International Science Group
ISG-KONF.COM

THEORETICAL FOUNDATIONS FOR THE IMPLEMENTATION AND ADAPTATION OF SCIENTIFIC ACHIEVEMENTS IN PRACTICE

22 JUNE 23 XXII SCIENTIFIC AND PRACTICAL CONFERENCE

HELSINKI, FINLAND

ISBN 978-1-64871-428-3
DOI 10.46299/ISG.2020.XXII

MINERAL COMPONENTS CONTENT IN PIGLETS BLOOD SERUM UNDER INFLUENCE OF VITAMIN E AND METAL CITRATES

Tokarchuk Tatyana
assistant
State agrarian and engineering university in Podilia

Modern technologies of pig breeding, weaning piglets from sows, require constant improvement of the quality of treatment and prevention work. The main reasons for the large loss of young and its lag in growth are a variety of nutritional diseases, among which the most common in suckling piglets are ferrum deficiency anemia and stress factors caused by technological processes [1]. Therefore, mineral elements must constantly enter the body of animals with food or water and normalize metabolism and energy metabolism, ensure the work of enzymes and hormones [2-6]. There is a high percentage of piglets' death when they are weaning and the use of poor quality pre-starter feed during this period against the background of stress is provided. The use of monocomponent ferrum dextran agents is accompanied by activation of lipid peroxidation, which reduces the activity of antioxidant protection. Modern experimental studies have proven the need to use synbiotic elements with antioxidant properties simultaneously with iron. Weaning piglets from sows significantly affects the content of lipid peroxidation products and the activity of enzymes of the antioxidant defense system in their body. The complex effect of micronutrient citrates on the metabolic processes in the body of piglets during their weaning from sows has been studied. Their effect in a much lower concentration compared to their inorganic salts is istablished. It was studied that complex use of nanocitrates of Fe, Zn and other citrates of microelements in piglets' feeding increases the adaptability of their bodies during weaning from sows, due to stimulation of the antioxidant system and adaptive factors of animals.

A number of authors had studied the effect of the use of nanoaquachelates and nanoparticles of trace elements [7–11], as well as vitamin E [12] on the body of animals. However, there is no information in the public literature regarding the establishment of the optimal dose of citrates of Germany, Iron, Zinc for piglets aged 24-50 days and their effect on metabolic processes in animals. It remains unclear the study the characteristics and intensity of biochemical processes in the body of piglets during weaning during sowing of vitamin E and intramuscular injection of a complex of citrate trace elements.

A promising area is the study of biochemical processes in piglets under the influence of technological factors using vitamin E and a complex of citrate trace elements Zinc, Iron and Germany, which will develop a way to preserve piglets and increase their growth. In the conditions of market competition the domestic pig

breeding feels an urgent need in use of modern achievements of biochemical science and in the qualified scientific support of their introduction into production.

The aim of the study was to determine the content of trace elements in the serum of piglets using vitamin E and citrates of Zn, Fe and Ge.

To this aim five groups of animals were formed: one control and four experimental. Piglets of first experimental group were drunk by vitamin E at a dose of 4.5 mg per 1 kg of body weight per day. Second experimental group received twice vitamin E and twice intramuscular injection of citrate complex of trace elements Zn, Fe and Ge in the amount of 2.0 cm^3 per 10 kg of body weight. Animals of the third experimental group, against the background of additional drinking of vitamin E, were injected with 2.5 cm^3 per 10 kg of body weight of trace element citrates. Piglets of the fourth experimental group received vitamin E in the amount of 4.5 mg per 1 kg of body weight and 3.0 cm^3 of micronutrient citrates.

The dynamics of the content of Fe and Cu are presented in table 1.

Table 1

The content of Fe and Cu in the piglets' serum under the action of vitamin E and citrate of trace elements, μmol/dm3 (M±m, n=5)

A group of animals	Fe	Cu
24th day		
Control group	14,9±0,38	27,3±1,08
Experimental group I	15,0±0,42	26,9±0,97
Experimental group II	14,7±0,79	27,8±0,78
Experimental group III	14,6±0,54	28,0±1,07
Experimental group IV	15,1±0,43	26,5±0,77
28th day		
Control group	15,2±0,45	28,9±1,02
Experimental group I	15,3±0,79	29,5±0,77
Experimental group II	19,2±1,31*	30,1±0,67
Experimental group III	22,3±0,98***	30,4±1,65
Experimental group IV	24,1±1,14***	31,0±1,75
35th day		
Control group	16,4±0,89	28,3±0,65
Experimental group I	17,2±2,17	29,3±3,25
Experimental group II	20,5±0,78**	30,2±0,98
Experimental group III	23,1±1,09**	31,0±1,67
Experimental group IV	26,7±1,67***	31,4±1,86
50th day		
Control group	17,1±0,86	27,5±0,88
Experimental group I	16,9±1,97	28,6±0,91
Experimental group II	19,0±0,72	30,2±1,22
Experimental group III	20,0±1,11	30,9±1,76

