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USE OF PHOSPHOLIPIDS IN COSMETICS

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KEYWORDS

Phospholipids, lipids, esters, lecithin, living cells, cell membranes, amphiphilic substances, hydrophilic , liposomes , cholesterol

ABSTRACT

The article discusses the composition and properties of phospholipids and its use with new technologies in cosmetics. Foreign experience in the use of phospholipids has been studied.

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Introduction. Cosmetologists note that recently in many countries, especially in large cities, the number of people suffering from symptoms associated with conditions such as dry, sensitive or hyper-reactive skin has been increasing. Experts associate this skin condition with disturbances in the functioning of the lipid barrier of the stratum corneum. One of the reasons for this phenomenon can be considered the content in cosmetic formulations of significant concentrations of substances that can have a destructive effect on the lipid barrier. An example of such substances is surfactants, which can work as part of a cosmetic formulation, including as emulsifiers. Another reason is the large number of aggressive polluting particles in the air of large cities, which can initiate the oxidation of sebum. As a result, the number of people who consider their skin dry, irritated and very sensitive is increasing all the time. We can say that these are people with impaired skin barrier function.

Methodology . In the study of this topic, the authors used methods such as analysis, observation, comparison, and biological review.

Discussion. Phospholipids are complex lipids ; they are esters of polyhydric alcohols and higher fatty acids. They contain a phosphoric acid residue and an additional group of atoms of different chemical nature connected to it. The previously used definition of lipids as a group of organic compounds that are highly soluble in non-polar organic solvents (benzene , chloroform) and practically insoluble in water is too vague. Firstly, such a definition, instead of a clear description of a class of chemical compounds, speaks only of physical properties. Secondly, a sufficient number of compounds are currently known that are insoluble in non-polar solvents or, conversely, highly soluble in water, which, nevertheless, are classified as lipids.

Phospholipids are complex lipids that contain fatty acids, phosphoric acid and an additional group of atoms, in many cases containing nitrogen. They are found in all living cells. Contained in nervous tissue, they are involved in the delivery of fats, fatty acids and cholesterol . Phospholipids are part of all cell membranes. An exchange of phospholipids occurs between plasma and erythrocytes, which play a critical role in maintaining non-polar lipids in a soluble state. The most common group of phospholipids is phosphoglycerides . Phospholipids also include phosphosphingolipids and phosphoinositides .

This determines many of the physical and chemical properties of phospholipids, such as the ability to form liposomes and biological membranes (lipid bilayer). The chemical structure of the polar “head” determines the total electrical charge and ionic state of the phospholipid. The “tails” are in contact with the lipid environment, and the “heads” are in contact with the water environment, since non-polar fatty tails cannot come into contact with water.

The biological role of phospholipids is the main lipid component of cell membranes. They accompany fats in food and serve as a source of phosphoric acid necessary for human life.

Phospholipids are an important part of cell membranes . They provide the fluid and

plastic properties of cell membranes and cellular organelles , while cholesterol provides the rigidity and stability of the membranes. Both phospholipids and cholesterol are often included in the lipoproteins of cell membranes, but they are also present in membranes in a free state not bound to proteins . The cholesterol/phospholipid ratio mainly determines the fluidity or rigidity of the cell membrane.

Phospholipids are involved in the transport of fats, fatty acids and cholesterol. An exchange of phospholipids occurs between plasma and erythrocytes, which play a critical role in maintaining non-polar lipids in a soluble state. Being more hydrophilic than cholesterol, due to the presence of phosphoric acid residues in the molecule, phospholipids are a kind of “solvents” for cholesterol and other highly hydrophobic compounds. The ratio of cholesterol/phospholipids in the composition of lipoproteins in blood plasma , along with the molecular weight of lipoproteins (HDL, LDL or VLDL), determines the degree of cholesterol solubility and its atherogenic properties.

The ratio of cholesterol/phospholipids in the composition of bile determines the degree of lithogenicity of bile - the degree of susceptibility to the loss of cholesterol gallstones. Phospholipids slow down collagen synthesis and increase the activity of collagenase (an enzyme that destroys collagen).

Depending on which polyhydric alcohol underlies the structure of the phospholipid, glycerophospholipids (based on glycerol), phosphosphingolipids (based on sphingosine) and phosphoinositides (based on inositol) are distinguished. The most common in nature are glycerophospholipids , in particular phosphatidylcholine which is the main lipid of cell membranes.

All glycerophospholipids are built according to a single plan, and their molecules are sterically consistent with each other. At the same time, the huge diversity of phospholipids is provided by the variety of fatty acids that make up their molecules. Thus, there are several dozen natural types of phosphatidylcholine.

Phospholipids are essential substances that are indispensable for humans. They are not produced in sufficient quantities in the body and must be obtained from food. Their most important function is direct participation in the construction of cell membranes. According to recent studies, most people do not receive up to 40% of the required phospholipids. The content of phospholipids in edible oils is relatively low and rarely exceeds 2%; the highest content can be noted in soybean, sunflower oils and cottonseed oil - 1.7–1.8%.

