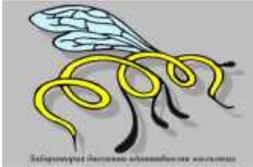


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Laboratory of Biochemistry of Insect adaptability

**IMMUNODEFICIENCY PROBLEM AS THE CAUSE OF
WEAKENING AND LOSS OF BEE COLONIES ON THE
BACKGROUND OF NEONICOTINOIDS ACTION**

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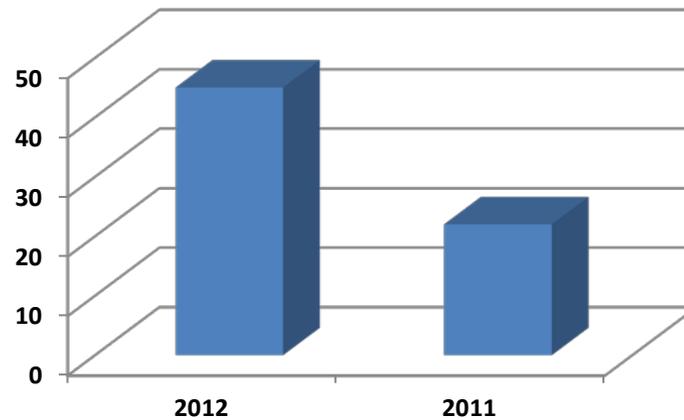
Colony Collapse Disorder

a phenomenon where worker bees abruptly disappear from the family.



Neonicotinoids - another version of the causes of death of bees

In Russia in 2012 total number of allowed for use of neonicotinoids has increased in comparison to the year 2011 more than doubled



Bees are dying from pesticides



Draw definitive conclusions has not been possible

29 biological agents: parasites, mushrooms, bacteria and viruses

chemical agents: 450 active agents which are a part of about 5 thousand agents let out by the industry, including **neonicotinoids**

environment changes, decrease in biological diversity

systematic top dressing by sugar syrup, treatment by strong antibiotics

frequent moving on long distances, wrong beekeeping management



violation of navigation opportunities under the influence of satellite radio navigational systems and mobile communication

