

# Effect of pesticide Decis on the levels of nucleic acids and protein in the animals under condition of air high temperature, and their regulation with complex of bioactivators

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There are data about changes of membrane digestion as a result of various disorders of synthesis and translocation of the enzymes on the mucosal surface under effect of some harmful chemical and physical factors.

The purpose of investigation was to study the effect of pesticides from group of pyrethroids (for example decis) on the enzymatic function in the homogenate of the mucosal membrane of the proximal and distal segments of the small intestine. Determination of the degree of the activity of hydrolytic enzymes in the homogenates of some parts of the intestine allowed to show effect of pesticide decis on the gradient of distribution of enzymatic activity along the intestine. For characteristic of the enzymatic activity of the small intestine there was performed study of the activity of dipeptidase, amylase, invertase and alkaline phosphatase in the homogenate of the mucosal membrane from proximal and distal parts in multiple effects of pesticide decis in toxic dose (1/20 LD<sub>50</sub> ) during 4 months. Changes of the enzymatic activity in acute poisoning were depended on the time of pesticide exposure and site of the bowel.

The different digestive enzymes have different response to effect of pesticides of pyrethroid group (decis), there are differences in the reactions of proximal and distal part of the small intestine and there is correlation between changes of activity of the majority hydrolases and administered dose of pesticides.

**Keywords:** Small intestine, enzymes activity, dipeptidase, amylase, invertase, alkaline phosphatase, pesticide Decis

## Introduction

The study of the metabolism of nucleic acid and total protein in the tissues and cellular organoids including the supernatant fluid of the liver and mucous environment of the intestine is the required condition for understanding of the causes of the protein synthesis changes of the body (Iskandarov and Sadikov 2005; Muminova, 2003). The significant part of harmful chemical substances impact the processes due to damage of DNA matrix changing covalent links between nucleotides and modifying their functional groups, inducing loss or break of some sites of chain (Iskandarov and Sadikov, 2005). The data of the proceedings testify, that pesticides of pyrethroid group induce the disturbance of biochemical processes in the animals (Alimbaeva, Khamitova and Mirakhmedova, 2005; Asanov, 2005; Muminova, 2003; Tutudzhan, Alimbaeva, Mirkhamidov, and Zakiryayev, 2006). In connection with the above-stated, the main purpose of

investigation was comparative evaluation of the effect of Decis on the levels of nucleic acids and protein in the subcellular fractions of the liver and intestinal mucosa in the experimental animals under the conditions of optimal and high temperature of air as well as correction of the levels of nucleic acids and protein by administration of the complex of bioactivators.

## Methods

The white mongrel male rats with initial body mass 160-180 g were selected for study levels of the nucleic acids and protein in the subcellular fractions of the liver and in the intestinal mucosa. They were divided into 5 groups: group 1A - the animals received gastric injections of pesticide in dose 4.12 mg/kg - 1/20 LD50, LD50 - 82.5 (58÷126.5 mg/kg) every day for 60 days under the conditions of air high temperature; group 1B - the animals received additionally complex of biologically active substances (BAS) during 60 days under the conditions of high temperature of air; group 1C - the animals were treated with pesticide in dose 7.75 mg/kg - 1/20 LD50 under the conditions of optimum temperature of air; two control groups (2A or control - 38°C - group of animal which was under conditions of air high temperature (38.5±3.3° C); 2B - or control - 22° C - the animals were under the conditions of vivarium in optimal temperature (22.4 ± 2.1°C). During all period of experiment the animals of groups 1A, 1C and 2A remained in the open air under the canopy for 4 hours a day. For definition of LD50 under optimum and high temperature of air in experiment there were used 66 white male rats: 30 and 36 animals accordingly.

The complex of BAS consisted of calcium pangamate (5 mg/kg), lipoic acid (5 mg/kg), calcium orotate (0.25 mg/kg), rosehip broth and licorice roots (10 g in 200 ml of boiled water). A mix of a complex of preparations was administrated intragastrically to the animals (1ml per 100g of body mass).

The rats were decapitated after ending of experience, the liver and intestines were isolated quickly and were washed with cold distilled water, the residual content from intestine were eliminated, then the intestine mucosa was stripped. The liver and intestine mucosa was placed into the cold medium and was homogenized. All procedure was performed in conditions of cold at temperature from 0 up to 4° C.

The contents of nucleic acids (DNA and RNA) and total protein including mitochondrial fractions were determined in the homogenate and supernatant fluid. The cellular organoids were isolated from the liver by centrifugal separation in 0,25 M of saccharose solution, containing 1mM EDTA, RN - 7,4 with double washing (Lowry, Rosenbrough, Farr, and Randalt, 1951).

The quantity of DNA and RNA was determined by spectrophotometric method in temperature 0+4°C; the results obtained were expressed in 1 mg per 1 g of raw tissue (mg/g) (Asanov, 2005; Iskandarov and Sadikov, 2005; Spirin, 1958; Trudolubova, 1977). The content of the total protein in the subcellular fractions was determined by method of Lowry (Lowry et al., 1951).

