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Master's Thesis

*The use of chelated metals in the rearing of young
pigs in the farm "Sumypostachfond" c. Krovne,
Sumy district, Sumy region*

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ABSTRACT

High productivity in pig farming can be achieved only when the herd is healthy, so along with the organization of proper feeding and maintenance, it is necessary to prevent the emergence of various diseases related to the perinatal period. After all, this period accounts for 90% of piglet deaths. Among the perinatal problems are most often observed: hypothermia, which leads to weight loss and death, hypoglycemia, which arose as a result of competition in the nest and lack of energy; infectious diarrhea, which occurs against the background of insufficient transmission of passive immunity. Also, there are many other factors of perinatal mortality in young piglets: maternal, genetic, human and many others. The first 24 hours of a piglet's life are generally considered critical, because at this time the adsorption of antibodies from colostrum by the mucous membrane of the small intestine takes place. For large alpha-globulin molecules, the small intestine is permeable only during the first hours of life. When passing through the intestinal wall, immunoglobulins are not destroyed or digested. But their entry into the blood plasma is quickly stopped due to the saturation of intestinal epithelial cells with proteins. Therefore, it is necessary for newborn piglets to suck colostrum during the first day. Receiving with him colostral immunity, which further determines the resistance of animals to disease (anemia, HSV, rotavirus infection, colibacillosis, anaerobic enterotoxemia). We should not forget that piglets with low birth weight (less than 1 kg) are at high risk of death before weaning. If such piglets are given drugs that provide energy, improve metabolism, they reach the same finishing weight as piglets with normal birth weight. Another cause of death in piglets in the early days is mechanical asphyxia. It accounts for about 16% of deaths in households. Asphyxia is understood as a violation of gas exchange processes in the body due to slowing down or stopping the access of oxygen and delaying the release of carbon dioxide. Therefore, it is very important for staff to make sure that sows do not squeeze the piglets. In order to minimize the perinatal

causes of death of piglets and in the future to have high weight in. Krovne, Sumy district, Sumy region, as microelement feed additives were used: ferrous sulfates and chelate produced by PE "Kronos-Agro", which contains 1.5% of the mass. Iron. The main rations of suckling sows were deficient in iron by 5.5% and dry feeding of suckling piglets - respectively by 33.2- 36.0% of the current "Standards and rations for feeding farm animals." The purpose of the work is to study the effectiveness of the use of iron chelate in the farm "Sumy Postachfond" p. Krovne, Sumy district, Sumy region. To achieve this goal, the following tasks were set: - to analyze rations in the farm "SumyPostachfund" p. Krovne, Sumy district, Sumy region; - to identify the effect of the drug chelate Iron on the morphological and biochemical parameters of the blood of suckling piglets; - to identify the effect of iron chelate preparations on the growth and development of suckling piglets; - to determine the economic efficiency of the use of iron chelate.

Object of research: suckling piglets of large white breed, their growth and development.

Subject of research: iron chelate.

Research methods: zootechnical, zoohygienic, clinical and physiological, morphological, biochemical, veterinary and sanitary.

All work was performed in the farm "SumyPostachfund" with. Krovne, Sumy district, Sumy region. Suckling piglets were selected from two machines for the study, taking into account the age and weight of these animals. The pig farm is divided into parts, the so-called piggeries, which keep pigs of different ages. The pigsty in which the research work was carried out has a rectangular shape, measuring 75 x 9 m, height - 3.5 m with a solid roof. The floor is concrete, the walls and machines are made of white brick and plastered. Straw litter, manure removal twice a day. The machines in the pigsty are arranged in 2

rows. Dimensions of the machine: length 2 m, depth - 2.5 m, in which there is a compartment for local heating of piglets with infrared lamps. The floor in the machines is cement, with a slope towards the manure channels from 2 to 5 cm per running meter. Ventilation in the boxes supply and exhaust. Watering of animals specifically in this barn is carried out manually. Ten sows and their suckling piglets were divided by the method of pairs-analogues into 2 groups of 5 sows and 35 newborn piglets, which received in addition to the basic diet (OR) of sows or dry feeding (SP) of piglets the following trace elements: 1 group - 10 , 0 mg of iron in the form of seven aqueous ferrous sulfate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) / kg of feed or dry fertilizer, group 2 - 5.0 mg of iron in the form of iron chelate produced by PE "Kronos-Agro" / kg of feed or dry fertilizer. Additives were introduced into the composition of the OP or SP in the form of premixes, which amounted to 5% of the mass. by weight, respectively, feed or dry fertilizer. Training sows for premixes began in the last 4 days before farrowing, increasing the dose of premix by 33% of the total dose every 2 days, training piglets - from 10 to 14 days of life, in the same way. Piglets were weaned in the first experiment - at 63 days of age, in the second - at 60 days of age. The general condition and clinical status of the piglets were determined. Blood was taken to determine the morphological composition and physicochemical properties. Practical significance of the obtained results: It has been experimentally proven that the use of iron chelate in piglets increases the intensity of growth. They also improve metabolism, resistance and do not have a negative impact on the morphobiological composition of the blood. Due to the drug, piglets, especially those who have a body weight below normal, received the required amount of iron. They passed the stage of adaptation faster after birth and more actively consumed sow colostrum. The results of research work are implemented in the farm "SumyPostachfund" p. Krovne, Sumy district, Sumy region. The use of these drugs in the cultivation of suckling piglets helped to increase the safety and increase the growth rate of animals.

INTRODUCTION

Anaemia translated from Greek means " bloodlessness & quot;. This term defines the pathological condition of the body that occurs due to a decrease in haemoglobin and erythrocytes or

one of them per unit volume of blood, which leads to hypoxia and changes in the hematopoietic organs.

Brush first reported alimentary anaemia in piglets in 1891. He described it as a disease that can be prevented by giving the animals land or green fodder. The nutritional anaemia of McGowan and Crichton piglets in Scotland in 1923 was described in more detail. These scientists described the clinical signs of anaemia and investigated the possibility of preventing the disease, as well as treating animals by adding crude iron oxides to the diets of suckling sows. The authors later concluded that the disease was caused by insufficient iron salts entering the body of piglets with breast milk.

