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**BIO SURFACTANTS AND SYNTHETIC VARIANTS USED IN HERBAL FACE
WASH: A REVIEW**

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ABSTRACT

Surfactants or surface active agents reduce the surface tension (interfacial tension) between a gas and a liquid or between two liquids or between a liquid and a solid. It consists two part. One part is hydrophilic in nature while the second portion is lipophilic in nature. The surfactants play a vital role in cosmetics, medicinal and textile processing. Here the, the natural surfactants, bio surfactants and synthetic surfactants are reviewed. Market available herbal face wash and their surfactants also discussed.

KEYWORDS

Surfactants, Interfacial tension and Face wash.

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INTRODUCTION

Compounds which decrease the surface tension (interfacial tension) between a gas and a liquid or between two liquids or between a liquid and a solid are known as surfactants or surface active agents. Surfactants are usually amphipathic organic compounds that are that possess both hydrophobic ("tails") and hydrophilic ("heads") groups. As a result, they are soluble in both organic solvents and water. The presence of both polar and non-polar regions indicates the existence of surfactants which is formed by two region with different affinities for the solvents. One prefers water (polar solvents) as well as the other prefers oil (non-polar solvents)¹.

Terms related to Surfactants

Amphipathic

Combining both natures [oil and water]

Amphiphilic

With affinity for both [oil and water]

Hydrophilic

With affinity for water

Lipophilic

With affinity for oil

Lyophilic

With affinity for the solvent

Lyophobic

Lack of affinity for the solvent³.

CLASSIFICATION OF SURFACTANTS

Surfactant can be classified based on charged groups present in their structure.

Non-ionic surfactant

Do not have any charge groups over its head. Examples are Polyoxyethylene alcohol, Alkyl phenol ethoxylate.

Ionic surfactant

The head of an ionic surfactant carries a net charge.

Anionic surfactant

The head of anionic surfactant carries negative charge. Examples are sodium stearates, sodium dodecyl sulphate and sodium dodecyl benzenesulfonate.

Cationic surfactant

The head of cationic surfactant carries positive charge. Examples are Laurylamine hydrochloride, Trimethyl dodecyl ammonium chloride, cetyl trimethyl ammonium bromide.

Zwitterionic surfactant

Zwitterionic surfactant is also known as amphoteric. Surfactants have both cationic and anionic ions attached to the same molecule. Examples are Dodecyl betaine, Lauramidopropyl betaine, cocoamido-2-hydroxypropyl sulfobetaine¹.

NATURAL SURFACTANTS

Natural surfactants are natural substances of plant and animal origin that can reduce surface tension. The empirical formula for surfactant is $C_{26}H_{31}O_{10}$. It is mainly glycoside. The glycosidic structure of

surfactant molecule has two ends-hydrophilic end that attract water and hydrophobic end that repel water. Due to this nature, while the water-hating extreme repels water, it is attracted to oily and greasy dirt, and the water-loving extreme attracts water molecules.

Bio surfactants

Bio surfactants are amphiphilic compounds that occur on living surfaces, mainly on surfaces of microbial cells or secreted hydrophobic and hydrophilic extracellular entities, which have the ability to accumulate between liquid phases, thus reducing surface or interfacial tension at the surface or interface. They have the unique property of reducing surface and interfacial tension through the same mechanisms as chemical surfactants⁵.

Examples of bio surfactants

Glycolipids

Glycolipids are comprised of sugars with long-chain of aliphatic acids or hydroxyl aliphatic acids. The organization is by methods for either ether or ester gathering. The most popular glycolipids are rhamnolipids, sophorolipids and trehalolipids.

Rhamnolipids

Rhamnolipids are the glycolipids in which one or two molecules of rhamnose are simultaneous to one or two molecules of hydroxydecanoic acid. It is the widely studied bio surfactant which are the principal glycolipids produced by *P. aeruginosa*.

Sophorolipids

These are glycolipids which are created by yeasts and comprise of adimeric sugar sophorose connected to a long-chain hydroxyl fatty acid by glycosidic linkage. Sophorolipids, by and large a combination of no less than six to nine distinct hydrophobic sophorolipids and lactone type of the sophorolipid is ideal for some applications.

