ВЕТЕРИНАРИЯ И ЖИВОТНОВОДСТВА

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THE ACUTE TOXICITY AND ALLERGIC EFFECTOF FEED ADDITIVES BASED ON ZEOLITES FROM CHANKANAY DEPOSIT (KAZAKHSTAN)

Abstract

Safety and quality of feed and feed additives is one of the most important criteria in the production of products of animal origin and the provision of a quality product of the population. Asa feed additives Zeolites, can be used in animal feeding as the supplement for the basic Ration, thus representing a major issue for safety of animal origin foods. This paper shows the approaches adopted by the Kazakhstan lawand Technical regulations «On the safety of feed and feed additives» to perform risk analysis of feed additives as regards the whole food production chain, including target species, consumers, occupational exposure and the environment. The results of this paper showed that the Zeolites from Chankanay minds of Kazakhstan, do not have an acute toxic and allergic effect, do not irritate the skin and mucous membranes.

Key words: zeolites, diet, toxicological characterization, laboratory animals, minerals, feed.

Introduction

Risk assessment of food and feed comprises an integrated approach where information is required on a number of characteristics from various types of tests, including toxicity. Data generated from toxicity testing, whether collected from in vivo or in vitro studies provide fundamental information for carrying out a risk assessment of a food for human consumption, or of a feed for animals [1].Feed additives make the bulk of chemicals used in animal production, thus representing a major issue for safety of foods of animal origin [2].

Zeolites are beneficial feed additives for ruminants because of their high affinity for nutritionally vital species. Through their ion-exchange selectivity, zeolite minerals may act as sinks for the adsorption of excess rumen ammonia after feeding and gradually release it as the zeolites are regenerated to their natural state by cations from the saliva. Zeolites provide a more stable rumen environment with respect to N availability that is beneficial to both rumen microbial fermentation and animal performance [3].

The use of clays as carriers allows the addition of vitamins; minerals, antibiotics and other active compounds to the feed mix in concentrations under 0.1%. Zeolites can be used as binding agents in animal feeds. Zeolite’s primary values are as growth promoters and carriers of nutrients. As growth promoters zeolites appear to act as a buffer in the animal’s digestive system, storing nitrogen in the form of ammonium and releasing it gradually by ion exchange with sodium and potassium. The animal receives greater benefit from the same quantity of feed. The ammonium absorbing characteristics result in drier faeces and an improved atmosphere in the stables [4].

Natural zeolites are harmless, have metabolism-normalising, bactericidal, immunostimulatory and antioxidative effects. They diminish mortality and morbidity with regard to many diseases and disorders affecting cattle, sheep and goats, swine and poultry. Hence it is rational to utilize zeolites in animal husbandry. They are used successfully in the treatment of different human diseases. Zeolite efficacy in gastroenterologymerits particular attention. It is established that zeolites can be used both in human and veterinary medicine as biological active food additives (dietic additives), drugs, drug carriers, adjuvants in anticancer therapy and antimicrobial agents as well [5].

Mineral components in the feed from a practical point of view can belong to the group of essential or toxic elements, depending on what is of great importance. The toxic effect is manifested when they are present in an excess amount of vital necessity manifested when the body needs in optimal amounts [6].

There was established that the supplementation of zeolites have positive effect on daily gain and productive performances of pigs and increase the hematological parameters in blood. Results of this study suggest that dietary supplement of zeolite can be used as a feed additive for pigs and it can affect some parameters of hematological indicators of pigs [7].

Materials and methods

The material of study was the Zeolitic tuff of Chankanay deposit (Kazakhstan, Almaty region. Chemical composition (%) of using zeolite: SiO2 - 55.90, Al2O3 - 15.60, Fe2O3 - 5.90, CaO - 5.57, MgO - 2.54, Na2O - 3.05, K2O - 2.15, TiO2 - 0.45 [8]. The number of toxic elements (mercury, lead, cadmium, arsenic, fluorine) and radionuclides is much lower than the maximum permissible concentrations.

The first series of experiments on the study of acute toxicity of zeolites was carried out with intragastric administration to 50 white rats at doses of 2 to 22 g / kg body weight during the30 days.