This is how we present the classification of anaemias today:

- blood loss (posthemorrhagic)
- impaired destruction (haemolytic);
- impaired haematopoiesis (hypoplastic, alimentary);
- with functional disorders of bone marrow haematopoiesis (deficient anaemia);
- anaemia from iron deficiency (iron deficiency, chloremia, - anaemia from the predominant violation of haemoglobin formation);
- anaemia from insufficiency of hematopoietic substances, B12 (folate deficient, pernicious anaemia);
- anaemia due to toxic bone marrow suppression (myelotoxic anaemia);
- anaemia due to a plasma, devastation and metaplasia (bone marrow replacement).

In this case, each group, depending on the pathogenetic principle, has its own clinical forms.

1) Posthemorrhagic anaemia (anaemia) occurs due to blood loss, which leads to a decrease in blood haemoglobin, red blood cells and hypoxic conditions.

2) Hypoplastic anaemia is characterized by incomplete, sometimes temporary, suppression of bone marrow function, decreased cell production of all three parts of haematopoiesis (erythrocyte, leukocyte, platelet) or any one of them, due to lack of substances for haematopoiesis or intoxication. According to the etiology, it is divided into alimentary-deficient and myelotoxic.

3) Haemolytic anaemia combines a group of diseases with a predominance of erythrocyte destruction over their formation, which is often manifested by splenomegaly, haemolytic jaundice and haemoglobinuria. Acquired forms of anaemia are mostly registered: toxic, parasitic and infectious, autoimmune, postpartum haemoglobinuria of cows and paroxysmal haemoglobinuria of calves.

4) Aplastic anaemia manifests itself due to depletion of bone marrow haematopoiesis. Hypoplastic anaemia is most often registered in farm animals.

REVIEW OF LITERATURE

1.1. Etiology, prevalence of the disease

Industrial technology of animal husbandry, chemicalization in crop and livestock production, man-made pressure, exposure to radiation, environmental pollution by industrial waste, changes in biocenoses caused by agricultural activities, and other adverse environmental factors lead to a number of pathologies in animals [1]. The basis for the development of these pathologies is the insufficient adaptation of animals to the technology of keeping and imbalance between the body and the environment. The role of stress has been proven in the development of many diseases and pathological processes [2,3]. The most important conditions for the realization of genetic potential are the optimal composition of rations and appropriate conditions for feeding and keeping animals. It is known that the health and productivity of animals depend on more than 60% of the feeding regime, feed composition, environmental factors and housing system.

Iron deficiency (alimentary) anaemia occurs as a result of the impact on the animal of a complex of environmental factors, the action of stressors and insufficient intake of trace elements necessary for haematopoiesis, the metabolism of which is very closely related to iron metabolism. According to the modern classification, it is dyshemopoietic and is caused by a violation of haemoglobin formation due to lack of iron and copper in the feed, deterioration of their absorption, as well as due to deficiency of cobalt, zinc and some vitamins [4,5, 6].

Significant in the occurrence of anaemia in pigs is anthropogenic factor - intensive use of sows without taking into account the readiness of their bodies for reproduction, lack of technological method to optimize the number of offspring taking into account the milk productivity of sows, unbalanced diets. as

well as containing alkaloids (mould-affected feed, peanut flour, cottonseed meal, etc.).

The course of anaemia increases, and the mortality of piglets increases in violation of housing technology and sanitation rules (congestion, insufficient gas exchange, high humidity in piggeries, microbial contamination, etc.), keeping sows on a cement floor in the absence of active exercise, and so on. Negative external factors are layered on biological features, which in the complex causes excessive stress on the sows body, especially during deep pregnancy, and causes a decrease in the content of plastic, energy and immune substances in her body. Under these conditions, the body of the fruit per unit time receives less oxygen and nutrients causes the development of piglets with low weight and reduced resistance to disease. Changes in peripheral blood in anaemia are combined with impaired haematopoiesis in the bone marrow, which, in some cases, have independent significance, and in others – develop secondarily, due to various diseases [7, 8, 9]. With optimal feeding of the sow, the liver of the new-born piglet contains 50 mg of iron. After 2 weeks, the concentration of iron in the liver of piglets decreases by 10-15 times, which indicates the depletion of iron depot in the body of the animal [10, 11, 12].

Limitation of iron stores in piglets (40-47 mg) and its low content in breast milk (2 mg per 100 g) when needed 70-200 mg lead to the development of anaemia. The value of iron deficiency in the etiology of anaemia in piglets is confirmed by an increase in blood haemoglobin and haematocrit after oral administration of iron. Half iron stores in piglets are reduced in the second – third week of their life [13, 14].

In the body of these animals decreases the synthesis of haemoglobin, disrupted external and internal gas exchange. Lack of oxygen reduces the secretory function of the stomach and intestines, the activity of enzymes. There are digestive disorders, impaired metabolism with a predominance of glycolysis, acidosis develops [15].

Alimentary anaemia of piglets is widespread in many countries and causes significant damage to farms. Thus, in Germany, losses from this disease are 20-30% of the total losses of piglets. In Denmark, of the 12 million piglets born each year, 2.4 million die mainly from nutritional anemia. In farms in France and Poland, the death of piglets from anemia in mass rearing reaches 30-35%, ie one piglet kills an average of three piglets [17, 18].

In patients with animal anemia, protein and mineral-gas metabolism is disturbed, the activity of the cardiovascular system, the functions of the digestive organs changes, and resistance to diseases decrease [19].

The leading link in the pathogenesis of anemia is oxygen starvation of tissues hypoxia). The respiratory function of the blood is related to the transfer of oxygen from the lungs to the tissues. In the state of hypoxemia of any etiology, the body is forced to partially switch to the anaerobic type of metabolism (glycolysis and glycogenolysis) [20, 21]. Erythrocyte hemoglobin, which transports more than 80% of the total amount of CO₂, plays an important role in the mechanism of CO₂ transfer from tissues to the lungs [22, 23, 24].

On the other hand, each of the 4 iron atoms in a hemoglobin molecule can attach only one oxygen molecule, resulting in the formation of oxyhaemoglobin, a compound of molecular oxygen with hemoglobin. Iron deficiency in the body causes a violation of the last stage of heme - synthesis - the conversion of protoporphyrin IX into heme, which in the form of heme- porphyrin is a prosthetic group not only of hemoglobin but also other respiratory enzymes (myoglobin, catalase, peroxidase and cytochromes in, c, c1) .

