Done By:

L. Dhuha Abdul Saheb Alshammaa
Pharmacognosy department


100

Introduction:

Amphipathic molecules having the ability to form micelles are termed as Surface Active Agents or SURFACTANTS. The surface activating ability makes surfactants excellent emulsifiers, dispersing, and foaming agents.

They reduce the surface tension of aqueous media (e.g. air-water), and the interfacial tension of liq–liq (e.g. oil-water or water-oil) or liq–solid (e.g. wetting phenomena) systems. They assist the solubility of polar compounds in organic solvents. Surfactants are the active ingredients found in soaps and detergents and are commonly used to separate oily stuff from a particular media. Because of these properties, surfactants find application in a variety of industrial processes. Surfactants are of synthetic or biological origin.

Biosurfactants:

Environmentally friendly
(‘green’) and mild surfactants
derived essentially from vegetable raw materials. Demand for these surfactants is stirred up by a fast-growing market of natural and organic products, especially from the personal care sector. Some recent developments in the field of green and natural surfactants from oleochemicals, butter, carbohydrates, proteins, and other raw materials are exemplified.

Characteristic features of green surfactants are:

- complete biodegradability in different surroundings,
- proven safety for the environment,
- minor contribution to the global warming and the ozone layer depletion,
- low or no waste technologies involving low-energy processing of renewable materials,
- low toxicity and volatility,
- excellent dermatological profile,
- absence of carcinogenicity and teratogenicity,
- appropriate certificates and documentation available.

Biosurfactant properties

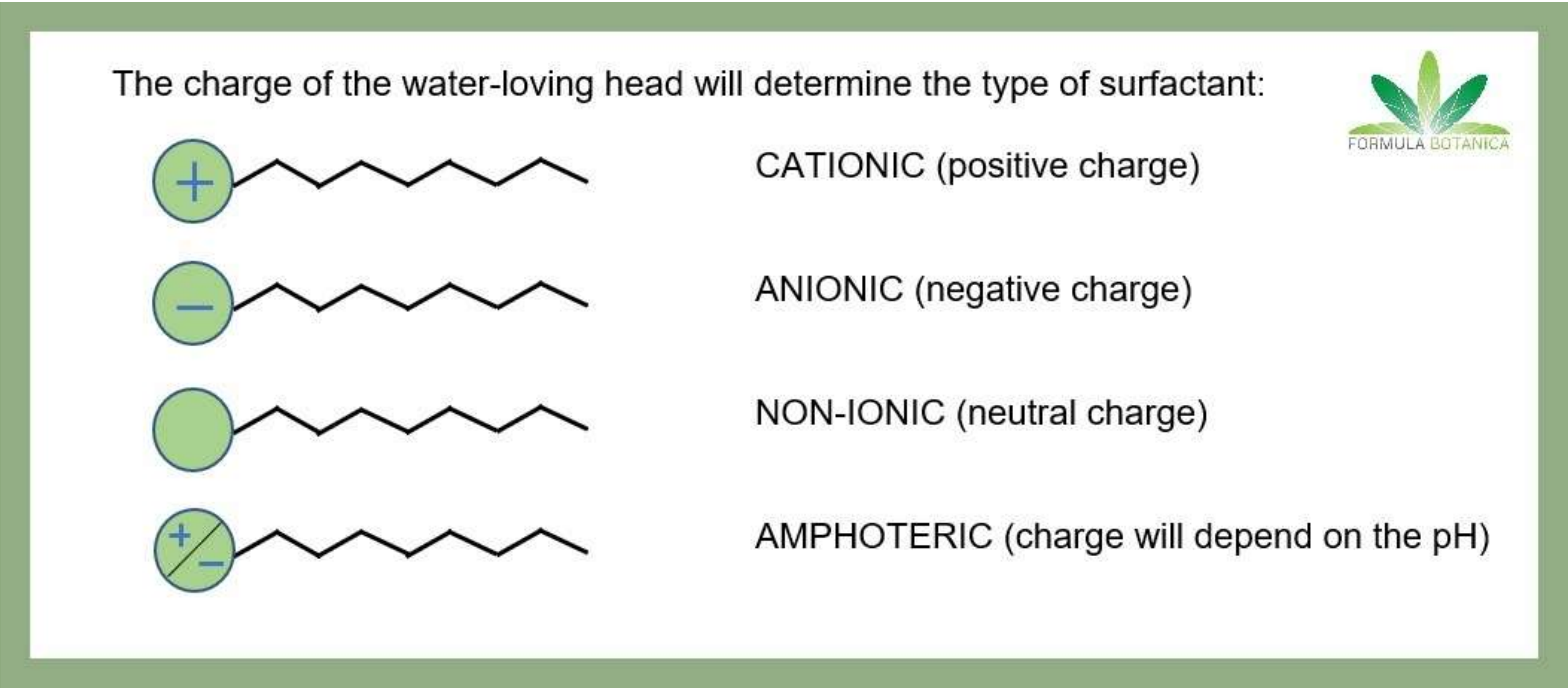
1. Surfactants are amphiphiles with both hydrophilic and hydrophobic moieties. This feature renders surfactants capable of reducing surface and interfacial tension and forming emulsions.