Local irritating and skin-resorptive effect of Zeolites of the Chankanay deposit was studied on white rabbits.In order to determine locally irritating action feed additive was suspended 1:1 in distilled water and by occasionally shaking, extracted for 24 hours at 37 ° C, then filtered through paper filter.The filtered solution in a volume of two droplets introduced into the conjunctiva of the left eye of rabbits;for comparison to the right eye, which was the control, was instilled the same volume of distilled water.

The skin-resorptive effect of the test additive was revealed by applying the application of the test additive to the right side of the rabbit; left side served as a control. The additive was applied in the form of a suspension at a rate of 20 ml per cm^2 of the previously prepared area. Applying of the slurry feed additive was performed by open method using a spatula, after preparing a suspension based on vegetable oil. For the control plot was using only vegetable oil. Plot size was 4x4 cm applications. Experimental rabbits were applied once with a four-hour exposure, and also every day during the 7 days.

Blood samplesfor the experiment were taken on the 15th and 30th days. Hematologicalblood tests carried out by standard methods or (The number of erythrocytes, leukocytes,levels of haemoglobin were established using the Symex SF-3000automatic counter. Blood smears were prepared and stained by standard method and investigatedunder a microscope in order to arrive at the differential blood count. The relative ratio ofindividual cells of leukocytes is given in percentages in relation to their total number).The obtained data were processed using MS EXCEL tables. The significance ofdifferences by the study group was determined in ANOVA, which were considered significant atp<0.05.

Results and discussions

During the acute toxicity study of zeolites with an intragastric administration for 15 and 30 days, it was found that none of the tested doses caused the death of the experimental animals. At doses of 2 to 22 g / kg body weight, there were no deviations from the behavioral reactions and the general state of white rats revealed (Table1).

Table1.Determination of acute toxicity of Chankanay Zeolites on rats, n = 50

	Doses g/kg	Animals		
		Mortality	Alive	Total
1	Control – water	0	5	5
2	2	0	5	5
3	4	0	5	5
table 1 continuation				
4	8	0	5	5
5	10	0	5	5
6	12	0	5	5
7	14	0	5	5
8	16	0	5	5
9	20	0	5	5
10	22	0	5	5

Results of the toxic potential experiment allow us to conclude that the acute median lethal dose (LD50) of the suspended material of Chankanay Zeolite in water on rats under conditions of oral supplementation exceeds 22 g/kg, which serves as the basis for the attribution of the feed additive to substantially non-toxic and non-hazardous in its ability to cause acute poisoning

The second set of experiments on the study of zeolites of acute toxicity was carried out on 12 clinically healthy piglets with a body mass of 7.1 to 8.2 kg. In this regard, the experimental piglets were injected with zeolites once in a dose of 20 g / kg body mass. Control animals received distilled water at the same doses.

In the experiments it was found that the study dose of zeolites does not cause clinical signs of poisoning and death of piglets.

Local irritating and skin-resorptive effect of the Zeolites of the Chankanay deposits of the preparation was studied on white rabbits. To determine the local irritating effect, the feed additive was suspended 1:1 in distilled water and extracted for 24 hours at 37°C repeatedly shaking, where after filtered through a paper filter. A filtered solution in the volume of two drops was introduced into the conjunctiva of the rabbits' left eye; for comparison, the same amount of distilled water was instilled into the right eye, which was a control. Then, it had been observed for one minute pressing the lacrimonasal canal and then rubbing of the eyelid was carried out. The local irritating effect of the feed additive was determined after two hours, and then every day for a week. The feed additive does not show a local irritating effect, since after having applied the filtrate of the study product into the conjunctiva of rabbit eyes, no visible changes were observed during the experiment.

