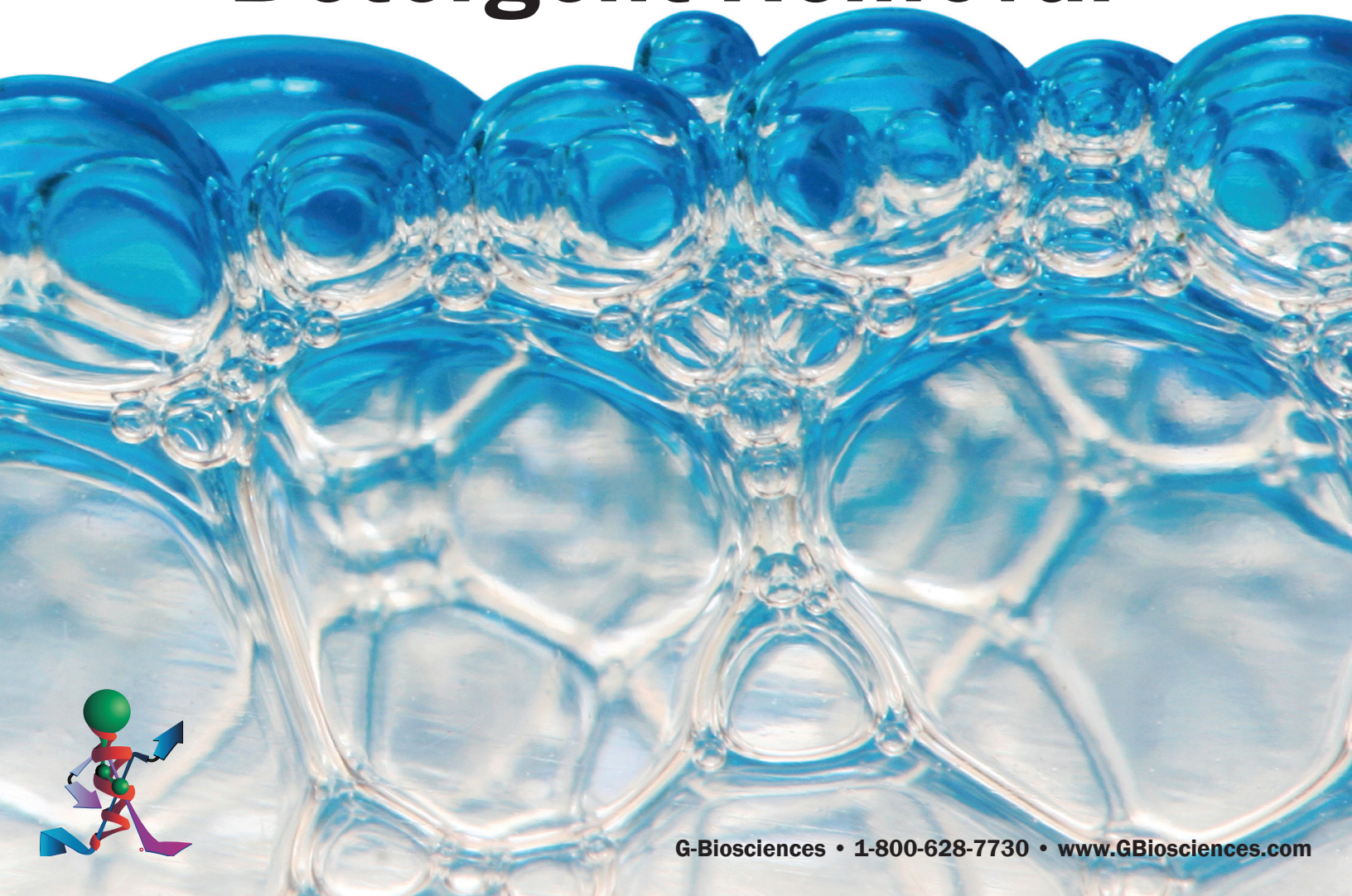
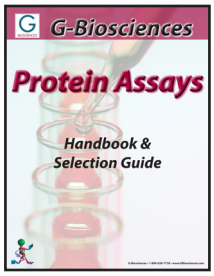
G-Biosciences

Detergents

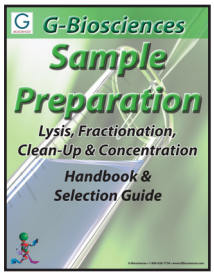
Handbook & Selection Guide to Detergents & Detergent Removal

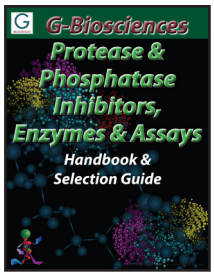




- Protein Estimation Assays
- Apoptosis Assays
- Cytotoxicity Assays
- SAM Methyltransferase Assays
- Protease Assays
- Phosphatase Assays
- Peroxide Assay

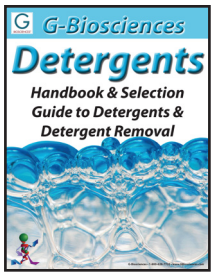
- Lysis Buffers & Systems
- Protein Fractionation Kits
- Dialysis (Micro) System
- Electrophoresis Clean-Up
- Concentration Systems
- Contamination Removal

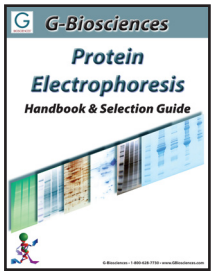




- Protease Inhibitor Cocktails
- Individual Protease Inhibitors
- Protease Assays
- Proteases for Mass Spec.
- Sequencing Grade Proteases

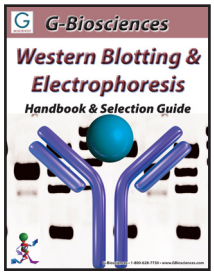
- Proteomic Grade Detergents
- Research Grade Detergents
- Non-Ionic, Ionic & Zwitterionic
- Detergent Estimations
- Detergent Removal Systems

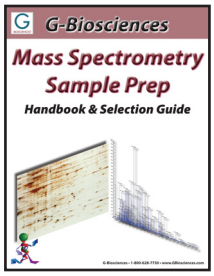




- Gel Preparation Chemicals
- Protein Marker Ladders
- Electrophoresis Buffers
- Reducing & Alkylating Reagents
- Protein Gel Stains

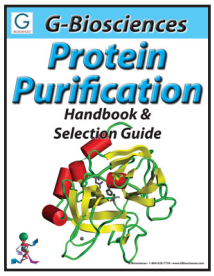
- 1-Hour Western System
- Transfer Buffers & Membranes
- Membrane Stains
- Blocking Buffers
- Secondary Antibodies
- Detection Reagents
- Reprobing Reagents

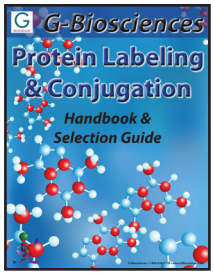




- Protein Sample Preparation
- Protein Clean-Up Systems
- Electrophoresis Reagents
- Mass Spec Grade Protease
- InGel Digestion Kits
- Peptide Generation Reagents

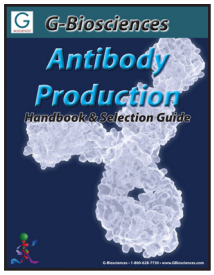
- Affinity Resins
- 6X His Protein Purification Kits
- GST Protein Purification Kits
- Antibody Purification
- Activated Resins
- Buffers & Reagents

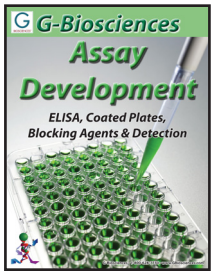




- Biotin Labeling
- Cell Surface Protein Labeling
- Agarose Coupling Kits
- Fluorescent Dye Labeling Kits
- Enzyme Labeling Systems

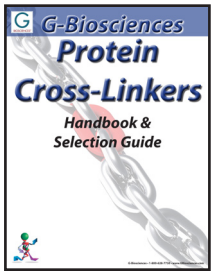
- Carrier Proteins
- Peptide Coupling Systems
- Antibody Purification Resins
- Antibody Fragmentation Kits

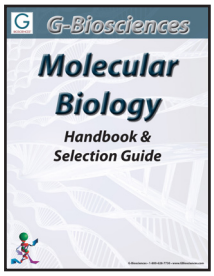




- Coated Plates
- Blocking Buffers
- Wash Buffers
- Secondary Antibodies
- Detection Reagents
- Antibody Labeling Systems

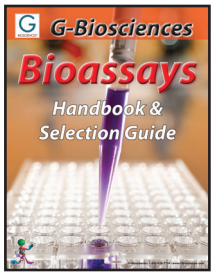
- Homobifunctional
- Heterobifunctional
- Optimizer Systems
- Cross-Linking Systems





- DNA Isolation
- Transformation & Screening
- Polymerase Chain Reaction
- Agarose Electrophoresis
- RNA Isolation
- Yeast Transformation

- Apoptosis Assays
- Cytotoxicity Assays
- SAM Methyltransferase Assays
- Protease Assays
- Phosphatase Assays
- Peroxide Assay
- ELISA



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Introduction

Detergents are amphipathic molecules that possess both a hydrophobic (water-fear) and a hydrophilic (water-friend) group that allow them to act as excellent solubilization agents.

Hydrophobicity

Hydrophobicity from the Greek words hydro (water) and phobos (fear) refers to the physical property of a molecule (known as a hydrophobe) that is repelled from a mass of water.

Water molecules form a highly ordered structure by the intermolecular action of its hydrogen bonds. Polar, or hydrophilic, molecules can readily dissolve in water as their charged groups can interact with the hydrogen bonds maintaining a ordered structure.

Non-polar, or hydrophobic, molecules are unable to form stable structures and are repelled by the water molecules and are therefore immiscible with the water. The addition of hydrophobic molecules disrupts the energy favoured structure of water, creating "holes" devoid of water molecules. The water molecules at the edge of the holes rearrange into an ordred manner and this results in an unfavorable decrease in entropy. To combat the loss of entropy, water molecules force the hydrophobic molecules to cluster to occupy the smallest space possible. This effect is known as the hydrophobic effect.

The hydrophobic effect plays an important role in protein structure and is involved in defining the tertiary structure of proteins. The amino acids of proteins can be polar or non-polar and therefore in an aqueous environment the proteins fold to protect the hydrophobic non-polar groups from the water molecules.

How do detergents work?

The structure of detergents is key to its ability to function as a solubilization agent. Detergent molecules contain a polar head group from which extends a long hydrophobic carbon tail.

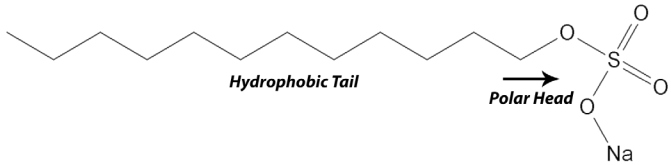

Figure 1: The structure of the detergent SDS (Sodium Dodecyl Sulfate).

