaoxapentacosan-1-Ol]

P340 2 ml (1 ampule)
10 ml (1 ampule)
50 ml (5 ampules)

Chemical Properties:
FW: 378.6 [23244-49-7] $C_{20}H_{42}O_6$
CMC (H_2O): ~ 0.81mM[1] (0.031%)

Aggregation number (H_2O): ~ 73[2]
Supplied as a 50% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Conductance (10% solution in water): < 50 µS
Peroxide: < 500 µM

References:
1. Borchardt, J. K. (1996) *Today's Chemist at Work 5,* **10**, 20-24.
2. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.

$CH_3(CH_2)_9O(CH_2CH_2O)_5H$

Pentaethylene Glycol Monooctyl Ether, Anagrade

[C_8E_5 / Octyl Pentaethylene Glycol Ether / Octylpentaglycol / 3,6,9,12,15-Pentaoxatricosan-1-Ol]

P350	2 ml (1 ampule)
	10 ml (1 ampule)
	50 ml (5 ampules)

Chemical Properties:
FW: 350.5 [19327-40-3] $C_{18}H_{38}O_6$
CMC (0.1 M NaCl): ~ 7.1 mM[1] (0.25%)
Supplied as a 50% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Conductance (10% solution in water): < 50 µS
Peroxide: < 500 µM

Reference:
1. Eisele, J. and Vulliez-Le Normand, B. (1993) *Anal. Biochem.* **208**, 241-243.

$$CH_3(CH_2)_7O(CH_2CH_2O)_5H$$

Pluronic F-68

[Polyoxyethylene-Polyoxypropylene Block Copolymer / Methyl-Oxirane, Polymer with Oxirane, (C_3H_6O•C_2H_4O)x / Poloxamer 188]

P300	100 gm
	500 gm

Chemical Properties:
FW: ~ 8400.0 [9003-11-6] $EO_{78}PO_{30}EO_{78}$
CMC (H_2O, 27°C): ~ 17.9 mM[1,2]

References:
1. Alexandridis, P., Holzwarth, J. F. and Hatton, T. A. (1994) *Macromolecules* **27**, 2414-2425.
2. Alexandridis, P., Athanassiou, V., Fukuda, S. and Hatton, T. A. (1994) *Langmuir* **10**, 2604-2612.

$$HO(CH_2CH_2O)_x(\overset{\overset{CH_3}{|}}{CH}CH_2O)_y(CH_2CH_2O)_zH$$

$$x \sim 78 \quad y \sim 30 \quad z \sim 78$$

Pluronic F-127

[Polyoxyethylene-Polyoxypropylene Block Copolymer / Methyl-Oxirane, Polymer with Oxirane, (C_3H_6O•C_2H_4O)x / Poloxamer 407]

P305	100 gm
	500 gm

Chemical Properties:
FW: ~ 12600.0 [9003-11-6] $EO_{100}PO_{65}EO_{100}$
CMC (H_2O, 19.5°C): ~ 3.97 mM[1,2]

References:
1. Alexandridis, P., Holzwarth, J. F. and Hatton, T. A. (1994) *Macromolecules* **27**, 2414-2425.
2. Alexandridis, P., Athanassiou, V., Fukuda, S. and Hatton, T. A. (1994) *Langmuir* **10**, 2604-2612.

$$HO(CH_2CH_2O)_x(\overset{\overset{CH_3}{|}}{CH}CH_2O)_y(CH_2CH_2O)_zH$$

$$x \sim 100 \quad y \sim 65 \quad z \sim 100$$

Sodium Dodecanoyl Sarcosine, Anagrade

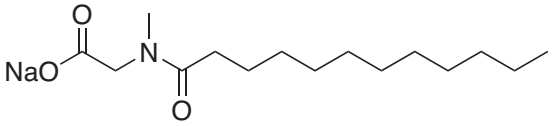
[Sodium Lauroyl Sarcosine / Sarkosyl / N-Methyl-N-(1-Oxododecyl)-Glycine, Sodium Salt]

S300	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 293.4 [137-16-6] $C_{15}H_{29}NO_3Na$
CMC (H_2O): ~ 14.4 mM[1] (0.42%)

Product Specifications:
Purity: ≥ 99% by HPLC analysis
Percent lauric acid: < 0.1 (HPLC)
pH (10% solution in water): 7-9
Solubility in water at 20°C: ≥ 10%
Absorbance of a 1% solution in water:
340 nm: < 0.04
280 nm: < 0.06
260 nm: < 0.08

Reference:
1. Anatrace measurement.



Sodium Dodecanoyl Sarcosine, Sol-Grade

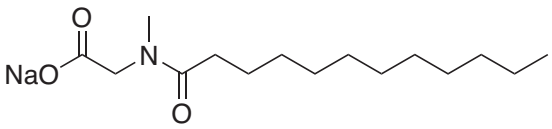
[Sodium Lauroyl Sarcosine / N-Methyl-N-(1-Oxododecyl)-Glycine, Sodium Salt]

S300S 5 gm, 25 gm, 100 gm

Chemical Properties:
FW: 293.4 [137-16-6] $C_{15}H_{29}NO_3Na$
CMC (H_2O): ~ 14.4 mM[1] (0.42%)

Product Specifications:
Purity: ≥ 96% by HPLC analysis
Percent lauric acid: < 4 (HPLC)
pH (10% solution in water): 7-9
Solubility in water at 20°C: ≥ 10%
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.15

Reference:
1. Anatrace measurement.



Tetraethylene Glycol Monooctyl Ether, Anagrade

[C_8E_4 / Octyl Tetraethylene Glycol Ether / Octyltetraglycol / 3,6,9,12-Tetraoxaeicosan-1-Ol]

T350 2 ml (1 ampule), 10 ml (1 ampule), 50 ml (5 ampules)

Chemical Properties:
FW: 306.5 [19327-39-0] $C_{16}H_{34}O_5$
CMC (0.1 M NaCl): ~ 8 mM[1] (0.25%)
Aggregation number (H_2O): ~ 82[1]
Supplied as a 50% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (5% solution in water): 5-8
Conductance (10% solution in water): < 50 µS
Peroxide: < 500 µM

References:
1. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.
2. Cortes, D. M. and Perozo, E. (1997) *Biochem.* **36**, 10343-10352.

$CH_3(CH_2)_7O(CH_2CH_2O)_4H$

Triton X-100

Peroxide-free version–see APX100, pg. 105

[α–[4-(1,1,3,3-Tetramethylbutyl)phenyl]–ω–Hydroxy-Poly(Oxy-1-2-Ethanediyl)]

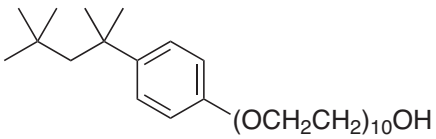
T1001 500 ml, 1 ga

Chemical Properties:
FW avg.: 647.0 [9002-93-1]
t-Oct-C_6H_4-$(OCH_2CH_2)_x$OH, x = 9-10
CMC (H_2O): ~ 0.010 - 0.016%[1-4] (w/v)
Aggregation number (H_2O): ~ 75-165[5]
Density: 1.070

Product Specifications:
Appearance: Clear viscous liquid
Identity: IR spectrum conforms to specification

Storage:
Store at room temperature.
Protect from moisture.

References:
1. Vendittis, E., Paumbo, G., Parlata, G., and Borchini, U. (1981) *Anal.Biochem.* **115**, 278-286.
2. Ross, S. and Oliver, J. P. (1959) *J. Phys.Chem.* **63**, 1671-1674.
3. Mankovich, A. M. (1964) *J. Amer. Oil Chem. Soc.* **41**, 449-452.
4. Rosenthal, K. S. and Koussale F. (1983) *Anal. Chem.* **55**, 1115-1117.
5. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.



Triton X-114

Peroxide-free version–see APX114, pg. 106

[α–[4-(1,1,3,3-Tetramethylbutyl)phenyl]–ω–Hydroxy-Poly(Oxy-1-2-Ethanediyl)]

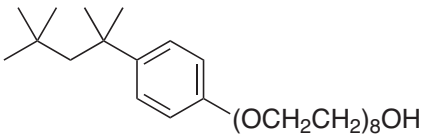
T1002 500 ml

Chemical Properties:
FW avg.: 536.0 [9036-19-5]
t-Oct-C_6H_4-$(OCH_2CH_2)_x$OH, x = 7-8
CMC (H_2O): ~ 0.009%[1] (w/v)

Product Specifications:
Appearance: Clear viscous liquid
Identity: IR spectrum conforms to specification

Storage:
Store at room temperature.
Protect from moisture.

Reference:
1. Rosenthal, K. S. and Koussale F. (1983) *Anal. Chem.* **55**, 1115-1117.



Tween 20

Peroxide-free version–see APT020, pg. 102

[Polyoxyethylene(20)sorbitan Monolaurate / Poly(Oxy-1,2-Ethanediyl) Derivs., Sorbitan Monododecanoate]

T1003 500 ml
1 ga

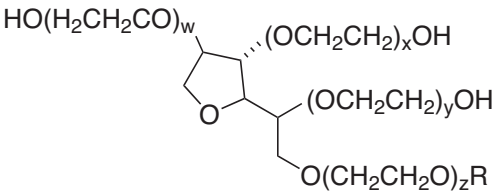
Chemical Properties:
FW avg.: 1228.0 [9005-64-5] $C_{58}H_{114}O_{26}$
CMC (H_2O): ~ 0.059 mM[1] (0.0072%)

Product Specifications:
Appearance: Clear viscous liquid
Identity: IR spectrum conforms to specification

Storage:
Store at room temperature.
Protect from moisture.

References:

1. Helenius, A., McCauslin, D. R., Fries, E. and Tanford, C. (1979) *Methods Enzymol.* **56**, 743-749.
2. Wu, G., Kulmacz, R. J., and Tsai, A. (2003) *Biochemistry* **42**, 13772-13777.



Sum of w+x+y+z=20
R=$C_{11}H_{23}C(O)$

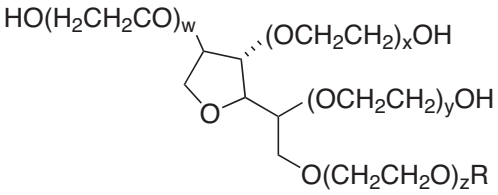
Tween 40

[Polyoxyethylene Sorbitan Monolaurate]

T1005 1 ga

Chemical Properties:
FW avg.: 1284.0 [9005-66-7] $C_{62}H_{123}O_{26}$
CMC (H_2O): 0.027 mM

Product Specifications:
Appearance: Yellow liquid



Sum of w+x+y+z=20
R=$C_{15}H_{31}C(O)$

Tween 80

Peroxide-free version–see APT080, pg. 103

[Polyoxyethylene(80)sorbitan Monolaurate / Poly(oxy-1,2-Ethanediyl) Derivs. (Z)-Sorbitan Mono-9-Octadecenoate]

T1004 500 ml
1 ga

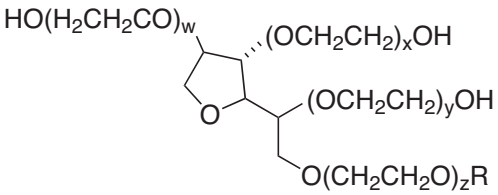
Chemical Properties:
FW avg.: 1310.0 [9005-65-6] $C_{64}H_{124}O_{26}$
CMC (H_2O): ~ 0.012 mM[1] (0.0016%)
Aggregation number (H_2O): ~ 58[2]

Product Specifications:
Appearance: Golden-yellow viscous liquid
Identity: IR spectrum conforms to specification

Storage:
Store at room temperature.
Protect from moisture.

References:

1. Helenius, A., McCauslin, D. R., Fries, E. and Tanford, C. (1979) *Methods Enzymol.* **56**, 743-749.
2. Black, Shaun D.: http://psyche.uthct.edu/shaun/SBlack/detergnt.html.