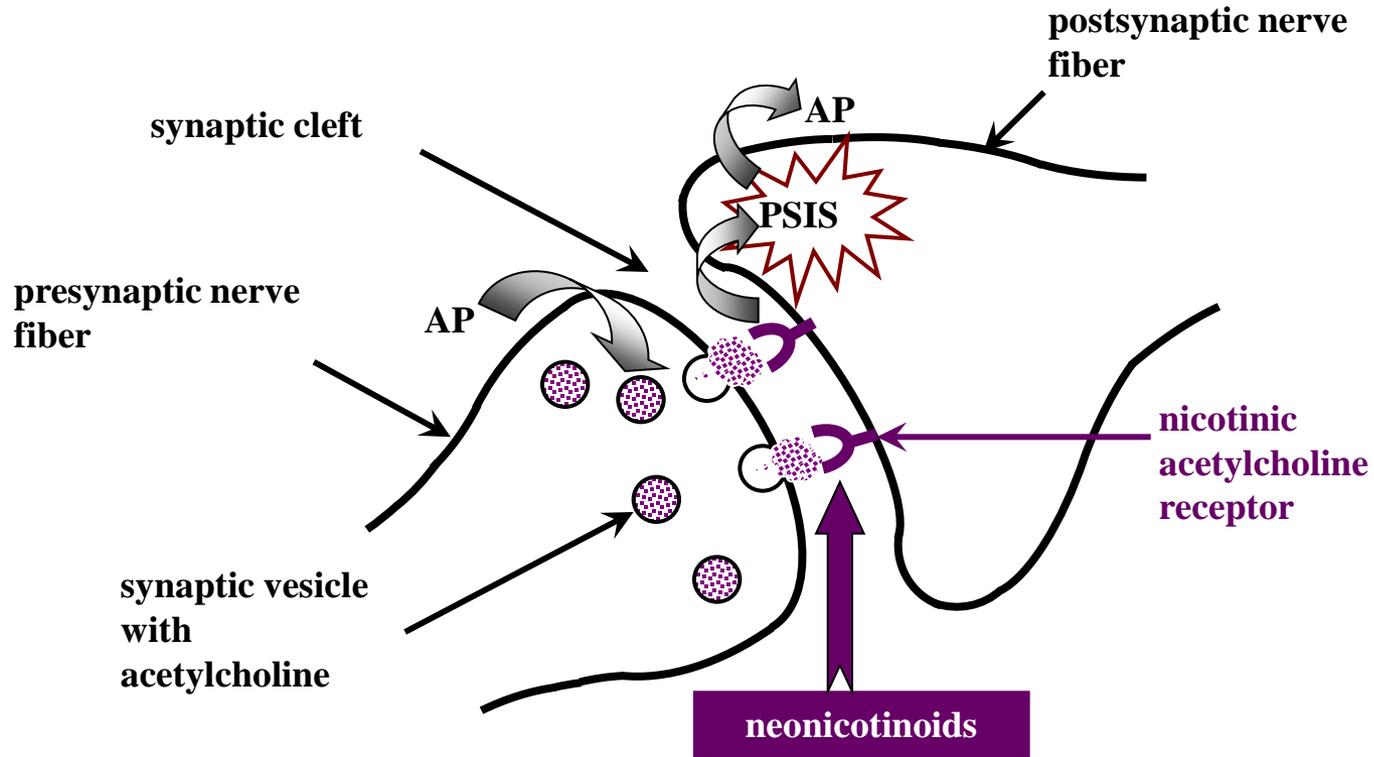
infectious disease of a queen

violation a gene machine of queen

wide spread of genetically modified crops

The complex of factors that weaken the immune honeybee

Cholinergic synapse



Comparative data on the toxicity of pesticides concerning bees

Pesticide	Trademark	Characterization	LD/50 ng/ab (ng/bee)	Toxicity compared to the DDT
DDT	Dinocide	инсектицид	27000,0	1
amitraze	Apivar	инс. \акарицид	12000,0	2
coumaphos	Perizin	инс. \акарицид	3000,0	9
tau-fluvalinate	Apistan	инс. \акрицид	2000,0	13,5
methiocarb	Mesurol	инсектицид	230,0	117
carbofuran	Curater	инсектицид	160,0	165
cyhalothrine	Karate	инсектицид	38,0	711
deltamethrine	Decis	инсектицид	10,0	2700
thiamethoxam	Cruiser	инсектицид	5,0	5400
fipronil	Regent	инсектицид	4,2	6475
clothianidine	Poncho	инсектицид	4,0	6750
imidaclopride	Gaucho	инсектицид	3,7	7297

neonicotinoids

(J.M. Bonmatin, SNRS, Possible factors of colony losses, Jilles Ratia conferences)

