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Fatty acid profile of different organs under action of new complex liposomal preparation "Interflok"

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The data about the effect of interferon, selenium and vitamins A, D_3, E of a new integrated product in the form of liposomal emulsions on the fatty- acid content of lipids of various organs of piglets are presented. The increase of content of arachidonic and linolenic acids in lipids of the studied pigs after parenteral introduction of the investigational drug has been established. I has been established a significant increase of unsaturation of total lipids of the studied pigs that were injected by the drug in the form of liposomal emulsion. We can assume that this is largely due to the presence of the drug interferon. The important role in the action of the drug is of it liposomal form, because liposomes protect the existing components of inactivation. We found increasing of lipids membrane unsaturation in the studied organs of piglets at an early age under the influence of the drug that can be considered as a result of complex effects of drug components.

Key words:fatty acids, interflock, liposoma, immune, lung, liver, lymph nodes, vitamins, membranes, pigs.

Lipid content, their individual classes and fatty-acid composition significantly affect the ultra structure and metabolic activity of cell membranes in the tissues of animals. The relationship between immune response of immunocompetent cells and fatty-acid composition of plasma membranes lipids has been established [2.4]. This detected link offers the prospect of creating of new and effective drugs for preventing and treating of animal diseases. Such preparations should provide immunomodulator effect by restoring the ultra structure of plasma membranes of immunocompetent cells in their damaged ultra structure and metabolic activity of cell membranes in the tissues of animals. This is due to urgency of research on the impact of new drugs on fatty-acid composition of lipid membranes of cells of various types, particularly immunocompetent cells. In this regard, the aim of our work was to investigate the effect of interferon, selenium and vitamins A, D_3, E of the new integrated product in the form of liposomal emulsions on fatty- acid lipid composition of lung, liver and lymph nodes of piglets.

Materials and methods of research. Researches were conducted in the research sector "Obroshino" of Pustomytivskyi region, Lviv district on two groups of piglets of 3-day age, who were keeping with the sow, separated by a principle of similarity at two groups – control and experimental, by 5 heads in each group. At the 3-day age pigs of control group were injected by isotonic solution of sodium chloride, pigs of experimental group – treated by liposomal emulsion, which contains in ts structure interferon, selenium and vitamins A, D_3, E in the recommended preventive doses. The drugs to the animals of experimental group were injected intramuscularly at a dose of 1 ml per kg of body weight. In the 30-day age the experimental slaughter of pigs was conducted and obtained from them samples of lung, liver and lymph nodes were used for biochemical studies. Lipids from researched organs were extracted by mixture of chloroform and methanol 2:1 by Folch method [5] and their fatty acid composition was determined by gas-liquid chromatography on chromatograph "Chrom-4" (Czechoslovakia) [6]. They obtained statistically received digital data.

Research results and discussion. As a result of the studies a significant changes of fatty acid composition of total lipids of studied various organs of piglets which were injected by drugs have been established. The direction and extent of these changes is

specific to each organ separately. Thus, fatty acid overall composition of lipids in lung tissue of piglets, which administrated the investigational drug compared to fatty acid composition of total lipid of piglets of the control group, characterized by greater relative content of unsaturated fatty acids (56.3% versus 50.5% in the control), including polyunsaturated fatty acids (21.7% vs. 17.6%), mainly due to increases in their stock number of arachidonic acid ($p<0.05$).

1. Fatty acid composition of total lipids of pig's lung, % (M±m, n = 3)

Fat acids	Code of fat acids	Animal groups	
		Control	Experimental
Laurinic	$C_{12:0}$	0,10±0	0,13±0,03
Miristic	$C_{14:0}$	0,53±0,03	0,73±0,09
Pentadecane	$C_{15:0}$	0,20±0	0,23±0,03
Palmitic	$C_{16:0}$	31,07±0,41	24,27±1,58*
Palmiticoleic	$C_{!6:1}$	0,97±0,03	1,30±0,06*
Stearic	$C_{18:0}$	14,23±0,12	15,83±0,92
Oleic	$C_{18:1}$	31,83±0,67	33,20±1,30
Linoleic	$C_{18:2}$	9,17±0,09	10,10±1,02
Linolenic	$C_{18:3}$	2,00±0,06	2,37±0,09*
Arachidic	$C_{20:0}$	0,83±0,03	0,80±0,06
Arachidonic	$C_{20:4}$	6,50±0,21	9,30±0,86*
Behenic	$C_{22:0}$	2,57±0,12	1,73±0,34
Saturated		49,53	43,73
Monounsaturated		32,8	34,50
Polyunsaturated		17,67	21,77

Note: In this and next tables ─ * indicates the likely difference ($p< 0.05$) in the relative content of individual fatty acids in total lipids of piglets experimental group compared to their content in total lipids of piglets of the control group.