Trehalolipids

This is one more sort of glycolipids. Disaccharide trehalose associated at C-6 and C-6 to mycolic destructive is associated with most kinds of Mycobacterium, Corynebacterium and Nocardia. Mycolic acids are the long chain, α -spread and β -hydroxyl unsaturated fats. Trehalolipids from grouped living creatures shift in the size and

construction of mycolic destructive, the amount of carbon atoms display and the level of unsaturation Trehalose lipids got from Rhodococcus erythropolis and Arthrobacter sp. decreased the surface pressure and interfacial strain in culture stock.

Surfactin

This is a champion among the most potential bio surfactant is joined by Bacillus subtilis. It is included a seven amino corrosive ring structure joined to an unsaturated fat chain by techniques for lactone linkage. It reduces the surface strain from 72 to 27.9Mn/m at an obsession as low as 0.005%⁶.

Advantages of bio surfactants

Biodegradability

Biocompatibility and digestibility

Low toxicity

Availability of raw materials

Economics

Disadvantages of bio surfactants

Expensive large scale production

Difficulty in obtaining pure substances

Very low productivity

Strong foam formation

Synthetic surfactants

Synthetic surfactants are chemical compounds which reduce the interfacial tension.

Examples: sodium laurylsulphate, sodiumstearate, ammonia lauryl sulphate, sodium cocoyl isethionate.

Sodium lauryl sulphate

Sodium lauryl sulphate is an alkaline, anionic surfactants. Now medical products, it has a number of functional uses as an emulsifying agent, modified-release agent, penetration enhancer and solublising enhancer⁸.

Ammonium lauryl sulphate











Very high foam surfactants that interrupt the surface tension of water in part by forming micelles. Generally used in shampoo and body wash preparations.

Application of surfactants in cosmetic industry

In cosmetic industry due to its emulsification, foaming, water binding capacity, spreading and wetting properties effect on viscosity and on product consistency, bio surfactant have been proposed to replace chemically synthesised surfactant. These surfactant are used as emulsifier, foaming agent, solubilizer, wetting agent, cleanser, anti-microbial agent, mediator for enzyme action, in insect repellents, antacids, bath products, acne pads, anti-dandruff product, contact lens solution, baby products, mascara, lipstick, toothpaste, dentine cleanser etc¹⁰.

Examples of natural surfactant⁴

Table No.1: Examples of natural surfactants

S.No	Name	Biological Source	Family	Chemical Constituents	Images
1	Aloe vera	Dried latex of leaves of it	Liliaceae	Vitamins Enzymes Mineral Salicylic acids Amino acids	
2	Fenugreek	The seeds and green leaves of fenugreek	Legumes	Cumarin, lipida, vitamins, mineeals, mucilage, protein	
3	Ginseng	The root of plants in the genus panax	Araliaceae	Ginseng saponins, ginseng oils and phytosterol, carbohydrate	
4	Shikakai	It consists the fruits of the plant acacia concinna linn	Fabaceae	Lupol, spinasterol, acacic acid, lactone, arabinose	
5	Soap bark	The inner dried bark of quillia saponaria molina	Rosaceae	Saponins, qualic acid, calcium oxalate, starch, sucrose and tannin	
6	Alfalfa	Perennial flowering plant	Fabaceae	Carbohydrate, protein	
7	Asparagus	Perennial flowering plant species	Asparagaceae	Essential oils, asparagine, arginine, tyrosine, flavonoids	
8	China rose	Flowering plant	Malvaceae	Tannins, anthraquinones, qunines, phenols, flavanoids, alkaloids, terpenoids, saponins, protein	
9	Tea	Prepared leaves and leaf buds	Theaceae	Polyphenols, catechins, flavanols, phenolic acid	
10	Oats	The grains refers specifically to the edible seeds of oat grass	Poaceae	Carbohydrates, dietary fiber, beta -glucans, fat	

Bio surfactant and their origin⁷

Table No.2: Bio surfactant and their origin

S.No	Class	Micro organism
1	Rhamnolipids	P.aeruginoso, Pseudomonas sp.
2	Sophorolipids	T.bombicola, T.apicola
3	Trehalolipids	R.erythropolis, Mycobacterium sp
4	Cellobiolipids	U.zeaе, U.Maydis
5	Surfactin	B.subtilis
6	Alasan	A.radioresistens
7	Liposan	C.lipolytica

