Extended Abstract Malaria Control & Elimination 2021
Vol.10 No.1

Infectious Diseases & Endocrinology 2019: Some notes about medical applications for microbial biosurfactants - Samer M Al-Hulu - Green University of Al Qasim

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Bio-surfactants are amphiphilic biological compounds made extracellular or cell membrane part bacteria, yeast and filamentous fungi. Bio-surfactants are made up of a hydrophilic moiety, may be acid, peptide, action, anion, mono, di or polysaccharides and a hydrophobic moiety, which may be unsaturated or saturated hydrocarbon chains or fatty acids. Many advantages for bio-surfactants comprise biodegradability, low toxicity, biocompatibility and digestivity, presence of raw materials and specificity. The bio-surfuctant production was known by many methods includes, hemolytic activity, oil displacement test emulsification index, surface tension reduction, blue agar plate or CTAB agar plate method, hydrocarbon overlay agar method. There are many medial applications for bio-surfactant which includes antimicrobial activity. Biosurfactants having capacity to be toxic on cell membrane permeability in similar method to detergent effect, anti-cancer activity, the neuronal differentiation in PC 12 cells induced by MEL and get ready the ground work for the use of microbial extracellular glycolipids as novel reagents for cancer cell treatment, antiviral activity, the sophorolipids surfactants produce by C. bombicola having structural analogues such as the sophorolipiddiacetate ethyl ester which is powerful spermicidal and virucidal agent and its virucidal activity similar to nonoxynol-9 against the human semen. Anti-adhesive agents, bio-surfactants having capability for adhesion residing for pathogenic organisms to solid surfaces or infection site, anti-fungal activity, flocculosin is a glycolipid produced by yeast like fungus *P. flocculosa* having antifungal activity against pathogenic yeasts and human mycoses. Immunological adjuvants, bacterial lipo-peptides when mix with classic antigens having active nontoxic, nonpyrogenic immunological adjuvants. Gene delivery, the liposomes based on bio-surfactants having increasing efficiency for gene transfection than cationic liposomes trading use.

Microbial compounds that possess pronounced surface and emulsifying activities are categorized as biosurfactants. Biosurfactants include a wide range of chemical structures, such as glycolipids, lipopeptides, polysaccharide–protein complexes, phospholipids, fatty acids and neutral lipids. For instance, Cooper and Goldenberg described different bio emulsifiers produced by two Bacillus species in water-soluble substrates with different emulsifying and surface activities. It is, therefore, reasonable to expect different properties and physiological functions for unique groups of biosurfactants. Moreover, these molecules can be tailor-made to suit different applications by modifying the growth substrate or growth conditions. Although most biosurfactants are regarded to be secondary metabolites, some may play crucial roles for the survival of biosurfactant-producing microorganisms through facilitating nutrient transport or microbe–host interactions or by acting as biocide agents. Biosurfactant roles include increasing the surface area and bioavailability of hydrophobic water-insoluble substrates, heavy metal binding, bacterial pathogenesis, and quorum sensing and biofilm formation. Biosurfactants are amphipathic molecules with both hydrophilic and hydrophobic moieties that partition preferentially at the interface between fluid phases that have different polarity and hydrogen bonding, such as oil and water or air and water interfaces. This property elaborates their wide use in environmental applications. Most work on biosurfactant applications has been focused on their use in environmental applications owing to their diversity, environmentally friendly nature, suitability for large-scale production and selectivity. Despite their potential and biological origin only a few studies have been carried out on applications related to the biomedical field. Some biosurfactants are suitable alternatives to synthetic medicines and antimicrobial agents and may be used as safe and effective therapeutic agents

Synthetic surfactants are becoming increasingly unpopular in many areas and applications due to previously disregarded effects on biological systems and this has led to a new focus on replacing such products with biosurfactants that are biodegradable and created from renewal resources. Microbially derived biosurfactants have been investigated in numerous studies in areas including: increasing feed digestibility in an agricultural context, improving seed protection and fertility, plant pathogen control, antimicrobial activity, antibiofilm activity, wound healing and dermatological care, improved oral cavity care, drug delivery systems and anticancer treatments. The development of the potential of biosurfactants has been stopped somewhat by the myriad of steps taken in their investigations, the focus on pathogens as source species and the costs associated with large-scale production. Here, we focus on various microbial sources of biosurfactants and the current trends in terms of agricultural and biomedical applications.

Biosurfactants are active compounds that are produced at the microbial cell surface or excreted, and reduce surface and interfacial tension. Microbial surfactants offer several advantages over synthetic ones, such as low toxicity and high biodegradability, and remain active at extreme pH and salinity. Biosurfactants are produced by bacteria, yeasts, and filamentous fungi.

This work is partly presented at Global Experts Meeting on Infectious Diseases, Diabetes and Endocrinology February on 27-28, 2021 held at Tokyo, Japan