The amphipathic properties of the detergent molecules allows them to exhibit unique properties in aqueous solutions. The polar (hydrophilic) head groups interact with the hydrogen bonds of the water molecules and the hydrophobic tails aggregate resulting in highly organized spherical structures called micelles. At low concentrations, the detergents exist as single molecules or small aggregates and as the concentration increases micelles begin to form. **The concentration at which micelles begin to form is known as the Critical Micelle Concentration (CMC).**

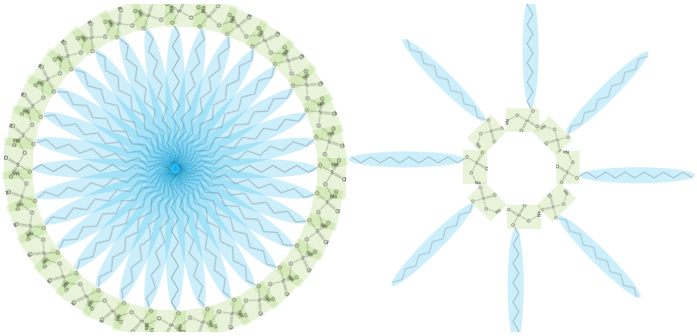

Figure 2: A detergent micelle formed with SDS molecules in an aqueous solution (left) or a non-aqueous solution (right).

Interestingly, detergents form reverse micelles in the presence of hydrocarbon solvents (non-aqueous solutions).

How do detergents solubilize proteins?

A wide range of detergents are routinely used to release, or solubilize, proteins from lipid membranes.

Biological membranes consist of phospholipids that are similar to detergents as they have the same amphipathic properties. The phospholipids have a charged polar head normally connected to two hydrophobic groups or tails. The phospholipids assemble as bilayers, with the hydrophobic tails between two faces of polar head groups.

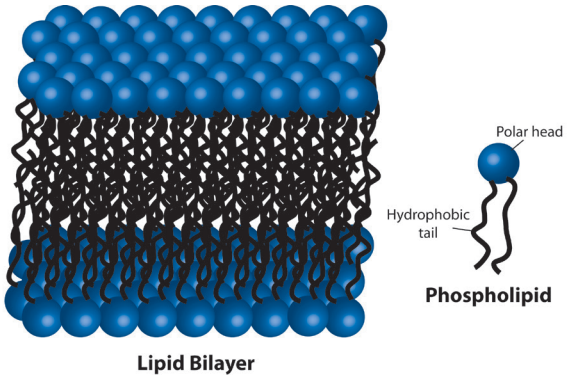

Figure 3: The structure of a lipid bilayer and a phospholipid.

For biological membranes , proteins and lipids (i.e. cholesterol) are embedded in the bilayer forming the fluid mosaic model. The proteins are held in the lipid bilayer by hydrophobic interations between the lipid tails and hydrophobic protein domains. These integral membrane proteins are not soluble in aqueous solutions as they aggregate to protect their hydrophobic domains, but are soluble in detergent solutions.

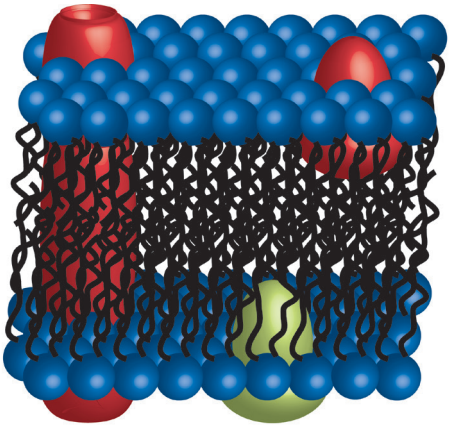

Figure 4: A Fluid -mosaic model of a biological membrane.

The proteins are released from lipid bilayers by detergents as the detergent micelles have similar properties as the lipid bilayer. The integral membrane proteins embed themselves in the detergent micelles protecting their hydrophobic domains from aggregation.

A schematic of how detergents solubilize membrane proteins is shown below. At low detergent concentrations, less than the detergent's CMC, the detergent molecules insert themselves in the lipid membrane and begin partioning the lipid bilayer. At concentrations equal to, or higher than the detergent's CMC, the lipid bilayer becomes saturated with detergent molecules and the lipid bilayer breaks apart. The resulting products are protein-detergent complexes, where the detergent hydrophobic regions bind to the protein hydrophobic domains protecting them from aggregations. In addition to these, detergent and detergent-lipid micelles are formed.

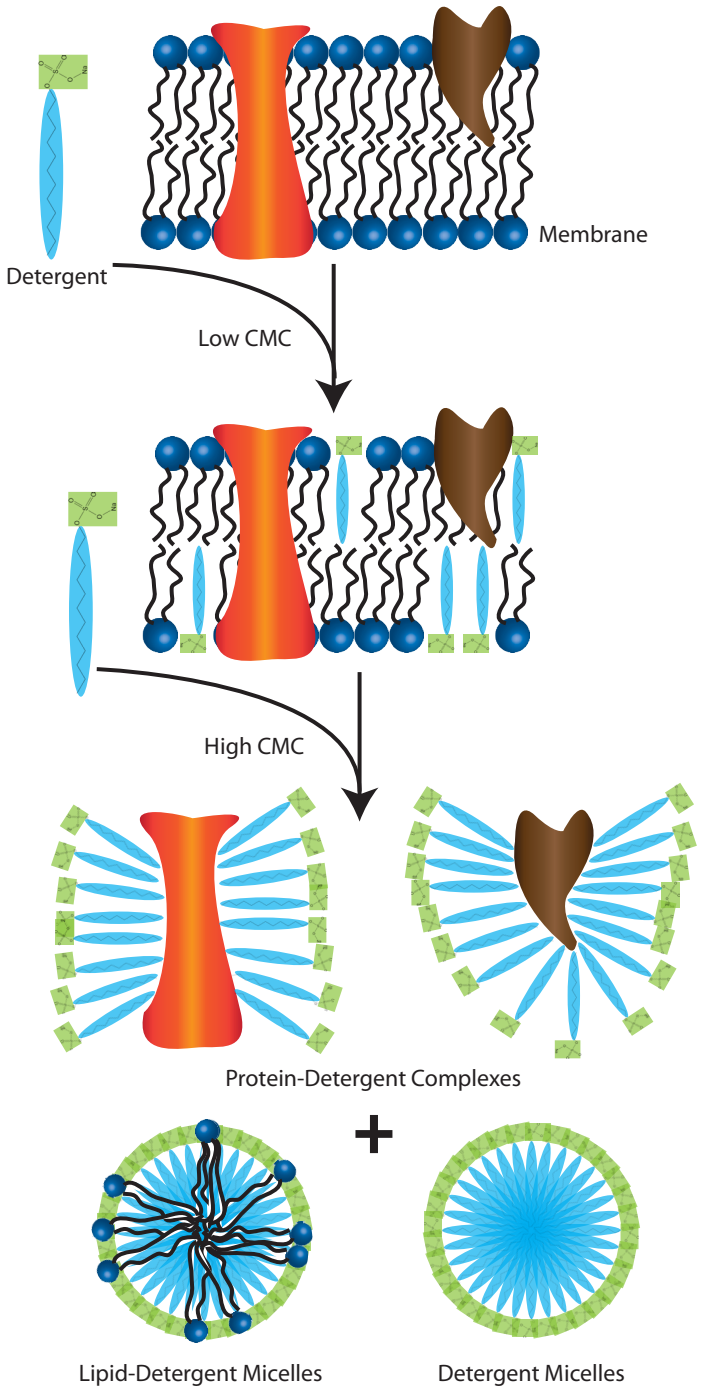

Figure 5: Schematic showing the stages of protein solubilization with detergent.

Critical Micelle Concentration (CMC)

The solubilization of proteins from lipid bilayers is dependent on the Critical Micelle Concentration (CMC) of the detergents.

The CMC is defined as the concentration of surfactants (detergents) above which micelles are spontaneously formed. The CMC is dependent on the alkyl chain length, presence of double bonds, branched points and additives in the solubilization buffers. As the alkyl chains increase, the CMC decreases; the introduction of double bonds and branch points increases the CMC; additives, such as urea, that are chaotropic increase the CMC.

The detergent CMC is important as it allows researcher's to use the precise amount of detergent, too little means inadequate solubilization of proteins, too much can affect downstream process and problematic detergent removal steps.

CMC can be determined by light scattering (increases with detergent concentration), surface tension (decrease) and dye solubilization (increase) (Vulliez-Le Normand and Jean-Luc Eisele (1993)). All three techniques are time consuming and are rarely performed for this reason. G-Biosciences has developed Optimizer-blueBALLS™, which is based on the dye solubilization method, but is significantly more convenient. More information on Optimizer-blueBALLS™ is provided later in this handbook.

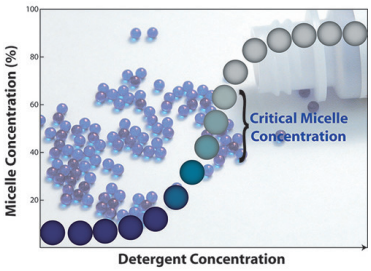

Figure 6: Graphical representation of critical micelle concentration determination. Blue colored Optimizer blueBALLS™ imitate membrane proteins and solubilize when the critical micellar concentration is reached, releasing a non-reactive blue color into the extraction buffer.

CLASSIFICATION & CHARACTERIZATION

There are a vast number of detergents available for protein solubilization. They can be classified based on the nature of their hydrophilic head group. The three classifications are:

- Non ionic
- Ionic
- Zwitterionic

In addition to the above classification, there are important properties or characteristics of detergents that can be used to aid researchers in their choice of detergent.

Critical Micelle Concentration (CMC)

The CMC is defined as the concentration of surfactants (detergents) above which micelles are spontaneously formed. See previous section.

Kraft Point

The Kraft Point is used to describe the temperature at which an equilibrium exist between an insoluble crystalline state, monomeric detergent and detergent micelles. At low temperatures, detergents form insoluble crystalline states that shift to detergent monomers and finally detergent micelles with increasing temperatures.

The temperature at which the CMC concentration is reached is known as the critical micellar temperature (CMT). In most cases, the CMT is equal to the Kraft Point.

Cloud Point

The Cloud Point is another temperature related property that is specific for non ionic detergents. As temperatures pass the CMT, the non ionic detergents become cloudy and separate into a detergent-rich and an aqueous layer, a process known as phase separation. This temperature is known as the cloud point.

This property is used for the purification of integral membrane proteins with Triton® X-114. The cloud point of Triton® X-114 is 23°C, therefore cellular membranes can be solubilized at 0°C and then warmed to >23°C. The integral membrane proteins partition into the detergent-rich phase away from the hydrophilic proteins that remain in the aqueous phase (Bordier, C (1981)).

Aggregation Number

This is quite simply the number of detergent molecules that are associated together to form a micelle and is calculated by:

$$\text{Aggregation No.} = \frac{\text{Micellar molecular weight}}{\text{Monomeric molecular weight}}$$

The micellar molecular weight can be determined by gel filtration, sedimentation equilibrium, X-ray scattering or light scattering.

Hydrophile-Lipophile Balance (HLB)

A measure of the hydrophilic character of a detergent. Basically, detergents with HLB of 12-20 are preferred for non-denaturing solubilization; >20 for extrinsic protein solubilization. Detergents with a low HLB are more readily removed by hydrophobic chromatography as they are more hydrophobic.