Sum of w+x+y+z=20
R=$C_{17}H_{33}C(O)$

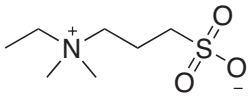
NDSB-195

[Dimethylethylammoniumpropane-sulfonate]

ND195	5 gm
	25 gm
	100 gm

Chemical Properties:
FW: 195.3 [160255-06-1] $C_7H_{17}NO_3S$

Product Specifications:
Solubility in water at 20°C: ≥ 10%
Identity: IR spectrum conforms to specification
Elemental analysis supplied with each lot (C,H,N)



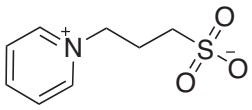
NDSB-201

[(3-1-Pyridino)-1-Propane Sulfonate / 1-(3-Sulfopropyl)-Pyridinium Hydroxide, Inner Salt]

ND201	25 gm
	100 gm
	500 gm

Chemical Properties:
FW: 201.2 [15471-17-7] $C_8H_{11}NO_3S$

Product Specifications:
Solubility in water at 20°C: ≥ 10%
Identity: IR spectrum conforms to specification
Elemental analysis supplied with each lot (C,H,N)



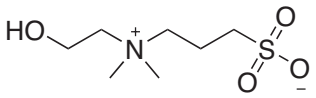
NDSB-211

[Dimethyl(2-Hydroxyethyl)Ammonium-1-Propanesulfonate]

ND211	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 211.3 [38880-58-9] $C_7H_{17}NO_4S$

Product Specifications:
Solubility in water at 20°C: ≥ 10%
Identity: IR spectrum conforms to specification
Elemental analysis supplied with each lot (C,H,N)



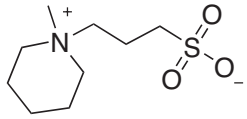
NDSB-221

[3-(1-Methylpiperidinium)-1-Propane Sulfonate]

ND221	5 gm
	25 gm
	100 gm

Chemical Properties:
FW: 221.3 [160788-56-7] $C_9H_{19}NO_3S$

Product Specifications:
Solubility in water at 20°C: ≥ 10%
Identity: IR spectrum conforms to specification
Elemental analysis supplied with each lot (C,H,N)



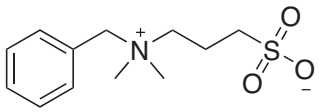
NDSB-256

[Dimethylbenzylammoniumpropane-sulfonate]

ND256	5 gm
	25 gm
	100 gm

Chemical Properties:
FW: 257.4 [81239-45-4] $C_{12}H_{19}NO_3S$

Product Specifications:
Solubility in water at 20°C: ≥ 10%
Identity: IR spectrum conforms to specification
Elemental analysis supplied with each lot (C,H,N)



Zwitterionic

Anzergent 3-12, Analytical Grade

[n-Dodecyl-N,N-Dimethyl-3-Ammonio-1-Propanesulfonate / N,N-Dimethyl-1-N-(3-Sulfopropyl)-1-Dodecanaminium Hydroxide, Inner Salt]

AZ312 5 gm, 25 gm, 100 gm

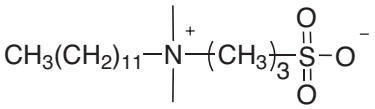
Chemical Properties:
FW: 335.5 [14933-08-5] $C_{17}H_{37}NO_3S$
CMC (Solution: 20 mM Tris-HCl, pH 8.0, 0.1 M NaCl): ~ 2.8 mM[1] (0.094%)
Aggregation number (H_2O): ~ 55-87[2]

For related products see the complete listing on pages 107–108.

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 70 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.04
260 nm: < 0.06
225 nm: < 0.1
Anzergent 3-12 is chemically identical to Zwittergent 3-12.

References:

1. Vulliez-LeNormand, B. and Eisele, J. (1993) *J. Anal. Biochem.* **208**, 241-243.
2. LeMaire, M., Champeil, P., and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.



n-Dodecyl-N,N-Dimethylamine-N-Oxide, Anagrade

[Lauryldimethylamine-N-Oxide / LDAO / DDAO / N,N-Dimethyl-1-Dodecanamine-N-Oxide]

D360 1 gm, 5 gm, 25 gm

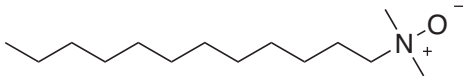
Chemical Properties:
FW: 229.4 [1643-20-5] $C_{14}H_{31}NO$
CMC (H_2O): ~ 1-2 mM[5] (0.023%)
CMC (0.1 M NaCl): ~ 0.14 mM[5]
Aggregation number (H_2O): ~ 76[6]
dn/dc (H_2O): 0.1381 ml/gm[7]
Micelle size: 17 kDa, 21.5 kDa[5,8]

For related products see the complete listing on pages 29–30.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 6-8.5
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 100 µS
Peroxide: < 500 µM
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.06
260 nm: < 0.08

References:

1. Michel, H. (1982) *J. Mol. Biol.* **158**, 567-572.
2. Malkin, R. (1975) *Arch. Biochem. Biophys.* **169**, 77-83.
3. Reithmeier, A. F., *et al.* (1993) *Biochem.* **32**, 1172-1179.
4. Dawkins, D. J., *et al.* (1991) in *Crystallization of Membrane Proteins* (Hartmut Michel, Ed.) 125-137, CRC Press, Boca Raton.
5. Herrmann, K. W. (1962) *J. Phys. Chem.* **66**, 292.
6. Herrmann, K. W. (1966) *J. Colloid Interface Sci.* **22**, 352.
7. Measurement obtained in collaboration with Professor Mark Foster (University of Akron) under an experimental services contract.
8. Strop, P. and Brunger, A. T. (2005) *Protein Sci.* **14**, 2207-2211.



n-Dodecyl-N,N-Dimethylglycine, Anagrade

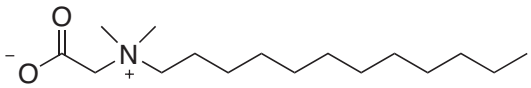
[Lauryl Dimethylglycine]
(Major component of the industrial detergent, Empigen BB)

D350 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 271.4 [683-10-3] $C_{16}H_{33}O_2N$
CMC (H_2O): ~ 1.5 mM[1] (0.041%)

For related products see the complete listing on pages 109–111.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 30%
Conductance (10% solution in water): < 80 µS
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.08
260 nm: < 0.1



Fos-Choline-12, Anagrade

[n-Dodecyl Phosphocholine]

F308	1 gm
	5 gm
	25 gm

Chemical Properties:
FW: 351.5 [29557-51-5] $C_{17}H_{38}NO_4P$
CMC (H_2O): ~ 1.5 mM[1] (0.047%)
Aggregation number (H_2O): ~ 54[6]
dn/dc (H_2O): 0.1398 ml/gm[6]

For related products see the complete listing on pages 81–90.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 0-5°C: ≥ 20%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1

References:

1. Anatrace measurement.
2. Fares, C., Libich, D. S., and Harauz, G. (2006) *FEBS J.* **273**, 601-614.
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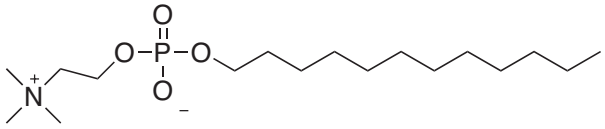


NDSB-256

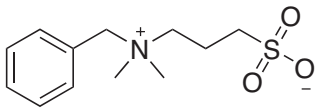
[Dimethylbenzylammoniumpropane-sulfonate]

ND256	5 gm
	25 gm
	100 gm

Chemical Properties:
FW: 257.4 [81239-45-4] $C_{12}H_{19}NO_3S$

For related products see the complete listing on pages 119.

Product Specifications:
Solubility in water at 20°C: ≥ 10%
Identity: IR spectrum conforms to specification
Elemental analysis supplied with each lot (C,H,N)



1-Palmitoyl-2-Oleoyl-sn-Glycero-3-Phosphoethanolamine

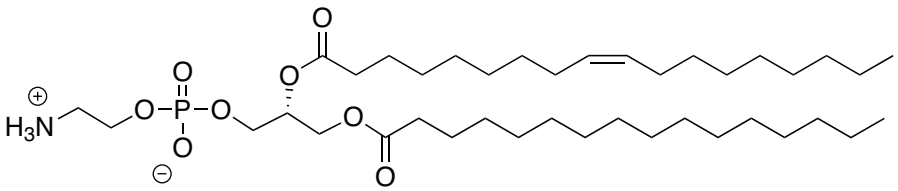
[POPE/1-Hexadecanoyl-2-(9Z-Octadecenoyl)-sn-Glycero-3-Phosphoethanolamine]

P416	250 mg
	1 gm

For related products see the complete listing on pages 92–94.

Chemical Properties:
FW: 717.996 [26662-94-2] $C_{39}H_{76}NO_8P$

Product Specifications:
Appearance: White solid
Solubility: Methanol, Chloroform



SPECIALTY DETERGENTS

Alkyl PEGs

Amphipols

BisMalts

Complex

Deuterated

Fluorinated

Lipidic Cubic Phase (LCP)

Selenated

Spin Label Reagents

TriPod

SPECIALTY DETERGENTS

Working on membrane proteins requires specialty detergents and Anatrace understands the needs of our customers. We are the only company which delivers on purity, consistency, and selection.

Anatrace offers several major advantages. We offer products which are chosen for their uniquely pure molecules—and the exacting chemistry behind them. We present the broadest portfolio available. Since detergent/membrane protein work requires a high degree of trial and error, pure products which have little batch to batch variation, plus a large selection, makes finding the best detergent easier with Anatrace products. We offer new classes of innovative detergents which can help take your work to new elevations and improve your results.

From our line of specialty detergents, Amphipol A8-35 (pgs. 127-129) is a detergent-free solution for stabilizing membrane proteins in aqueous solutions. The molecule is well characterized and capable of stabilizing membrane proteins in their native structure and preserving functionality. The molecule is quickly becoming a favorite for Single Particle Cryo-EM work as well.

Anatrace also offers deuterated, fluorinated and selenated detergents. For applications such as NMR, we used popular detergents and replaced hydrogen atoms with deuterium. Deuterium reduces the signal, making the deuterated-version detergent NMR-silent.

Among the detergents growing in popularity are our alkyl PEG products and GDN. Our alkyl PEG detergent line is made up of lipophilic chains between 8 and 12 carbons long. In any screening library, alkyl PEG products should be used in conjunction with OG, DM, and DDM. GDN, on the other hand, is quietly becoming a substitute for digitonin. The molecule is non-toxic and more cost efficient.

Anatrace takes pride in helping scientists unravel once unsolvable challenges by providing custom synthesis services and expert analytical work to aid your research and development team. Contact our chemists to help you develop specialized solutions tailored to meet your unique specifications.

Hexaethylene Glycol Monodecyl Ether, Analytical Grade

Peroxide-free version–see APO106, pg. 103

[$C_{10}E_6$ / Decyl Hexaethylene Glycol Ether / Decyl Hexaglycol]

H360 4 ml (1 ampule)
10 ml (1 ampule)

Chemical Properties:
FW: 422.6 [5168-89-8] $C_{22}H_{46}O_7$
CMC (H_2O): ~ 0.9 mM[1]
Aggregation number (H_2O): ~ 73[1]
Supplied as a 25% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 3-7
Conductance (10% solution in water): < 100 µS
Peroxide: < 500 µM

Reference:
1. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.

$CH_3(CH_2)_9O(CH_2CH_2O)_6H$

Hexaethylene Glycol Monooctyl Ether, Anagrade

[C_8E_6]

H350 2 ml (1 ampule)
10 ml (1 ampule)
50 ml (5 ampules)

Chemical Properties:
FW: 394.5 [4440-54-4] $C_{20}H_{42}O_7$
CMC (H_2O): ~ 10 mM[1] (0.39%)
Aggregation number (H_2O): ~ 32[1]
Supplied as a 50% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Conductance (10% solution in water): < 50 µS
Peroxide: < 500 µM

Reference:
1. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.

$CH_3(CH_2)_7O(CH_2CH_2O)_6H$

Octaethylene Glycol Monododecyl Ether, Anagrade

Peroxide-free version–see APO128, pg. 104

[$C_{12}E_8$ / Dodecyl Octaethylene Glycol Ether / Dodecyl Octaglycol / 3,6,9,12,15,18,21,24-) Octaoxahexatriacontan-1-Ol]

O330 4 ml (1 ampule)
20 ml (2 ampules)
100 ml (10 ampules)

Chemical Properties:
FW: 538.8 [3055-98-9] $C_{28}H_{58}O_9$
CMC (0.01 M TES, pH 7.5, 0.05 M NaCl, 0.1 mM $CaCl_2$): ~ 0.09 mM[1,2] (0.0048%)
Aggregation number (0.01 M TES, pH 7.5, 0.05 M NaCl, 0.1 mM $CaCl_2$): ~ 90-120[2]
Supplied as a 25% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 3-7
Solubility: > 25% at room temperature
Conductance (10% solution in water): < 100 µS
Peroxide: < 500 µM

References:
1. LeMaire, M., Kwee, S., Andersen, J. P. and Miller, J. V. (1983) *Eur. J. Biochem.* **129**, 525-532.
2. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.

$CH_3(CH_2)_{11}O(CH_2CH_2O)_8H$

Octaethylene Glycol Monododecyl Ether, Analytical Grade

Peroxide-free version–see APO128, pg. 104

[$C_{12}E_8$ / Dodecyl Octaethylene Glycol Ether / Dodecyl Octaglycol / 3,6,9,12,15,18,21,24-Octaoxahexatriacontan-1-Ol]

O330A 4 ml (1 ampule)
20 ml (2 ampules)
100 ml (10 ampules)

Chemical Properties:
FW: 538.8 [3055-98-9] $C_{28}H_{58}O_9$
CMC (0.01 M TES, pH 7.5, 0.05 M NaCl, 0.1 mM $CaCl_2$): ~ 0.09 mM[1,2] (0.0048%)
Aggregation number (0.01 M TES, pH 7.5, 0.05 M NaCl, 0.1 mM $CaCl_2$): ~ 90-120[2]
Supplied as a 25% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 3-7
Solubility: > 25% at room temperature
Conductance (10% solution in water): < 500 µS
Peroxide: < 500 µM

Note:
May contain organic peroxides.

