MARKETING ASPECTS OF THE DEVELOPMENT OF VETERINARY PREPARATIONS BASED ON PELOIDS AND PRODUCTS OF THEIR PROCESSING

The use of peloids and their derivatives in veterinary is based on their low toxicity and a wide range of the pharmacological activity due to the multi-component chemical composition and significant resources of this raw material in Ukraine.

Aim. To monitor the range of veterinary preparations based on peloids and products of their processing used in veterinary medicine at the Ukrainian market for further substantiation of the feasibility of developing domestic drugs based on peloids.

Materials and methods. The study used marketing and statistical methods for analyzing electronic sources of information and scientific publications. The study objectives were the information about veterinary preparations developed from peloids and products of their processing and registered in Ukraine. The catalogs of veterinary drugs, feed supplements, premixes registered in Ukraine, the Russian Federation, the Republic of Belarus, instructions for their use, electronic catalogs, etc., were studied in depth.

The theoretical side of the research was based on scientific publications of domestic and foreign scientists. The empirical base was focused on the analysis of information set forth in the State Register of Medicinal Products of Ukraine, electronic databases using the information retrieval program "Morion", the price lists of "Apteka" weekly as of 2018. The logical, system-analytical, structural-functional and comparative methods of analysis were used in the article.

Monitoring of the range of products from peloids taking into account the ATC classification system has shown that the pharmaceutical market is represented by drugs belonging to the following groups: M02AH – other drugs used topically for joint and muscle pain, C05BA – heparin and heparinoids for topical use and C05CX – other capillary-stabilizing drugs.

Results. The analysis of the range of preparations of peloids and their derivatives used in veterinary medicine has shown that most of them are presented by premixes and feed supplements (75 %), veterinary preparations (21 %) and preservatives (4 %). The basis of the Ukrainian pharmaceutical market is the products of the Russian Federation, Ukraine, Belarus, Germany, and Hungary.

Conclusions. The absence of veterinary preparations based on sapropels at the Ukrainian market, a poor range of feed supplements indicates the need and relevance of the development of veterinary products – sapropel derivatives.

Key words: peloids; sapropel; veterinary preparations; feed supplements; premixes; marketing research.

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MATERIALY TAKI MÉTHODY: MARKETNÍ ASPEKTY ROZVOJU VETERINAŘSKÝCH PREPARÁTŮ NA SOVNÍ PELOIDŮ A ÍNÝCH VÝROBKŮ JÍH PEREPLOBÍKY

Výkostinné pěloídů a jejich pochodů v veterinárii spočívá v nízké tóxickosti a širokém spektru farmakologické aktivnosti, které způsobují polikomponentní chování složky a známé zdroje resorptivního průběhu v Ukrajině.

Metoda: monitoring a srovnání aparatur v veterinárních přípravcích na základě pěloidů a jejich produkty v případě, jakým fungují v veterinární praxi pro podmínek obecnějšího využívání. Důležitost rozvoje většinou přípravců na základě pěloidů. Studie byla realizována na základě záznamů z farmaceutického systému ATC v Ukrajině, elektronických databází, elektronických katalogů a pletiv přípravců.

Materiály a metody: materiály a metody v veterinární medicíně a analýza elektronických záznamů, informačního systému pro vyhledání v veterinární medicíně. Výsledky byly aplikovány na základě záznamů z farmaceutického systému ATC v Ukrajině, elektronických databází, elektronických katalogů a pletiv přípravců.

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Statement of the problem. The use of pe­lo­id­s and their derivatives in veterinary is based on their low toxicity and a wide range of the pharmacological activity due to the multi­component chemical composition (amino ac­ids AA), organic acids (OA), vitamins, mac­ro­and microelements, humic acids (HA), as well as significant resources of this raw material in Ukraine.

At the present stage, the market of sapro­pel preparations is represented by feed sup­plements (FS) and new generation premixes – natural sapropels [1, 2]. Each preparation is characterized by its chemical composition, which is formed under the influence of a number of environmental factors, formation conditions, differences in composition, etc. [3].