Being essential components of the biological membranes of all living cells, phospholipids are non-toxic and very well accepted by the skin. The most common type of phospholipids in the tissues of animals and plants is phosphatidylcholine (lecithin), which consists of structural residues of phosphoric acid, choline, fatty acids, glycerol **.** Lecithin is also the main phospholipid used in cosmetic formulations.

Cosmetic lecithin is described as a mixture of phospholipids that consists primarily of phosphatidylcholine , but may also include components such as fatty acids, triglycerides, sterols, hydrocarbons and glycolipids. Lecithins can be fractionated by phosphatidylcholine

content, ranging from "crude" lecithin, containing about 15% phosphatidylcholine and a significant amount of the vegetable oil from which the lecithin was derived, to defatted or fractionated lecithin, containing 25 to 96% phosphatidylcholine . Sources of lecithin for industry can be soybeans, eggs, milk, raw materials of marine origin, rapeseed, cotton and sunflower. The fatty acid composition of isolated phospholipids is typical for each specific type of raw material and determines the temperature at which fatty acids change their mobility. Below a point called the " gel- to-liquid crystalline transition temperature," the fatty acids are in a rigid gel form. Above this temperature value they are mobile and are in liquid crystalline or liquid form. Phospholipids containing polyunsaturated fatty acids are characterized by a very low (below 0 ^{0} C) transition temperature. This means that at a temperature of 22 ^{0} C, these lipids are in liquid crystalline form and, upon contact with water, form very mobile structures - liposomes. Phospholipids containing unsaturated fatty acids can be converted to phospholipids containing saturated fatty acids as a result of hydrogenation. Such hydrogenated phospholipids are in a gel state at skin temperature and tend to form more rigid and stable membrane-like structures. Recently, mainly soy lecithin or lecithin obtained from other plant materials (rapeseed, sunflower) have been used in cosmetics. There is also a trend to use lecithin that is not derived from genetically modified soybeans.

Lecithin and its derivatives have the following properties useful in cosmetics: emulsification and solubilization; hydration; improving barrier function, stimulating the synthesis of ceramides in the skin; reduction of skin irritation; reducing pore size; reduction of hyperkeratosis; stimulation of cell proliferation; increasing the active penetration of other active ingredients into the skin; hair conditioning additives; formation of liposomes and active delivery of active substances; increased deposition of cationic dyes onto hair.

Conclusions. Important commercial lecithin derivatives used in cosmetics are lysolecithin , hydroxylated lecithin, lysophosphatidic acid and hydrogenated lecithin. Lysolecithin , also called lysophosphatidylcholine, is produced by partial hydrolysis of phosphatidylcholine , thereby removing one of the fatty acid residues. Lysolecithin has been shown to have good emulsifying, moisturizing and solubilizing properties, and also increases the active penetration of substances into the skin.

Hydrogenated lecithin is produced by reacting hydrogen with lecithin. The result is a very stable waxy material. The healthiest varieties contain 20-30% phosphatidylcholine and are non-irritating emulsifiers with excellent moisturizing properties. They facilitate the delivery of both oil-soluble and water-soluble assets. Hydrogenated Phosphatidylcholine has pronounced hydrophilicity. One molecule of hydrogenated Phosphatidylcholine is able to bind 20 molecules of water and "carry" this water into the deeper layers of the epidermis, providing a direct moisturizing effect.

There are good prospects for the development of domestic production of lecithin in Uzbekistan. What is important in the case of soy products is that we are talking about non-GMO products. According to export forecasts, the potential of the Russian lecithin market is

very high. With the active introduction of lecithin into the food, pharmaceutical and cosmetic industries, as well as the spread of lecithin for technical use, the total consumption of lecithin may increase several times.

Considering the American and European experience in the technical use of lecithin, the actual potential for growth in lecithin consumption in Uzbekistan is much higher. Experts predict that the development of the Uzbek market will occur along with its structural change. On the one hand, it is obvious that imported lecithins are gradually being replaced by domestic analogues. On the other hand, we can expect a change in the proportions of GMO and non-GMO lecithins on the local market with a significant increase in the share of non-GMO both domestic and imported lecithins. Moreover, the further development of domestic production of lecithin can reorient Uzbekistan from imports to partial exports of this product.

References .

1. P. van Hoogevest , D. Prusseit , R. Wajda "Phospholipids-Natural Functional Ingredients and Actives for Cosmetic Products", SOFW-Journal,139, 8–2013, p. 9–14.
2. G. Deckner "Use of Phospholipids in Personal Care Products", http://www.ulprospector.com
3. Olga Kuznetsova, Lecithin is the king in the market of natural emulsifiers http://bfi-online.ru/ .
4. Phospholipids. Physiological activity of phospholipids./ Jazawa K. // Yukagaku = S. Sap . Jil Chem . Soc.- 1991 40. N 10 - P.845-857.
5. Scherer R. Lecithin Consumption in the Western European Diet, “Lecithin and Health Care” // F. Paitaf a D. Lekim , eds), Semmelweis Verlag , Houa.- 1985/ S. 109.
6. Immunomodeling effect of polyunsaturated phospholipids Uteshev B.S., Laskova I.L. Chem. pharmacist _ and. No. 5, 1993. - P.19-23.