Experimental group IV	21,1±1,83	31,8±2,92

It was found that vitamin E (α-tocopherol) and citrates of trace elements Zn, Fe and Ge activate erythropoiesis in piglets from 24 to 50 days of age, stimulate hemoglobin synthesis, reduce the content of phospholipids, cholesterol and low-density lipoproteins. Repeated intramuscular administration of micronutrient citrate complexes had been shown to increase the serum levels of Zinc, Iron, and Germany in the serum of Great White × Landrace piglets at 35 and 50 days of age. The use of citrates of trace elements Zn, Fe and Ge and vitamin E stimulates anabolic processes in piglets, which is confirmed by an increase in live weight on the 35th and 50th day of life.

References

1. Zhuo, Z., Yu, X., Li, S., Fang, S., & Feng, J. (2019). Heme and non-heme iron on growth performances, blood parameters, tissue mineral concentration, and intestinal morphology of weanling pigs. Biological trace element research, 187(2), 411–417.

2. Bitytskyy, V. S., Tsekhmistrenko, O. S., Tsekhmistrenko, S. I., Spyvack, M. Y., Shadura, U. M. (2017). Perspectives of cerium nanoparticles use in agriculture. The Animal Biology, 19(3), 9–17.

3. Цехмістренко, С. І., Цехмістренко, О. С. (2014). Біохімія м'яса та м'ясопродуктів: Навч. посіб. Біла Церква, 192 с.

4. Tsekhmistrenko, S. I., Bityutskyy, V. S., Tsekhmistrenko, O. S., Polishchuk, V. M., Polishchuk, S. A., Ponomarenko, N. V., Melnychenko, Y. O., & Spivak, M. Y. (2018). Enzyme-like activity of nanomaterials. Regulatory Mechanisms in Biosystems, 9(3), 469–476. DOI https://doi.org/10.15421/021870

5. Tsekhmistrenko, O., Tsekhmistrenko, S., Bityutskyy, V. (2019). Nanoscale cerium dioxide as a mimetic of antioxidant protection enzymes. Multidisciplinary conference For young researchers 22 November 2019, 68–71.

6. Chabaev, M. G., Nekrasov, R. V., Moshkutelo, I. I., Nadeev, V. P., Tsis, E. Y., & Yuldashbaev, Y. A. (2019). Growing Pigs' Production Potential Using Feed Mixes Enriched with a Bioorganic Iron Complex. Russian Agricultural Sciences, 45(1), 72–76.

7. Bityutskyy, V., Tsekhmistrenko, S., Tsekhmistrenko, O., Melnychenko, O., Kharchyshyn, V. (2019) Effects of Different Dietary Selenium Sources Including Probiotics Mixture on Growth Performance, Feed Utilization and Serum Biochemical Profile of Quails. In: Nadykto V. (eds) Modern Development Paths of Agricultural Production. Springer, Cham, 623-632. https://doi.org/10.1007/978-3-030-14918-5_61

8. Tsekhmistrenko, S. I., Bityutskyy, V. S., Tsekhmistrenko, O. S., Horalskyi, L. P., Tymoshok, N. O., Spivak, M. Y. (2020). Bacterial synthesis of nanoparticles: A green approach. Biosystems Diversity, 28(1), 9–17.

9. Цехмістренко, О. С, Бітюцький, В. С., Цехмістренко, С. І., Мельниченко, О. М., Тимошок, Н. О., Співак, М. Я. (2019). Використання наночастинок

металів та неметалів у птахівництві. Технологія виробництва і переробки продукції тваринництва: Зб. наук. праць, Біла Церква, 2, 113–130.

10. Tymoshok, N. O., Kharchuk, M. S., Kaplunenko, V. G., Bityutskyy, V. S., Tsekhmistrenko, S. I., Tsekhmistrenko, O. S., Spivak, M. Y., Melnichenko, O. M. (2019). Evaluation of effects of selenium nanoparticles on *Bacillus subtilis*. Regulatory Mechanisms in Biosystems, 10(4), 544–552.

11. Цехмістренко, О. С., Цехмістренко, С. І., Бітюцький, В. С., Мельниченко, О. М., Олешко, О. А. (2018). Біоміметична та антиоксидантна активність нанокристалічного діоксиду церію. Світ медицини та біології, 1(63), 196–201.

12. Miyazawa, T., Burdeos, G. C., Itaya, M., Nakagawa, K., & Miyazawa, T. (2019). Vitamin E: Regulatory redox interactions. IUBMB life, 71(4), 430–441.