Proteomic Grade Detergent Solutions (10%), Sterile

Ultra low carbonyl & peroxide contaminants

Many commercial grade detergents contain elevated levels of sulfhydryl oxidizing agents, peroxides, salts and carbonyl compounds. The proteins that are isolated with these detergents are highly susceptible to contaminating peroxides and carbonyls. The peroxides will oxidize proteins and the carbonyl groups will form Schiff's bases with the proteins that will interfere with a protein's structure.

Our Proteomic Grade Detergent Solutions contain reduced peroxides and carbonyl compounds. In addition, the detergents have less than 50µS conductivity. These detergents are offered as sterile, 10% aqueous solutions, sealed under inert gas and are suitable for protein applications. These non ionic detergents are suitable for isolating membrane-protein complexes.

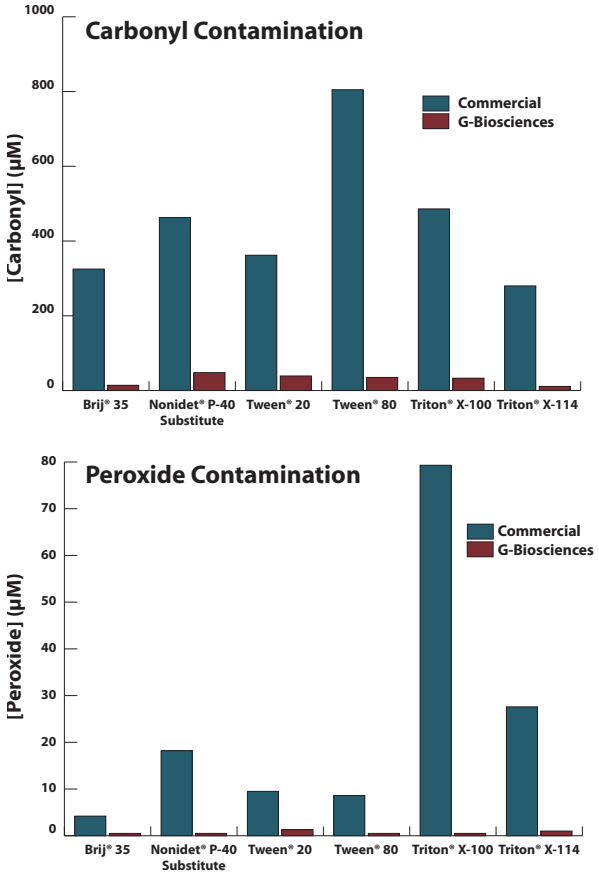

Figure 7: Comparison of aldehyde (top) and peroxide (bottom) concentration in G-Biosciences Proteomic Grade Detergent Solutions and non-proteomic grade commercially available detergents.

FEATURES

- Low peroxide contamination
- Low carbonyl contamination
- Low conductivity
- Sterile detergent solutions
- Reduced metal ions
- 10% aqueous solutions
- Sealed under inert gas to prevent oxidation

We offer a selection of widely used Proteomic Grade Detergent Solutions. The aldehyde and peroxide levels are <100µM and <50µM respectively with a conductivity of <50µS.

Non ionic detergents have a hydrophilic head group that is uncharged and are preferred for their ability to break lipid-lipid and lipid-protein interactions. They have limited ability to break protein-protein interactions and are often referred to as non-denaturing detergents and are used to isolate biologically active membrane proteins.

The non ionic deteregents are supplied as a general Research Grade, Proteomic Grade (PG) Solutions and 2D-Detergents™. The Proteomic Grade (PG) Solutions have ultra low aldehyde (<100µM) and peroxide (<50µM) concentrations to reduce the effects of peroxidase and carbonyl compounds that negatively interact with membrane proteins. The 2D-Detergents™ have low conductivity (<10µS) and ultra low aldehyde (<100µM) and peroxide (<50µM) concentrations.

Triton® X-100

Octylphenolpoly(ethyleneglycolether)$_x$

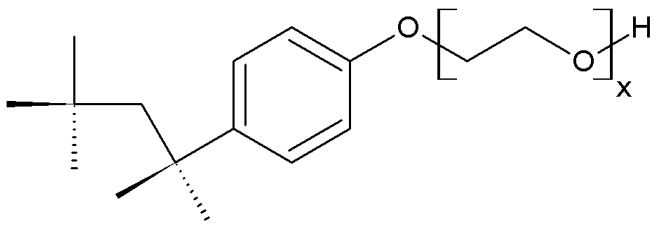

Figure 8: Structure of Triton® X-100.

Type: Non ionic detergent
Form: 10% aqueous solution (w/v) or 100% solution
Mol. Formula: $C_{34}H_{62}O_{11}$ for x =10
Mol. Weight: 647 (for x=10)
Absorbance (254nm): 0.16 (0.05% w/v)
Aldehyde content: <100µM
Peroxide content (as H_2O_2): <50µM
Critical micelle concentration (CMC): approx 0.2 x 10^{-3}M (25°C)
Aggregation number: 100-155
Cloud Point: 65°C
Average micellar weight: 80,000
Application: One of the most commonly used non ionic detergents for solubilizing membrane proteins during isolation of membrane-protein complexes. Ultra low aldehyde and peroxide concentrations reduce the effects of peroxidase and carbonyl compounds that negatively interact with membrane proteins

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Cat. No.	Description	Size
786-513	Triton® X-100, 100% solution	500ml
786-514	Triton® X-100, 100% solution	1L
DG007	Triton® X-100, 10% solution	5 x 10ml vials
DG008	Triton® X-100, 10% solution	10 x 10ml vials
DG507	Triton® X-100, 10% solution	50ml bottle
DG517	Triton® X-100, 10% solution	100ml bottle

Triton® X-114

Polyethylene glycol tert-octylphenyl ether

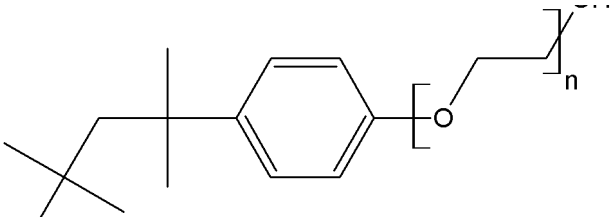

Figure 9: Structure of Triton® X-114.

Type: Non ionic detergent
Form: 10% aqueous solution (w/v)
Mol. Formula: $C_{14}H_{22}O \bullet [C_2H_4O]_{7\text{-}8}$ for n =8
Mol. Weight: ~537 (for n=7-8)
Absorbance (254nm): 0.18 (0.05% w/v)
Aldehyde content: < 100µM
Peroxide content (as H_2O_2): < 50µM
Critical micelle concentration (CMC): approx 0.35 x 10^{-3}M (25°C)
Cloud Point: 23°C
Application: A non ionic detergent with a low cloud point (23°C) making it suitable for protein solubilization with phase-partitioning of hydrophilic proteins from amphiphilic proteins

Cat. No.	Description	Size
786-515	Triton® X-114, 100% solution	500ml
786-516	Triton® X-114, 100% solution	1L
DG009	Triton® X-114, 10% solution	5 x 10ml vials
DG010	Triton® X-114, 10% solution	10 x 10ml vials
DG509	Triton® X-114, 10% solution	50ml bottle
DG518	Triton® X-114, 10% solution	100ml bottle

Brij® 35

Polyoxyethylene (23) lauryl ether

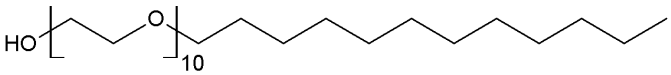

Figure 10: Structure of Brij® 35.

Type: Non ionic detergent
Form: 10% aqueous solution (w/v), white solid
Mol. Formula: $C_{12}H_{26}O(OCH_2CH_2)_{10}$
Mol. Weight: 627
Absorbance (225nm): 0.07 (1% w/v)
Aldehyde content: < 100µM
Peroxide content (as H_2O_2): < 50µM
Critical micelle concentration (CMC): 90µM
Aggregation number: 24-40
Cloud Point: >100°C
Average micellar weight: 48,000
Appearance: Clear solution with a faint yellow color
Application: For protein extraction, permeabilization of cells, and preparation of yeast spheroplasts

CITED REFERENCES

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Cat. No.	Description	Size
786-351	Brij® 35	250g
786-521	Brij® 35	500g
DG003	Brij® 35, 10% solution	5 x 10ml vials
DG004	Brij® 35, 10% solution	10 x 10ml vials
DG503	Brij® 35, 10% solution	50ml bottle
DG515	Brij® 35, 10% solution	100ml bottle

Brij® 58

Polyoxyethylene (20) cetyl ether

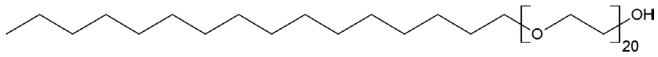

Figure 11: Structure of Brij® 58.

Type: Non ionic detergent
Form: 10% aqueous solution (w/v), white solid
Mol. Formula: $C_{16}H_{33}(OCH_2CH_2)_{20}$-OH
Mol. Weight: 1122
Absorbance (225nm): 0.0788 (1% w/v)
Aldehyde content: < 100µM
Peroxide content (as H_2O_2): < 50µM
Critical micelle concentration (CMC): 7-77µM
Aggregation number: 70
Cloud Point: >100°C
Average micellar weight: 79,000
Appearance: Clear solution with a faint yellow color
Application: For protein extraction, permeabilization of cells, and preparation of yeast spheroplasts

Cat. No.	Description	Size
786-352	Brij® 58	250g
786-522	Brij® 58	500g
DG005	Brij® 58, 10% solution	5 x 10ml vials
DG006	Brij® 58, 10% solution	10 x 10ml vials
DG505	Brij® 58, 10% solution	50ml bottle
DG516	Brij® 58, 10% solution	100ml bottle

Tween® 20

Polyethylene glycol sorbitan monolaurate

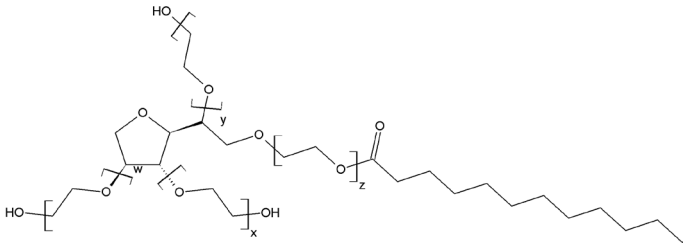

Figure 12: Structure of Tween® 20.

Type: Non ionic detergent
Form: 10% aqueous solution (w/v), 100% solution
Mol. Formula: $C_{18}H_{34}O_6 \bullet [C_2H_4O]_{w+x+y+z}$ for w+x+y+z =20
Mol. Weight: ~1227 (for w+x+y+z =20)
Absorbance (215nm): 0.05 (0.05% w/v)
Aldehyde content: < 100µM
Peroxide content (as H_2O_2): < 50µM
Critical micelle concentration (CMC): approx 0.06 x 10^{-3}M
Cloud Point: 76°C
Application: A commonly used non ionic detergent for solubilizing membrane proteins during isolation of membrane-protein complexes

CITED REFERENCES

1. *Luke, C. et al (2015) ACS Synth Biol. DOI: 10.1021/acssynbio.5b00094*

Cat. No.	Description	Size
786-517	Tween® 20, 100% solution	500ml
786-518	Tween® 20, 100% solution	1L
DG011	Tween® 20, 10% solution	5 x 10ml vials
DG012	Tween® 20, 10% solution	10 x 10ml vials
DG511	Tween® 20, 10% solution	50ml bottle
DG519	Tween® 20, 10% solution	100ml bottle

Tween® 80

Polyethylene glycol sorbitan monooleate

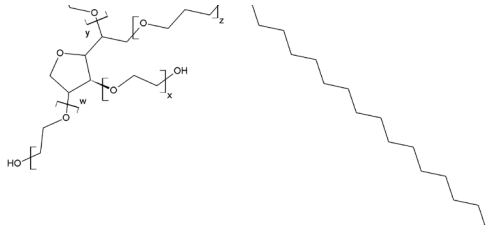

Figure 13: Structure of Tween® 80.