It is the hemic (blood) type of hypoxia that occurs when the hemoglobin content in the blood decreases (anemia) or when the hemoglobin loses its ability to attach or give oxygen in exchange for carbon dioxide [25, 26, 27].

1.2. Clinical signs

From the first 10-15 days at young growth of all kinds of animals there is a decrease in hemoglobin and number of erythrocytes. In foals, calves and lambs, it is usually temporary, and in piglets it often turns into a severe form of the disease. Alimentary anemia occurs in piglets, often well-developed, at the age of 3-6 weeks. There is a pallor of the skin and visible mucous membranes, which later become yellow, swollen age, lethargy [28,29].

Significantly reduced mobility of piglets, they become inactive, buried in the litter, poorly suck the sow, quickly lag behind in growth and development, the bristles become rough, brittle, and the skin wrinkled. There may be a distortion of appetite, indigestion. Abdomen often bloated or tightened diarrhea alternates with constipation. Diarrhea and bronchopneumonia develop [30,31]. Mucus may be present in the feces.

In the blood of sick animals, simultaneously with a decrease in hemoglobin, a decrease in the number of erythrocytes and hematocrit, the content of hemoglobin in a single erythrocyte decreases, as well as the saturation of transferrin with iron. At the same time increases the latent iron-binding capacity of blood serum [32, 33, 34].

1.3. Diagnosis

Early diagnosis is to determine the amount of iron in the blood, liver, spleen, kidneys. In other cases, analyse the diet of piglets, based on clinical symptoms and the results of haematological studies [35, 36, 37].

Piglets with a hemoglobin content below 40% are considered sick. At disease differentiation anemia, the influences arising against influence on an organism of young growth of other factors and, in particular, infectious and invasive are excluded [38, 39].

The diagnosis is made comprehensively: analyse the diets of sows, taking into account the provision of their diets with protein, iron and trace elements; take into account the symptoms of the disease (anemia, weakness) of piglets and conduct a selective blood test, take into account the pathological diagnosis[40].

Early signs of the disease also include a decrease in serum iron and ascorbic acid in the internal organs. With further progression of the disease in the blood of sick animals establish a significant decrease in the amount of hemoglobin (oligochromemia) [41, 42, 43].

This indicator is a reliable diagnostic test for iron deficiency, because at least 65% of this element is in the hemoglobin of the blood.

1.4. Differential diagnosis

It is necessary to exclude hemolytic disease of new-borns, posthemorrhagic anemia, B₁₂- and folate deficiency anemia, hypocobaltosis, hypocuprosis [45, 46].

For hemolytic disease of new-borns is characterized by age. In addition, this pathology, along with anemia, emphasizes the jaundice of the mucous membranes, and sometimes hemoglobinuria. The change in color (anisochromia) and size (anisocytosis) of erythrocytes is the most characteristic sign of posthemorrhagic anemia [47, 48, 49].

At the anemias caused by deficiency of vitamin B12 and folic acid, take into account results of research of blood and efficiency of purpose of the corresponding therapy.

1.5. Treatment and prevention of the disease

One of the main issues in the system of combating anemia is prevention. From the 30s of the last century until recently for the treatment and prevention

of anemia in piglets tested several methods and many antianemic drugs: orally used red clay, compounds of salts of iron, copper, cobalt, vitamins, iron glycerophosphate both individually and in combination with other compounds, antianemine - raw liver drug, nobiferol (briquette), iron-vitamin pastes, iron tartrate, iron fumarate, & quote apple juice flour & quote;, chelated iron compounds with lactic acid and many other compounds and combinations [50, 51, 52] .

From the sixties of the last century to the present in veterinary medicine for the prevention and treatment of iron deficiency anemia use drugs whose main active ingredient is a complex compound of iron with dextran: brovaferan, suiferovit, ferroglucin-75, microanemin, impozil, hemithorax, upexer, feridextran, ferrum, Ferrante, ferrodex, fedex, iron, myopher, ferry-100, pigdex, ferrumlek, bioferon, uniferon, ferro-vet-7.5%, suiferon, etc [53, 54].

For the treatment and prevention of alimentary anemia, iron dextran drugs are used orally or parenterally. Most spread has parenteral (intramuscular) use [55, 56, 57].

The low bioavailability of a number of micronutrients, in particular iron, and their unproductive costs in farm animals, in particular pigs, combined with rising prices for feed additives of these micronutrients, require ways to reduce the cost of micronutrient components of diets. This issue is especially relevant for such sex and age groups of pigs as suckling sows and their piglets, in which the deficiency of these trace elements causes anemia, and feeding rations with full compensation of the deficiency due to the salt form causes the removal of micronutrients from the drains in irreversible quantities. environment, primarily soils. Therefore, research is currently being conducted to reduce the doses of micronutrients required to balance diets, by increasing the bioavailability of these micronutrients in the body, by switching from salt forms of these feed additives to chelates [58, 59, 60].

The use of complex compounds of trace elements (including Fe) reduces the use of these trace elements in feeding pigs and thus reduce the cost of balancing the diets of these trace elements, reduce environmental pollution by these trace elements by reducing their excretion in the feces, which is of great environmental importance. A possible option for the use of Fe complexes may be developed by the company " Kronos-Agro" complex additive " Preparation feed biocatalyst (chelated iron complex) (TU 24.1-303931207-011: 2007) with a content of from 15.0 to 16.5 g Fe / kg of additives, which also contains activators of enzymes of energy, lipid and amino acid metabolism and in which the carrier of biologically active substances (BAS) is a natural aluminosilicate [61, 62, 63].

Iron is one of the most important trace elements necessary for the processes of growth, respiration, haematopoiesis, immunobiological and redox reactions in the body. Its main biological role is participation in erythropoiesis, during which it is used for the synthesis of hemoglobin [64, 65, 66]. Iron deficiency, as well as excess, adversely affects the health of both humans and animals. In iron deficiency anemias, colloidal solutions of iron hydroxides in low-molecular-weight polymers of glucose, the so-called iron dextran, are particularly effective. Most often in veterinary medicine they are used to create iron reserves in the liver of piglets during fetal development, in the first days after birth to piglets and calves, as well as fur-animals in the presence of fish in their diet [67-70].