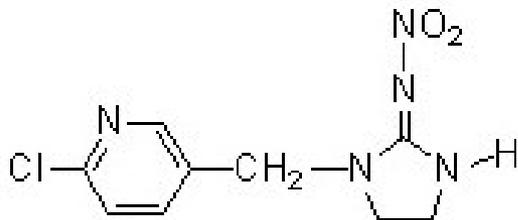
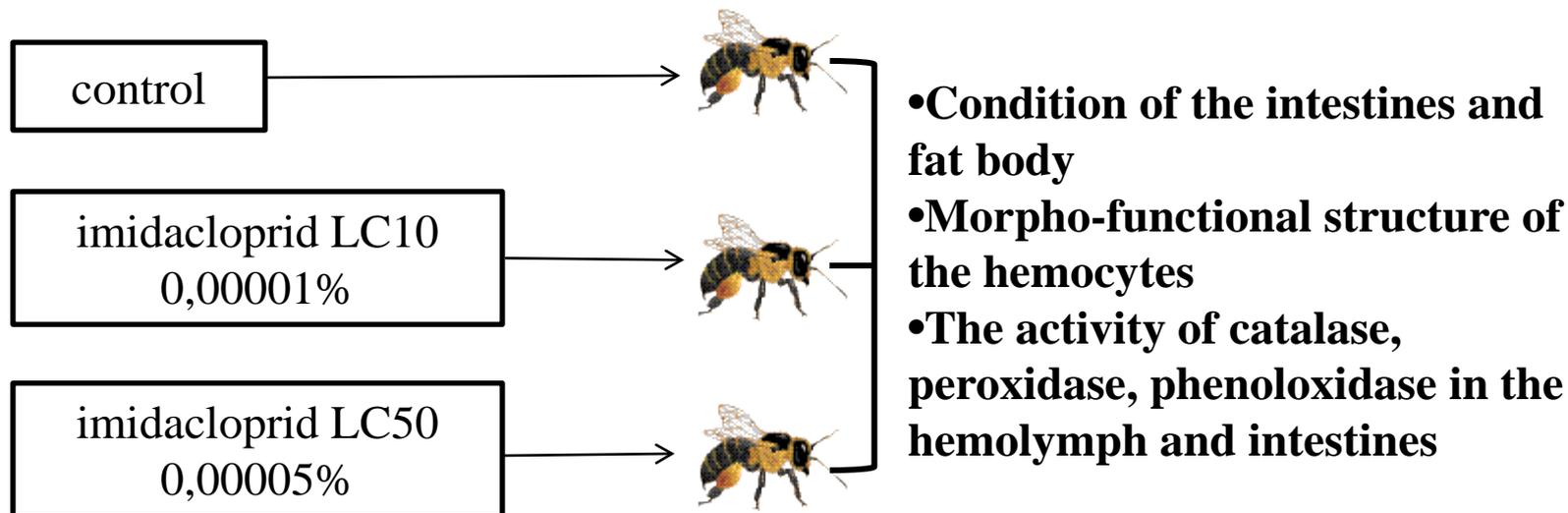
Imidokloprids of mouse LD50 131mg/kg

Imidokloprids of bee LD50 37mg/kg

Objective: To evaluate the impact of imidacloprids on the cellular immune system of the honeybee

The experimental scheme

Apis mellifera L.



Treatment of insects was carried per os, imidacloprid was diluted in honey syrup. Parameters were evaluated after 1 day and 3 day.

Condition of the intestine honeybee under the influence of imidokloprids

control



Imidokloprid LC10

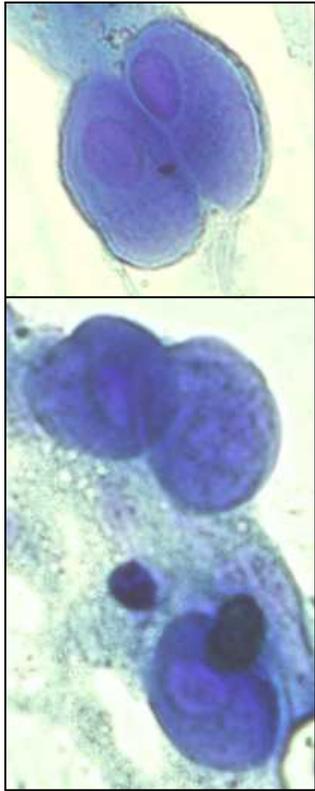


Imidokloprid LC50

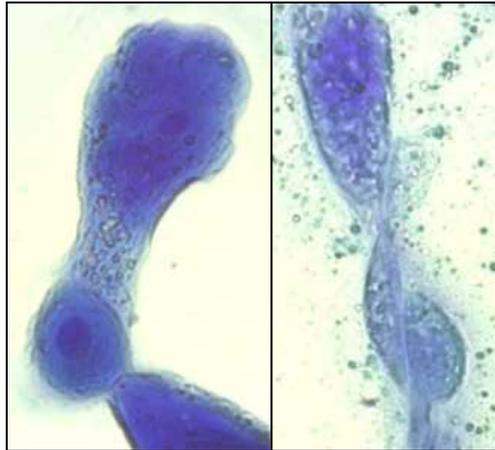


Consequences of imidacloprids action were pathological changes of intestine. Length and width of the hindgut were increased. Hyperemia and decreased elasticity of walls, the high sensitivity to mechanical damage, and inhibition functions of stinger were observed.