Type: Non ionic detergent
Form: 10% aqueous solution (w/v), 100% solution
Mol. Formula: $C_{24}H_{46}O_6 \bullet [C_2H_4O]_{w+x+y+z}$ for w+x+y+z =20
Mol. Weight: ~1325 (for w+x+y+z =20)
Absorbance (250nm): 0.14 (0.05% w/v)
Aldehyde content: < 100µM
Peroxide content (as H_2O_2): < 50µM
Critical micelle concentration (CMC): ~0.012 x 10^{-3}M (25°C)
Aggregation number: 60
Cloud Point: 65°C
Average micellar weight: 79,000
Application: For solubilizing membrane proteins during isolation of membrane-protein complexes

CITED REFERENCES

1. O'Donnell, V. et al (2016) J Virol. doi: 10.1128/JVI.01760-16
2. Carlson, J. et al (2016) Viruses doi:10.3390/v8100291
3. O'Donnell, V. (2016) Virus Res.doi:10.1016/j.virusres.2016.05.014
4. Andrade-Ochoa, S. et al (2015) BMC Complement. Altern. Med. 15:332
5. Knudson, S.E. et al (2014) Tuberculosis. http://dx.doi.org/10.1016/j.tube.2014.03.007
6. Hewitt, D. et al (2008) J. Chromatogr A. 1215:156

Cat. No.	Description	Size
786-519	Tween® 80, 100% solution	500ml
786-520	Tween® 80, 100% solution	1L
DG013	Tween® 80, 10% solution	5 x 10ml vials
DG014	Tween® 80, 10% solution	10 x 10ml vials
DG513	Tween® 80, 10% solution	50ml bottle
DG520	Tween® 80, 10% solution	100ml bottle

Nonidet® P-40 Substitute

Nonylphenyl-polyethylene glycol

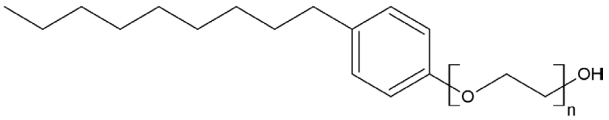

Figure 14: Structure of Nonidet® P-40 Substitute.

Type: Non ionic detergent
Form: 10% aqueous solution (w/v), 100% solution
Mol. Formula: $C_{15}H_{24}O[C_2H_4O]_n$
Mol. Weight: 573 (for n=8)
Absorbance (254nm): 0.14 (0.05% w/v)
Aldehyde content: < 100µM
Peroxide content (as H_2O_2): < 50µM
Critical micelle concentration (CMC): approx 0.05-0.3mM (25°C)
Application: A commonly used non ionic detergent for solubilizing membrane proteins during isolation of membrane-protein complexes

Cat. No.	Description	Size
786-511	Nonidet® P-40 Substitute, 100% solution	500ml
786-512	Nonidet® P-40 Substitute, 100% solution	1L
DG001	Nonidet® P-40 Substitute, 10% solution	5 x 10ml vials
DG002	Nonidet® P-40 Substitute, 10% solution	10 x 10ml vials
DG501	Nonidet® P-40 Substitute, 10% solution	50ml bottle
DG514	Nonidet® P-40 Substitute, 10% solution	100ml bottle

Octyl β Glucoside

N-Octyl-beta-D-glucopyranoside

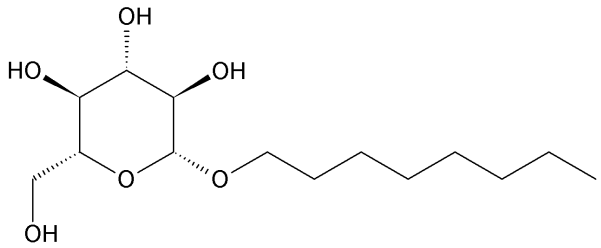

Figure 15: Structure of Octyl-β-Glucoside.

Type: Non ionic detergent
Mol. Formula: $C_{14}H_{28}O_6$
Mol. Weight: 292.4
Form: White to off white powder
Purity: >98%
Solubility: Water soluble
Critical micelle concentration (CMC): 20-25mM (25°C)
Aggregation number: 84
Cloud Point: >100°C
Average micellar weight: 25,000
Application: Widely used for membrane proteins. For solubilization of membrane-bound proteins in their native state, and for preparation of lipid vesicles. Low molecular weight permits easy removal by dialysis. Useful for solubilizing enzymes, receptors and phosphatidylcholine bilayers

Cat. No.	Description	Size
DG015	Octyl β Glucoside	1g
DG016	Octyl β Glucoside	5g

MEGA 8

Octanoyl-N-methylglucamide

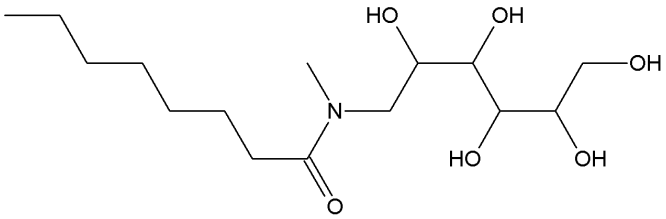

Figure 16: Structure of MEGA 8.

Type: Non ionic detergent
Mol. Formula: $C_{15}H_{31}NO_6$
Mol. Weight: 321.4
Form: White powder
Purity: >99%
Solubility: Water soluble
Critical micelle concentration (CMC): 58mM (25°C)
Application: Non ionic detergent that is water soluble and readily removed by dialysis. Used for the solubilization of membranes

CITED REFERENCES

1. *Kudlinzki, D. et al (2015) Acta Cryst. 71:1088*

Cat. No.	Description	Size
DG017	MEGA 8	1g
DG018	MEGA 8	5g

MEGA 9

Nonaoyl-N-methylglucamide

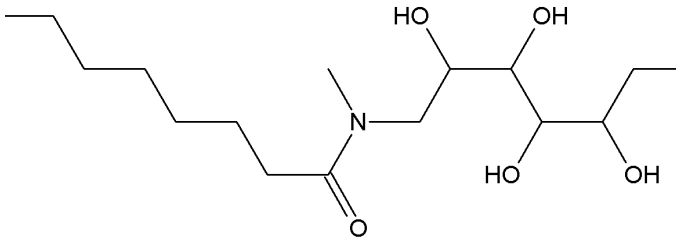

Figure 17: Structure of MEGA 9.

Type: Non ionic detergent
Mol. Formula: $C_{16}H_{33}NO_6$
Mol. Weight: 335.4
Form: White powder
Purity: >99%
Solubility: Water soluble
Critical micelle concentration (CMC): 19-25mM (25°C)
Application: Non ionic detergent that is water soluble and readily removed by dialysis. Used for the solubilization of membranes

Cat. No.	Description	Size
DG019	MEGA 9	1g
DG020	MEGA 9	5g

MEGA 10

Decanoyl-N-methylglucamide

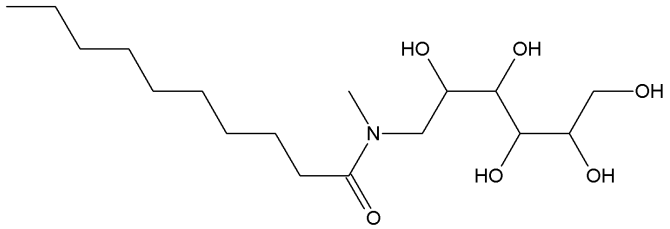

Figure 18: Structure of MEGA 10.

Type: Non ionic detergent
Mol. Formula: $C_{17}H_{35}NO_6$
Mol. Weight: 349.5
Form: White powder
Purity: >99%
Solubility: Water soluble
Critical micelle concentration (CMC): 6-7mM (25°C)
Application: Non ionic detergent that is water soluble and readily removed by dialysis. Used for the solubilization of membranes

Cat. No.	Description	Size
DG021	MEGA 10	1g
DG022	MEGA 10	5g

Big CHAP

N,N-Bis[3-(D-gluconamido)propyl]cholamide

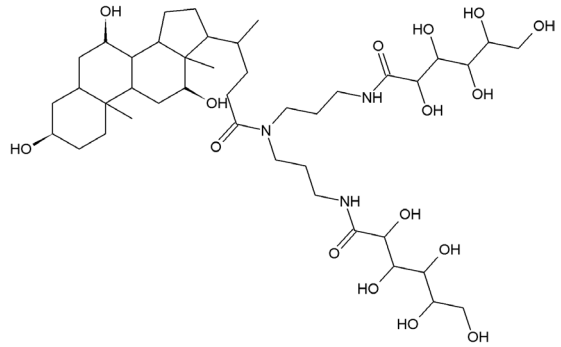

Figure 19: Structure of Big CHAP.

Type: Non ionic detergent
Mol. Formula: $C_{42}H_{75}N_3O_{16}$
Mol. Weight: 878.1
Form: Fine colorless crystals
Purity: >99%
Solubility: Water soluble
Conductivity: <25µS in a 10% solution
Critical micelle concentration (CMC): 3.4mM (25°C)
Aggregation number: 10
Average micellar weight: 8800
Application: Non ionic detergent for membrane solubilization

Cat. No.	Description	Size
DG023	Big CHAP	1g
DG024	Big CHAP	5g

Deoxy Big CHAP

N,N-Bis[3-(D-gluconamido)propyl]deoxycholamide

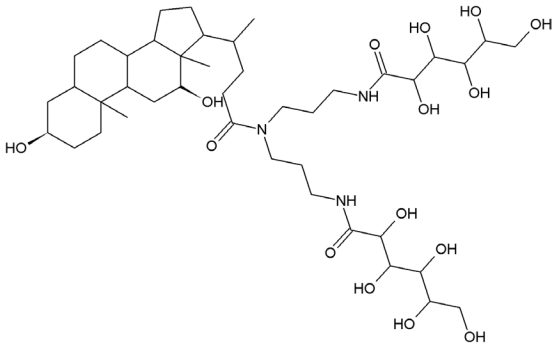

Figure 20: Structure of Deoxy Big CHAP.

Type: Non ionic detergent
Mol. Formula: $C_{42}H_{75}N_3O_{15}$
Mol. Weight: 862.1
Form: White powder
Purity: >95%
Solubility: Water soluble
Critical micelle concentration (CMC): 1.1-1.4mM (25°C)
Aggregation number: 8-16
Average micellar weight: 10,500
Application: Non ionic detergent that is water soluble and has increased solubility compared to CHAPS. Used for the solubilization of membranes

Cat. No.	Description	Size
DG025	Deoxy Big CHAP	1g
DG026	Deoxy Big CHAP	5g

Proteomic Grade Detergent Variety Pack

The variety pack contains a selection of our non ionic Proteomic Grade Detergent Solutions, Zwitterionic and non-detergent sulfobetaines for trial and optimization.