References:
1. LeMaire, M., Kwee, S., Andersen, J. P. and Miller, J. V. (1983) *Eur. J. Biochem.* **129**, 525-532.
2. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.

$CH_3(CH_2)_{11}O(CH_2CH_2O)_8H$

Alkyl PEGs

Pentaethylene Glycol Monodecyl Ether, Anagrade

[$C_{10}E_5$ / Decyl Pentaethylene Glycol Ether / Decylpentaglycol / 3,6,9,12,15-Pentaoxapentacosan-1-Ol]

P340	2 ml (1 ampule)
	10 ml (1 ampule)
	50 ml (5 ampules)

Chemical Properties:
FW: 378.6 [23244-49-7] $C_{20}H_{42}O_6$
CMC (H_2O): ~ 0.81mM[1] (0.031%)
Aggregation number (H_2O): ~ 73[2]
Supplied as a 50% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Conductance (10% solution in water): < 50 µS
Peroxide: < 500 µM

References:

1. Borchardt, J. K. (1996) *Today's Chemist at Work 5,* **10**, 20-24.
2. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.

$CH_3(CH_2)_9O(CH_2CH_2O)_5H$

Pentaethylene Glycol Monooctyl Ether, Anagrade

[C_8E_5 / Octyl Pentaethylene Glycol Ether / Octylpentaglycol / 3,6,9,12,15-Pentaoxatricosan-1-Ol]

P350	2 ml (1 ampule)
	10 ml (1 ampule)
	50 ml (5 ampules)

Chemical Properties:
FW: 350.5 [19327-40-3] $C_{18}H_{38}O_6$
CMC (0.1 M NaCl): ~ 7.1 mM[1] (0.25%)
Supplied as a 50% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Conductance (10% solution in water): < 50 µS
Peroxide: < 500 µM

Reference:

1. Eisele, J. and Vulliez-Le Normand, B. (1993) *Anal. Biochem.* **208**, 241-243.

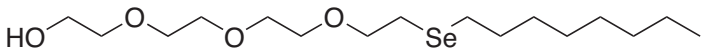
$CH_3(CH_2)_7O(CH_2CH_2O)_5H$

12-Selenotetraethyleneglycol Mono Octyl Ether

T908	500 mg
	1 gm

Chemical Properties:
FW: 369.4 $C_{16}H_{34}O_4Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis
Identity: NMR and MS conform to standard



Tetraethylene Glycol Monooctyl Ether, Anagrade

[C_8E_4 / Octyl Tetraethylene Glycol Ether / Octyltetraglycol / 3,6,9,12-Tetraoxaeicosan-1-Ol]

T350	2 ml (1 ampule)
	10 ml (1 ampule)
	50 ml (5 ampules)

Chemical Properties:
FW: 306.5 [19327-39-0] $C_{16}H_{34}O_5$
CMC (0.1 M NaCl): ~ 8 mM[1] (0.25%)
Aggregation number (H_2O): ~ 82[1]
Supplied as a 50% (w/w) solution under argon.

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (5% solution in water): 5-8
Conductance (10% solution in water): < 50 µS
Peroxide: < 500 µM

References:

1. LeMaire, M., Champeil, P. and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.
2. Cortes, D. M. and Perozo, E. (1997) *Biochem.* **36**, 10343-10352.

$CH_3(CH_2)_7O(CH_2CH_2O)_4H$

Amphipol A8-35: Amphipathic Polymer for Membrane Protein Studies

Amphipols are a new class of polymers that serve as stabilizers of membrane proteins in aqueous solutions. In general, amphipols are used to replace detergents after the solubilization step. Membrane proteins trapped in amphipols are soluble in detergent-free, aqueous solutions and biochemically stabilized[1-4].

Amphipol A8-35 is the most thoroughly characterized amphipol and is becoming widely used for membrane protein research. It consists of a strong hydrophilic polyacrylate chain onto which octylamine and isopropylamine have been randomly grafted[1, 5, 6] (Figure 1A). Amphipol A8-35 is highly water-soluble (> 200 gm/lt depending on pH, ionic strength of the solutions, and the concentration of divalent cations)[5-7]. The high solubility is due to the anionic charges (~12 per molecule) carried by the carboxylate groups. The average molecular mass of individual A8-35 molecules is ~4.3 kDa[8]. In aqueous solutions (pH > 7.0), Amphipol A8-35 self-assembles into globular particles, each comprising ~ 9 average A8-35 molecules, with an average mass of ~ 40 kDa and a Stokes radius of ~ 3.15 nm[6] (Figure 1B). The critical aggregation concentration is so low (~ 0.002 g/L)[9] as to be negligible under most circumstances[3, 4].

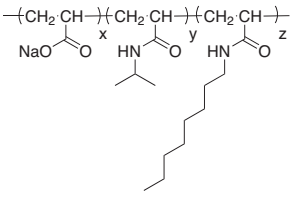
Due to its amphipathic character, Amphipol A8-35 is able to "trap" solubilized membrane proteins by adsorbing onto their hydrophobic transmembrane surface, stabilizing their native structure and preserving their functionality[2-4].

Table 1. Applications of Amphipol A8-35 to membrane protein studies.
For a more complete bibliography, see ref. 11 and http://tinyurl.com/amphipolbibliography.

Application	Benefits	Example of studies
Stabilization	Reducing inactivation by the detergent and preserving membrane protein native structure, most likely due to limitation of hydrophobic sink, preservation of MP/lipid interactions, and damping of transmembrane domain conformational excursions	Bacteriorhodopsin[12] Ca^{2+}-ATPase[7, 14] GPCRs[15] cytochrome **bc_1** complex[18] MOMP[19]
Functional studies and ligand binding	Avoiding functional perturbations by detergents such as most MPs are functional in APols, but the enzymatic cycle of the calcium ATPase is slowed down, possibly due to damping of large-scale transmembrane conformational changes. Ligand binding is generally unperturbed.	Bacteriorhodopsin[12] nicotinic acetylcholine receptor[16] GPCRs[15] Ca^{2+}-ATPase[7, 14]
Folding/Refolding	Amphipol A8-35 is a mild surfactant which provides a favorable environment for proteins to fold or refold from denatured state.	OmpA[20, 21], FomA[20], OmpT[22] and PagP[22] Bacteriorhodopsin[20, 23] GPCRs[12]
NMR	Stabilizing the native structure of membrane proteins by amphipols facilitates working for extended periods at relatively high temperature. Note, however, that membrane protein/Amphipol A8-35 complexes cannot be handled at acidic pH. Addition of EDTA improves the spectra.	OmpX[24, 25] transmembrane β-barrel of OmpA[26] BR[27, 28] GPCRs[29] MOMP[30]
Electron microscopy (Cryo-EM)	Stabilizing native structure and/or conformational changes of membrane proteins and supercomplexes that are easily disrupted by detergent. Mitochondrial Complex I/Amphipol A8-35 particles were observed to spread better than Complex I/detergent ones in cryo-EM single-particle experiments.	mitochondrial respirasome[31] TRPA1[32], TRPV1[33, 34] mitochondrial Complex I[35] Bacteriorhodopsin[12] OmpF[36]
Immobilization of membrane proteins onto solid supports	Appropriate functionalization of Amphipol A8-35 turns it into a sort of double-faced tape that can be used to anchor amphipol-trapped membrane proteins onto solid surfaces such as chips or beads for ligand binding studies.	nicotinic acetylcholine receptor, Bacteriorhodopsin, cytochrome **b_6f** complex, cytochrome **bc_1** complex, detection of antibodies or toxin binding by SPR or fluorescence measurements[17, 37, 38]
Light spectroscopy	UV and visible absorption, fluorescence, CD and SR-CD spectroscopies can all be used. All current APols interfere with IR absorption spectroscopy in the amide band region, but resonance Raman spectroscopy is accessible.	Bacteriorhodopsin[4, 12]
Mass spectrometry	MALDI-TOF, ESI-MS and ESI-IMS-MS have all been validated. Subunits and lipids can be detected, and the folded and unfolded states of the proteins distinguished. A8-35 facilitates whole-proteome trypsinolysis and identification of tryptic peptides.	OmpT and PagP[22] Bacteriorhodopsin, cytochrome **b_6f** complex, cytochrome **bc_1** complex, tOmpA[39]
Delivery of membrane proteins to pre-existing membranes	Amphipol A8-35 can be used to transfer membrane proteins to lipidic mesophases where they crystallize. Also, amphipols do no lyse target membranes (lipid vesicles or black films, cell plasma membrane) and can, therefore, be used to deliver to them hydrophobic cargoes. Note that amphipols will remain associated to the target membrane.	Bacteriorhodopsin[40] OmpA[20] DAGK[41]
Vaccination	Stabilizing membrane proteins used as immunogenes. Co-delivering them along with amphipol-bound or co-trapped adjuvants. The A8-35-trapped major outer membrane protein (MOMP) from *Chlamydia trachomatis* offers a much better protection to vaccinated mice than its detergent-solubilized counterpart.	MOMP[19, 42]

(Continued on next page)

Amphipol A8-35: Amphipathic Polymer for Membrane Protein Studies (continued)



X = 0.35, Y = 0.25, Z = 0.40

Figure 1A

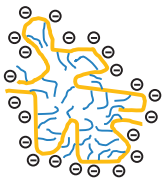


Figure 1B

Applications

Although its detergency is too weak to effectively extract and solubilize most membrane proteins (for some exceptions, see ref. 2), Amphipol A8-35 has been very successfully used to replace the detergent after the solubilization step and handle the extracted proteins in their native state in detergent-free solutions. For a detailed protocol of a trapping procedure, see ref. 10 (Figure 2). To date, amphipols have been used to trap more than three dozen different types of membrane proteins reviewed in ref. 11, ranging in molecular weight from 5 kDa to > 1MDa. Small proteins, like bacteriorhodopsin, may bind ~ 50 kDa of amphipols[12], the mass of amphipol bound increasing slowly with the size of the transmembrane region[11]. The protein/amphipol complexes thus formed are slightly larger than those formed with classical detergents[12, 13]. Although there can be exceptions[7, 14] in most cases, trapping by Amphipol A8-35 affects neither the binding of ligands or substrates nor the functionality of membrane proteins[12, 15-17]. A list of applications is given in Table 1 (shown on previous page).

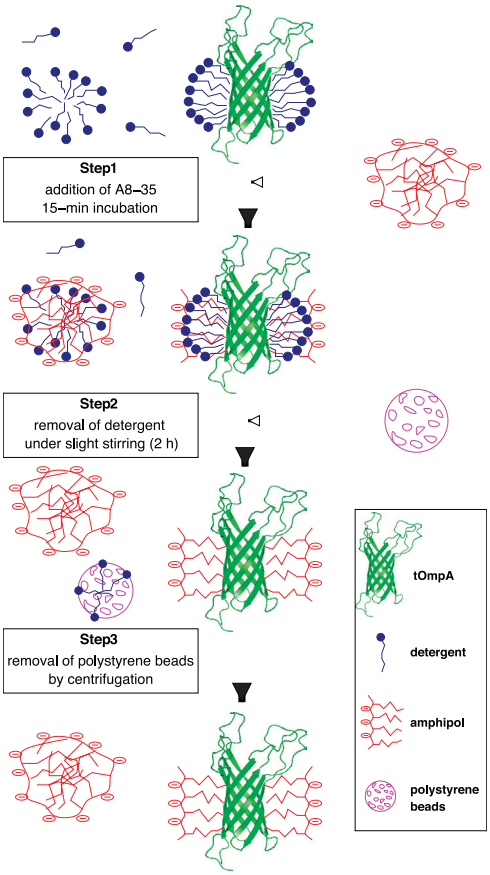


Figure 2. An example of trapping procedure. Figure reproduced from "NMR study of a membrane protein in detergent-free aqueous solution." (2005) *Proc. Natl. Acad. Sci. USA*, **102**, 8893-8898, Zoonens, M., Catoire, L. J., Giusti, F. and Popot, J.-L. Copyright (2005) National Academy of Sciences, U.S.A.

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Amphipol A8-35

Amphipathic surfactant for maintaining solubilized membrane proteins in detergent-free solutions

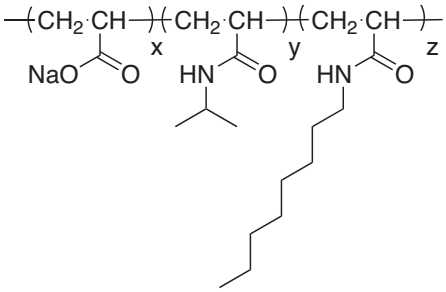
A835	50 mg
	100 mg
	500 mg

Chemical Properties:
FW: ~ 8 kDa $(C_{6.2}H_{10.3}O_{1.35}N_{0.65}N_{0.35})_{\sim 35}$

Product Specifications:
Appearance: White solid
Solubility: Up to 20% in water

Amphipols are a non-detergent alternative for stabilizing membrane proteins in aqueous solutions. Extracted membrane proteins can be exchanged into these amphipathic polymers, keeping them soluble in detergent-free, aqueous solution while stabilizing them biochemically.