## Results

Table 1 shows that the contents of nucleic acids and protein in the subcellular fractions in the liver and intestinal mucosa in the animals under the effect of high temperature of air was reliably reduced in comparison with control - 22°C. At the same time the quantity of DNA in the homogenate, nuclei, supernatant fluid in the liver decreased by 26.1; 21.3 and 22%, respectively, and in the intestinal mucosa - by 12%. During the same period in all fractions of the liver and in the mucous

environment of the intestine the level of RNA in the animals from group 2A decreased in comparison with group 2B.

$LD_{50}$  Decis at optimum temperature of air accounted for 155 (128 ÷ 187.50) mg/kg, and at high temperature - 82.5 (58 ÷ 126.5) mg/kg. Consequently under conditions of high temperature of air toxicity of Decis increased by 46.8% in comparison with toxicity of preparation used under conditions of optimum temperature.

The results of investigations showed that intragastric administration to the animals of group 1B of pesticide Decis during 60 days in a doze of 7.75 mg/kg  $LD_{50}$ =155.0 (128 ÷ 187.5 mg/kg) results in the certain changes in the contents of nucleic acids in the subcellular fractions of the liver and mucous layer of the intestine. Table 1 showed that in this group of animals there were seen decrease in the DNA and RNA contents in the homogenate, nuclear fractions, supernatant fluid of the liver and intestinal mucosa. The significant changes of DNA were observed in the supernatant fluid, and RNA - in the homogenate and liver nuclei. The degree of changes of the level of nucleic acid depended on duration of the exposure to pesticide: than the more time of exposure to chemical, the higher degree of changes.

TABLE 1. THE LEVELS OF NUCLEIC ACIDS CONTENTS IN THE SUBCELLULAR FRACTIONS OF THE LIVER AND INTESTINA MUCOSA IN POISONED ANIMALS (GROUPS 1A, 1B, AND 1C) WITH THE EFFECT PF DECIS AND ACTIVATION OF THEIR METABOLISM DUE TO ADMINISTRATION OF BAS, mg/g

Days of study	Groups	Liver			Intestinal mucosa
		Homogenate	Nucleus	Supernatant fluid	
<b>DNA</b>					
30-60	Control -22°(2B)	4.60± 0.20	4.18± 0.32	5.03± 0.30	3.22± 0.22
	Control-38°(2A)	3.40± 0.24**	3.33± 0.19*	3.93± 0.14	2.83± 0.13
30	Decis - 22°(1C)	2.51± 0.30	2.27± 0.16	2.83± 0.30	2.01± 0.18
	Decis - 38°(1A)	2.18± 0.12***	2.38± 0.088*	2.13± 0.11**	1.23 ± 0.11***
	Decis+BAS- 38° (1C)	2.63± 0.21	2.95 0.33	3.28 0.22***	2.89± 0.30
60	Decis - 22°(1C)	2.47± 0.23	2.33± 0.12	2.48± 0.48	1.91± 0.27
	Decis - 38°(1A)	2.10± 0.15***	1.91± 0.02***	3.25± 0.25	1.87± 0.14***
	Decis+BAS- 38° (1C)	2.69± 0.35	3.06± 0.26***	3.18± 0.19	2.77± 0.30**
<b>RNA</b>					
30-60	Control -22°(2B)	5.34± 0.36	4.98± 0.26	5.51± 0.45	4.7 ± 0.48*
	Control-38°(2A)	3.86± 0.21**	3.48± 0.16***	4.5± 0.35	3.42± 0.37
30	Decis - 22°(1C)	3.85± 0.56	3.57± 0.29	3.56± 0.26	3.05± 0.35
	Decis - 38°(1A)	2.37± 0.13**	2.24± 0.09**	2.70± 0.11***	2.22± 0.15**
	Decis+BAS- 38° (1C)	3.20± 0.30	3.15± 0.24	3.50± 0.36	3.03± 0.27
60	Decis - 22°(1C)	2.79± 0.47	2.98± 0.35	2.94± 0.36	1.95± 0.12
	Decis - 38°(1A)	2.53± 0.16***	2.53± 0.19*	2.68± 0.17**	1.99± 0.17***
	Decis+BAS- 38° (1C)	3.01± 0.29	3.02± 0.18	3.46± 0.34	2.90± 0.23**

Note: Values of reliability were calculated by comparison of data of the following groups of animals: 2A-2B; 1A-2A; 1B-1A; 1C-2B. Reliability - \* - P,0.05; \*\* - P<0.02-0.01; \*\*\* - P<0.002-0.001