The following proteomic grade detergents are available as a trial pack. The pack contains one 10ml vial of 10% aqueous solutions of:

- Triton® X-100
- Triton® X-114
- Tween® 20
- Tween® 80
- Nonidet® P-40 Substitute
- Brij® 35
- Brij® 58

And 1gm of:

- CHAPS
- NDSB 201

Cat. No.	Description	Size
DG521	Proteomic Grade Detergent Variety Pack	9 vials

2D-Detergent™

Ultra low conductivity & low carbonyl & peroxide contaminants

Our 2D-Detergent™ solutions contain reduced peroxides and carbonyl compounds. In addition, the detergents have less than 15µS conductivity. These detergents are offered as 10% aqueous solutions, sealed under inert gas and are suitable for all protein applications, including 2D-electrophoresis. These non ionic detergents are suitable for isolating membrane-protein complexes.

The aldehyde levels are <50µM, the peroxide levels are <10µM and have a conductivity of <15µS.

FEATURES

- Low conductivity; <15µS
- Low peroxide contamination
- Low carbonyl contamination
- Reduced metal ions
- Ready to use 10% aqueous solutions
- Sealed under inert gas to prevent oxidation

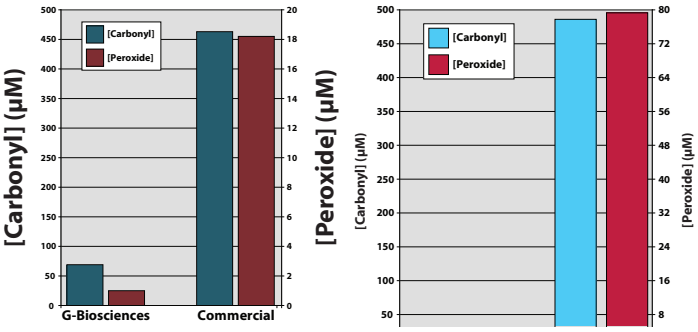

Figure 21: Comparison of carbonyl (as a measure of aldehyde) (blue) and peroxide (red) concentration in G-Biosciences 2D-Detergent™ NP-40 Substitute (left) or 2D-Detergent™ Triton® X-100 (right) and non-proteomic grade commercially available detergents.

Cat. No.	Description	Size
DG907	2D-Detergent™ Triton® X-100	5 x 10ml vials
DG908	2D-Detergent™ Triton® X-100	10 x 10ml vials
DG901	2D-Detergent™ Nonidet® P-40 Substitute	5 x 10ml vials
DG902	2D-Detergent™ Nonidet® P-40 Substitute	10 x 10ml vials

Ionic Detergents

Ionic detergents are used for complete disruption of cellular structure and denaturing of proteins for separation during gel electrophoresis. Ionic detergents bind with protein molecules masking their native charge and rendering the protein molecules the overall charge of the ionic detergent.

SDS

Sodium dodecyl sulfate

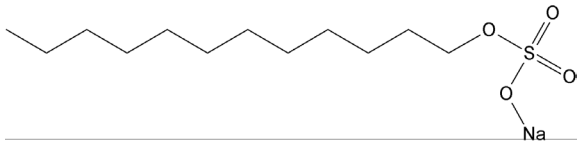

Figure 22: Structure of SDS.

Type: Anionic detergent
Mol. Formula: $C_{12}H_{25}NaO_4S$
Mol. Weight: 288.38
Form: White to off white powder, 10% or 20% solution
Purity: >99%
Solubility: Water
Critical micelle concentration (CMC): 7-10mM (25°C)
Aggregation number: 62
Cloud point: >100°C
Average micellar weight: 18,000
Application: Capable of almost complete disruption of cellular structures and denaturation. Used for solubilization of a wide variety of proteins, including membrane proteins, for electrophoretic separation. Detergent molecules tightly bind with the protein molecules masking their native charge and rendering the protein molecules with an overall negative charge.

Cat. No.	Description	Size
DG092	SDS	100g
DG093	SDS	500g
R014	SDS, 10% Solution	100ml
786-016	SDS, 20% Solution	500ml
786-017	SDS, 20% Solution	1L

CTAB

Hexadecyltrimethylammonium bromide

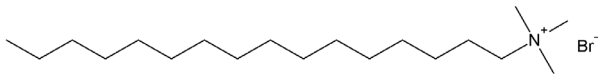

Figure 23: Structure of CTAB.

Type: Cationic detergent
Mol. Formula: $CH_3(CH_2)_{15}N(Br)(CH_3)_3$
Mol. Weight: 364.5
Form: White to off white powder
Purity: >99%
Solubility: Water soluble
Critical micelle concentration (CMC): 1mM (25°C)
Aggregation number: 61 in water; 169 in 13mM KBr
Average micellar weight: 62,000
Application: A cationic detergent used for solubilization of a wide variety of proteins and nucleic acids

CITED REFERENCES

1. *Canbek, Z.C. et al (2015) Cryst. Growth Des. DOI: 10.1021/acs.cgd.5b00121*
2. *Youssry, M. et al (2012) Meas. Sci. Technol. 23:125306*

Cat. No.	Description	Size
DG094	CTAB	25g
DG095	CTAB	100g

Deoxycholate

Deoxycholic acid, sodium salt

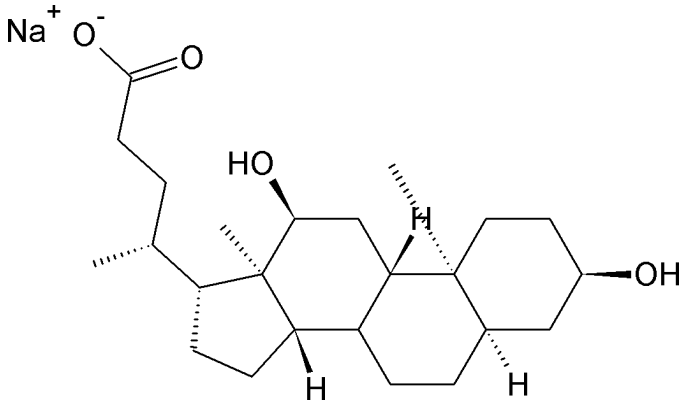

Figure 24: Structure of Deoxycholate.

Type: Anionic detergent
Mol. Formula: $C_{24}H_{39}NaO_4$
Mol. Weight: 414.6
Form: White to off white powder
Purity: >99%
Solubility: Water soluble
Critical micelle concentration (CMC): 4-8mM (25°C)
Aggregation number: 3-12
Average micellar weight: 1,200-5,000
Application: Anionic detergent useful for extraction of membrane proteins and nuclei isolation. Not recommended for use with Mn^{2+}

Cat. No.	Description	Size
DG090	Deoxycholate, sodium salt	100g
DG091	Deoxycholate, sodium salt	500g

Zwitterionic detergents protect the native state of proteins without altering the native charge of the protein molecules. Zwitterionic detergents are used for isoelectric focusing and 2D electrophoresis. Synthetic zwitterionic detergents are known as sulfobetaines. Sulfobetaines retain their zwitterionic characteristics over a wide range of pH. The following zwitterionic detergents are the most efficient and widely used for 2D gel electrophoresis.

CHAPS

3-[(3-Cholamidopropyl)dimethylammonio]-1-propanesulfonate

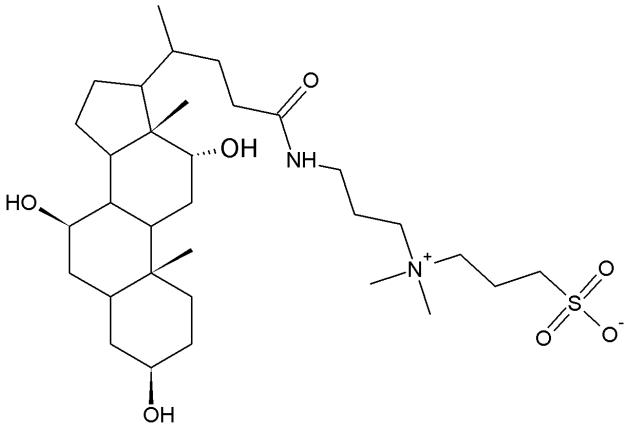

Figure 25: Structure of CHAPS.

Type: Zwitterionic detergent
Mol. Formula: $C_{32}H_{58}N_2O_7S$
Mol. Weight: 614.9
Form: White solid
Purity: >99%
Solubility: Water soluble
Conductivity: <25µS in a 10% solution
Critical micelle concentration (CMC): 6-10mM (25°C)
Aggregation number: 10
Cloud point: >100°C
Average micellar weight: 6150
Application: Zwitterionic detergent. Non-denaturing. Electrically neutral. CHAPS has all the advantages of sulfobetaine containing detergents: hydrophobic, bile salt, and anionic detergents in a single molecule. Better at solubilizing proteins and breaking protein-protein interactions. Less protein aggregation than non ionic detergents. Capable of solubilizing opiate receptors. CHAPS can be removed from protein solutions with a detergent removing gel or by dialysis.

CITED REFERENCES

1. Kaliszewski, M. et al (2016) SOD1 Front. Cell. Neurosci. doi.10.3389/fncel.2016.00287
2. Chandrasekhar, R. et al (2016) J Biol Chem. Doi: jbc.M115.705301.
3. Alzayady, K.J. et al (2013) JBC. 288:11122
4. Alzayady, K.J. et al (2013) JBC. 288:29772
5. Onodera, H. et al (2013) Brain Res. 1534:87
6. Ahmed, Z. et al (2013) Food Chem. 140:238
7. Song, W. et al (2013) Neurobio. Dis. 51:72
8. Tiwari, V. et al (2012) PLOS. DOI: 10.1371/journal.pone.0039451
9. Fujisawa, Y. et al (2009) Biochem. J. 423: 219

Cat. No.	Description	Size
DG049	CHAPS	1g
DG050	CHAPS	5g
DG051	CHAPS	25g
DG096	CHAPS	100g
DG097	CHAPS, 5% filtered solution	50ml
DG098	CHAPS, 5% filtered solution	100ml
DG099	CHAPS, 5% filtered solution	500ml

CHAPSO

3-[(3-Cholamidopropyl)dimethylammonio]-2-hydroxy-1-propanesulfonate

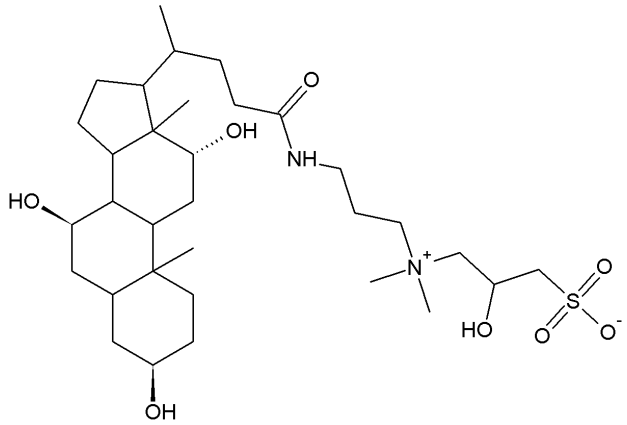

Figure 26: Structure of CHAPSO.