Applications:
- Cryo-EM
- Stabilization of native membrane protein structure
- *In vitro* functional studies
- Facilitating membrane protein folding/refolding
- NMR
- Electron microscopy
- Immobilization of membrane proteins onto solid surface



X = 0.35, Y = 0.25, Z = 0.40

PMAL®-C8

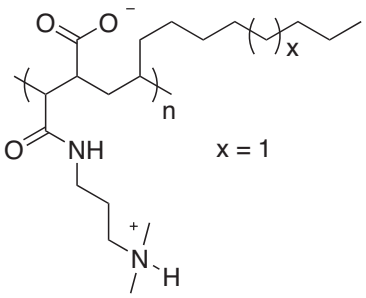
[Poly (Maleic Anhydride-alt-1-Decene) substituted with 3-(Dimethylamino) Propylamine]

P5008	1 gm
	5 gm

Chemical Properties:
FW: ~ 18,500.0
[869856-84-8] $(C_{19}H_{36}O_3N_2)_n$

Product Specifications:
Solubility in water at 20°C: ≥ 10%
Absorbance of a 0.1% solution in water:
340 nm: < 0.1
280 nm: < 0.3
260 nm: < 0.5
Identity: IR spectrum conforms to specification
No maleic anhydride present by thermographic analysis

References:
1. Nagy, J. K., Hoffmann, A. K., Keyes, M. H., Gray, D. N., Oxenoid, K. and Sanders, C. R. (2001) *FEBS Letters* **501**, 115-120.
2. Gorzelle, B. M., Hoffmann, A. K., Keyes, M. H., Gray, D. N., Ray, D. G., and Sanders, C. R. (2002) *J. Am. Chem. Soc.* **124**, 11594-11595.



PMAL-C12

[Poly (Maleic Anhydride-alt-1-Tetradecene) substituted with 3-(Dimethylamino) Propylamine]

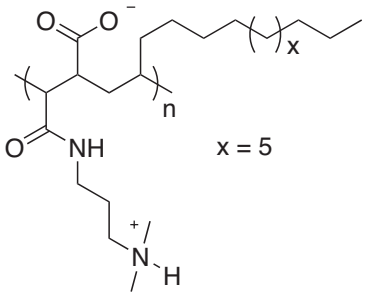
P5012 1 gm
5 gm

Chemical Properties:
FW: ~ 12,000.0
[869857-14-7] $(C_{23}H_{44}O_3N_2)_n$

Product Specifications:
Solubility in water at 20°C: ≥ 5%
Absorbance of a 0.1% solution in water:
340 nm: < 0.1
280 nm: < 0.3
260 nm: < 0.5
Identity: IR spectrum conforms to specification
No maleic anhydride present by thermographic analysis

References:

1. Nagy, J. K., Hoffmann, A. K., Keyes, M. H., Gray, D. N., Oxenoid, K. and Sanders, C. R. (2001) *FEBS Letters* **501**, 115-120.
2. Gorzelle, B. M., Hoffmann, A. K., Keyes, M. H., Gray, D. N., Ray, D. G., and Sanders, C. R. (2002) *J. Am. Chem. Soc.* **124**, 11594-11595.



PMAL-C16

[Poly (Maleic Anhydride-alt-1-Octadecene) substituted with 3-(Dimethylamino) Propylamine]

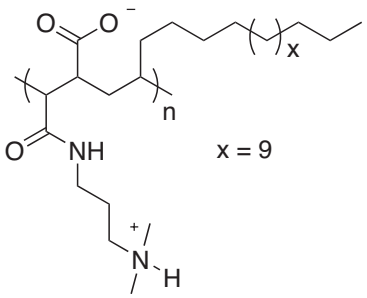
P5016 1 gm
5 gm

Chemical Properties:
FW: ~ 39,000–65,000
[869857-16-9] $(C_{27}H_{52}O_3N_2)_n$

Product Specifications:
Solubility in water at 20°C: ≥ 1%
Absorbance of a 0.1% solution in water:
340 nm: < 0.1
280 nm: < 0.3
260 nm: < 0.5
Identity: IR spectrum conforms to specification
No maleic anhydride present by thermographic analysis

References:

1. Nagy, J. K., Hoffmann, A. K., Keyes, M. H., Gray, D. N., Oxenoid, K. and Sanders, C. R. (2001) *FEBS Letters* **501**, 115-120.
2. Gorzelle, B. M., Hoffmann, A. K., Keyes, M. H., Gray, D. N., Ray, D. G., and Sanders, C. R. (2002) *J. Am. Chem. Soc.* **124**, 11594-11595.



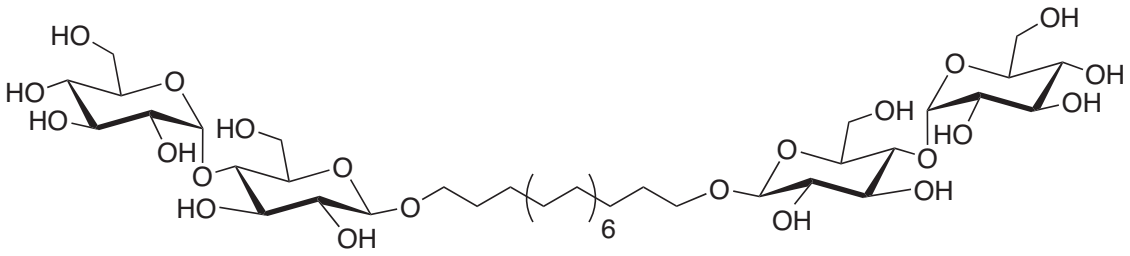
BisMalt-18

[1,18-bis-(β-D-Maltopyranosyl) Octadecane]
Bolalipid like detergent with 18-carbon atom acyl chain

B518 100 mg
250 mg

Chemical Properties:
FW: 949.1 $C_{43}H_{80}O_{22}$

Product Specifications:
Purity: ≥ 95% by HPLC analysis
Appearance: White solid
Solubility: Water, Methanol
Identity: NMR and MS conform to standard



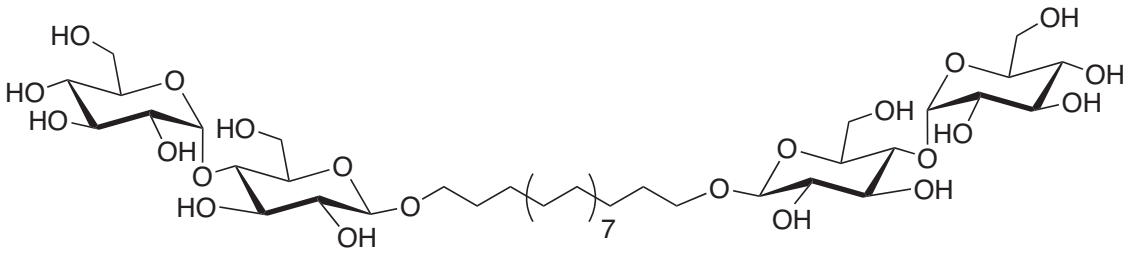
BisMalt-20

[1,20-bis-(β-D-Maltopyranosyl) Docosane]
Bolalipid like detergent with 20-carbon atom acyl chain

B520 100 mg
250 mg

Chemical Properties:
FW: 977.1 $C_{45}H_{84}O_{22}$

Product Specifications:
Purity: ≥ 95% by HPLC analysis
Appearance: White solid
Solubility: Water, Methanol
Identity: NMR and MS conform to standard



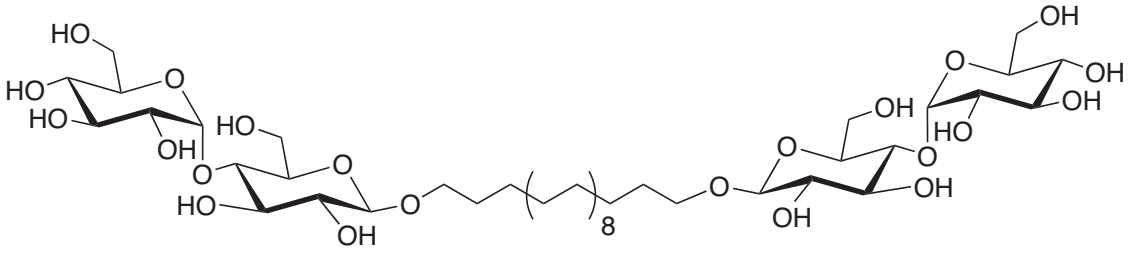
BisMalt-22

[1,22-bis-(β-D-Maltopyranosyl) Docosane]
Bolalipid like detergent with 22-carbon atom acyl chain

B522 100 mg
250 mg

Chemical Properties:
FW: 1005.2 $C_{47}H_{88}O_{22}$

Product Specifications:
Purity: ≥ 95% by HPLC analysis
Appearance: White solid
Solubility: Water, Methanol
Identity: NMR and MS conform to standard



BisMalts

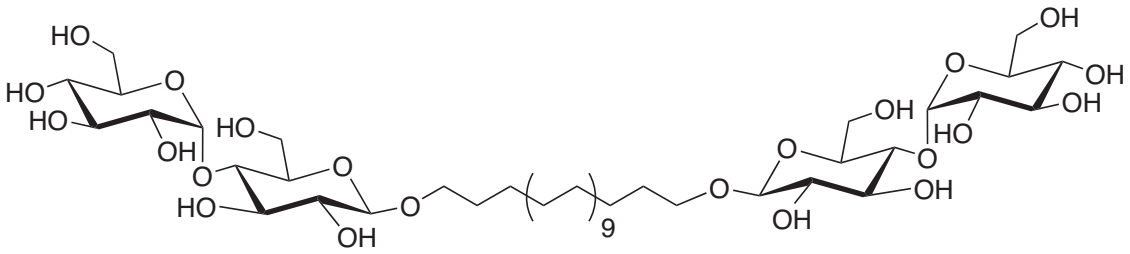
BisMalt-24

[1,24-bis-(β-D-Maltopyranosyl) Tetracosane]
Bolalipid like detergent with 24-carbon atom acyl chain

B524 100 mg
250 mg

Chemical Properties:
FW: 1033.2 $C_{49}H_{92}O_{22}$

Product Specifications:
Purity: ≥ 95% by HPLC analysis
Appearance: White solid
Solubility: Water, Methanol
Identity: NMR and MS conform to standard



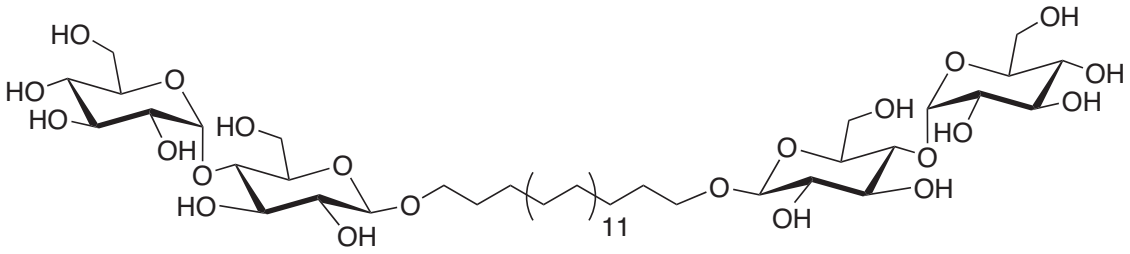
BisMalt-28

[1,28-bis-(β-D-Maltopyranosyl) Octacosane]
Bolalipid like detergent with 28-carbon atom acyl chain

B528 100 mg
250 mg

Chemical Properties:
FW: 1089.4 $C_{53}H_{100}O_{22}$

Product Specifications:
Purity: ≥ 95% by HPLC analysis
Appearance: White solid
Solubility: Water, Methanol
Identity: NMR and MS conform to standard