The data given in table 1 indicated that pesticide Decis under the conditions of high temperature of air had the expressed influence on studied parameters. So, the measurement of the contents of DNA and RNA in the subcellular fractions of the liver and in the mucous layer of the intestine at repeated introduction of the pesticide Decis to the animals showed that on the 30 day of a poisoning the content of DNA was significantly reduced in the homogenate, nuclei and supernatant fluid of the liver and in the mucosa of intestine. The similar phenomenon occurs and on the 60 day after poisoning, however the contents of

nuclear DNA changed in the greater degree, than on the 30 day of research. Thus, high temperature of air causes change of metabolism of the nucleic acids in the subcellular fractions of the liver and in the mucosa of the intestine. There was observed reduced concentration of nucleic acid in the intestine. Evidently, that was a result of change of velocity of synthesis and disintegration of DNA and RNA in the subcellular fractions of liver. The observed reduction of the level of nucleic acids in the tissues was probably connected to disintegration of cells, lysis of some cellular organoids, subsequent removal of DNA and RNA in the products of their disintegration in the tissue. The disturbance of permeability of the cellular and subcellular membranes can also result in withdrawal of DNA and RNA from tissue and low molecular compounds necessary for their synthesis.

The study of the contents of protein in the subcellular fractions of the liver and in the mucosa of intestine allowed to establish that in repeated intragastric poisoning with Decis there was change in the contents of cellular proteins (Table 2).

TABLE 2. EFFECT OF COMPLEX BAS ON THE CONTENTS OF PROTEIN IN THE SUBCELLULAR FRACTIONS OF THE ANIMAL BODIES BEING UNDER THE CONDITIONS OF OPTIMUM AND HIGH TEMPERATURE OF AIR UNDER THE EFFECT OF DECIS (g/%)

Days of study	Groups	Liver				Intestinal mucosa
		Homogenate	Mitochondria	Nucleus	Supernatant fluid	
30-60	Control -22°(2B)	12.47± 1.10	13.27± 0.78	12.71± 0.82	13.73± 0.99	9.97± 0.91
	Control-38°(2A)	9.05± 0.40**	8.87± 0.40**	9.90± 0.20**	7.81±0.27***	7.81±0.24**
30	Decis - 22°(1C)	9.29± 0.54	9.73± 1.00	9.04± 0.89	9.81± 0.35	7.63± 0.73
	Decis - 38°(1A)	5.98± 0.34***	7.32± 0.21*	8.12± 0.42*	6.66± 0.41*	6.00±0.41***
	Decis+BAS- 38° (1B)	7.39± 0.50*	8.29± 0.57	8.33± 0.50	7.77± 0.58	8.57± 0.43
60	Decis - 22°(1C)	9.35± 0.40	8.04± 0.65	7.71± 0.73	9.20± 0.52	8.33± 0.47
	Decis - 38°(1A)	6.15± 0.65	7.57± 0.40*	7.52±0.52***	6.97± 0.44	6.56±0.37*
	Decis+BAS- 38° (1B))	7.25± 0.51*	8.27± 0.69	8.73± 0.67	8.35 ±0.76	7.62± 0.62

Note: Values of reliability were calculated by comparison of data of the following groups of animals: 2A-2B; 1A-2A; 1B-1A; 1C-2B

Reliability - \* - P,0.05; \*\* - P<0.02-0.01; \*\*\* - P<0.002-0.001

It was established that at influence of toxic dose of pesticide the contents of protein in the subcellular liver fractions and in the intestinal mucosa in all times of research was reliably reduced. It is possible to assume that the observed changes were one of the pathological mechanisms of formation of the body response to the effect of toxic dose of Decis.

The comparative analysis of the data received under influence of pesticide on the animals, being under various temperature conditions, showed that the changes of parameters of nucleic acids and protein in the body were much higher in optimum - 1A to group in comparison with optimum 1C group.

At a repeated poisoning of laboratory animals with a preparation Decis, under the conditions of optimum temperature of air, the contents of protein in the subcellular liver fractions reduced independently on term of intoxication. The contents of protein in the intestinal mucosa also decreased in comparison with parameters of subcellular liver fractions; however the changes were expressed to a less degree.

The choice of complex BAS, recommended for correction of metabolic processes in the poisoned body, was based, first of all, on the literature data concerning adaptogenic properties and ability to make active some sites of metabolism and oxidative-restorative process, and also on the results of own toxicological researches on study of the mechanism of action of pesticides pyrethroids.

The study of the functional state of the liver and intestine showed that during the chronic priming with pesticide Decis with simultaneous introduction of the complex of preparations BAS the level of DNA and RNA as well as protein in the studied elements of liver and intestinal mucosa and their quantity came nearer to control parameters. The simultaneous administration of Decis and complex with BAS resulted in stopping of pesticide effect on nucleic acids and proteins and to a greater or to a lesser degree, providing normalization of their contents in the body.

## Conclusion

Intragastric introduction of pesticide Decis to the animals in a doze of 7,75 mg/kg during 60 day 3/4 LD50 under the conditions of optimum temperature caused decrease in contents of nucleic acids and protein in the subcellular fractions of the liver and mucosa of intestine.

The administration to the poisoned animals of a complex of preparations BAS, consisting from calcium pangamate, lipoic acid, potassium orotate, rosehip broth and licorice roots normalized metabolism of nucleic acids and protein in the cellular elements of liver and intestinal mucosa.

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