Type: Zwitterionic detergent
Mol. Formula: $C_{32}H_{58}N_2O_8S$
Mol. Weight: 630.9
Form: White solid
Purity: >99%
Solubility: Water soluble
Conductivity: <50µS in a 10% solution
Critical micelle concentration (CMC): 8mM (25°C)
Aggregation number: 11
Cloud point: 90°C
Average micellar weight: 7000
Application: Zwitterionic detergent. Non-denaturing. Electrically neutral. Higher solubility than CHAPS because of a more polar head group. Solubilizes membrane proteins in their native state. Solubilizes opiate receptor to a state exhibiting reversible binding of opiates

Cat. No.	Description	Size
DG052	CHAPSO	1g
DG053	CHAPSO	5g

Sulfobetaine 3-10 (SB 3-10)

N-Decyl-N,N-dimethyl-3-ammonio-1-propanesulfonate

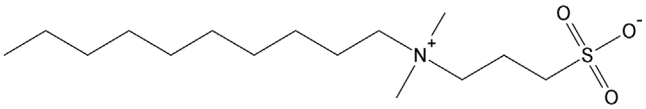

Figure 27: Structure of Sulfobetaine 3-10.

Type: Zwitterionic detergent
Mol. Formula: $CH_3(CH_2)_9N^+(CH_3)_2CH_2CH_2CH_2SO_3^-$
Mol. Weight: 307.5
Form: White solid
Purity: >99%
Solubility: Water soluble
Critical micelle concentration (CMC): 25-40mM (25°C)
Aggregation number: 41
Average micellar weight: 12,600
Application: Zwitterionic detergent for solubilization of membrane proteins in their native state

CITED REFERENCES

1. Basic, A. et al (2017) BMC Microbiol.DOI: 10.1186/s12866-017-0967-9

Cat. No.	Description	Size
DG054	Sulfobetaine 3-10	1g
DG055	Sulfobetaine 3-10	5g

Sulfobetaine 3-12 (SB 3-12)

N-Dodecyl-N,N-dimethyl-3-ammonio-1-propanesulfonate

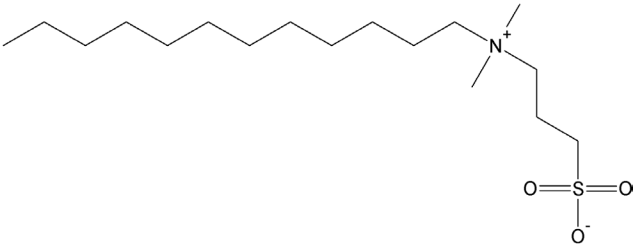

Figure 28: Structure of Sulfobetaine 3-12.

Type: Zwitterionic detergent
Mol. Formula: $CH_3(CH_2)_{11}N^+(CH_3)_2CH_2CH_2CH_2SO_3^-$
Mol. Weight: 335.5
Form: White solid
Purity: >99%
Solubility: Water soluble
Critical micelle concentration (CMC): 2-4mM (25°C)
Aggregation number: 55
Average micellar weight: 18,500
Application: Zwitterionic detergent for solubilization of membrane proteins in their native state

Cat. No.	Description	Size
DG056	Sulfobetaine 3-12	1g
DG057	Sulfobetaine 3-12	5g

Sulfobetaine 3-14 (SB 3-14)

N-Tetradecyl-N,N-dimethyl-3-ammonio-1-propanesulfonate

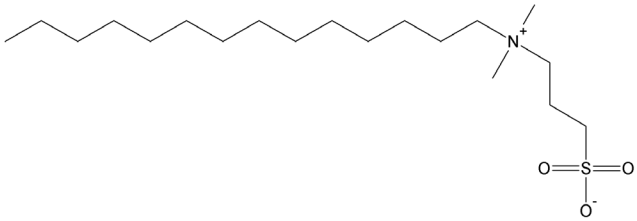

Figure 29: Structure of Sulfobetaine 3-14.

Type: Zwitterionic detergent
Mol. Formula: $CH_3(CH_2)_{13}N^+(CH_3)_2CH_2CH_2CH_2SO_3^-$
Mol. Weight: 364.0
Form: White solid
Purity: >99%
Solubility: Water soluble
Critical micelle concentration (CMC): 0.1-0.4mM (25°C)
Aggregation number: 83
Average micellar weight: 30,200
Application: Zwitterionic detergent for solubilization of membrane proteins in their native state

Cat. No.	Description	Size
DG058	Sulfobetaine 3-14	1g
DG059	Sulfobetaine 3-14	5g

ASB-14

Amidosulfobetaine-14

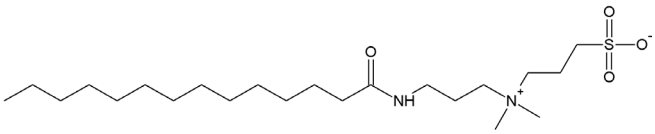

Figure 30: Structure of ASB-14.

Type: Zwitterionic detergent
Mol. Formula: $C_{22}H_{46}N_2O_4S$
Mol. Weight: 434.7
Form: White to off white powder
Purity: >99%
Solubility: Water soluble
Conductivity: <50µS in a 10% solution
Critical micelle concentration (CMC): 8mM (25°C)
Application: Zwitterionic detergent. Aminosulfobetaine with C_{14} alkyl tail. Useful for solubilizing proteins for 2D analysis. Optimal solubility achieved in urea-thiourea mixtures and not in urea alone. Reported to show better protein solubilization properties than CHAPS. ASB-14 has been shown to solubilize membrane proteins previously undetected

Cat. No.	Description	Size
DG060	ASB-14	1g
DG061	ASB-14	5g

ASB-16

Amidosulfobetaine-16

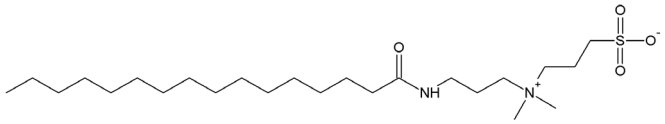

Figure 31: Structure of ASB-16.

Type: Zwitterionic detergent
Mol. Formula: $C_{24}H_{50}N_2O_4S$
Mol. Weight: 462.7
Form: White to off white powder
Purity: >99%
Solubility: Water soluble
Conductivity: <50µS in a 10% solution
Critical micelle concentration (CMC): 8mM (25°C)
Application: Zwitterionic detergent. Aminosulfobetaine with C_{16} alkyl tail. In some cases superior than ASB-14. Useful for solubilizing proteins for 2D analysis. Optimal solubility achieved in urea-thiourea mixtures and not in urea alone. Reported to show better protein solubilization properties than CHAPS. ASB-16 has been shown to solubilize membrane proteins previously undetected

CITED REFERENCES

1. McCoin, C. et al (2015) Am J Physiol. DOI: 10.1152/ajpendo.00602.2014
2. Shrake, R. et al (2014) J Colloid Interface Sci. 437:140

Cat. No.	Description	Size
DG062	ASB-16	1g
DG063	ASB-16	5g

ASB-C8Ø

4-n-Octylbenzoylamido-propyl-dimethylammonio sulfobetaine

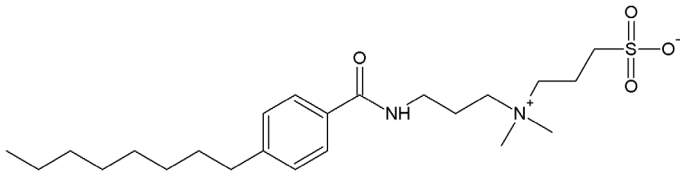

Figure 32: Structure of ASB-C8Ø.

Type: Zwitterionic detergent
Mol. Formula: $C_{23}H_{40}N_2O_4S$
Mol. Weight: 440.6
Form: Off white powder
Purity: >99%
Solubility: Water soluble
Application: A Zwitterionic aminosulfobetaine with an aromatic core that stabilizes and solubilizes integral membrane proteins. Useful for solubilizing proteins for 2D analysis

Cat. No.	Description	Size
DG064	ASB-C8Ø	1g
DG065	ASB-C8Ø	5g

NON-DETERGENT SULFOBETAINE

NDSB 201

3-(1-Pyridino)-1-propane sulfonate

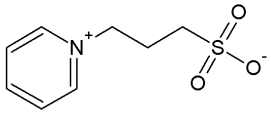

Figure 33: Structure of NDSD 201.

Type: Non-detergent sulfobetaine
Mol. Formula: $C_8H_{11}NO_3S$
Mol. Weight: 201.4
Form: White powder
Purity: >99%
Solubility: Water
Application: NDSB 201 is a zwitterionic compound. Unlike zwitterionic detergents, the hydrophobic group in NDSB 201 is too short to form micelles, even at 1M concentrations. NDSB 201 has been used for purification of proteins and solubilization of protein samples for 2D gel electrophoresis

CITED REFERENCES

1. Otsuka, T. et al (2014) Infect. Immun. doi: 10.1128/IAI.01832-14

Cat. No.	Description	Size
DG080	NDSB 201	25g
DG081	NDSB 201	100g

Detergent Selection Guide

Detergent	Type	Cat. No.	Size	Molecular Weight	Critical Micelle Concentration(mM)	Aggregation No.[2]	HLB[3]	Average Micellar Weight	Cloud Point (°C)	Conductivity (µS)	Sterile
NON IONIC DETERGENTS											
BigCHAP	Research Grade	DG023	1gm	878.1	3.4	10	-[4]	8,800	-	<25 in 10% solution	
		DG024	5gm								
Deoxy BigCHAP	Research Grade	DG025	1gm	862.1	1.1-1.4	8-16	-	10,500	-	-	
		DG026	5gm								
Brij® 35	Research Grade	786-521	500gm	627	0.09	24-40	16.9	48,000	>100	-	
	Proteomic Grade (10% aqueous solution)	DG003	5 x 10ml							<50	Yes
		DG004	10 x 10ml								
		DG503	50ml								
		DG515	100ml								
Brij® 58	Research Grade	786-522	500gm	1122	0.007-0.077	70	15.7	79,000	>100	-	
	Proteomic Grade (10% aqueous solution)	DG005	5 x 10ml							<50	Yes
		DG006	10 x 10ml								
		DG505	50ml								
		DG516	100ml								
MEGA 8	Research Grade	DG017	1gm	321.4	58	-	-	-	-	-	
		DG018	5gm								
MEGA 9	Research Grade	DG019	1gm	335.4	19-25	-	-	-	-	-	
		DG020	5gm								
MEGA 10	Research Grade	DG021	1gm	349.5	6-7	-	-	-	-	-	
		DG022	5gm								
Nonidet® P-40 Substitute	Research Grade	786-511	500ml	573	0.05-0.3	-	-	-	45-50	<50	Yes
		786-512	1 liter								
	Proteomic Grade (10% aqueous solution)	DG001	5 x 10ml								
		DG002	10 x 10ml								
		DG501	50ml								
		DG514	100ml								
	2D-Detergent™ (10% aqueous solution)	DG901	5 x 10ml							<15	Yes
		DG902	10 x 10ml								
Octyl ß Glucoside	Research Grade	DG015	1gm	292.4	20-25	84	-	25,000	>100	-	
		DG016	5gm								
Triton® X-100	Research Grade	786-513	500ml	647	0.2-0.9	100-155	13.5	80,000	65	-	
		786-514	1 liter								
	Proteomic Grade (10% aqueous solution)	DG007	5 x 10ml							<50	Yes
		DG008	10 x 10ml								
		DG507	50ml								
		DG517	100ml								
	2D-Detergent™ (10% aqueous solution)	DG907	5 x 10ml							<15	Yes
		DG908	10 x 10ml								
Triton® X-114	Research Grade	786-515	500ml	537	0.35	-	12.4	-	23	-	
		786-516	1 liter								
	Proteomic Grade (10% aqueous solution)	DG009	5 x 10ml							<50	Yes
		DG010	10 x 10ml								
		DG509	50ml								
		DG518	100ml								
Tween® 20	Research Grade	786-517	500ml	1227	0.06	-	16.7	-	76	-	
		786-518	1 liter								
	Proteomic Grade (10% aqueous solution)	DG011	5 x 10ml							<50	Yes
		DG012	10 x 10ml								
		DG511	50ml								
		DG519	100ml								
Tween® 80	Research Grade	786-519	500ml	1325	0.012	60	15	76,000	65	-	
		786-520	1 liter								
	Proteomic Grade (10% aqueous solution)	DG013	5 x 10ml							<50	Yes
		DG014	10 x 10ml								
		DG513	50ml								
		DG520	100ml								