Today the market of veterinary drugs in Ukraine is sufficiently provided with effective antianemic drugs. To reduce the dependence of our country on foreign producers, Ukrainian scientists There are 2 more antianemic drugs. Yes, in the composition of GAFERVIT (Bioveta, AS, Czech Republic) includes: iron (III) dextran complex, vitamin B1, vitamin B2, vitamin B6, vitamin PP, calcium pantothenate, copper chloride, cobalt chloride, inactivated normal serum of pigs [71-74].

Suiferovit (Biovet Pulawy Sp. Z o.o., Poland) contains active substances: immunoglobulin of normal pig serum, iron dextran, thiamine hydrochloride, riboflavin, pyridoxine hydrochloride, nicotinamide, calcium pantothenate, copper chloride, copper chloride. The above drugs, which contain ferrum dextran complex in combination with other substances, account for 46% of the domestic pharmaceutical market of iron preparations; it is an imported product and only one is produced in Ukraine, namely iron (Fe): chelated form, 5% solution [75-80].

Medicines according to the PBX-vet classification have the code QB03A Antianemic drugs. Iron supplements. Iron-containing drugs have an antianemic effect due to nyalow toxicity and water-soluble iron dextran complex. They stimulate the hematopoietic system and the synthesis of hemoglobin leads to an increase in the number of erythrocytes. The result of the activation of tissue metabolic processes is an increase in the growth rate of animals, the growth of their resistance to the effects of negative environmental factors [81]. Copper, cobalt and B vitamins act synergistically, enhancing the effects of iron, regulating metabolism and compensating for the lack of these elements in feed. After feeding, iron dextran is rapidly absorbed in the intestine through capillaries and lymphatic vessels. It is removed from blood plasma by cells of the reticuloendothelial system, in which it is divided into iron and dextran[82].

Iron binds to proteins to form hemosiderin, ferritin and transferrin complexes. Up to 60% of iron dextran is absorbed after 3after administration, up to 90% - within 1-3 weeks. The half-life of iron from blood plasma is 5hours; small amounts are excreted in the urine. Iron is metabolized and excreted by the kidneys. Indications for the use of iron-containing agents are the treatment and prevention of anaemia, oedema, hypo- and agammaglobulinemia of piglets and pigs, as well as diseases associated with the period of weaning from sows Contraindications to such drugs include: Do not use in animals with vitamin E and / or selenium deficiency, in the presence of diarrhea, in

combination with tetracyclines and in case of hypersensitivity to the active substance [83-88].

1.6. Conclusions from the review of literature sources

Alimentary (iron deficiency) anemia (Anemiaalimentaria) - this term defines the pathological condition of the body that occurs due to a decrease in hemoglobin and erythrocytes, or one of them per unit volume of blood, which leads to hypoxia and changes in hematopoietic organs.

This disease was first discussed at the dawn of the XIX century. Scottish scientists were the first to describe the clinical signs of the then unknown disease and prescribed treatment by adding crude iron oxides to the diets of suckling sows. The authors later concluded that the disease is caused by an insufficient amount of iron salts that enter the body of piglets with breast milk.

Much later, the classification of anemia was given, mainly due to morphological changes and etiological factors. The most characteristic signs of the disease are: pale skin and visible mucous membranes, which later turn yellow, swollen age, lethargy. Significantly reduced mobility of piglets, they become inactive, buried in the litter, poorly suck the sow, quickly lag behind in growth and development, the bristles become rough, brittle, and wrinkled skin. In a laboratory blood test, the hemoglobin content does not reach the lower limits of normal. Ferrodextran preparations are administered to sows 15-20 days before farrowing. Include in the diet feed additives that contain vitamin E, copper, zinc, cobalt (this is especially important in those regions whose soils are poor in these trace elements).

Piglets are prevented from three days of age, the introduction of parenteral iron dextran drugs, fed cows milk. Preventive measures should also take into account the proper maintenance of animals and care, which in combination with vitamin and mineral prophylaxis, give 100% safety and excellent growth of piglets.

2. Materials and methods of research

To perform the masters thesis, the farm "Sumy Postachfond" was selected. Krovne, Sumy district, Sumy region. As microelement feed additives were used: ferrous sulphates and chelate produced by PE; Kronos-Agro; which contains 1.5% of the mass. Ferrum .

The main rations of suckling sows were deficient in iron by 5.5% and dry feeding of suckling piglets - respectively by 33.2-36.0% of the current "Standards and rations for feeding farm animals " [2]. Ten sows and their suckling piglets were divided by the method of pairs-analogues into 2 groups of 5 sows and 35 newborn piglets, which received in addition to the basic diet (OR) of sows or dry feeding (SP) piglets the following trace elements: 1 group - 10 , 0 mg of iron in the form of seven aqueous ferrous sulphate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) / kg of feed or dry fertilizer, group 2 - 5.0 mg of iron in the form of iron chelates produced by PE "Kronos-Agro" / kg of feed or dry fertilizer.

Additives were introduced into the composition of the OP or SP in the form of premixes, which amounted to 5% of the mass. by weight, respectively, feed or dry fertilizer. Training of sows for premixes began in the last 4 days before farrowing, increasing the dose of premix by 33% of the total dose every 2 days, training of piglets - from 10 to 14 days of life, in the same way.

Piglets were weaned in the first experiment - at 63 days of age, in the second - at 60 days of age. The general condition and clinical status of the piglets were determined. Blood was taken to determine the morphological composition and physicochemical properties.

Methods of clinical examination of animals

During the clinical study, we determined: the general condition of the piglets, habit, skin condition, hair, visible mucous membranes. Palpation - examined the condition of the joints and caudal vertebrae.

Laboratory methods of blood tests. Whole blood and serum were used to determine the physiological condition of the sows during laboratory tests. Before taking blood, the sow was fixed with a rope to the upper jaw. The piglets were fixed in a hanging position, behind the legs, in the dorsal position.

In sows, blood was obtained from the cranial vena cava using an injection needle 75 mm long and 2 mm in diameter and a syringe. In piglets, blood was taken using a conventional injection needle and syringe from the ocular venous sinus. Whole blood was examined for the presence of hemoglobin, the number of erythrocytes, leukocytes, ESR, hematocrit; in the serum – the content of total protein, calcium and inorganic phosphorus.