Unfortunately, feeding natural sapropels are mainly exported to our market from neighboring countries, such as Russia, Belarus [2]. Western companies do not use peloids for production of FS and premixes due to poor know­ledge or the lack of the raw material [4, 5]. And in Ukraine, work on the FS production increased only in the last decade [6-8].

Veterinary preparations (VP) as a component of the medicinal mud preparation market constitute about 1/3 of all products [9], and the study of their therapeutic properties is a promising di­rection of modern veterinary medicine [10-14].
As is well known, according to the requirements of the European legislation any medicine is obliged to undergo a series of stages for implementation of it in practice. The main factors are standardization and certification [15]. They are quite complex and laborious processes that affect the quality of a medicine in the future and the conditions of its use. FS, premixes, peloid processing products or peloid derivatives (PD) used in veterinary medicine have a simplified standardization system applied to supplements and their analogs [16]. This is mainly due to the active presence of such products at the pharmaceutical market.

In veterinary medicine mud preparations and combination compounds have a number of advantages and are used as enterosorbents; immunomodulators; animal growth (productivity) stimulants; medicines with the antimicrobial, wound healing, anticancer effects; for the treatment and prevention of iron deficiency anemia; adaptogenes and others [12, 17-19].

The marketing analysis of the PD market in Ukraine [20] has shown that mainly VP are represented by products based on peat and its derivatives, FS – sapropels, peat and PD. In connection with the expansion of the range of feed additives, veterinary preparations and peloid premixes (therapeutic mud, sapropels), it is necessary to systematize the latter, if possible, to classify them and show their importance and relevance at the present stage.

Analysis of recent research and publications. Our analysis of publications and electronic information sources showed that the Department of General, Inorganic and Bioorganic Chemistry of the Samara State Medical University, the Tula State University, the Siberian State University, the Pacific Institute of Bioorganic Chemistry (Russia), the Institute of Animal Husbandry of the National Academy of Sciences of Belarus and others are engaged in studying the chemical composition, properties and the biological activity of medicinal muds. The National Research Tomsk State University (Russia) studied the issues of the rational use and processing of sapropel.

In Ukraine, the biogeochemical composition of sapropel silts (deposits) for use in crop production to increase crop yields is studied by the I. Franko Lviv National University; the Department of Marine Geology and Sedimentary Ore-Formation of the NAS of Ukraine concerns the issues of studying the composition, methods of extraction, the possibilities of using sapropels, as well as information about the reserves of this raw material in Ukraine.

Thus, the works of N. A. Avvakumova with co-authors are devoted to the study of the peloid composition features that affect their quality and practical application [3]; the comparative analysis of thermodynamic properties of peloids [21]; the study of therapeutic properties [22]. G. D. Ryzhova developed the optimal method for sapropel processing by physico-chemical methods [23]. V. V. Platonov studied the biological effect of sapropel and medicines on their basis [12, 24]. V. V. Muradov conducted the study of the microbiological activity and biomedical testing of therapeutic mud preparations [11]. Kh. G. Karagulov developed cosmeceuticals of peloids [4]. Domestic scientists studied natural deposits of sapropels and their properties (M. Y. Shevchuk, 1996; S. M. Shtin, 2005; V. O. Khmelivsky, 2017) [7, 8, 25], therapeutic properties and prospects of creating new medicines on their basis (N. S. Fizor, 2012; O. E. Strus, 2014) [13, 14] and others.

Separately, the State Register of Medicinal Products of Ukraine [26], the National Drug Formulary [27], and Anatomical Therapeutic Chemical (ATC) classification system [28] were analyzed. The study of the Ukrainian pharmaceutical market of medicines was conducted, and it was found that pellid preparations were represented by the following groups: M02AXM – other drugs used topically for joint and muscle pain, C05BA – heparin and heparinoids for topical use and C05CX – other capillary-stabilizing drugs.