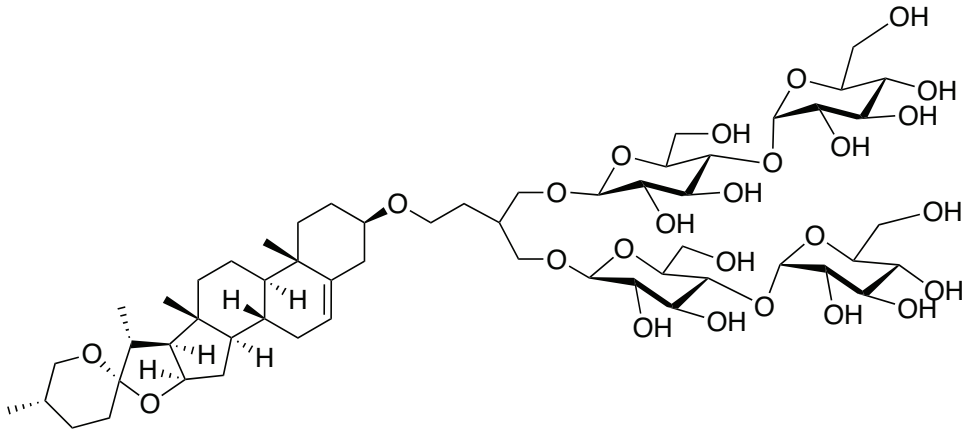
GDN

GDN101	500 mg 1 gm 5 gm

Chemical Properties:
FW: 1165.31 $C_{56}H_{92}O_{25}$

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 100 µS

Absorbance of a 1% solution in water
340 nm: < 0.1
280 nm: < 0.12
260 nm: < 0.15



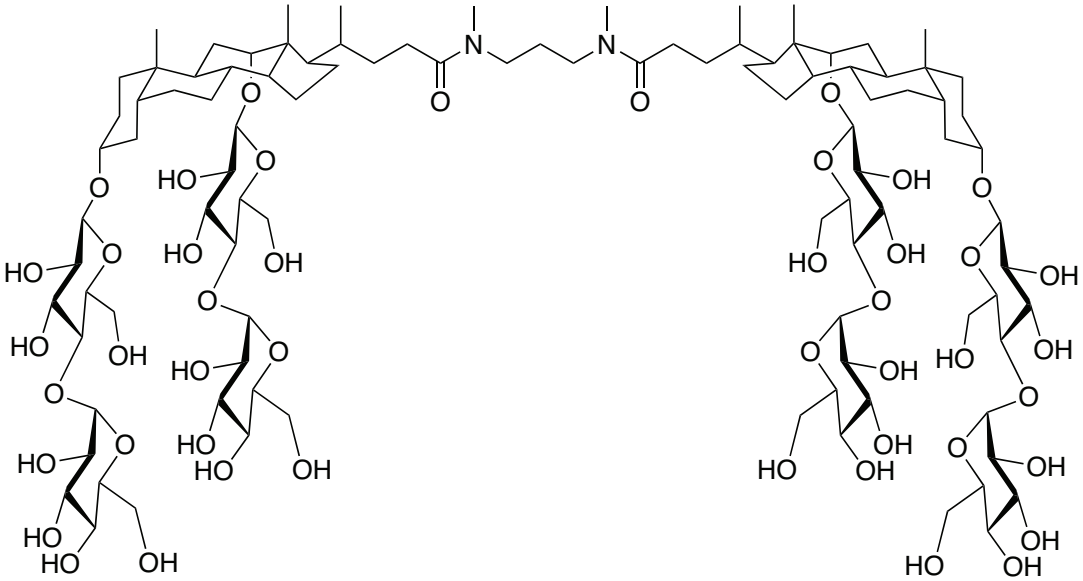
TFA

TFA101	500 mg 1 gm 5 gm

Chemical Properties:
FW: 2148.42 $C_{101}H_{170}N_2O_{46}$

Product Specifications:
Purity: ≥ 98% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 5%
Conductance (10% solution in water): < 100 µS

Absorbance of a 1% solution in water
340 nm: < 0.1
280 nm: < 0.12
260 nm: < 0.15



Deuterated Detergents

NMR studies of membrane and other hydrophobic / lipophilic proteins often require the use of a lipid or lipid-like detergent to maintain solubility and stability[1-3]. However, this can create NMR signal interference from the increased concentration of hydrogen atoms added by the densely packed detergent. By replacing the hydrogen atoms in the detergent with a per deuterated equivalent, you can silence the interference and make it easier to resolve the protein structure.

PER DEUTERATED TAIL	
F308PDT	Fos-Choline-12, Per Deuterated Tail

PER DEUTERATED HEAD	
F304PDH	Fos-Choline-10, Per Deuterated Head
F306PDH	Fos-Choline-11, Per Deuterated Head
F308PDH	Fos-Choline-12, Per Deuterated Head
F312PDH	Fos-Choline-14, Per Deuterated Head

SEMI DEUTERATED HEAD	
F304SDH	Fos-Choline-10, Semi Deuterated Head
F306SDH	Fos-Choline-11, Semi Deuterated Head
F308SDH	Fos-Choline-12, Semi Deuterated Head
F312SDH	Fos-Choline-14, Semi Deuterated Head

DEUTERATED	
F308D	Fos-Choline-12, Deuterated
F312D	Fos-Choline-14, Deuterated
O311T	n-Octyl-d17-β-D-Glucopyranoside
O311D	n-Octyl-d17-β-D-Glucopyranoside-d7
D310T	n-Dodecyl-d25-β-D-Maltopyranoside

References:

1. Jun Kim, H., Howell, S. C., Van Horn, W. D., Ho Jeon, Y., and Sanders, C. R. (2009) *Prog. Nucl. Magn. Reson. Spectrosc.* **55**, 335-360.
2. Sanders, C. R. and So, F. (2006) *Magn Reson Chem* **44**, S24-40.
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n-Dodecyl-d25–β–D-Maltopyranoside

[n-Dodecyl-d25–β–D-Maltoside, Lauryl Maltoside, Tail Deuterated / Lauryl Maltoside / DDM / LM]

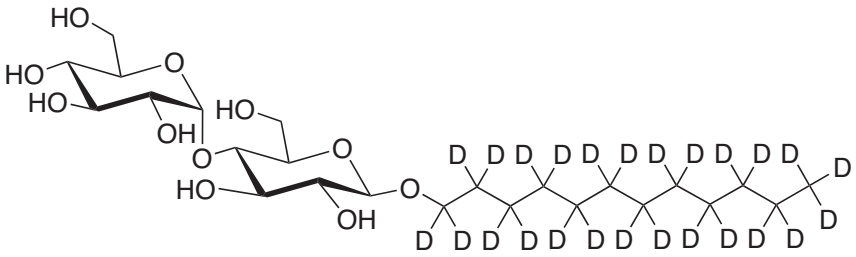
D310T 100 mg, 250 mg, 500 mg

Chemical Properties:
FW: 535.8 [849110-74-3] $C_{24}D_{25}H_{21}O_{11}$
CMC (H_2O): ~ 0.2 mM(1)

Product Specifications:
Purity (β + α): ≥ 97% by HPLC analysis
Percent anomer: < 15 α (HPLC)
Percent dodecanol: < 0.05 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 200 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.25
260 nm: < 0.25
225 nm: < 0.8

Reference:
1. CMC value for the undeuterated compound.



Fos-Choline-10, Per Deuterated Head

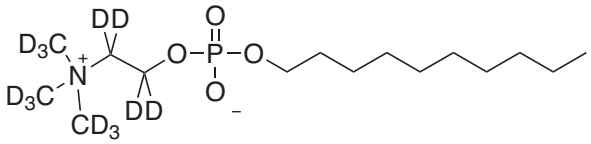
[n-Decyl Phosphocholine-d13]

F304PDH 100 mg, 500 mg, 1 gm

Chemical Properties:
FW: 336.5 $C_{15}H_{21}D_{13}NO_4P$

Product Specifications:
Appearance: White solid
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Fos-Choline-10, Semi Deuterated Head

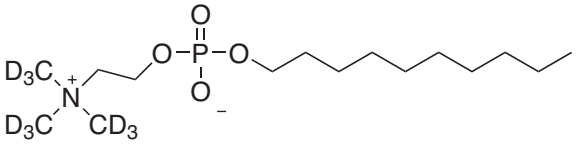
[n-Decyl Phosphocholine-d9]

F304SDH 100 mg, 500 mg, 1 gm

Chemical Properties:
FW: 332.5 $C_{15}H_{25}D_9NO_4P$

Product Specifications:
Appearance: White solid
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Fos-Choline-11, Per Deuterated Head

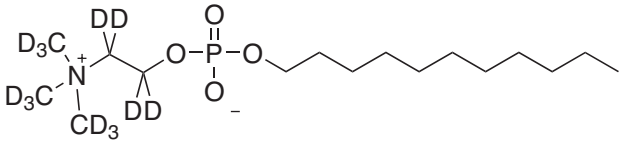
[n-Undecyl Phosphocholine-d13]

F306PDH 100 mg, 500 mg, 1 gm

Chemical Properties:
FW: 350.5 $C_{16}H_{23}D_{13}NO_4P$

Product Specifications:
Appearance: White solid
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Deuterated

Fos-Choline-11, Semi Deuterated Head

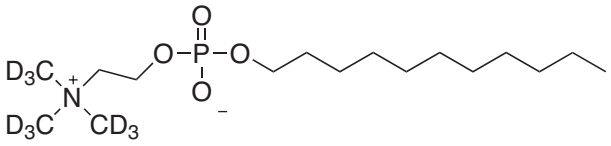
[n-Undecyl Phosphocholine-d9]

F306SDH	100 mg
	500 mg
	1 gm

Chemical Properties:
FW: 346.5 $C_{16}H_{27}D_9NO_4P$

Product Specifications:
Appearance: White solid
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Fos-Choline-12, Deuterated

[n-Dodecyl Phosphocholine-d38]

F308D	100 mg
	500 mg
	1 gm

Chemical Properties:
FW: 389.8 [130890-78-7] $C_{17}D_{38}NO_4P$
CMC (H_2O): ~ 1.5 mM[1] (0.047%)
Aggregation number (H_2O): ~ 54[2]
dn/dc (H_2O): 0.1398 ml/gm[8]

Product Specifications:
Purity: ≥ 90% by HPLC analysis
pH (1% solution in water): 4-9

References:

1. Anatrace measurement—CMC value for the undeuterated compound.
2. Aggregation number for the undeuterated compound.
3. Fares, C., Libich, D. S., and Harauz, G. (2006) *FEBS J.* **273**, 601-614.
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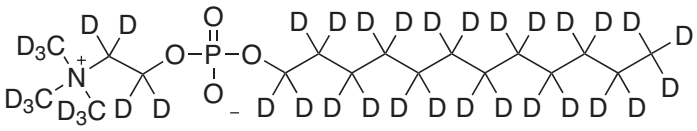
7. LeMaire, M., Champeil, P., and Moller, J. V. (2000) *Biochimica et Biophysica Acta* **1508**, 86-111.
8. dn/dc for the undeuterated compound.



Fos-Choline-12, Per Deuterated Head

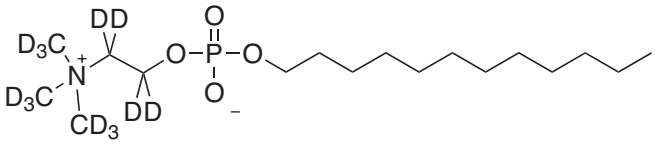
[n-Dodecyl Phosphocholine-d13]

F308PDH	100 mg
	500 mg
	1 gm

Chemical Properties:
FW: 364.5 $C_{17}H_{25}D_{23}NO_4P$

Product Specifications:
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



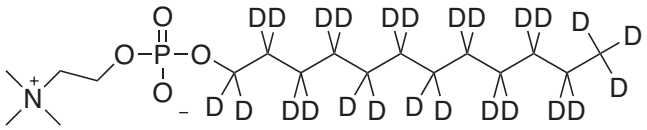
Fos-Choline-12, Per Deuterated Tail

[n-Dodecyl Phosphocholine-d25]
F308PDT 100 mg, 500 mg, 1 gm

Chemical Properties:
FW: 376.6 $C_{17}H_{13}D_{25}NO_4P$

Product Specifications:
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



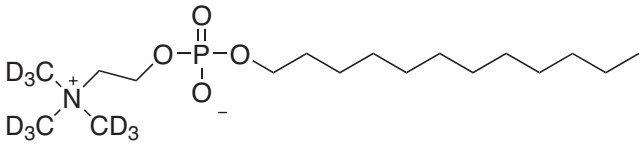
Fos-Choline-12, Semi Deuterated Head

[n-Dodecyl Phosphocholine-d9]
F308SDH 100 mg, 500 mg, 1 gm

Chemical Properties:
FW: 360.5 $C_{17}H_{29}D_9NO_4P$

Product Specifications:
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Fos-Choline-14, Deuterated

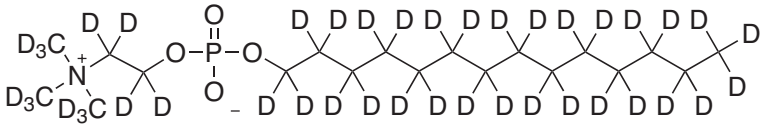
[n-Tetradecyl Phosphocholine-d42]
F312D 100 mg, 500 mg, 1 gm

Chemical Properties:
FW: 421.5 [869638-98-2] $C_{19}D_{42}NO_4P$
CMC (H_2O): ~ 0.12 mM[1] (0.0051%)
Aggregation number (H_2O): ~ 108[2]
dn/dc (H_2O): 0.1416 ml/gm[3]

Product Specifications:
Purity: ≥ 90% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 1%

References:

1. Anatrace measurement—CMC value for the undeuterated compound.
2. Aggregation number for the undeuterated compound.
3. dn/dc for the undeuterated compound.
4. Strop, P. and Brunger, A. T. (2005) *Protein Sci.* **14**, 2207-2211.
5. Zeisig, R., Ress, A., Fichtner, I. and Walther, W. (2003) *Cancer Gene Ther.* **10**, 302-311.



