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Basic parameters of acute toxicity of synthetic piretroids, applied in veterinary practice in Uzbekistan and some effects of their action on animals and poultry

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Abstract

The conducted experiments on toxicometria of synthetic piretroids of cypermethrin, cyrax and sumi-alfa, produced in Navoi electrochemical plant have shown, that they don't differ from foreign analogues.

In the concentrations and doses, recommended for medical processing of productive live-stock and poultry they are not dangerous for their health.

As harmless maximum permissible degree (MPD) of cypermethrin, cerax, sumi-alfa and neo – stomazan in the fodder for animals it is recommended 0,2 mg/kg correspondingly.

Keywords: synthetic piretroids, cypermethrin, cyrax, sumy-alfa, neo-stomazan, insect – acaracyde, toxicometria, LD₅₀, LD₁₀₀, poisoning.

1. Introduction

1.1 The actuality of the problem: For the past years in Uzbekistan there are widely used pesticides of the group of synthetic piretroids for the protection of productive live-stock and poultry from parasitical arthrodas – carriers of many dangerous infections and invasional diseases.

Synthetic piretroids- analogues of natural piretrines, contained in the flowers of dalmat camomile, differ with high insecticide activity, rapid biodegradation in outward environment, and the doses and concentrations, recommended for practical use, particularly in veterinary are comparatively harmless not only for animals and poultry, but for other useful inhabitants of biocenoses (G.G. Galyantdinova and others; 2005) ^[1].

1.2 The aim and tasks of inquiry: However, for prevention of possible negative results, which undoubtedly characteristic for these xenobiotics it is necessary to conduct a thorough and detailed research of their toxic properties.

Owing to it, we conducted some experimental researches on the study of degrees of acute toxicity and some peculiarities of influence of synthetic piretroids on organisms of animals, which are more widely used in veterinary practice of Uzbekistan.

1.3 Methods and results of experiments: During the experiment there were used 157 rabbits “shinshilla” 5-6 months old 87 hens of Holland and “Loman-Brown” breeds and 32 karakul sheep valukhs of 1,5-2 years old.

The researched synthetic piretroids were presented; 25 %-concentrate of emulsion of cypermethrin (c.e.), 25 % c.e. cyrax, sumy-alfa, production of Navoi electro-chemical plant (Uzbekistan); 5,5 %-c.e. neostomazan (“Hinoin”, Hungary) and 5%-c.e. sumy-alfa (“Sumitomo, Chemicles, LTD” Japan). All these preparations were studied at peroral, one time taking internally and in the form of water emulsion in appropriate doses, counting in per a kg of mass of animals and poultry on active matter (a.m.). In separate experiments the preparations were given to animals and poultry together with fodders counting in mg/kg of fodder according to a.m.

At determining the basic parameters of toxicometria of mentioned above preparations we kept a permanent clinical observation after experimental hens, rabbits and sheep during 2 weeks after their usage, taking into consideration the quantity of the fallen and survived animals and poultry in groups. The fallen hens, rabbits and sheep were subjected to be dissected with the following pathologoanatomical examination of their internal organs and tissues.

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For calculation of main parameters of acute toxicity of piretroids there was applied the method of probit – analysis of Miller-Teynter and statistic method of B.M. Shtabskoy and others (1980) [8]. The degree of danger and toxicity of these piretroids for animals and poultry was estimated in conformity with famous classification of L.I. Medved and others (1974).

In the researches on the study of some effects of toxic influence of piretroids on animals and poultry there was used the preparation less toxic and dangerous among famous synthetic piretroids. So, the state of haematological and immunological status, the reproductive ability of infected with neo-stomazan hens, rabbits and sheep; the peculiarities of the dynamics of accumulation, distribution and removal of its remains from organisms of these animals and poultry, veterinary – sanitary quality of their slaughter production are the basic objects of observation. The researches ascertained, that synthetic piretroids of NEChP production were characterized by the following parameters of toxicometry at one time peroral injection internally to the animals and poultry; cypermethrin for rabbits-LD₁₆ =1275, LD₅₀ =1350, LD₈₄ =1425 mg/kg according to active matter; cyrax for rabbits-1115, 1185 and 1270; hens (Loman Brown-400,505, and 610 mg/kg, according to active matter, correspondingly: sumy-alfa, for rabbits-335, 400,465;) hens (Loman Brown 140, 200 and 260 mg/kg according to A.M. The parameters of acute toxicity, of sumy-alfa production “Sumitomo-chemicals LTD” (Japan) were presented by the following figures: for rabbits-LD₁₆ =333, LD₁₆ =367 and LD₈₄ =401, Karakul sheep-59,100 and 141 mg/kg. correspondingly.

Eshimating of these piretroids in conformity with classification of L.I. Medved and others, we can see, that cypermethrin and cyrax (NEChP) turned out to be less toxic for rabbits and average-toxic pesticides for poultry. Sumy-alfa (NEChP) should be classified as highly toxic pesticides for poultry and average toxic-for rabbits. A foreign preparation sumy-alfa is average – toxic pesticide for rabbits and highly-toxic – for karakul sheep.

A synthetic piretroid neo-stomazan had a low degree of toxic action for hens, rabbits and sheep (LD₅₀) more than 1000 mg/kg.