The hemoglobin content was determined by hematocrit (Sally method); the number of erythrocytes and leukocytes - in the calculation chamber with Goryaevs grid; erythrocyte sedimentation rate - in the Panchenkov apparatus for 1 hour; haematocrit - micro method in the modification of Todorov. Biochemical blood tests.

The total amount of proteins and protein fractions, urea, creatinine, total glucose, cholesterol, inorganic calcium, inorganic phosphorus, total bilirubin, in animal serum was determined on a photoelectron colorimeter KFK-3 using reagents Simko-LTD (m). biochemical research. In suckling piglets, blood and serum tests were performed as in adult animals.

Methods of studying the productivity of pigs. Live weight of pigs was determined monthly. Young animals were weighed on scales (with a weighing limit of 500 kg), which are equipped with special cages. In adult animals, live

weight was determined by measuring with a measuring tape with an accuracy of 1 cm on the following indicators: body length, chest girth behind the shoulders, height at the withers, depth and width of the chest according to the formula:

The coefficient for pigs of average fattening is 142, medium - 156, lower - 162.

The average daily gain was calculated by the formula:

where W_t is the live mass (measurement) at the end of the observation;

W_0 - the value of the indicator at the beginning of the observation;

t is the period of time (days) between the previous and next weighing (taking measurements) of pigs.

Standards for determining the categories of pigs were carried out according to (GOST 1213-74).

At the weight of the animal at the last weighing ranged from 95-105 kg, the age of pigs to reach a live weight of 100 kg was calculated by the formula:

Otherwise, when the live weight was more than 100 kg:

where X is the age of reaching a live weight of 100 kg;

B - the actual age on the day of the last weighing of the animal, days;

M - actual live weight on the day of the last weighing, kg;

P - average daily gain for the control period of the test, kg [97].

3. Own research

3.1 Characteristics of the economy

Farm Sumy Postachfund c. Krovne, Sumy district, Sumy region, is located in the north western part of the Ukrainian forest-steppe, which is characterized by a temperate climate with warm summers with significant rainfall and not very cold with thawing winters. The region is dominated by winds from the south-west and north-east. The average relative humidity ranges from 45 to 67%.

The average annual temperature is + 6.2, the date of the beginning of autumn frosts is October 3-4, the date of cessation of withered frosts is April 28-30. The average duration of the frost-free period is 155 days, which is enough for the growth and development of all crops grown in Ukraine.

The soil cover of the farm consists of various rocks, but the most common chernozems are typical carbonate.

The total area of agricultural land is only 2472 hectares. The pig farm is connected to the village by an asphalt road. The pig complex includes: 4 buildings of 90 machines for keeping sows during farrowing, 3 buildings for keeping sows, 8 buildings for keeping piglets for rearing and pigs for fattening, isolator, sanitary slaughterhouse, feed warehouse, veterinary point, artificial point insemination, stable, administrative building with living space, garage.

The subject of activity of the farm is: industrial pig breeding, production and sale of pig production.

The advantage of the economy in the field of pig breeding is that: currently used productive breeds of pigs - Landrace, Pietren, Great White Ukrainian.

Table 3.1

The state of animal husbandry

Livestock	year	
	2019	2020
0-2 months	4216 goals	4043 goals
2-4 months	1876 goals	1920 goals
Main sows	352 goals	340 goals
Fattening	3025 goals	3115 goals
Repair youngsters	90 goals	69 goals
Boars	15 goals	14 goals

Analysing this table, we can conclude that no significant changes in the structure of the herd over the past two years. The share in the structure of the herd is occupied by piglets aged 0 to 2 months and pigs for fattening.

Table 3.2

The structure of sown areas

Name of cultures	Od. measurement	2018	2019	2020
Winter wheat	ha	920	830	956
Spring wheat	ha	245	236	260
Peas	ha	27	23	27
Buckwheat	ha	22	28	30
sunflower	ha	860	930	920
Corn for grain	ha	230	260	250
Fodder beet	ha	18	22	21
Silage com	ha	320	340	320
Perennial grasses on green mass	ha	100	110	112
Perennial grasses on hay	ha	100	112	120

Analyzing the data of table 3.2., We can trace which agricultural crops predominate in crops annually, and which, on the contrary, reduce their sown areas. This is, of course, due to the recent development of livestock farming on the farm.

The basis of all pig farming is highly productive animals adapted to the conditions of industrial technology.

In turn, when keeping pigs should take into account their biological characteristics. It is especially important to pay attention to the reproductive qualities of sows and boars, as well as the average period of their economic use.

The first insemination of a sow is carried out at the age of 7-8 months, when her body reaches physiological maturity. The average duration of economic use of sows is 3-3.5 years, after which they are culled.

Provided that on average 21-22 weeks pass between farrowing (reproduction cycle), 2.3 farrowing are received per sow per year. In each farrowing she brings 10-12 piglets.

Further care of livestock is 10-12% during the suckling period, 4-5% during the rearing period and 2-3% during fattening. Further care of livestock is 10-12% during the suckling period, 4-5% during the rearing period and 2-3% during fattening. The most effective way to obtain more pork of the best quality is the production system, which provides for the division of all production facilities into specialized technological areas.

Insemination site (with individual maintenance for 30 days);

Area of pregnant sows (keeping for 75 days);

The farrowing area and suckling period of piglets (21-27 days);

Pig breeding area (8-36 kg);

Fattening area (from 30 kg to 120 kg)

Insemination site

At the insemination site, repair pigs and sows are kept in individual machines on partially slotted floors for 5-7 days before insemination and the first 30 days of gestation. Individual content provides sedentary animals, which prevents the leakage of seeds. In addition, it reduces the risk of embryonic mortality, a high level of which is characterized by this period of gestation. In

the department for pregnant sows, individual walking content is used, which provides for the presence of free sections for group keeping in boxes on straw. Thus, sections of branch meet the following requirements: the minimum area per main sow is 1.3 m² and 0.95 m².

The floors are strong and not smooth to prevent sows from slipping and falling. The required temperature and ventilation mode is maintained in the section. Feeding pregnant sows is strictly dosed. Pregnant sows are kept in this area for 12-16 weeks. 5-7 days before farrowing, they are transferred to farrowing branches. The farrowing area contains sows with suckling piglets in specially equipped farrowing machines. The lair for piglets is heated by infrared lamps. Farrowing lasts from 3 to 6 hours and takes place without the participation of the operator. The weight of a newborn piglet is 1000 g - 1500 g. Immediately after birth, the piglets are weighed, tagged and teeth sharpened. On day 3-5, boars are castrated, tails are docked and injections of iron-containing drug are made.