Surfactants used in market available face wash⁹

Table No.3: Surfactants used in market available face wash

S.No	Name of face wash	Surfactant
1	Himalaya moisturizing aloe vera face wash	Aqueous ammonium lauryl sulphate Cocoamidopropyl betaine
2	Aroma magic Neem and tea tree face wash	Lauryl glycoside
3	Wow face wash	Decyl glycoside
4	St .Botanica face wash	Sodium lauryl sarcosinate
5	Nivea face wash	Sodium myreth sulfate
6	Deep clean face wash	Cocoamidopropyl betaine
7	Cetaphil cleanser	Sodium laureth sulfate
8	Everyuth tulasi turmeric face wash	Sodium lauryl ether sulfate
9	Clean and clear foaming face wash	Hydroxyl propyl methyl cellulose
10	Pears pure and gentle cleaning face wash	Sodium lauryl ether sulfate
11	Lakme clean up face wash	Cocoamidopropyl betaine
12	Joy face wash-Tea	Dodocyl benzene sulfonate
13	VLCC face wash	Sodium laureth sulfate
14	Lotus face wash	Sodium lauryl ether sulphate Sodium lauryl sulphate
15	Ponds pure white anti-pollution activated charcoal face wash	Decyl glucoside

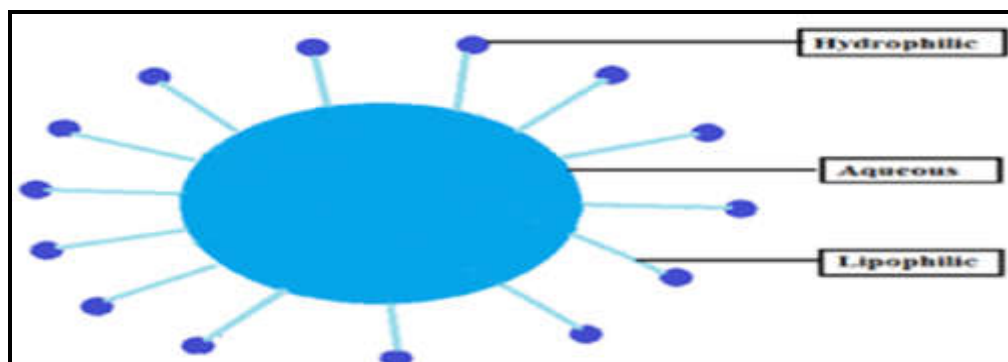


Figure No.1: Structure of surfactants²

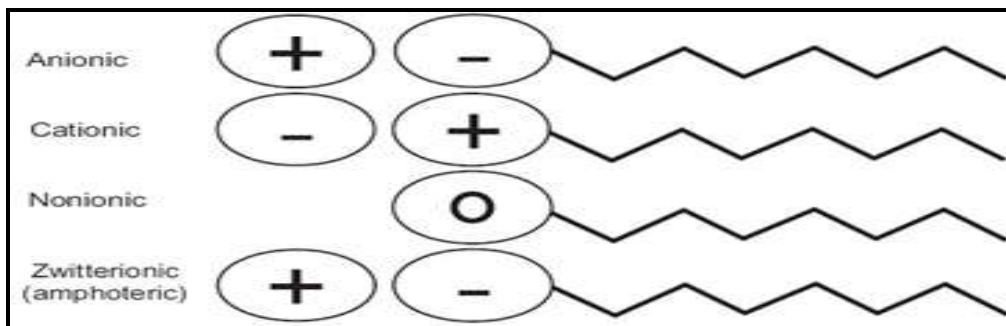


Figure No.2: Types of surfactants

CONCLUSION

From this review, it has been concluded that natural, bio and synthetic surfactants show the vital role in development of different pharmaceutical products by acting as dispersant, detergents, foaming agents, wetting agents and emulsifier. The surfactants are surface active compounds possess the capability of decreasing surface and interfacial tension at the interfaces between gases, liquid, solids. The study reveals the fundamental knowledge of surfactant is the very essential in formulation science.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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