As a consequence, in lungs of piglets of experimental group compared to the piglets of control group unsaturation of total lipids is increased and lipids saturation index (INL) is decreased, respectively 0.98 and 0.78 times. Increasing of relative content of unsaturated fatty acids in total lipids of piglets of experimental group is at the expense of an increase in their content of palmitooleic, linolenic and arachidonic acid ($p< 0.05$). These data are of vital interest due to the fact that arachidonic acid is the precursor of prostaglandins, which play an important role in the regulation of the reduction of bronchial smooth muscle tension [7]. Increased arachidonic acid content of lipids in the lung of piglets of experimental group compared to the control group of pigs is accompanied by reduction of the content in their part of palmitic acid ($p < 0.05$), which plays an important role in the synthesis of specific membrane of alveolus – dypalmitoil phosphatidyl holine, which provides surface-active properties of pulmonary function of alveoli [1]. It is a cause of a protective effect of selenium and vitamins A and E, which are the parts of the investigational drug, on the processes of peroxide oxidation of arachidonic acid in membrane phospholipids of lung alveoli.

In fatty-acid stock of total liver lipids of animals of experimental group compared with the control group of pigs also found significantly greater content of unsaturated fatty acids,

(61.8% vs. 57.9%) including polyunsaturated (39.8% vs. 35, 2%). As a result, unsaturation of total lipids of piglets' liver of experimental group increased and decreased INL (0.62 respectively against 0.72 in control). These differences, as well as in lungs,

2. Fatty acid composition of liver of total lipids studied piglets, (M±m, n = 3)

Fat acids	**Code of fat acids**	**Animal groups**	
		Control	**Experimental**
Laurinic	$C_{12:0}$	0,10±0	0,10±0
Miristic	$C_{14:0}$	0,30±0,06	0,23±0,03
Pentadecane	$C_{15:0}$	0,10±0	0,10±0
Palmitic	$C_{16:0}$	13,77±1,29	11,03±0,29
Palmiticoleic	$C_{!6:1}$	0,97±0,07	0,97±0,07
Stearic	$C_{18:0}$	26,60±1,19	25,07±1,33
Oleic	$C_{18:1}$	21,83±1,64	21,10±1,27
Linoleic	$C_{18:2}$	18,53±2,18	17,23±0,79
Linolenic	$C_{18:3}$	0,63±0,03	1,37±0,23*
Arachidic	$C_{20:0}$	0,43±0,03	0,57±0,09
Arachidonic	$C_{20:4}$	16,03±1,06	21,20±1,44*
Behenic	$C_{22:0}$	0,70±0,15	1,03±0,09
Saturated		42,0	38,13
Monounsaturated		22,8	21,47
Polyunsaturated		35,19	39,80

are due to greater content of arachidonic and linolenic acids in total lipids of liver experimental group of piglets than in piglets of the control group ($p < 0.05$).

In lymph nodes in pigs of experimental group, compared with pigs of control group also show greater relative content of unsaturated fatty acids (49.3% vs. 44.2%), including polyunsaturated fatty acids (22.7% vs. 17 , 8%). As a result, unsaturation of lipids increased, and INL is 1.03 against 1.26. However, increasing of unsaturation of lipids in the liver and lungs, caused mainly at the expense of amounts of mono-and polyunsaturated fatty acids, and in the lymph nodes it is caused by increasing particularly arachidonic acid ($p < 0.05$). These data are of considerable interest due to the fact that arachidonic acid in animal tissues by cycloxygenase way

3. Fatty acid composition of total lipids of lymph nodes of studied piglets,(M m, n = 3)

Fat acids	**Code of fat acids**	**Animal group**	
		Control	**Experimental**
Laurinic	$C_{12:0}$	0,13±0,03	0,1±0
Miristic	$C_{14:0}$	1,26±0,29	1,0±0,38
Pentadecane	$C_{15:0}$	1,16±0,03	0,10±0
Palmitic	$C_{16:0}$	33,17±3,38	29,20±3,09
Palmiticoleic	$C_{!6:1}$	0,80±0,05	0,67±0,17
Stearic	$C_{18:0}$	18,06±1,39	18,27±0,49
Oleic	$C_{18:1}$	25,53±0,64	25,93±2,50
Linoleic	$C_{18:2}$	8,43±1,65	9,33±0,64
Linolenic	$C_{18:3}$	2,07±0,33	1,63±0,52
Arachidic	$C_{20:0}$	1,30±0,2	0,70±0,12
Arachidonic	$C_{20:4}$	7,33±0,91	11,73±1,2*
Behenic	$C_{22:0}$	1,73±0,07	1,33±0,15
Saturated		55,84	51,73
Monounsaturated		26,33	26,60
Polyunsaturated		17,83	22,69

becomes prostaglandins that are non-specific inducer of T-suppressor and by lipoxygenase way – in leicotrien, which are mediators of the hormone action [8, 9]. Derivatives of arachidonic acid, in particular, eicosanoids play an important role in the functioning of the immune system. Firstly, they are an important link in the communication system between the driving signal and response of cells, and secondly, they may act as mediators and modulators of many immunological processes [9].