Detergent	Type	Cat. No.	Size	Molecular Weight	Critical Micelle Concentration(mM)	Aggregation No.[2]	HLB[3]	Average Micellar Weight	Cloud Point (°C)	Conductivity (µS)	Sterile
IONIC DETERGENTS											
CTAB	Proteomic Grade	DG094	25gm	364.5	1	170	-	62,000	-	-	
		DG095	100gm								
Deoxycholate	Proteomic Grade	DG090	100gm	414.6	4-8	3-12	16	1,200-5,000	-	-	
		DG091	500gm								
SDS	Proteomic Grade	DG092	100gm	288.38	7-10	62	40	18,000	>100	-	
		DG093	500gm								
	10% Solution	R014	100ml								
	20% Solution	786-016	500ml								
		786-017	1L								
ZWITTERIONIC DETERGENTS											
ASB-14	Proteomic Grade	DG060	1gm	434.7	8	-	-	-	-	<50 in 10% solution	
		DG061	5gm								
ASB-16	Proteomic Grade	DG062	1gm	462.7	8	-	-	-	-	<50 in 10% solution	
		DG063	5gm								
ASB-C8Ø	Proteomic Grade	DG064	1gm	440.6	-	-	-	-	-	-	
		DG065	5gm								
CHAPS	Proteomic Grade	DG049	1gm	614.9	6-10	10	-	6,150	>100	<25 in 10% solution	
		DG050	5gm								
		DG051	25gm								
		DG096	10gm								
CHAPSO	Proteomic Grade	DG052	1gm	630.9	8	11	-	7,000	90	<50 in 10% solution	
		DG053	5gm								
Sulfobetaine 3-10	Proteomic Grade	DG054	1gm	307.5	25-40	41	-	12,600	-	-	
		DG055	5gm								
Sulfobetaine 3-12	Proteomic Grade	DG056	1gm	335.5	2-4	55	-	18,500	-	-	
		DG057	5gm								
Sulfobetaine 3-14	Proteomic Grade	DG058	1gm	364	0.1-0.4	83	-	30,200	-	-	
		DG059	5gm								
NON-DETERGENT SULFOBETAINE											
NDSB 201	Proteomic Grade	DG080	25gm	201.4	No micelles are formed				-	-	
		DG081	100gm								

[1]**Critical Micellular Concentration (CMC)** determined at 20-25°C. CMC is the concentration at which micelles begin to form.
[2]**Aggregation number** is the average number of monomers in a micelle.
[3]**Hydrophile-Lipophile Balance (HLB)** defines the hydrophilic character of a detergent.
[4]Data not available

Triton is a registered trademark of Union Carbide Corp; Tween is a registered trademark of Uniqema, a business unit of ICI Americas, Inc.; Nonidet is a registered trademark of Shell Chemicals; Brij is a registered trademark of ICI Americas, Inc.

G-Biosciences offers a range of detergent removal systems that use either a rapid column based system or a precipitation system. Our products are designed to remove a wide variety of detergents, including SDS, Tween® 20, Triton® X-100, Triton® X-114, Nonidet® P-40, CTAB, CHAPS, deoxycholate and Lubrol®.

DetergentOUT™ GBS10

Detergents are essential for protein solubility during protein extraction and sample preparation, especially when working with hydrophobic proteins. The presence of high concentrations of detergents in protein samples can impair ELISA, IEF, protease digestion of proteins and suppress peptide ionization when analyzed by mass spectrometry.

The resin removes free, unbound anionic, nonionic or zwitterionic detergents (e.g. SDS, Triton® X-100 or CHAPS) from aqueous protein and peptide samples with minimal sample loss for downstream analysis by mass spectrometry and other techniques.

The DetergentOUT™ GBS10 columns were shown in independent studies to be fully compatible with DI-QTOF and LC-MS/MS (see references). The use of the DetergentOUT™ GBS10 columns significantly increased the number of peptide spectra detected. In addition, the DetergentOUT™ GBS10 columns have a high binding capacity for detergents, i.e. 6mg SDS and 14mg Triton® X-100 by every ml settled resin.

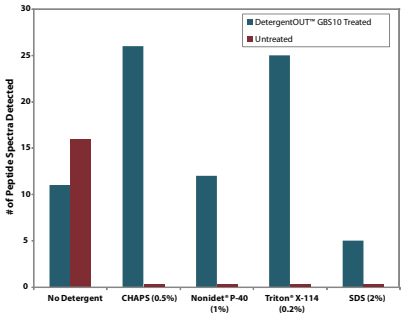

Figure 34: DetergentOUT™ GBS10 removes detergent & allows detection of peptide fragments by mass spectrometry. 500µg phosphorylase B was digested in solution & then the indicated amount of detergent was added. Samples were treated with DetergentOUT™ GBS10. Number of peptide spectra were determined as per the protocol of Alvarez, S. et al.

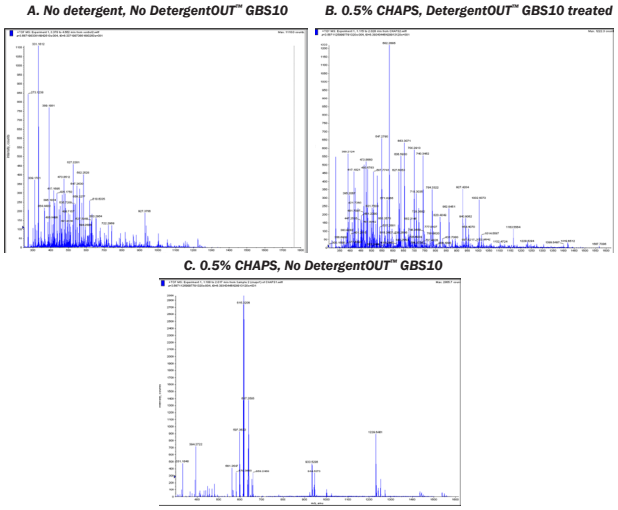

Figure 35: DetergentOUT™ GBS10 enhances mass spectrometry spectra. 5µg/µl protein mixture (BSA, cyctochrome C and phosphorylase B) in water (Panel A) was supplemented with 0.5% CHAPS (Panel B and C). The CHAPS containing sample was treated with DetergentOUT™ GBS10 and compared to an untreated sample (Panel C). Spectra were generated per Alvarez et al.

Detergent	% Removed	BSA	Phosphorylase B	Cytochrome C	E.coli Lysate
Triton X-100, 2%	>99	>90	>91	>92	>93
Triton X-114, 2%	>96	>99	>98	>97	>91
Nonidet P-40, 1%	>96	>93	>95	>91	>91
Brij 35, 1%	>99	>98	>99	>97	>91
SDS, 2.5%	>99	>96	>97	>92	>90
Sodium deoxycholate, 5%	>99	>99	>99	>98	>95
CHAPS, 3%	>99	>92	>95	>92	>91
Octyl glucoside, 5%	>99	>93	>95	>96	>91
Lauryl maltoside, 1%	>97	>99	>99	>99	>91

Table 1: A comparison of the detergent removal rates and percentage protein recovery with DetergentOUT™ GBS10.

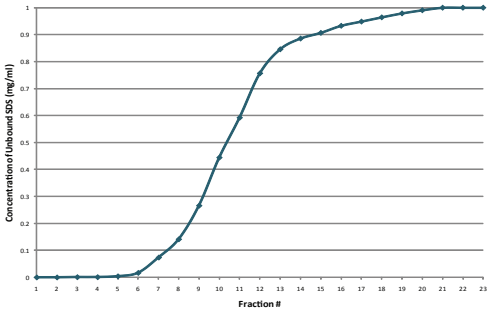

Figure 36: DetergentOUT™ GBS10 retains ≤6mg SDS per ml settled resin. SDS solution was continuously applied to DetergentOUT™ GBS10 column. The graph depicts the amount of SDS detected in the flow-through. SDS was not detected until fraction 7, so after 12mg SDS had been retained by the 2ml of DetergentOUT™ GB-S10 resin, resulting in a 6mg/ml settled resin binding capacity.

CITED REFERENCES

1. Srivastasva, O.P. et al (2017) Biochemistry and Biophysics Report. http://dx.doi.org/10.1016/j.bbrep.2017.01.011
2. Min, L. et al (2015) Electrophoresis. DOI: 10.1002/elps.201400579
3. Valente, K. N. et al (2014) Biotechnol Bioeng. DOI: 10.1002/bit.25515
4. Hou, S. et al (2013) Methods. 61:269
5. Higgins, D. et al (2005) Anitmicrob. Agents Chemother. 49:1127
6. Hashii, N. et al (2005) Proteomics. 5:4665

Cat. No.	Description	Sample Size (µl)	Resin (µl)	Size
786-154	DetergentOUT™ GBS10-125	10-30	125	10 columns
786-155	DetergentOUT™ GBS10-800	30-200	800	10 columns
786-156	DetergentOUT™ GBS10-3000	200-750	3,000	10 columns
786-157	DetergentOUT™ GBS10-5000	500-1,250	5,000	10 columns
786-998	DetergentOUT™ GBS10 Spin Plates	30-200	800	2 plates
786-159	DetergentOUT™ GBS10 Resin	-	-	10ml resin

OrgoSol DetergentOUT™

Suitable for hydrophobic proteins, removes detergents and concentrates protein solutions

OrgoSol DetergentOUT™ is suitable for removal of detergents from protein solutions, including hydrophobic protein solutions and is compatible with all detergent types. Its performance is not dependent on detergent concentration in the solution, is highly flexible and can process small and large sample volumes.

OrgoSol DetergentOUT™ first concentrates the protein solution through precipitation and then the detergent is extracted and removed with the supplied OrgoSol™ buffer. The proprietary precipitation agent ensures >99% protein recovery, however precipitation may result in some loss of a protein's biological activity.