Our observations showed that one time peroral usage internally to animals and poultry of lethal and toxic doses of researched piretroids in 2,5-3 hours after introduction, it stimulated the development of the same type of symptom-complex of acute intoxication of neurotropic action, and displayed by general depression and salivation and phenomenon of bronchial spasm, ataxia convulsion, paresis and paralysis of limbs, comatous state. The death comes during the first 24-48 hours and comparatively seldom-in a later terms. The degree of display and the rapidness of display, of clinical signs of intoxication, and also the hardness of pathological process, its outcome and further rehabilitation were closely correlated the amount of the injected pesticides.

Pathoanatomical changes in the internal organs and tissues of animals and poultry, died as a result of acute poisoning with piretroids, they are also of the same type and differed with pronounced haemodynamic disorders in the brain, liver, kidneys, lungs and spleen with symptoms of acute catarrhal inflammation of mucous capsule of stomach (suchuga) and small intestine.

Mostly these breaches were expressed in animals and poultry

under the influence of the preparation sumy-alfa.

In the following experiments on the study of possible negative effects of action of synthetic piretroids on the organism of animals and poultry, conducted with the application of the least toxic preparation neo-stomazan, it was ascertained that the acute poisoning of hens, rabbits and sheep with this piretroid accompanied by definite breaches of morphological, biochemical and immunological indexes of blood and serum, and what is more they were characterized with lowering of form elements, the content of haemoglobin, the level of common and recreated content of haemoglobin, the level of common and recreated glutathione, oppressing the activity of acetylcholinesterase to 25-30% at poultry and rabbits. The rise of haemoglobin almost to 3 times metahaemoglobin percent, to 1,5-3,4 times the activity of cytoplasmatic marker ferments-aspartate and alanine aminotransferases was observed at sheep. At the same time there took place the lowering of the amount of leucocytes, the level of common glutathione and its recreated form, the oppression of the activity of the activity of acetylcholinesterase to 20%.

The immunological indexes differed with lowering of relative and absolute amount of T-cells, 2 times and the phagocytic activity of neutrophils and a considerable raise to 2,2 and 1,7 times correspondingly, relative and absolute content lymphocytes of peripheral blood of poisoned rabbits. Obtained results testify the effect of piretroids on organism of warmblooded animals, where the breach of functional state of liver, elements of membrano-toxicity and immunodepressive influence take place.

An acute intoxication of animals and poultry with neo-stomazan, where it is characterized with its rapid absorption from the stomach and intestine into blood, with the following distribution and accumulation in the form of components; transmethrin-isomer of cypermethrin and tetramethrin in all vitally important organs and tissues. What is more, independently of the type differences of experimental animals, the organs-accumulators of these components served: spleen, liver and myocardium. In less degree they were contained in the brain, lungs and muscle tissues. Maximum level of trans and tetramethrin were discovered in the content of stomach (pouch) of the fallen and forcibly killed hens, rabbits and karakul sheep and comprised accordingly: 5,0 and 3,0, 17,0 and 5,0; 10,0 and 4,0 mg/kg. full elimination of neo-stomazan from the organism of poisoned animals and poultry accomplished in 30 days after its one time peroral usage in lethal and toxic doses.

Veterinary – sanitary examination of slaughtered production of hens, rabbits and sheep at acute poisoning with neo-stomazan, conducted with application of different methods: organoleptical, biochemical and chemical-analytical, and obtained results testified that meat products of such animals and poultry fully answer the requirement of the State Standards in 30 days from the moment of discovery of clinical signs of poisoning with piretroids. The complex study of long influence of fodders with neo-stomazans in doses from 3,0 to 300 mg/kg of fodder on animals and poultry revealed the absence of their negative influence on the state of the physiological health of hens, rabbits and sheep, and also organoleptical and biochemical indexes of the quality of slaughtered production. However, the fodders with neo-stomazan in doses 30 mg/kg of fodder and higher, caused the breaches in haematological and immunological indexes of animals and poultry and negatively influenced on

the reproductive function of rabbits (a sharp lowering of the growth and viability of new born young animals at early period of postnatal ontogenesis) and promoted the accumulation of trans and tetrametrine in separate organs and tissues of hens, rabbits and karakul sheep, which testified their toxicity. At the same time a long application of fiddler with neo-stomazan in the ration of poultry in the dose 3,0 mg/kg of fodder was absolutely harmless for their organism and productivity.

2. Conclusion

Thus, the analyses of obtained results allow us to make a conclusion, that synthetic piretroids – cypermetrin, cyrax and sumi-alfa produced in Navoi electro-chemical plant (Uzbekistan) according to their main parameters of toxicometria don't differ from foreign analogues.

The researches on the example of neo stomazan, presenting the mixture of trans-izomers of cypermetrine and tetrametrin and related to cyanopiretroids show, that synthetic piretroids characterized by the same chemical structure, are poisons of neurotoxic effect, represent high potential danger for organisms of animals and poultry, and that is why demand efficient and rational application in stock-breeding.

In the concentrations and dozes, recommended for medicinal processing of productive livestock and poultry they don't present the danger for their health. However in the dozes, causing a generaltoxis effect on animals (in cases of poisoning with piretroids) together with neurotoxicity they have hepatotoxic and immunodepressive effects, and also influence on their reproductive capacity. Polytropic mechanism of toxic effect of these pesticides create definite difficulties for working out effective antidote therapy against poisoning with them. That is why the most acceptable and reliable way of prophylaxis of poisoning and other negative results of effect of synthetic piretroids on animals and poultry is a strict control over their content in remains of fodders and other objects of outer environment. As harmless maximum admissible levels (m.a.l.) of cypermetrin, cyrax, sumi-alfa and neo-stomazan in fodders for animals we recommend 0,2 mg/kg, correspondingly.

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