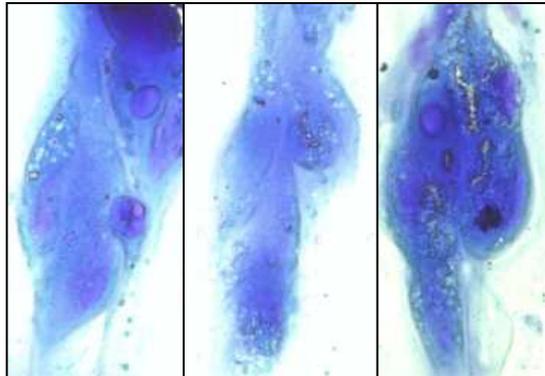
Destructive processes in the cells of the fat body under the influence of honeybee imidokloprids



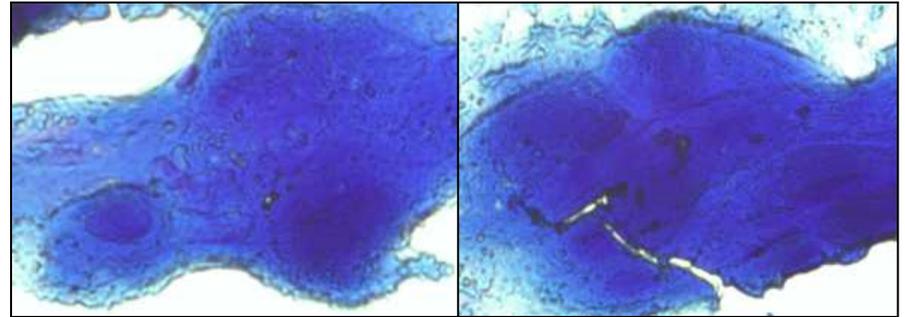
control



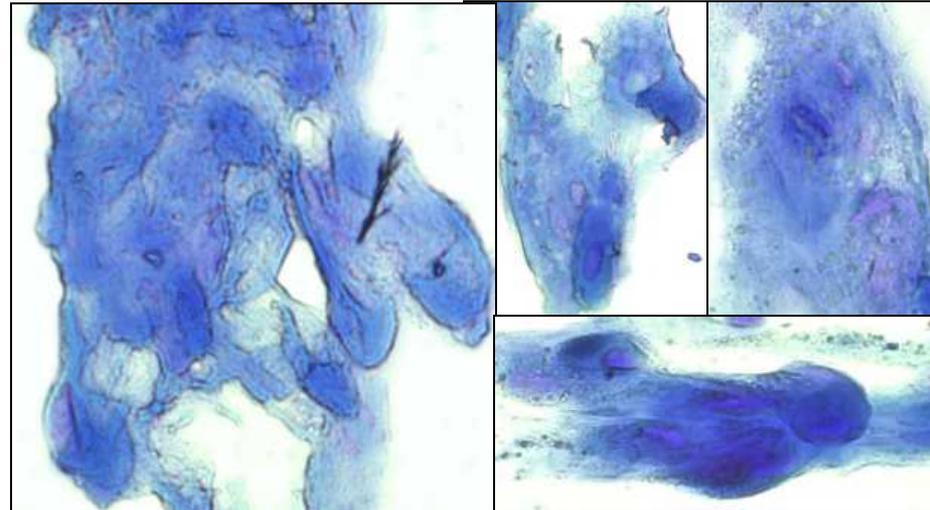