Absorption through skin of the study additive was identified by applying the application of the study additive to the right side of the rabbit; the left side served for control. The additive was applied in the form of a suspension at a rate of 20 ml per cm^2 of the prepared area. The application of a slurry of the feed additive was applied by the open method with the help of a putty knife, having prepared the seed oil suspension. Only the seed oil was used in the control section. The size of the application section was 4x4 cm. It has been plated on a one-off basis with a four-hour exposure to the experimental rabbits, and also every day for a week. On the expiry of the indicated time, a skin reaction was established. The comparison was made with the control area of the skin of the animal under study. The experiment was carried out for two weeks. The obtained data showed that there was no puffiness, redness and soreness as in the control sites were not noted as a result of the application of the mineral supplement to the

experimental shaved areas of the rabbit skin. Thus, the Zeolites of the Chankanay deposits do not show a local irritating and skin-resorptive effect.

The research results of hematological indice of rats are presented in Table 2.

Table 2- Hematological indices of white rats that have received zeolite (n = 5) for 15 and 30 days

Groupofanimals	Indicators		
	Hemoglobin, g/l	Erythrocytes, $x10^{12}$	Leukocytes, $x10^{9}$
	15 days later.		
Control	104,9±6,1	7,2±0,05	11,9 ±0,06
I - treatment group BR + 2% zeolites	104,8±8,1	7,4±0,07	12,2±0,05
II - treatment group BR + 3% zeolites	105,3 ±5,7	7,8±0,03	12,6±0,04
II - treatment group BR + 5% zeolites	105,1±7,3	7,6±0,04	12,3±0,03
30 days later			
Control	107,6±5,9	8,5±0,02	11,9 ±0,03
I - treatment group BR + 2% zeolites	107,4±3,6	8,7±0,08	12,2±0,09
II - treatment group BR + 3% zeolites	108,2 ±3,1	8,8±0,04	12,1±0,08
II - treatment group BR + 5% zeolites	108,1±7,9	8,6±0,09	12,3±0,06

* $P<0,05$

Given tables indicate that the content of red blood cell and hemoglobin in the blood of the experimental rats did not exceed the limits of the physiological norm, but exceeded the control values by 10-16%. The number of the white blood cell tended to increase in all experimental groups compared with the control.

The table shows that all the hematological indices of the experimental animals did not exceed the limits of the physiological norm, but the control values of the number of red blood cells exceeded by3.8-9.9%, the content of hemoglobin in them by 0.8-4.2% and white blood cell - by 1.7-18.3%.

Conclusion

Thus, the results of toxicological studies showed that the zeolite-containing breed of the Chankanay deposits of Almaty region belongs to the 4th class according to the classification of chemical species conforming to the requirements of GOST 31674-2012 Feeds, compound feeds, material for compound feeds. Methods for the determination of common toxicity. The preparation does not have cumulative, allergic, embryotoxic, teratogenic effects and irritating effects on the skin and mucous membranes. A biological test conducted on white rats and piglets showed that feeding animals feed which contains zeolites does not have a side effect on the animal organism and contributes to an increase in the body mass of rats as well. Considering the large set of macro- and microelements, as well as the high sorption properties of zeolites, it was considered necessary to conduct scientific and industrial experiments using them as feed additives on farm animals, assessment of their effect on the metabolism and productivity of animals and the quality of livestock products.

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ИССЛЕДОВАНИЕ ОСТРОЙ ТОКСИЧНОСТИ И АЛЛЕРГИЧЕСКОГО ЭФФЕКТАКОРМОВОЙ ДОБАВКИ НА ОСНОВЕ ЦЕОЛИТА ЧАНКАНАЙСКОГО МЕСТОРОЖДЕНИЯ (КАЗАХСТАН)

Аннотация

Безопасность и качество кормов и кормовых добавок является одним из важнейших критериев при производстве продуктов животного происхождения и обеспечения населения качественным продуктом. В качестве кормовых добавок цеолиты могут использоваться как дополнения к основному рационудля кормления животных, что представляет собой серьезную проблему безопасности пищевых продуктов животного происхождения. В статье представлены подходы, принятые законодательством Казахстана а также Технический регламент ЕАЭС «О безопасности кормов и кормовых добавок», для проведения анализа рисков кормовых добавок по всей цепочке производства продуктов питания. Результаты этой работы показали, что цеолиты из Чанканайских месторождении Казахстана не обладают острым токсическим и аллергическим действием, не оказывает раздражающего действия на кожу и на слизистую оболочку.