Identification of aspects of the problem unsolved previously. Unfortunately, in Ukraine, which has sapropel reserves of more than 86 million tons, its extraction, use and processing are at a low level, and the research work is practically not carried out. Extraction and processing of sapropel in the territory of Ukraine are done by several enterprises: "Volynsapros", "Zender Ukraine" (Volyn region) and "Sapropel Center" (Kyiv region). The economic effect of their use in various fields has already been proven by the experience of our neighbors.

Thus, according to the Republican Unitary Enterprise (RUE) of the Institute of Animal
Husbandry of the National Academy of Sciences of Belarus, the use of a ton of a dry sapropel gives an economic effect of 70 EUR [4, 5, 25]. Therefore, the analysis of economic indicators when using peloids not only in agriculture, extraction, but also in the pharmaceutical and veterinary fields, which may be the subject of further research, should be considered promising.

The topical issue of our time is ecological situation. Cleaning lakes from sapropels simultaneously solves the problem of their preservation. Extraction of sapropel leads to deepening of lake basins, and therefore, improves the hydrological, hydrochemical and biological regime of lakes and has a positive effect on the environment [4, 19, 25]. Environmental safety issues have always deserved a careful study not only by science, but also the public.

As is known, peloids and PD are widely used in veterinary medicine. However, there is practically no systematization of such preparations, and in fact, the composition has not been analyzed. There are several sapropel classifications, and the most common ones are the classification based on the chemical composition and the method of obtaining (mechanical and chemical) [4, 9, 10]. The issues of the classification of mud extraction preparations are not sufficiently studied and do not have an unambiguous interpretation; it is due to their complex composition and the variety of methods for obtaining. Thus, work in these areas is quite relevant at the present stage.

**Objective statement of the article.** Based on the foregoing, monitoring of the marketing research of FS, VP and PD market is an important task of the modern stage of veterinary medicine development in the context of industry reform, and therefore, is the aim of our publication.

**Presentation of the main material of the research.** The information on VP from peloids that were popular in Ukraine was collected; the screening of catalogs of VP, FS, premixes registered in Ukraine, Russia, Republic of Belarus, their instructions for use was conducted using marketing and statistical methods of analysis of scientific materials and electronic databases using the information retrieval program “Morion”, the materials of “Apteka” weekly as of 2018.

The range of mud products present at the Ukrainian market was systematized, with a focus on the manufacturer, drug form, the drug composition. The results of the analysis are given in Table.