Growing area.

3-4 weeks after farrowing - piglets weigh 6-8 kg and are transferred to the rearing area. Here are 11 weeks and their weight by the end of this period will reach 25-30 kg. Compartments for piglets on rearing can be equipped with: a canopy in the resting area of piglets, a system of heating sections for keeping piglets, systems of automatic feeding and water distribution. When the piglets reach a weight of 30 kg, they are transferred to the fattening area.

Fattening area.

Piglets are fattened at the age of 11-12 weeks at a live weight of 25-30 kg. In 3 months, they gain weight 110-120 kg, after which they are sent to the slaughterhouse and for sale.

Table 3.3

Diet analysis

Indicators	Given in the diet	normal	+/- to the required security	Percentage security (%)
Feed, unit	2.900	3.1	-0.15	96.8
Exchange, energy	32.94	34.2	-1.26	90.34
Dry matter, Kg	2,530	295	-0.42	85.0
Cheese, protein	378.7	413	-34.3	73.7
Per. Protein, m	250.1	310	-59.9	60.5
Lysine, m.	12.3	17.7	-15.4	62.5
Methionine + cystine, m	9	10.6	-0.4	84.9
Tryptophan, m.				
Cheese cellulose, m.	222.9	342	-119.1	24.8
Calcium , m.	20	26	-6	64.7
Phosphorus, m.	11	21	-10	58.4
Iron, mg.	125	239	-115	52.3
Copper, mg.	17.4	50	-32.6	34.0
Zinc, mg.	100.3	257	-156.7	50.1
Manganese, mg.	108.9	139	-30.1	73.3
Cobalt, mg	2.3	5	-2.7	42.4
Iodine, mg	0.69	1	-31	85.3
Carotene, mg.	26.1	34	-7.9	83.2
Vit A thousand ME	12.7	17	-4.3	45.9
Vit D thousand ME	0.7	1.7	-1.0	32.3
Vit E, mg.	125	121	4	103.4
Vit B1, mg		8	-8	
Vit Vz, mg	23.5	68	-44.5	34.5
Vit B5,mg.	150	239	-89	
Vit B12, mk, d.		86	-86	
Table salt, g.	12	17	-5	94.2

Studying table 3.3. it is possible to pay attention that practically on all indicators there is a lack. Absolutely absent in the diet: vitamins B12, B1; critical deficiency of vital trace elements for young animals such as zinc (-156.7 mg), copper (-32.6 mg), cobalt (-2.7 mg), insufficient vitamin D (only 32.3% of security); in small amounts of calcium, phosphorus, iron. But work on improvement is already underway, because full-fledged feeding provides a high percentage of young animals and animal health.

3.2. The results of their own research.

There are many problematic stages in pig breeding, one of which is the cultivation of suckling piglets. This is due to a number of physiological features of the development of the body of new-born piglets. The most common problem is their supply of iron (Fe). With cows milk, a piglet can receive only about 1 mg of Fe per day on average. However, the daily requirement of iron in suckling piglets is about 7-10 mg.

Due to the lack of Fe in the diet, piglets develop iron deficiency anemia (hypochromic, microcytic), the clinical signs of which begin to appear on the 10th or 14th day of life. The occurrence of anemia is due to high-intensity metabolic processes and very rapid growth of piglets. Animals with anemia grow poorly, are lethargic and more susceptible to infectious diseases. Today, available preparations of iron are amino acid chelates. Assimilation of chelates in the gastrointestinal tract is insufficient due to their high chemical stability. Attempts to prevent the development of ferrum deficiency anemia in piglets by administering chelated amino acid complexes with iron to pregnant sows have not been successful. In addition, iron chelates proposed for suckling piglets in drinking water as the sole source of Fe do not always have a positive effect.

Along with chelated compounds of iron, Ferrum dextran preparations are widely used, but their cost is quite high. The aim of our work was to study

the effectiveness of the use of the negligent form of iron in order to prevent ferrum deficiency anemia in piglets. At the beginning of the study, conducted a clinical examination of all animals, determined the clinical parameters of the blood in both groups. The animals were moderately fat; slight anemia of the skin; bristles - whole, but without shine; mucous membranes - pale pink, intact; joints - painless, mobile, without enlargement and deformation; tail vertebrae - anatomically correctly formed, without signs of softening; lymph nodes - not enlarged, mobile, not painful, not hot.

Table 3.4

The results of blood tests of pregnant sows in the control group

№	Inv. No animal	Hemo-globin g/L	Erythro-cyte T/L	Leuco-cyte G/L	ESR mm/year	Haemat o-crit %	Total protei n g/l	Total calci- um mmol/ l	Neorg P mmol/l
1	06267	78.3	4.29	8.17	11.3	30.2	73.4	2.1	1.1
2	06233	75.7	4.67	7.84	9.4	36.4	70.2	2.3	1.3
3	05912	82.2	5.14	8.15	12.2	32.4	71.5	2.0	1.0
Average values		78.2	4.7	8.05	10.6	32.6	71.5	2.33	1.3
norm		92-114	5-7.58	8-16	2-9	35-43	70-85	2.5-3.12	1.45-2.4
+/- to norm		-1.2	-1.3	+0.5	+8	-10.5	+17	-1.47	-0.2

Based on the results of Table 3.4, most blood parameters in both animals of the experimental and base groups are at the lower limit or even below normal. Hemoglobin is an indicator of the quality of erythrocytes, it contains ferrous iron, which is a carrier of oxygen. In piglets with nutritional anemia, there is hypoxia, ie lack of oxygen. The above table shows that the amount of hemoglobin is - 12% lower than normal. The number of erythrocytes in 1 µl is

lower than normal by 1.3% in both groups, which in turn will affect newborn piglets.

