BIOCOMPATIBLE SURFACE-ACTIVE GLYCOLIPIDS FOR COATING SUPER-PARAMAGNETIC NANOPARTICLES

Description

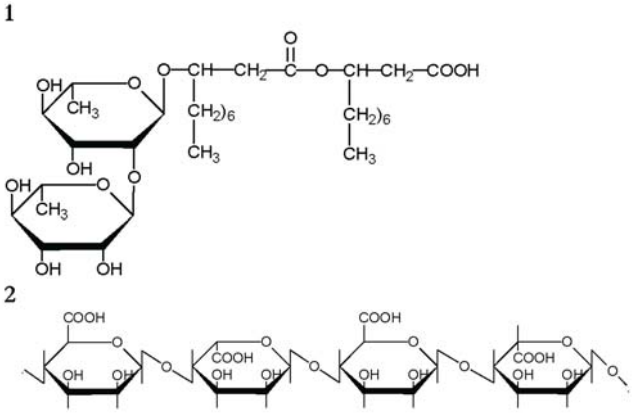
Novel biogenic surface-active substances of microbial origin (biosurfactants), which can be stabilizers for the biocompatible nanoparticles, are proposed. Synthesis of the particles involves a new method of particle surface modification with the biosurfactants and biopolymer.

The bacterial strain PS was identified as the most efficient producer of extracellular surface-active substances which represent a unique natural composition of a biosurfactant (two types of rhamnolipids) and a biopolymer (polysaccharide of alginate nature) is used for biosurfactant obtaining. The proposed microbial surfactants are active at a broad range of temperatures, pH, and high concentration of salts. Both these substances decreased considerably surface and interfacial tension of aqueous solutions and water-oil dispersions to 29.0 and 0.01-0.07 mN/m, respectively. The microbial surfactants are active at a broad range of temperatures, pH, and high concentration of salts. Stable aqueous colloid solution of super-paramagnetic (Fe3O4) nanoparticles was obtained for functionalizing their surface with specific biosurfactants of strain PS. Such approach will facilitate the production of such complexes without synthetic surfactants.

For application in biomedicine, the surface of magnetic, gold or polymeric nanoparticles must be coated with materials, which make the nanoparticles biocompatible and increase their stability in blood, intra- and extra-cellular media. Such coatings contain functional groups (hydroxyl-, carboxyl-, etc.), which are necessary for binding the nanoparticles with target biomolecules in blood stream or in specific cells.

Innovative Aspect and Main Advantages

The microbial surfactants, as compared to their synthetic analogues, are biodegradable and non-toxic. Such properties of biosurfactants promote creation of new effective biocompatible magnetic, gold or polymeric nanoparticles.



Pic.1. Composition of glycolipid (1) and biopolymer (2) for modification of nanoparticles

Areas of Application

The developed nanoparticles will be applied in biology, biomedical diagnostics and treatment, pharmacy including development of novel drug delivery systems in living organism.

Stage of Development

Development phase – laboratory tested

Contact Details

Alexandr Shulga, Ph.D., Senior Researcher of Biotechnology Laboratory
Lviv Department of Physical Chemistry of Combustible Minerals of L.M.Litvinenko Institute of Physical Organic Chemistry,
Naukova Str., 3a, Lviv, 79053, Ukraine
Phone: (380 322) 63-51-74;
E-mail: biotech@org.lviv.net