2. Diverse functional properties such as emulsification, foaming, wetting, cleansing, surface activity, phase separation and reduction in viscosity of crude oil, makes it some of the most versatile process chemicals.

3. The activities of biosurfactant depend on their concentration until the critical micelle concentration (CMC) is obtained. Above the CMC, biosurfactant monomer molecules associate to form micelles, bilayers and vesicles. This property enables biosurfactants to minimize the surface and interfacial tension and enhance the solubility and bioavailability of nonpolar organic compounds.

4. The CMC is usually used to measure surfactant efficiency. More efficient biosurfactants have lower CMC, i.e. less biosurfactant is needed to decrease the surface tension.

Biosurfactant classification



GROWTH

of naturally derived surfactants is expected to continue, driven by consumers who are increasingly demanding environmentally friendly products

SOME FAMILIAR REPRESENTATIVES OF THIS CATEGORY OF SURFACTANTS INCLUDE:

Alkyl Polyglucosides

Produced from the reaction of glucose and vegetable-derived fatty alcohols

Plantaren 1200 N UP:
Lauryl Glucoside

Endinol Mild CG-850: Caprylyl/-Capryl Glucoside

Lactylates

Emulsifiers sourced from vegetable-derived fatty acids reacted with lactic acid

Akoline SL:
Sodium Stearoyl Lactylate

Capmul S12L:
Sodium Lauroyl Lactylate

Glutamates

Reaction products of L-Glutamic Acid and Coconut fatty acids

Amisoft CK-11:
Potassium Cocoyl Glutamate

BIOSURFACTANTS TO KEEP AN EYE ON:

- Algae-derived
- Rhamnolipids
- Sophorolipids
- Marine-derived


5
NATURAL
SURFACTANTS
FORMULA BOTANICA

We selected five plant-derived non-ionic surfactants for comparison: Coco glucoside, Decyl glucoside, Lauryl glucoside, Sucrose cocoate, Caprylyl/Capryl glucoside.

Main Applications:

1. Personal Care:

Anti-aging Products, Acne Skin Creams, Body Wash, Hair Care.

2. Agricultural:

Food Emulsifiers, Crop Health (Adjuvants), Soil Remediation.

3. Cleaning Agents:

Medical Device Cleaning, Surface Cleaning, Oil Spill Clean-up.

4. High Tech Services:

Metals Recovery, Soil Remediation, Enhanced Oil Recovery.

Factors affecting biosurfactant production:

Surface activity

Emulsification and de-emulsification

Biodegradability

Temperature, pH and ionic strength tolerance

Chemical diversity

Recommendations for future research:

Compared to synthetic surfactants, biosurfactants possess many industrially attractive properties and advantages. Yet, they have not been commercialized extensively due to high investment costs. The major operating costs in their production are fermentation and recovery. To overcome this, the use of pure carbon sources (such as oleic acid) can be done. But the use of these pure carbon sources is extremely expensive. The use of low-cost raw materials can be a possible solution. Different substances such as vegetable oils, animal fat, distillery, and dairy wastes, starchy wastes, etc. can be used as raw materials. Rhamnolipid production from olive oil mill effluent by Pseudomonas spp. is a remarkable development in this field. Recent improvement in the production technology of biosurfactants has already enabled a 10 to 20-fold increment in productivity, but further significant improvements are required. Little is known about the production of biosurfactants by microbes. Most of the productions were done under laboratory conditions. So development is needed in this section

Conclusion:

In spite of many laboratory-based successes in biosurfactants production, its production at an industrial scale remains a challenging issue. The commercial production of any product depends on its market demand, ease of availability of raw material, and production cost. Low productivity, expensive downstream processing, and a dearth of appropriate understanding of the bioreactor systems are the major barriers to the production of biosurfactants. We expect that in the future super active microbial strains would be developed using a genetic modification for their production at the industrial level. The invention of modern methods and the discovery of more reliable sources are also expected in the future. So yields would then be increased and production costs would be decreased and new biosurfactants will continue to be discovered and the chemistry of these molecules would be better understood. So the time is not far when the biosurfactants will begin to compete favorably with their synthetic equivalents in the surfactant industry.

THANK YOU