Table 3.5

The results of the study of blood of pregnant sows of the experimental group

№	Inv. No animal	Hemo-globin g/l	Erythrocyte T/l	Leucocyte G/l	ESR mm/year	Haematocrit %	Total protein g/l	Total calcium mmol/g	Neorg P mmol/g
1	06435	81.2	4.56	8.15	12.3	33.4	75.6	2.5	1.0
2	06220	78.3	4.62	8.20	11.2	34.2	81.14	2.8	1.5
3	05915	74.6	4.78	8.86	10.3	32.4	83.4	2.3	1.3
Average values		78.2	4.65	8.40	11.25	33.3	80.3	2.1	1.2
norm		90-110	6-7.5	8-16	2-9	35-43	70-85	2.5-3.12	1.45-2.4
+/- to norm (%)		-12	-1.35	+0.40	+9	-2.0	+10	-18.1	-0.3

It is known that the largest amount of iron is in erythrocytes. However, increased ESR by 20 -28% (this indicates the development of anemia). Hematocrit is the ratio of the volume of shaped elements (erythrocytes) to the total volume of blood. According to the results of table 3.5, we can say that in this case the hematocrit is reduced by 10% (this number is also observed in the development of anemia of various origins).

The following table shows the reduction of calcium and phosphorus. Decrease in these microelements in blood serum, indicates its insufficient receipt in a diet that is also an indicator of disturbance of a metabolism. However, the table shows that the total number of leukocytes is within normal limits, which can be attributed to the absence of an infectious process in the body. After analysing the results, it is safe to say that piglets obtained from such

sows will be at risk for diseases of young animals (in particular, for nutritional anemia).

In piglets with nutritional anemia, there is hypoxia, ie lack of oxygen. The above table shows that the amount of haemoglobin is - 12% lower than normal. The number of erythrocytes in 1 μ l is lower than normal by 1.3% in both groups, which in turn will affect newborn piglets. It is known that the largest amount of iron is in erythrocytes. However, increased ESR by 20 - 28% (this indicates the development of anaemia).

Table 3.6

The results of blood tests in piglets of the control group

№	Haemo- Globin g/l	Erythr- ocyte T/l	Leuco- cyte G/l	ESR mm/year	Haema- tocrit %	Total protein g/l	Total Ca mmol/l	Neorg P mmol/l
1	78.4	5.5	7.4	12.3	27.8	40.1	2.1	1.3
2	76.6	4.6	7.8	10.5	23.4	41.3	2.5	1.0
3	79.2	5.1	6.7	11.6	26.2	42.5	2.4	1.2
4	80.02	4.8	7.24	10.2	31.3	41.10	2.7	1.5
5	83.4	4.5	8.23	11.4	30.2	42.4	2.5	1.4
6	78.8	5.5	8.3	13.5	34.4	40.3	2.8	1.5
Average	79.4	4.8	7.6	11.24	28.4	41.5	2.3	1.4
Norm	90-110	6-7.5	8-16	2-9	35-43	40-45	2.5- 3.12	1.45- 2.4
+/- to norm (%)	-13.5	-1.2	-0.3	+2.22	-6.3	+1	-0.6	-1.1

Analyzing the data from table 3.6, in whole blood of piglets of the control group, which received 10.0 mg of iron in the form of ferric sulphate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) / kg of feed or dry feed, it can be noted that almost all clinical indicators are below the minimum norm. This suggests that these piglets did not receive

from their mothers the necessary supply of vital substances, and the drug did not give the proper effect.

This means that their immunity and reactivity of the body is at a minimum level. Therefore, such animals are most prone to disease, including alimentary anemia. Most of these piglets, even with parenteral administration of iron dextran drugs, immediately after birth, can get a lot of diseases.

Table 3.7

The results of blood tests in piglets of the experimental group

№	Haemo- globin g/l	Erythro- cyte T/l	Leuco- cyte G/l	ESR mm/year	Haemato- crit %	Total protein g/l	Total Ca mmol/l	Neorg P mmol/l
1	91.2	6.0	9.12	7.4	37.5	41.4	1.6	1.2
2	93.5	6.2	10.2	8.3	32.3	42.3	1.8	1.3
3	92.7	7.1	8.5	9.8	27.5	43.2	1.9	1.6
4	93.1	6.3	9.6	9.9	35.3	36.5	2.3	1.4
5	92.3	6.10	10.1	8.9	38.4	37.2	1.6	1.10
6	93.4	7.5	11.2	9.1	39.2	39.3	2.2	1.8
average	92.7	6.56	9.6	8.6	34.70	39.7	2.1	1.8
norm	90-110	6-7.5	8-16	2-9	35-43	40-45	2.5- 3.12	1.45- 2.4
+/- to norm	Within the norm						-5	-7.2

Speaking of data from table. 3.7, it should be concluded that piglets which for the preventive purpose of alimentary anemia added to the feed Ferrate sulphate, have a significantly better clinical picture of the blood than the animals of the control group. Haemoglobin levels, erythrocyte count, leukocyte count, erythrocyte sedimentation rate and haematocrit are within normal limits.

These indicators suggest that the piglets received the necessary substances from the mother during fetal development. Which, in turn, will

positively affect their further development and resistance to disease. However, it should be noted that as in piglets of both groups found a lack of calcium -4.6% and phosphorus -7.2 to a minimum. In the next study, we determined the effect of the dose of chelated iron supplement (compared with sulphate) on the growth of piglets (Table 3.8).

Table 3.8

The effect of the dose of chelated additive Ferrum (compared with sulphate) on the growth of piglets (M ± m)

indicators	Control group	Experimental group
1.The average number of piglets/ “nest”, heads, for periods;		
At birth	10.70 +/- 0.57	10.70 +/- 0.63
At age of 21 days	9.85 +/- 0.36	10.22 +/- 0.44
At age of 63 days	9.00 +/- 0.43	9.80 +/- 0.36
2. the average safety of piglets, % (of the number of live newborns)		
At the age of 21 days	91.20 +/- 2.63	94.85 +/- 2.23
At the age of 63 days	83.45 +/- 1.50	91 .35 +/- 2.63
3. average live weight of piglets (Kg) for the period		
At birth	1.18+/- 0.03	1.17 +/- 0.04
At the age of 21 days	6.18 +/- 0.14	6.46 +/- 0.15
At the age of 63 days	17.22 +/- 0.23	18.12 +/- 0.28
4. the average yield of live weight of piglets / farrowing , (Kg)		
At birth	12.6 +/- 0.5	12.7 +/- 0.7
At the age of 21 days	60.41 +/- 2.13	67.02 +/- 3.14
At the age of 63 days	156.5 +/- 8.7	177.3 +/- 6.5
5. average age. Increase from 1 to 63 days, g	257.8 +/- 3.8	269.2 +/- 4.0
6. Ser. Vitr. Feed/ kg gain 1- 63 days	19.17 +/- 0.26	18.35 +/- 0.25

Based on the data of table 3.8, the use of iron at a dose of 5.0 mg / kg of feed or dry feed increases compared to the control for the first 63 days of life of piglets average survival by 7.82%, the average number of piglets per farrowing by 0.80 heads. Also in the experimental group increased the average live weight of piglets by 0.69 kg (2.3%), the average yield of live weight of piglets per farrowing by 20.7 kg (13.2%), the average daily gain of 11.1 g or at 4.3%. The average milk yield of sows increased by 5.65 kg or 9.3%, the average feed consumption / kg of piglet growth decreased by 4.1%.