Ключевые слова: цеолиты, кормление, токсикологическая характеристика, лабораторные животные, минералы, корма.

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ШАНҚАНАЙ КЕН ОРНЫНАН (ҚАЗАҚСТАН) ӨНДІРІЛГЕН ЦЕОЛИТ НЕГІЗІНДЕГІАЗЫҚ ҚОСПАСЫНЫҢ ЖІТІ УЛЫЛЫҚ ҚАСИЕТІ МЕН АЛЛЕРГИЯЛЫҚ ӘСЕРІН АНЫҚТАУ

Аңдатпа

Азық және азық қоспасының қауіпсіздігі мен сапасы жануарлардан алынатын өнімдерін өндіруде және халықты сапалы өніммен қамтамасыз етуде ең маңызды өлшемдердің бірі болып табылады. Цеолиттер азық қоспасы ретінде жануарларды азықтандыру үшін негізгі рационынақосымша қолданылады, сондықтан да ол жануарлардан алынатын өнімдердің қауіпсіздікмәселесіне маңызды әсеретеді. Мақалада мақсатты түрде, азық өнімдерін өндірукезіндегі барлық тізбектерде азық қоспаларының қауіп-қатерін талдау үшін Қазақстан Республикасының заңнамасымен және ЕАЭО «Азық және азықтық қоспалардың қауіпсіздігі»Техникалық регламентінде бедгіленгензерттеулер жүргізілген. Бұл жұмыстың нәтижесінде Қазақстанның Шанқанай кенорнынанөндірілген цеолиттердің улылық қасиеті және аллергиялық әсері жоқ, теріге және кілегейлі қабыққа әсерін тигізбейтіні анықталған.

Түйін сөздер: цеолиттер, диета, уландырғыш қасиет, зертханалық жануарлар, минералдар, азық.

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ЖЫЛ МЕЗГІЛІ МЕН МАЛ ЖАСЫНЫҢ СҮТ ӨНІМДІЛІГІ МЕН ҚҰРАМЫНА ӘСЕРІ

Аңдатпа

Мақалада жыл мезгілі мен малдың жасының сүт өнімділігі мен құрамына әсері келтірілген. Жыл мезгілі ,сонымен қатар, малдың жас ерекшелігі сүт өнімділігіне әсері зерттеу жұмыстарының нәтижесінде толықтай зерттелінген.

Кілт сөздер: ақуыз, мезгіл, өнімділігі, азықтандыру, сүт өнімділігі.

Кіріспе

Сүт өніміне бірден-бір ықпал ететін әсерлердің бірі малдың жасы.Бүкіл организмнің жалпы дамуы мен өсуіне байланысты, әсіресе сүт безі өсе түседі. Сүт өнімділігі жас ерекшеліктің жалпы заңдылығына байланысты, сауылым сүт белгілі-бір максималға дейін біркелкі өседі, сонан кейін ақырындап азая береді. Біздің елімізде өсірілетін сиыр тұқымының максималды сауылым сүті 4-6 сүт түзілуінде (лактацияда) байқалады. 1-і сүт түзілуден максималды (ең жоғарғы) сауылым сүтке дейінгі өнімділік мөлшермен 40-50%-ке өседі.

Сүт – басқа ешқандай азық – түлік тең келмейтін аса бағалы тағамдық өнім. Өйткені организмге оның құрамды бөлігінің 95-98%-ы сіңеді. Сондай–ақ сүт – амин қышқылдарының, макро және микроэлементтердің, витаминдердің таптырмайтын көзі. Сүттің тағы бір қасиеті: түрлі азық түлікпен керемет үндесіп, адам тағамының биологиялық құндылығын көтереді. Өйткені сүт организмге түсетін қоректік заттардың көлемін арттырып, сонымен бірге май, ақуыз, көмірқышқылы, минералды тұздары, т.б. бірлесе, үндесе отырып, қоректік заттардың организмге сіңімділігін жақсартады. Адамзат