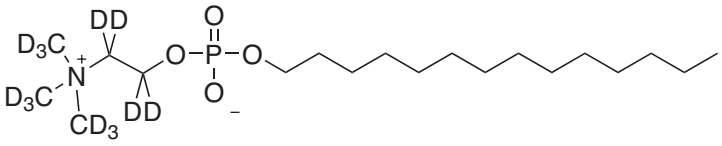
Fos-Choline-14, Per Deuterated Head

[n-Tetradecyl Phosphocholine-d13]
F312PDH 100 mg, 500 mg, 1 gm

Chemical Properties:
FW: 392.6 $C_{19}H_{29}D_{13}NO_4P$

Product Specifications:
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



Deuterated

Fos-Choline-14, Semi Deuterated Head

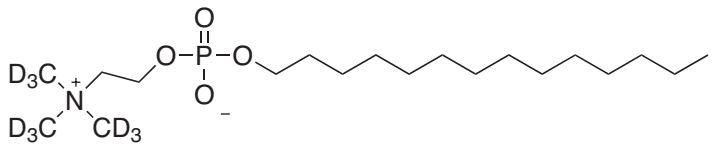
[n-Tetradecyl Phosphocholine-d9]

F312SDH 100 mg, 500 mg, 1 gm

Chemical Properties:
FW: 388.6 $C_{19}H_{33}D_9NO_4P$

Product Specifications:
Solubility: Water
Purity: ≥ 95% by HPLC analysis
Conductance (1% solution in water): < 500 µS
pH (1% solution in water): 4-9

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2



n-Octyl-d17-β-D-Glucopyranoside

[n-Octyl-d17-β-D-Glucoside, Tail Deuterated / Tail Deuterated OG/ Octyl Glucoside]

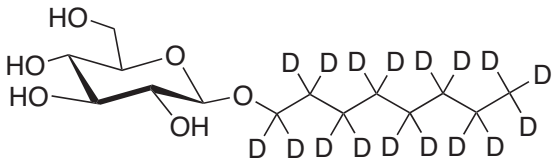
O311T 100 mg, 250 mg, 500 mg

Chemical Properties:
FW: 309.5 [129522-81-2] $C_{14}D_{17}H_{11}O_6$
CMC (H_2O): ~ 18-20 mM(1) (0.53%)

Product Specifications:
Purity (β + α): ≥ 97% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent octanol: < 0.05 (HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 40 µS

Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.15
260 nm: < 0.15
225 nm: < 0.5

Reference:
1. CMC value for the undeuterated compound.



n-Octyl-d17–β–D-Glucopyranoside-d7

[n-Octyl-d17–β–D-Glucoside-d7 / Deuterated OG / Octyl Glucoside]

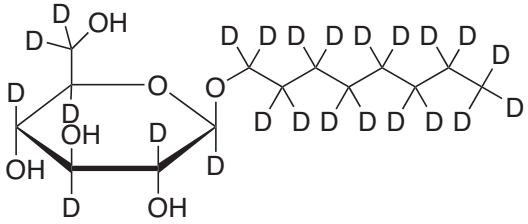
O311D 100 mg, 250 mg, 500 mg

Chemical Properties:
FW: 316.5 [869666-57-9] $C_{14}D_{24}H_4O_6$
CMC (H_2O): ~ 18-20 mM(1)

Product Specifications:
Purity (β + α): ≥ 97% by HPLC analysis
Percent anomer: < 2 α (HPLC)
Percent octanol: < 0.05 (HPLC)
Conductance (1% solution in water): < 40 µS
Percent fluorescence due to a 0.1% solution in water at 345 nm: < 10

Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.15
260 nm: < 0.15
225 nm: < 0.5

Reference:
1. CMC value for the undeuterated compound.



Fos-Choline-8, Fluorinated, Anagrade

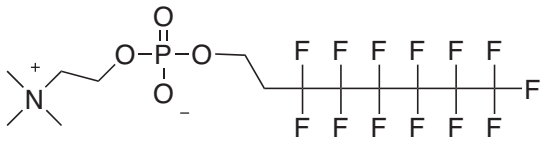
[(1H, 1H, 2H, 2H-Perfluorooctyl)phospho-choline]

F300F 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 529.2 $C_{13}H_{17}F_{13}NO_4P$
CMC (H_2O): 2.2 mM[1]

Product Specifications:
Purity: ≥ 99% by HPLC analysis
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 200 µS
Absorbance of a 1% solution in water:
340 nm: < 0.02
280 nm: < 0.08
260 nm: < 0.1

Reference:
1. Krafft, M-P., Giulieri, F., and Riess, J. G. (1993) *Angew Chem. Intl.* **32**, 741-743.



Octyl Maltoside, Fluorinated, Anagrade

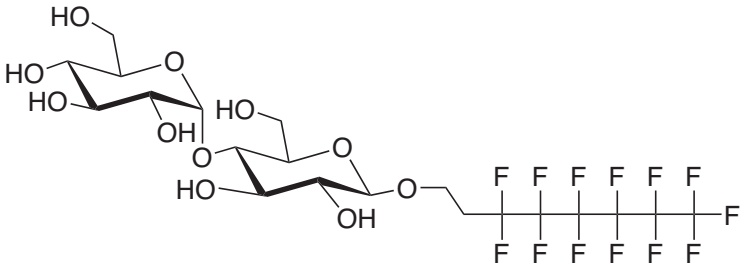
[1H, 1H, 2H, 2H-Perfluorooctyl)-β-D-Maltopyranoside / FOM]

O310F 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 688.4 $C_{20}H_{25}F_{13}O_{11}$
CMC (H_2O): 1.02 mM[1]

Product Specifications:
Purity (β + α): ≥ 99% by HPLC analysis
Percent anomer: < 2 (α HPLC)
pH (1% solution in water): 5-8
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 100 µS
Absorbance of a 1% solution in water:
340 nm: < 0.05
280 nm: < 0.1
260 nm: < 0.1

Reference:
1. Greiner, J., Manfredi, A. and Riess, J. G. (1989) *New J. Chem.* **13**, 247-254.



Lipidic Cubic Phase (LCP)

Lipidic Cubic Phase (LCP) Products

Crystallization is usually the bottleneck in membrane protein work. Temperature, salt and detergent concentrations all affect the crystallization process. Determining the conditions necessary to crystallize one protein provides very little insight into the conditions needed to crystallize another. The process is truly more of an art than a science.

Lipidic Cubic Phase (LCP) promises to remove the crystallization bottleneck. The Anatrace LCP product range includes both monoolein and monopalmitolein products. Both molecules have the ability in aqueous solution to self-assemble into a lattice structure. Conceptually, the lattice is comprised of a quasi lipid phase and channels. While the quasi lipid component suspends proteins and is chemically similar to a lipid bi-layer, the channels allow water-soluble material to pass through the lattice.

The multi-layered lattice structure itself acts as a trap and constrains any membrane protein which slips or diffuses into it. Inside of the lattice, proteins can diffuse laterally through the structure and this process helps separate out water-soluble impurities which affect crystallization. Once proteins are suspended in the lattice, the aqueous solution is allowed to evaporate, and the trapped proteins eventually reach the needed supersaturated state. At this point, the lattice structure contributes one last important service. The LCP limits protein movement and creates the order needed for crystal growth to begin.

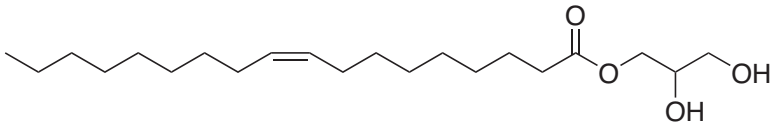
MonoOlein

LCP18	100 mg 500 mg 1 gm

Chemical Properties:
FW: 356.54 [111-03-5] $C_{21}H_{40}O_4$

Product Specifications:
Appearance: Clear liquid to waxy solid at room temperature
Solubility: Organic solvents

Storage:
Store at -20°C.



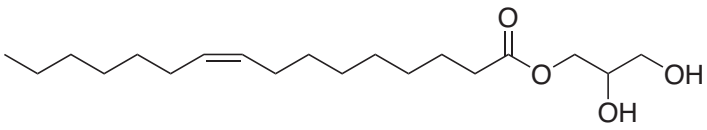
MonoPalmitolein

LCP16	100 mg 500 mg 1 gm

Chemical Properties:
FW: 328.49 [37515-61-0] $C_{19}H_{36}O_4$

Product Specifications:
Appearance: Clear liquid to waxy solid at room temperature
Solubility: Organic solvents

Storage:
Store at -20°C.



Selenated Detergents

A selenium atom is very dense and in X-ray diffraction studies these dense atoms are used as points of reference to overcome crystal phasing problems. Historically, selenium has been incorporated into protein crystals either by leaching selenium into previously formed crystals or by using proteins selenated via expression in selenomethionine media.

Replacing your current detergent that previously produced poor X-ray diffraction results with an Anatrace selenium-based equivalent will create reference points and help to resolve your protein. In addition, recent membrane protein studies have suggested that detergents can bind at putative lipid binding sites on membrane proteins. Why not try co-crystallizing with the lipidic 12-Selenotetraethyleneglycol Mono Octyl Ether to assist phasing?

PER DEUTERATED HEAD	
D910	Decyl-β-D-Selenomaltoside
D912	Dodecyl-β-D-Selenomaltoside
H907	Heptyl-β-D-Selenoglucoside
O908	Octyl-β-D-Selenoglucoside

PER DEUTERATED HEAD	
O918	Octyl-β-D-Selenomaltoside
S2000	L-(+)-Selenomethionine, Anagrade
T908	12-Selenotetraethyleneglycol Mono Octyl Ether
U911	Undecyl-β-D-Selenomaltoside

Selenated

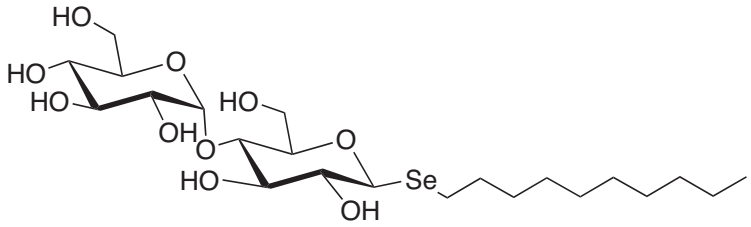
Decyl-β-D-Selenomaltoside

[Decyl Selenomaltoside]
D910 500 mg, 1 gm

Chemical Properties:
FW: 545.5 $C_{22}H_{42}O_{10}Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis

pH (1% solution in water): 5-9
Solubility in water at 20°C: ≥ 1%
Conductance (1% solution in water): < 100 µS



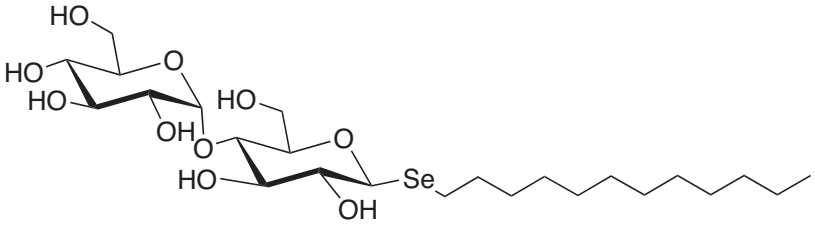
Dodecyl-β-D-Selenomaltoside

[Selenium Maltoside]
D912 500 mg, 1 gm

Chemical Properties:
FW: 573.6 $C_{24}H_{46}O_{10}Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis

pH (1% solution in water): 5-9
Solubility in water at 20°C: ≥ 1%
Conductance (1% solution in water): < 100 µS



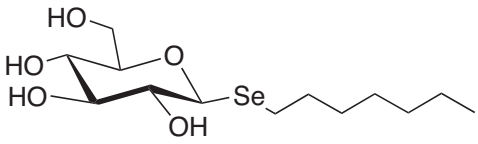
Heptyl–β–D-Selenoglucoside

H907 500 mg, 1 gm

Chemical Properties:
FW: 341.3 $C_{13}H_{26}O_5Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis

pH (1% solution in water): 5-9
Solubility in water at 20°C: ≥ 1%
Conductance (1% solution in water): < 100 µS



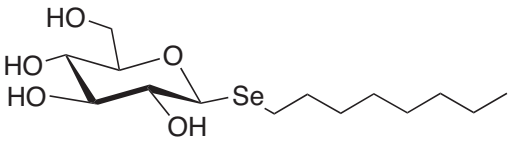
Octyl-β-D-Selenoglucoside

[Selenium Glucoside]
O908 500 mg, 1 gm

Chemical Properties:
FW: 355.3 $C_{14}H_{28}O_5Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis

pH (0.1% solution in water): 5-9
Solubility in water at 20°C: ≥ 0.1%
Conductance (0.1% solution in water): < 100 µS