In the next experiment (table 3.9) determined the cost-effectiveness of the use of chelated additive Ferrum, compared with sulphate.

Table 3.9

Cost-effectiveness of the use of chelated additive Ferrum, compared with sulphate

indicators	Control group	Experimental group
Conditional net profit compared to the control group from the use of additives, UAH.		
At 21 days of age, for farrowing	-	83.30
At 21 days of age, per piglet	-	8.15
At 63 days of age, for farrowing	-	303.20
At 63 days of age, per piglet	-	30.92
The cost of growing 1 quintal of life weight of piglet, UAH		
On the 63 rd day of live of piglet	766.95	701.53
+/- to control %/ UAH	-	-8.5/-65.22
Profitable of piglet, %, in periods		
On the 63 rd day of life of piglets	43.2	56.7
+/- to control, %	-	+13.5

The use of iron at a dose of 5.0 mg / kg of feed allows at 63 days of age to obtain a relatively net profit (compared to the control group) in the amount of UAH 303.22. for one farrow or UAH 30.94. per piglet.

You can also reduce the average cost of 1 quintal of live weight of piglets by 65.44 UAH. or by 8.5%, increase the profit from growing 1 quintal of live weight of piglets by 19.7% and profitability by 13.7%.

When compensating for iron deficiency in the main diets of suckling sows and in dry feeding of their suckling piglets, the dose of chelated forms Iron can be reduced by half compared to the dose for the salt form of iron without reducing the effectiveness of this trace element or even with some improvement in its effectiveness on the growth rates of suckling piglets.

The possibility of reducing the optimal dose of iron in the main diets of suckling sows and in dry feedings of their suckling piglets twice in the transition from salt forms of micronutrients to chelates makes it possible to reduce the level of secretion of these microelements.

Discussion

The work was performed in the farm "SumyPostachfund" with. Krovne, Sumy district, Sumy region, where piglet anemia was detected. Piglets were selected from two machines for research, taking into account the age and weight of these animals. The disease, which heads one of the leading places in the area. The main causes of this disease are poor feeding of the uterus, insufficient preventive work and physiological features. In some cases, we have observed that piglets do not approach the udder or stop sucking it at the time when the nipple sphincters open, and milk is released on the floor. Sometimes there is a distorted appetite: animals lick the walls, feeders, drink manure.

At auscultation of a site of heart, heart tones are muffled, frequent. Pulse of weak filling, accelerated. The use of iron at a dose of 5.0 mg / kg of feed or

dry feed increases compared to the control for the first 63 days of life of piglets average survival by 7.82%, the average number of piglets per farrowing by 0.80 heads. Also in the experimental group increased the average live weight of piglets by 0.69 kg (2.3%), the average yield of live weight of piglets per farrowing by 20.7 kg (13.2%), the average daily gain of 11.1 g or at 4.3%. The average milk yield of sows increased by 5.65 kg or 9.3%, the average feed consumption / kg of piglet growth decreased by 4.1%. Most blood counts were within normal limits, although it must be said that total calcium and inorganic phosphorus were outside the minimum range.

However, piglets from such sows had a pink skin color; mobile, well-defined act of sucking; the hair is shiny, there is rapid growth and development. Piglets to which ferric sulphate was added to compound feed for the purpose of alimentary anemia have a much better clinical picture of blood than animals of the control group. Hemoglobin counts, erythrocyte count, leukocyte count, erythrocyte sedimentation rate and hematocrit are within normal limits. These indicators suggest that the piglets received the necessary substances from the mother during fetal development.

Which, in turn, will positively affect their further development and resistance to disease. The use of iron chelate at a dose of 5.0 mg / kg of feed allows at 63 days of age to obtain a relatively net profit (compared to the control group) in the amount of UAH 303.22. for one farrow or UAH 30.94. per piglet. You can also reduce the average cost of 1 quintal of live weight of piglets by 65.44 UAH. or by 8.5%, increase the profit from growing 1 quintal of live weight of piglets by 19.7% and profitability by 13.7%. When compensating for iron deficiency in the main diets of suckling sows and in dry feedings of their suckling piglets, the dose of chelated forms of Ferrum can be halved compared to the dose for saline form of Ferrum without reducing the effectiveness of this trace element or even with some improvement in the growth of piglets. -suckers.

Conclusions

1. It was established based on the results of research that in pregnant sows the amount of hemoglobin is lower than normal by 12%, erythrocytes by 1.3%, which in turn will affect newborn piglets.

2. It was experimentally proved that in piglets of the control group hemoglobin was lower by 13% compared to normal.

3. It was found that with the use of a dressing gown, the average milk yield of sows increased by 5.65 kg or 9.3%, the average feed consumption / kg of piglet growth decreased by 4.1%.

4. The use of iron chelate at a dose of 5.0 mg / kg of feed or dry feed increases compared to the control for the first 63 days of life of piglets average survival by 7.82%, the average number of piglets per farrowing by 0.80 heads.

5. The use of iron chelate in the experimental group contributed to an increase in the average live weight of piglets by 0.69 kg (2.3%), the average yield of live weight of piglets per farrowing by 20.7 kg (13.2%), the average daily gain of 11.1 g or 4.3%. Suggestions For intensive work of the farm, obtaining high labor rates, increasing economic efficiency, we offer pregnant sows and piglets to use quality feed with the addition of iron chelate 5.0 mg / kg of feed.

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