### Table

| Name of PP or PD | Drug forms | Composition |
|------------------|------------|-------------|
| **Feed supplements (FS)** | | |
| Institute for Nature Management of the National Academy of Sciences of Belarus, JSC “Lelchitsky Agroservice”, Republic of Belarus [1] | | |
| 1. Sapropel for feed supplements, sapropel of the Pribilovichi lake | a dry granular powder from gray to dark brown color | HA |
| 2. Organic sapropel for feed, sapropel of the Pribilovichi lake | a granular powder from gray to dark brown color | HA |
| 3. A protein-vitamin-mineral concentrate based on sapropel of the Pribilovichi lake | a dry granular powder from gray to dark brown color | HA |
| 4. Sapropel FS, sapropel of the Pribilovichi lake | granules or powder | HA |
| 5. Humosil, biologically active FS enriched with selenium | granules or powder | humic substances and melanoids (65-70 %), carboxylic acids (15-20 %), AA (2-4 %), pectins (6-7 %), selenium (0.5-0.7 mg/kg), iodine (10.5-11.5 mg/kg) |
| 6. Humoplus – a preservative of wet flattened grain, sapropel of the Pribilovichi lake | granules or powder obtained on the basis of peat oxidation products and carbimide | HA, phenolcarboxylic acids |
| 1 | 2 | 3 |
|---|---|---|
| **CJSC “Respect” (LLC “Vega-2000 – SO”, Omsk, Russia)** [29, 30] | **SaproSORB-FS**, sorbent / adsorbent, lakes of the Omsk region | granules | AA: lysine, methio-nine, threo-nine, fat, iodine, sulfur, manganese, ash, nitrogen, calcium, potassium, phosphorus, crude protein, iron, magnesi-um, zinc, copper, sodium, vitamin A, B2, B4, B12, C, D, E, heat treated sapropel |
| **Organic premixes based on SaproSORB** | 8. Premix for growing, fattening pigs, cows, laying hens, broilers | granules | Sapropel enriched with vitamins and microelements |
| | 9. Extract of sapropel from lakes in the Omsk region | solution for indoor and outdoor use | tar-like and ichthyol-like substances, hormone-like substances and peptides, enzymes; antioxidants; vitamins E, B12 |
| **Agropremix, “Capital-PROK”, Moscow, Russian Federation** [31, 32] | 10. Premix-Milk | powder | macro- and micro-elements, vitamins A, D, E, niacin, L-lysine, sapropel, humic additive, probiotic *Lactobacillus acidophilus*, *Ruminococcus albus* |
| | 11. Premixes – “A storehouse of 34 formulas” concentrates | powder | calcium phosphate, natural zeolites, sapropel, limestone, chalk, wheat flour, wheat bran, vitamins, micro, macronutrients, AA, antio-xidants, antimicrobial and enzymatic substances |
| | 12. Gumival, FS | powder | product of natural or artificial lignin meta-bolism to humic substances |
| **“Ekorost” LLC (Ryazan Region, Russian Federation)** [2] | 13. “Ekorost”- humic FS | water suspension | suspension of humic and fulvic acids obtained by alkaline extraction from peat |
| **EXPERT-MEDICAL LTD., Hungary** [2] | 14. Humapol | water suspension | peat suspension containing HA |
| **Humentech GmbH, Germany** [2] | 15. Huminfide | granulated powder | sodium humate, sodium oxide (12-13 %) |
| “Freya”, Cherkassy region, Gorodishche, Ukraine [33] | 16. Humate sodium FS “Freya” | powder | sodium humate |
| **“Agrofirma Hermes” Ltd, Ukraine** [1] | 17. Humisol – T2 | solution | HA and their salts, lactic bacteria, bifidus bacteria, *Bacillus subtilis* |
| **Veterinary preparations** | 1. Enterosorbent EST-1 (Research Institute of Agrarian Problems of Khakassia, Siberian Branch of the Russian Academy of Medical Sciences and the Siberian Research Institute of Peat, Russian Academy of Medical Sciences, Tomsk, Russia) | light-brown powder with an astringent taste | complex of vitamins, mineral and humic substances, probiotics *Lactobacillus acidophilus*, *Ruminococcus albus* |
As can be seen from Table, most FS and premixes are produced on the basis of sapropel with the main active ingredient – humic substances, and they all have differences in the chemical composition.

The entire range of PP and PD was distributed according to their purpose (Fig. 1). It has been determined that the overwhelming majority (75%) are premixes and feed supplements; veterinary preparations accounts for 21% of the available range; 4% are preservatives.

In the course of the study it has been found that VP are mainly represented by manufacturers of the Russian Federation. At the same time, FS and premixes are produced by different countries (Fig. 2).
Moreover, the share of the Russian manufacturer accounts for 64%, and the Ukrainian producer has only 7% of the drugs analyzed.

The analysis of preparations according to the drug forms has shown that powders prevail – 36%, granules and solutions – 21%, granules or powders – 11%, suspensions – 7% of all medicines. Only one preparation is produced in the form of solution for injections, and it is 4% (“Ligfol”, Russia) (Fig. 3).

**Conclusions.** The analysis of the range of derivatives of peloids used in veterinary medicine has shown that the overwhelming majority of preparations are presented by premixes and feed supplements. The domestic market of peloid drugs is, in fact, import-dependent.

Due to the low level of financing of the industry the Ukrainian manufacturer develops and produces only FS, it is conditioned by the relative simplified registration scheme of the latter when bringing them to a competitive market.

**Prospects for further research.** The absence of veterinary preparations based on sapropels at the Ukrainian market, and a poor range of feed supplements indicate the relevance of the development of new veterinary products.

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