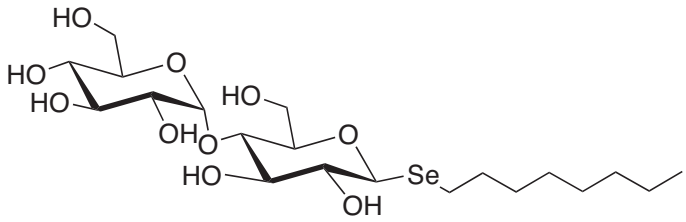
Octyl-β-D-Selenomaltoside

[Selenium Maltoside]

O918	500 mg
	1 gm

Chemical Properties:
FW: 517.5 $C_{20}H_{38}O_{10}Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 20°C: ≥ 1%
Conductance (1% solution in water): < 100 µS



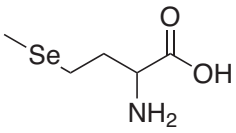
L-(+)-Selenomethionine, Anagrade

[(S)-2-Amino-4-(Methylseleno)butyric Acid]

S2000	250 mg
	1 gm
	5 gm

Chemical Properties:
FW: 196.1 [3211-76-5] $C_5H_{11}NO_2Se$

Product Specifications:
Purity: ≥ 98% by HPLC analysis
Percent anomer: Specific rotation: $[\alpha]_D^{20}$ (C=0.5 in 2 N HCl) +18.5° ± 1.5°
Melting point: 258-262°C
Solubility: Soluble in water, slightly soluble in methanol
Identity: IR spectrum conforms to specification

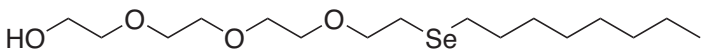


12-Selenotetraethyleneglycol Mono Octyl Ether

T908	500 mg
	1 gm

Chemical Properties:
FW: 369.4 $C_{16}H_{34}O_4Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis
Identity: NMR and MS conform to standard

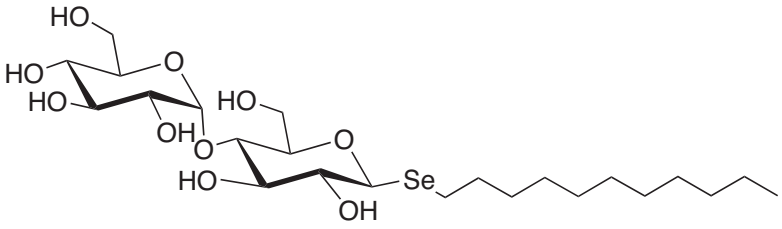


Undecyl-β-D-Selenomaltoside

U911	500 mg
	1 gm

Chemical Properties:
FW: 573.6 $C_{23}H_{44}O_{10}Se$

Product Specifications:
Appearance: White solid
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 5-9
Solubility in water at 20°C: ≥ 1%
Conductance (1% solution in water): < 100 µS



Spin Label Reagents

2-Aminoethyl Methane Thiosulfonate Hydrobromide

[MTSEA]

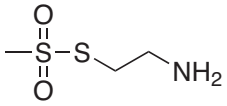
A110MT	100 mg 500 mg 1 gm

Chemical Properties:
FW: 236.2 [16599-33-0] $C_3H_9NO_2S_2 \cdot HBr$

Product Specifications:
Positively charged reagent that reacts very rapidly and specifically with cysteine groups.
Half-life (pH 7.0, 20°C): ~ 12.0 minutes[2]
Half-life (pH 6.0, 20°C): ~ 92.0 minutes[2]
Half-life (pH 7.0, 4°C): ~ 116.0 minutes[2]

References:

1. Karlin, A. and Akabas, M. H. (1998) *Methods Enzymol.* **293**, 123-136.
2. Sobszak, I. and Lolkema, J. S. (2003) *Biochem.* **42**, 9789-9796.



Sodium (2-Sulfonatoethyl) Methanethiosulfonate

[MTSES / Methanesulfonothioic Acid, Sodium Salt]

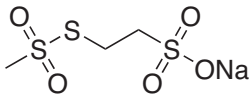
S110MT	100 mg 500 mg 1 gm

Chemical Properties:
FW: 242.28 [1950-85-2] $C_3H_7NaO_5S_3$

Product Specifications:
Negatively charged reagent that reacts very rapidly and specifically with cysteine groups[1, 3, 4].
Half-life (pH 7.0, 20°C): ~ 370.0 minutes[2]

References:

1. Akabas, M. H., Stauffer, D. A., Xu, M. and Karlin, A. (1992) *Science* **258**, 307-310.
2. Karlin, A. and Akabas, M. H. (1998) in *Methods Enzymol.* **293**, 123-136.
3. Stauffer, D. A. and Karlin, A. (1994) *Biochem.* **33**, 6840-6849.
4. Sobszak, I. and Lolkema, J. S. (2003) *Biochem.* **42**, 9789-9796.



[2-(Trimethylammonium)Ethyl] Methane Thiosulfonate Bromide

[MTSET]

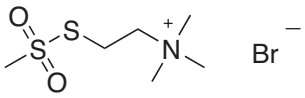
T110MT	100 mg 500 mg 1 gm

Chemical Properties:
FW: 278.24 [91774-25-3] $C_6H_{16}BrNO_2S_2$

Product Specifications:
Positively charged reagent that reacts very rapidly and specifically with cysteine groups [1–3].
Half-life (pH 7.0, 20°C): ~ 11.2 minutes[1]
Half-life (pH 6.0, 20°C): ~ 55.0 minutes[1]

References:

1. Karlin, A. and Akabas, M. H. (1998) *Methods in Enzymol.* **293**, 123-136.
2. Stauffer, D. A. and Karlin, A. (1994) *Biochem.* **33**, 6840-6849.
3. Sobszak, I. and Lolkema, J. S. (2003) *Biochem.* **42**, 9789-9796.



Cy-Tripglu

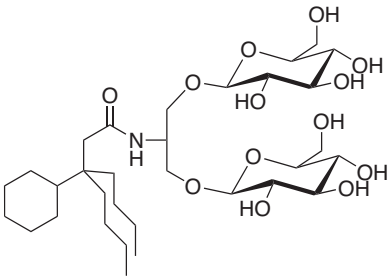
[N-(1,3-bis(Glucopyranoside)propan-2-yl)-3-Butyl-3-Cyclohexylheptanamide]

T385 500 mg, 1 gm, 5 gm

Chemical Properties:
FW: 665.8 $C_{32}H_{59}NO_{13}$
CMC (H_2O): 1.8 mM[1]

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2
260 nm: < 0.2

Reference:
1. Chae, P. S. *et al.* (2008) *ChemBioChem.* **9**, 1706-1709.



Ph-Tripglu

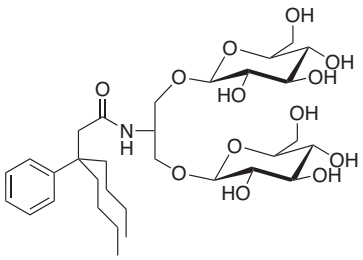
[N-(1,3-bis(Glucopyranoside)propan-2-yl)-3-Butyl-3-Phenylheptanamide]

T380 500 mg, 1 gm, 5 gm

Chemical Properties:
FW: 659.8 $C_{32}H_{53}NO_{13}$
CMC (H_2O): 3.6 mM[1]

Product Specifications:
Purity: ≥ 97% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 10%
Conductance (10% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.1
280 nm: < 0.2

Reference:
1. Chae, P. S. *et al.* (2008) *ChemBioChem.* **9**, 1706-1709.



Tripao

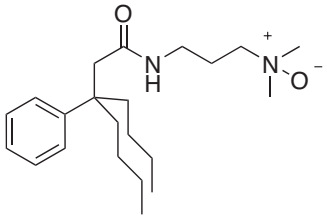
[((3-(3 Butyl-3-Phenylheptanamido)-N,N-Dimethylpropan-1-Amine Oxide))]

T370 1 gm, 5 gm, 25 gm

Chemical Properties:
FW: 362.5 $C_{22}H_{38}N_2O_2$
CMC (H_2O): ~ 4.5 mM[1]

Product Specifications:
Purity: ≥ 95% by HPLC analysis
pH (1% solution in water): 4-9
Solubility in water at 20°C: ≥ 2%
Conductance (1% solution in water): < 500 µS
Absorbance of a 1% solution in water:
340 nm: < 0.2
280 nm: < 0.3

References:
1. McQuade, D. T., Quinn, M. A., Yu, S. M., *et al.* (2000) *Angew Chem Int Ed.* **39**, 758-761.
2. Yu, S. M., McQuade, D. T., Quinn, M. A., *et al.* (2000) *Protein Sci.* **9**, 2518-2527.
3. Theisen, M. J., Potocky, T. B., McQuade, D. T., *et al.* (2005) *Biochim Biophys Acta.* **1751**, 213-216.



KITS

Solid Kits

Solution Kits

KITS

One of the most challenging aspects of working with membrane proteins is the difficulty choosing which detergent may be best suited for your application. Membrane proteins evolved in nature into slightly different chemical environments inside their host lipid bilayer. Once extracted, they require a similar environment to remain stable. This makes finding a micelle with similar features challenging.

To select the optimum detergent or combination of detergents and reagents for a particular membrane protein application, often multiple detergents must be tested. Moreover, a detergent that is suitable for extraction may not be useful for storage of the purified protein or for functional studies conducted on the purified protein. To aid in the selection process, Anatrace offers a wide variety of solid and solution based detergent kits to screen for the best fit.

Detergents like Dodecyl Maltopyranoside (D310), Decyl Maltopyranoside (D322), Octyl Glucopyranoside (O311), CHAPS (C316), LDAO (D360), and Lauryl Maltose Neopentyl Glycol (NG310) are often the first detergents to screen. For times when those detergents fail to stabilize your membrane protein, Anatrace enables you to screen large numbers of detergents quickly and cost-effectively. For example, if you need to find the right glucoside, our Glucopyranoside Detergent Kit (D399-G) contains six different glucosides with tail lengths between 6 (hexyl) and 12 (dodecyl) carbon lengths long. When you're not quite sure which detergent will work best for your project, Anatrace kits are there to help with multiple 1 gm sample solid kits or ampuled 10% solution kits based around a common theme.

Detergent Kits

To select the optimum detergent or combination of detergents and reagents for a particular membrane protein application, oftentimes multiple detergents must be tested. Moreover, a detergent which is suitable for extraction may not be useful for storage of the purified protein or for bio-chemical studies conducted on the purified protein. To aid in the detergent selection process, we offer a wide variety of solid and solution based detergent kits.

D399-PM816 — **Amphipol Refold Detergent Kit**
Kit contains 50 mg of the following: PMAL-C8, PMAL-C12, PMAL-C16, and Amphipol A8-35.

D399-BIC — **Bicelle Kit**
Kit contains two lipids and two detergents: 200 mg DMPC, 200 mg DMPG, 1 gm CHAPS, and 1 gm CHAPSO.

D399-C14 — **CYMAL Detergent Kit (1-4)**
Kit contains 1 gm of each of the following: CYMAL-1, 2, 3, and 4.

D399-F812 — **Fos-Choline Detergent Kit**
Kit contains 1 gm of each of the following: Fos-Choline 8, 9, 10, 11, 12, 13, 14, 15, and 16.

D399-G — **Glucoside Detergent Kit**
Kit contains 1 gm of each of the following: n-Hexyl–β–D-Glucopyranoside, n-Heptyl–β–D-Glucopyranoside, n-Octyl–β–D-Glucopyranoside, n-Nonyl–β–D-Glucopyranoside, n-Decyl–β–D-Glucopyranoside, and n-Dodecyl–β–D-Glucopyranoside.

D399-IDK — **Ionic Detergent Master Kit**
Kit contains 1 gm of each of the 37 detergents listed below:

Anzergent 3-8	Cyclofos-6	Fos-Choline-13	PMAL-C8
Anzergent 3-10	Cyclofos-7	Fos-Choline-14	PMAL-C12
Anzergent 3-12	n-Decyl-N,N-Dimethylglycine	Fos-Choline-15	PMAL-C16
Anzergent 3-14	Deoxycholic Acid, Sodium Salt	Fos-Choline-16	Sodium Dodecanoyl Sarcosine
CHAPS	n-Dodecyl-N,N-Dimethylglycine	Fos-Choline-ISO-9	Sodium Dodecyl Sulfate
CHAPSO	Fos-Choline-8	Fos-Choline-ISO-11	Sodium Taurocholate
Cyclofos-2	Fos-Choline-9	Fos-Choline-UNSAT-11-10	n-Tetradecyl-N,N-Dimethylglycine
Cyclofos-3	Fos-Choline-10	Fos-Mea-8	
Cyclofos-4	Fos-Choline-11	Fos-Mea-10	
Cyclofos-5	Fos-Choline-12	Fos-Mea-12	

D399-M611 — **Maltoside Detergent Kit I (6-11 carbon chain length)**
Kit contains 1 gm of each of the following: n-Hexyl–β–D-Maltopyranoside, n-Octyl–β–D-Maltopyranoside, n-Nonyl-β-D-Maltopyranoside, n-Decyl–β–D-Maltopyranoside and n-Undecyl–β–D-Maltopyranoside.