Two sizes are offered: Micro Kit for processing up to a total of 10ml protein solution and Medi Kit for processing up to a total of 30ml protein solution, either in a single or multiple experiments.

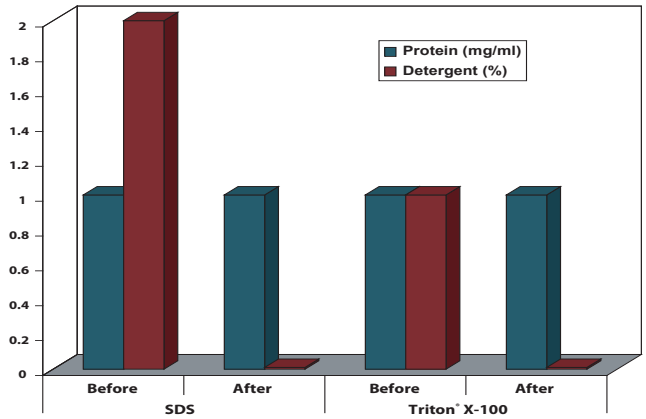

Figure 37: Removal of Detergent. Hydrophobic nuclear fraction proteins (1mg/ml) in 2% SDS and 1% Triton® X-100 before and after OrgoSol DetergentOUT™ treatment.

CITED REFERENCES

1. Cortes, D.F. et al (2012) Electrophoresis. 33:3712
2. Orr, S.J. et al (012) Molecular Sys Biol. DOI: 10.1038/msb.2012.5
3. Troese, M.J. et al (2011) Infect Immunol. 79:4696

Cat. No.	Description	Size
786-127	OrgoSol DetergentOUT™, Micro	For 10ml
786-128	OrgoSol DetergentOUT™, Medi	For 30ml

DetergentOUT™ Tween®

Removal of Tween® (polysorbate) detergents

A spin column format detergent removal resin for polysorbate or Tween® detergents or surfactants. DetergentOUT™ Tween® removes polysorbate detergents without significant loss of proteins, dilution of the protein solution, or change to the buffer composition of the protein solution.

Cat. No.	Description	Size
786-214	DetergentOUT™ Tween®, Micro	10 columns
786-215	DetergentOUT™ Tween®, Medi	10 columns

DETERGENT OPTIMIZATION

Optimizer *blue*BALLS™

Establish optimal detergent conditions

The "Critical Micelle Concentration" (CMC) of a detergent varies with temperature, pH, ionic strength, detergent concentration, purity and presence of organic agents in the detergent. Using a large excess of detergent may pose problems during purification or other downstream applications.

A simple hydrophobic dye solubilization method for the determination of CMC has been described (1) and involves the solubilization of a dye in a detergent solution only in the presence of micelles. The amount of dye solubilized is directly proportional to the micelle concentration. The CMC is determined by plotting optical density of the solubilized dye against detergent concentration. The points of inflection on the plot of observed data versus detergent concentration correspond to the CMC of a typical detergent.

This method is simple and comparable to CMC determined by expensive light scattering or surface tension methods. Furthermore, this method is applicable to all detergents.

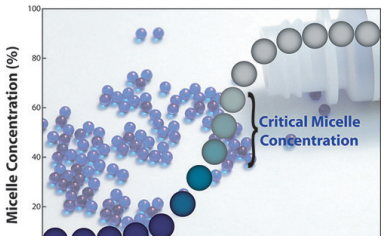

Figure 38: Graphical representation of critical micelle concentration determination. Blue colored Optimizer blueBALLS™ imitate membrane proteins and solubilize when the critical micellar concentration is reached, releasing a non-reactive blue color into the extraction buffer.

FEATURES

- Hydrophobic blue dye coated glass balls that behaves as membrane proteins
- Add to extraction or perform parallel extractions
- Ensures optimal detergent concentration is used for extraction
- Improve downstream processing results
- Compatible with all detergent types

APPLICATIONS

- Tool for establishing an optimal protein extraction protocol

CITED REFERENCES

1. Chang, Y. H. et al (2015) J. Proteome. Res. 14:1587
2. Falkinham, J.O. et al (2012) Tuberculosis. 92:173
3. Maisuria, B.B. et al (2011) Bioorganic & Medicinal Chemistry 19:2918
4. Deutschle, T. et al (2006) Toxicol In Vitro. 20:1472

Cat. No.	Description	Size
DGA01	Optimizer *blue*BALLS™	500

DETERGENT ASSAY

CMC-535™ Detergent Assay

The CMC-535™ Detergent Assay is a simple, fluorescent assay designed for the detection of various detergents in aqueous solutions and is an ideal compliment for the DetergentOUT™ detergent removal columns.

The basic principle of the assay is the interaction of detergents with the CMC-535™ Fluorescent Dye, resulting in an enhancement of the fluorescent signal that is proportional to the detergent concentration.

The assay can be used to quantitate detergent levels with the use of a standard curves or can be used to compare detergent removal rates to a diluted starting material sample.

The assay is designed to detect detergents at concentrations below their CMC values for most detergents. The assay is compatible with most aqueous buffers, with the exception of buffers that contain phosphates, including molecules that release phosphates (i.e. ADP and ATP). As the assay is sensitive to molecules with strong hydrophobic segments, we recommend <1mg/ml protein and <0.1mg/ml nucleic acids. Suitable for 200 microwell assays.

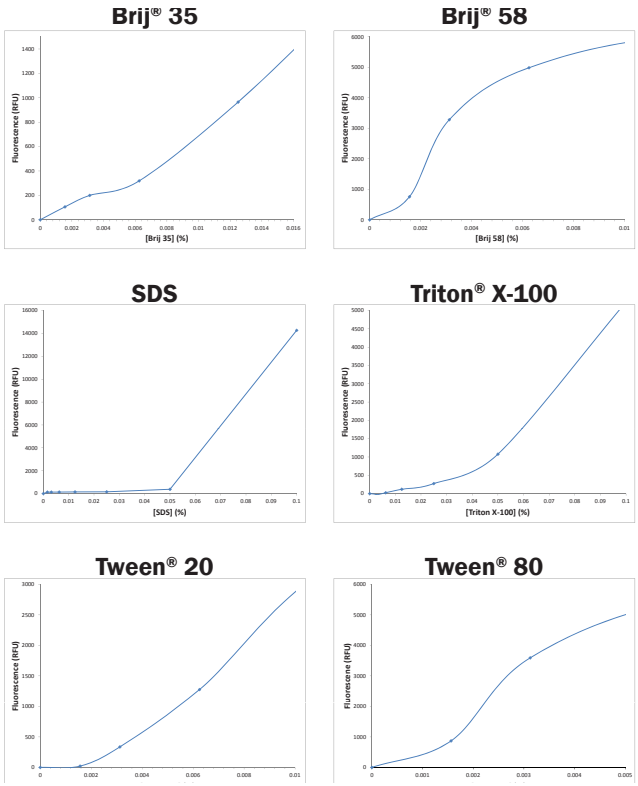

Figure 39: A selection of detergent standard curves produced with CMC-535™ Detergent Assay.

Cat. No.	Description	Size
DG535	CMC-535™ Detergent Assay	200 Microwell Assays

SDS Detection & Estimation

A reagent kit for detection and estimation of SDS in a sample. Mix the test sample in the extraction buffer reagents provided with the kit. If SDS is present in the sample, a blue color is extracted that can be quantitatively measured.

CITED REFERENCES

1. *Kapoor, M. and Rajagopal, R. (2011) Int. Biodeter. Biodegrad. 65:896*
2. *Sivakumar, S. et al (2007) JBC 282:7312*

Cat. No.	Description	Size
786-129	SDS-Detection Kit	15 assays

G-Biosciences Product Line Overview

Protein Research

- **Estimation**
  - 7 Assays
    - CB-X
    - Non Interfering
    - SPN
    - RED 660
    - dotMETRIC
    - BCA
    - CB
- **Isolation**
  - Extraction & Lysis
    - Sample Grinding
    - Lysis Buffers
      - Mild Denaturing
      - Strong Chaotropic
      - Specialized
  - Fractionation & Enrichment
    - 12 Fractionation Kits
  - Sample Preparation
    - Dialysis (Micro)
    - Concentration
    - Contamination Removal
      - Desalting
      - Detergent Removal
      - General Cocktails
      - Species Specific
      - Individual Inhibitors
  - Reagents
    - Protease Inhibitors
    - Detergents
    - Chaotropes
- **Detection**
  - Electrophoresis
    - 1D & 2D Reagents
      - 2D Specific Kits
      - Buffers & Reagents
    - Gel Stains
      - Coomassie
      - Silver
      - Reversible
  - Western Blotting
    - 1 Hour System
    - Blocking Agents
      - Non-Animal
      - Animal
      - Non-Protein
    - Secondary Antibodies
    - Chemiluminescence Detection
  - Mass Spectrometry
    - Trypsin, Mass Spec Grade
    - InGel Kits
  - Assays (ELISA)
    - Coated Plates
    - Blocking Agents
      - Non-Animal
      - Animal
      - Non-Protein
    - Secondary Antibodies
    - Detection Reagents
- **Purification**
  - Affinity Resins
    - 6X His Tag
      - Nickel resin
      - Cobalt resin
      - Copper resin
      - Zinc Resin
    - GST Tag
      - Glutathione Resin
    - Biotin Tag
      - Streptavidin Resin
    - CBP Tag
      - Calmodulin Resin
  - Activated Resins
    - Sulfhydryl reactive
    - Amine reactive
    - Carboxyl reactive
    - Drug/ Steroid reactive
  - Antibody Purification
    - Protein A or G
    - Pearl Resin
- **Modification**
  - Labeling
    - Biotin
    - Fluorescent Dye
    - Enzyme (HRP/AP)
  - Crosslinkers
  - Reducing Agents
  - Alkylating Agents
  - Protein Cleavage
  - Iodination
  - Amino Acid Side Chain Modifiers
- **Antibody**
  - Production
    - Carrier Proteins
      - BSA
      - KLH
      - HyperCarrier
  - Purification
    - Peptide Coupling
    - Protein A or G Resin
    - Activated Resins
    - Pearl Resin
    - Thiophilic Resin
  - Fragmentation
    - Ficin
    - Pepsin
    - Papain

BioAssays

- SAM Methyltransferase
  - Continuous, Enzymatic Assays
- Cell Toxicity & Proliferation
  - Lactate Dehydrogenase (LDH)
  - SRB
  - WST-1
- **Apoptosis**
  - Caspase
    - Assays
    - Substrates
    - Inhibitors
  - Inducers
- **Protease**
  - Assays
  - Inhibitors
- Phosphatase
- Peroxide
- **B-Galactosidase**
  - CPRG
  - Fluorescent (MUG)

Molecular Biology

- **Genomic DNA**
  - Isolation
    - Tissue
    - Blood
    - Plant
    - Yeast
    - Bacteria
    - Fungi
    - Mouse Tail
- **Plasmid DNA**
  - Isolation
  - Colony Screening
  - Transformation
- **Electrophoresis**
  - Apparatus
  - Loading Dyes
  - DNA Ladders
- **PCR**
  - Gel Extraction
  - Taq
  - dNTPs
- **RNA**
  - Extraction
  - RNase Decontamination
- **Yeast**
  - Transformation
  - Plasmid Isolation

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