Thus, as a result of experiments it was established a significant increase of unsaturation of total lipids of the studied pigs that were injected by the drug in the form of liposomal emulsion. We can assume that this is largely due to the presence of the drug interferon. Studies on the cell cultures showed that the stimulation of immune reactions in the body of animals by interferon combined with the influence on lipid composition of cell membranes. Particularly, under the influence of interferon the content of unsaturated fatty acids in phosphatidyletanolamin of cell membranes increased. The important role in the action of the drug is of it liposomal form, because liposomes protect the existing components of inactivation. Membrane of liposom is similar of bilayer of cell membranes. It is known that fatty acid composition of lipid membranes is closely connected with functional activity of cells because of membrane lipid composition significantly affects on the

activity of several lipid depend enzymes [1], which are key enzymes in the chain of reactions of cellular immune system, including antigenic processing. We found increasing of lipids membrane unsaturation in the studied organs of piglets at an early age under the influence of the drug that can be considered as a result of complex effects of drug components.

Role of lipid homeostasis in stabilizing of the immune reactions is principally due to the directly lipid components involved in the processes of cell activation and regulation of phagocytosis. It is the evidence of substantiation expediency substantiation of immune drugs application, which is due to the impact of optimization composition of the cell membranes of animal body, including immuno competent cells in medicines.

Conclusion

Administration of interferon in pigs, selenium and vitamins A, D_3, E within a new integrated product in the form of liposomal emulsion leads to increase the content of polyunsaturated fatty acids (arachidonic and linolenic) in total lipids in lung, liver and lymph nodes.

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ЖИРНОКИСЛОТНЫЙ ПРОФИЛЬ РАЗНЫХ ОРГАНОВ ПОД ДЕЙСТВИЕМ НОВОГО КОМПЛЕКСНОГО ЛИПОСОМАЛЬНОГО ПРЕПАРАТА "ИНТЕРФЛОК"

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В статье представлены данные о влиянии нового комплексного продукта, содержащего интерферон, селен и витамины А, D_3, Е в виде липосомной эмульсии на содержание жирных кислот липидов различных органов поросят. Отмечено увеличение содержания арахидоновой и линоленовой кислот в липидах исследуемых свиней после парентерального введения исследуемого препарата. Было установлено значительное увеличение ненасыщенности общих липидов у

исследуемых свиней, которым вводили препарат в форме липосомальной эмульсии. Предполагается, что это в значительной степени обусловлено присутствием интерферона. Важную роль в действии липосомальной формы препарата играют липосомы способные защитить существующие компоненты. Онаружено увеличение ненасыщенности липидов мембран в исследованных органах поросят в раннем возрасте под воздействием препарата, которые можно рассматривать как результат сложных эффектов компонентов препарата.

Ключевые слова: *жирные кислоты, Интерфлок, липосома, иммунитет, легкие, печень, лимфатические узлы, витамины, мембраны, свини.*

ЖИРНОКИСЛОТНИЙ ПРОФІЛЬ РІЗНИХ ОРГАНІВ ПІД ДІЄЮ НОВОГО КОМПЛЕКСНОГО ЛІПОСОМАЛЬНОГО ПРЕПАРАТУ "ІНТЕРФЛОК"

І. Є. Соловодзінська

У статті наведено дані про вплив нового комплексного продукту, що містить інтерферон, селен і вітаміни А, D_3, Е у вигляді ліпосомальної емульсії на вміст жирних кислот ліпідів різних органів поросят. Відзначено збільшення вмісту арахідонової і ліноленової кислот у ліпідах досліджуваних

свиней після парентерального введення досліджуваного препарату. Було встановлено значне збільшення ненасиченості загальних ліпідів у досліджуваних свиней, яким вводили препарат у формі ліпосомальної емульсії. Передбачається, що це в значній мірі обумовлено присутністю інтерферону. Важливу роль у дії ліпосомальної форми препарату грають ліпосоми здатні захистити компоненти препарату. Виявлено збільшення ненасиченості ліпідів мембран в досліджених органах поросят в ранньому віці під впливом препарату, які можна розглядати як результат складних ефектів компонентів препарату.

***Ключові слова**: жирні кислоти, Інтерфлок, ліпосома, імунітет, легені, печінка, лімфатичні вузли, вітаміни, мембрани, свині.*