D399-M1216 — **Maltoside Detergent Kit II (12-16 carbon chain length)**
Kit contains 1 gm of each of the following: n-Dodecyl–β–D-Maltopyranoside, n-Tridecyl–β–D-Maltopyranoside, n-Tetradecyl–β–D-Maltopyranoside and n-Hexadecyl–β–D-Maltopyranoside.

(Continued on next page)

PLEASE NOTE—While components of the kit are subject to change at any time due to discontinuation, etc. of individual items, we endeavor to keep our website up to date to reflect changes in kit configuration.

Detergent Kits (continued)

D399-NDK **Nonionic Detergent Master Kit**

Contains 1 gm of each of the 55 detergents listed below:

- Anameg-7
- Big CHAP
- Big CHAP, Deoxy
- CYGLU-3
- CYGLU-4
- CYMAL-1
- CYMAL-2
- CYMAL-3
- CYMAL-4
- CYMAL-5
- CYMAL-6
- CYMAL-7
- n-Decyl-α-D-Maltopyranoside
- n-Decyl-β-D-Glucopyranoside
- n-Decyl-β-D-Maltopyranoside
- n-Decyl-β-D-Thioglucopyranoside
- n-Decyl-β-D-Thiomaltopyranoside
- 2,6-Dimethyl-4-Heptyl-β-D-Maltopyranoside
- n-Dodecyl-α-D-Maltopyranoside
- n-Dodecyl-β-D-Glucopyranoside
- n-Dodecyl-β-D-Maltopyranoside
- n-Dodecyl-β-D-Thiomaltopyranoside
- n-Dodecyl-N,N-Dimethylamine-N-Oxide (DDAO)
- n-Heptyl-β-D-Glucopyranoside
- n-Heptyl-β-D-Thioglucopyranoside
- n-Hexadecyl-β-D-Maltopyranoside
- Hexaethylene Glycol Monooctyl Ether (C_8E_6) (50% w/w), 2 ml
- n-Hexyl-β-D-Glucopyranoside
- n-Hexyl-β-D-Maltopyranoside
- MEGA-8
- MEGA-9
- MEGA-10
- n-Nonyl-β-D-Glucopyranoside
- n-Nonyl-β-D-Maltopyranoside
- n-Nonyl-β-D-Thioglucopyranoside
- n-Nonyl-β-D-Thiomaltopyranoside
- Octaethylene Glycol Monododecyl Ether ($C_{12}E_8$) (25% w/w), 4 ml
- n-Octyl-α-D-Glucopyranoside
- n-Octyl-β-D-Galactopyranoside
- n-Octyl-β-D-Glucopyranoside
- n-Octyl-β-D-Maltopyranoside
- n-Octyl-β-D-Thioglucopyranoside
- n-Octyl-β-D-Thiomaltopyranoside
- Pentaethylene Glycol Monooctyl Ether (C_8E_5) (50% w/w), 2 ml
- Pentaethylene Glycol Monodecyl Ether ($C_{10}E_5$) (50% w/w), 2 ml
- 2-Propyl-1-Pentyl-β-D-Maltopyranoside
- Sucrose Monododecanoate
- n-Tetradecyl-β-D-Maltopyranoside
- n-Tetradecyl-N,N-Dimethylamine-N-Oxide (TDAO)
- Tetraethylene Glycol Monooctyl Ether (C_8E_4) (50% w/w), 2 ml
- n-Tridecyl-β-D-Maltopyranoside
- n-Undecyl-α-D-Maltopyranoside
- n-Undecyl-β-D-Maltopyranoside
- n-Undecyl-β-D-Thiomaltopyranoside
- ω-Undecylenyl-β-D-Maltopyranoside

D399-POP **Popular Detergent Kit**

Kit contains 1 gm of each of the following: CHAPS, CYMAL-5, Fos-Choline-12, n-Decyl–β–D-Maltopyranoside, n-Dodecyl–β–D-Maltopyranoside and n-Octyl–β–D-Glucopyranoside.

PLEASE NOTE—While components of the kit are subject to change at any time due to discontinuation, etc. of individual items, we endeavor to keep our website up to date to reflect changes in kit configuration.

Soluble Detergent Kits

Anatrace detergents are available in kits as ampuled 10% solutions stored under argon. These solution kits cost a fraction of the one gram detergent kits, making the selection of the right detergent for extraction of a membrane protein less expensive. The master kit listed below contains nearly every detergent offered by Anatrace that possesses sufficient solubility to prepare a 10% solution.

DSOL-ANP10 — **Anapoe Kit**
Kit contains 10 ml of all 15 Anapoe detergents:

- Anapoe-20
- Anapoe-35
- Anapoe-58
- Anapoe-80
- Anapoe-$C_{10}E_6$
- Anapoe-$C_{10}E_9$
- Anapoe-$C_{12}E_8$
- Anapoe-$C_{12}E_9$
- Anapoe-$C_{12}E_{10}$
- Anapoe-$C_{13}E_8$
- Anapoe-NID-P40
- Anapoe-X-100
- Anapoe-X-114
- Anapoe-X-305
- Anapoe-X-405

DSOL-C57 — **CYMAL Detergent Kit (5–7)**
Kit contains CYMAL 5, 6, and 7.

DSOL-F812 — **Fos-Choline Detergent Kit**
Kit contains 1 ml of the following: Fos-Choline 8, 9, 10, 11, 12, 13, 14, 15, and 16.

DSOL-POP — **Popular Detergent Kit**
Kit contains CHAPS, CYMAL-5, n-Decyl–β–D-Maltopyranoside, n-Dodecyl–β–D-Maltopyranodise, Fos-Choline 12, and n-Octyl–β–D-Glycopyranoside.

DSOL-MK — **Solution Master Detergent Kit**
Kit contains one ampule (1 ml of a 10% solution) of each detergent listed below:

- Anameg-7
- Anapoe-20
- Anapoe-35
- Anapoe-58
- Anapoe-80
- Anapoe-$C_{10}E_6$
- Anapoe-$C_{10}E_9$
- Anapoe-$C_{12}E_8$
- Anapoe-$C_{12}E_9$
- Anapoe-$C_{12}E_{10}$
- Anapoe-$C_{13}E_8$
- Anapoe-X-100
- Anapoe-X-114
- Anapoe-X-305
- Anapoe-X-405
- Anzergent 3-8
- Anzergent 3-10
- Anzergent 3-12
- Anzergent 3-14
- Big CHAP
- Big CHAP, Deoxy
- CHAPS
- CHAPSO
- Cholic Acid, Sodium Salt
- Cyclofos-2
- Cyclofos-3
- Cyclofos-4
- Cyclofos-5
- Cyclofos-6
- Cyclofos-7
- CYGLU-3
- CYMAL-1
- CYMAL-2
- CYMAL-3
- CYMAL-4
- CYMAL-5
- CYMAL-6
- CYMAL-7
- n-Decyl-α-D-Maltopyranoside
- n-Decyl-β-D-Maltopyranoside
- n-Decyl-β-D-Thiomaltopyranoside
- n-Decyl-N,N-Dimethylglycine
- Deoxycholic Acid, Sodium Salt
- 2,6-Dimethyl-4-Heptyl-β-D-Malto-pyranoside
- n-Dodecyl-α-D-Maltopyranoside
- n-Dodecyl-β-D-Maltopyranoside
- n-Dodecyl-β-D-Thiomalto-pyranoside
- n-Dodecyl-N,N-Dimethylamine-N-Oxide (DDAO)
- n-Dodecyl-N,N-Dimethylglycine
- Fos-Choline-8
- Fos-Choline-9
- Fos-Choline-10
- Fos-Choline-11
- Fos-Choline-12
- Fos-Choline-13
- Fos-Choline-14
- Fos-Choline-15
- Fos-Choline-16
- Fos-Choline-ISO-9
- Fos-Choline-ISO-11
- Fos-Choline-Unsat-11-10
- Fos-Mea-8
- Fos-Mea-10
- n-Heptyl-β-D-Glucopyranoside
- n-Heptyl-β-D-Thiogluco-pyranoside
- Hexaethylene Glycol Monooctyl Ether (C_8E_6)
- n-Hexyl-β-D-Glucopyranoside
- n-Hexyl-β-D-Maltopyranoside
- MEGA-8
- n-Nonyl-β-D-Glucopyranoside
- n-Nonyl-β-D-Maltopyranoside
- n-Nonyl-β-D-Thiomalto-pyranoside
- Octaethylene Glycol Monododecyl Ether ($C_{12}E_8$)
- n-Octyl-β-D-Glucopyranoside
- n-Octyl-β-D-Maltopyranoside
- n-Octyl-β-D-Thiomaltopyranoside
- Pentaethylene Glycol Monodecyl Ether ($C_{10}E_5$)
- PMAL-C8
- 2-Propyl-1-Pentyl Malto-pyranoside
- Sodium Dodecanoyl Sarcosine
- Sucrose Monododecanoate
- n-Tetradecyl-β-D-Maltopyranoside
- n-Tetradecyl-N,N-Dimethylamine-N-Oxide (TDAO)
- Tetraethylene Glycol Monooctyl Ether (C_8E_4)
- n-Tridecyl-β-D-Maltopyranoside
- n-Undecyl-α-D-Maltopyranoside
- n-Undecyl-β-D-Maltopyranoside
- n-Undecyl-β-D-Thiomalto-pyranoside

PLEASE NOTE—While components of the kit are subject to change at any time due to discontinuation, etc. of individual items, we endeavor to keep our website up to date to reflect changes in kit configuration.

CUSTOM PRODUCTS

CUSTOM PRODUCTS

Before producing the first commercially available version of high purity Dodecyl Maltoside, Anatrace began as a small, boutique, specialty chemical company that manufactured contract products and provided both research support and analytical testing. Throughout our evolution, the heart of our business has remained that of offering personalized service to the customer, ready to produce new molecules on demand. We'll continue to work as both your supplier and your partner in technically challenging research.

Anatrace is the number one source for the broadest selection of high-purity detergents with low batch-to-batch variation. For over 25 years, Anatrace has collaborated with the membrane protein structural biology community to offer every key detergent and all possible derivatives. We now offer a selection of over 200 detergents to choose from. Along with the highest-quality detergents, the Anatrace portfolio offers a host of specialized compounds you can count on for reliable functional biology studies and structural studies—readily producing hundreds of novel, 3-D crystal structures.

Our expertise includes, but is not limited to, carbohydrates, modified lipids, nucleosides, nucleotides, and polymer chemistry. We have an experienced staff that holds advanced degrees with a combined 40 years of chemistry experience. This allows us to deliver single grams of individual molecules up to large scale production runs in the annual range of several hundred kilograms. Anatrace chemists are experts at liquid chromatography, utilizing ion exchange, normal phase, reverse phase, size exclusion, etc.

Our team's forte is the design and development of water-soluble organic compounds. We take a systematic approach in which we utilize multiple, synthetic chemistry database search systems for process development, perform high selectivity chromatography, and reliably repeat complex, multistage syntheses. Our state-of-the-art facility is equipped to support complicated chemical synthesis projects that require fast turnaround and allows us to supply thorough communication of laboratory results. Our chemists can modify existing molecules or produce completely customized ones for you as needed, creating specialized Anatrace products that meet your unique specifications. The applications are nearly limitless.

To contact us directly about your custom projects, please call us at 1-800-252-1280/419-740-6600 or visit https://www.anatrace.com/Products/Custom.aspx.

Anatrace takes price in helping scientists unravel once unsolvable challenges. Let us help you take your research to the next level. We keep our standards high so you can too.

Our chemical synthesis team has experience with various chemical compounds including:

- Specialty and fine chemicals
- Pharmaceutical intermediates, analogs, and metabolites
- Analytical services, including but not limited to, determination of Critical Micelle Concentration (CMC), Differential Scanning Calorimetry (DSC), Nuclear Magnetic Resonance (NMR), and Mass Spectrometry (MS), as well as High Performance Liquid Chromatography (HPLC) method development and validation with dual detection capabilities.

Our contract synthesis expertise includes:

- Small molecule synthesis
- Heterocyclic chemistry
- Ultrapure surfactants/detergents /lipids
- Diagnostic/Contrast agents
- Nucleosides and nucleotides
- Polymer chemistry

We also provide custom synthesis of small scale Active Pharmaceutical Ingredients (APIs), intermediates, and fine chemicals, from milligram to kilogram quantities, including reference standards, impurities, and metabolites.

Additional services include:

- Novel route design
- Literature synthesis
- Multi-step reaction schemes
- Process design and scale-up

Our state-of-the-art manufacturing facility is well-equipped. Below is a list of some of the available equipment:

- GE ÄKTA Explorer™ FLPC purification system
- Bulk chromatography stations capable of delivering kilo scale plus purification
- BÜCHI Labortechnik AG and Heidolph North America rotary evaporators
- Shimadzu analytical and prepared HLPC with UV and ELSD Detector
- Applied Biosystems® LC-MS instruments
- MilliQ™ water purification system
- BÜCHI Mini Spray Dryer
- VirTis™ Benchtop Freeze-Dryer

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