Imidokloprid LC10 1 day



Imidokloprid LC10 3 day



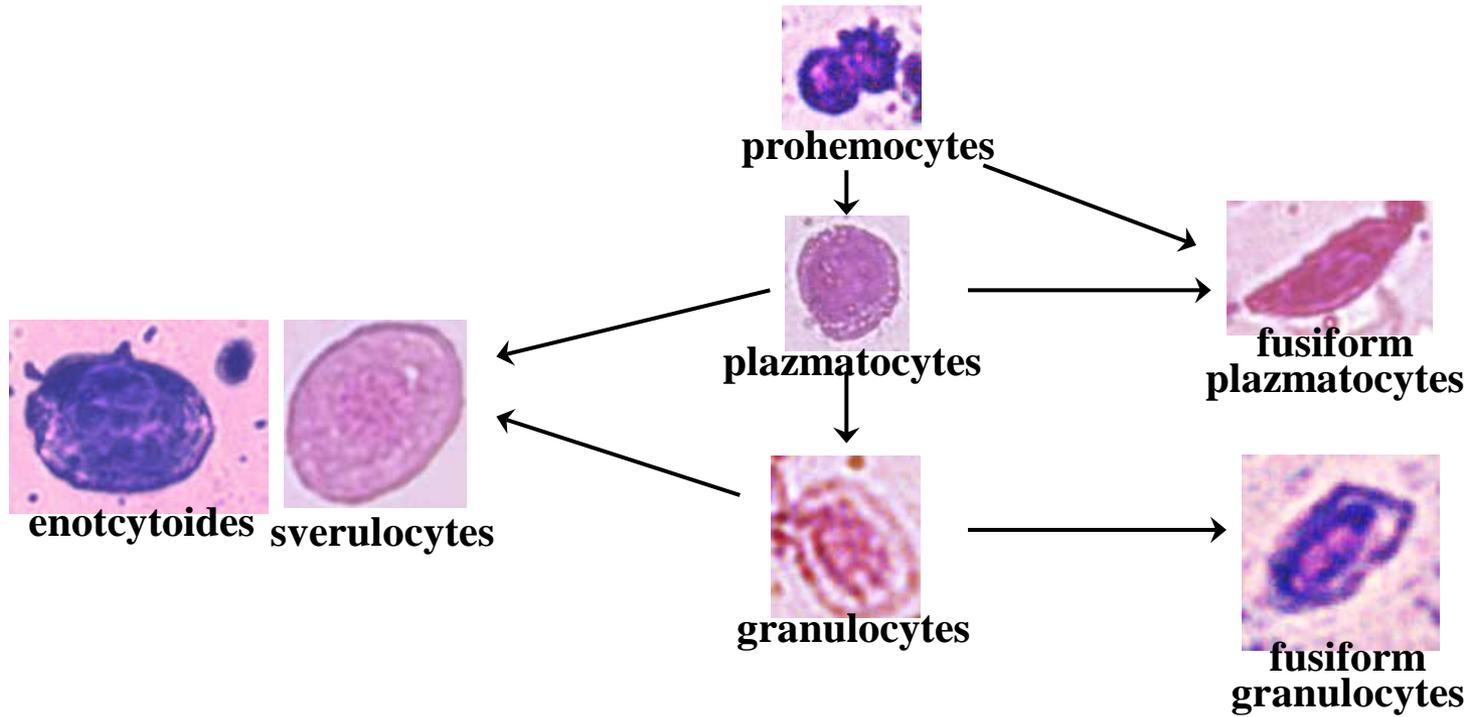
Imidokloprid LC50 1 day



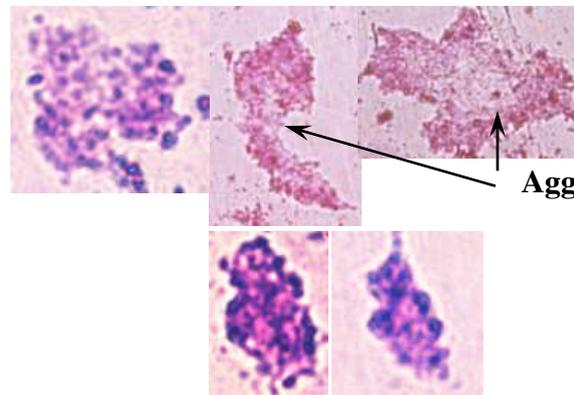
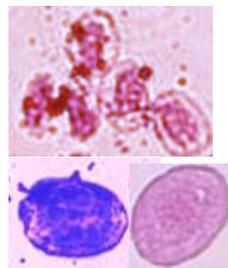
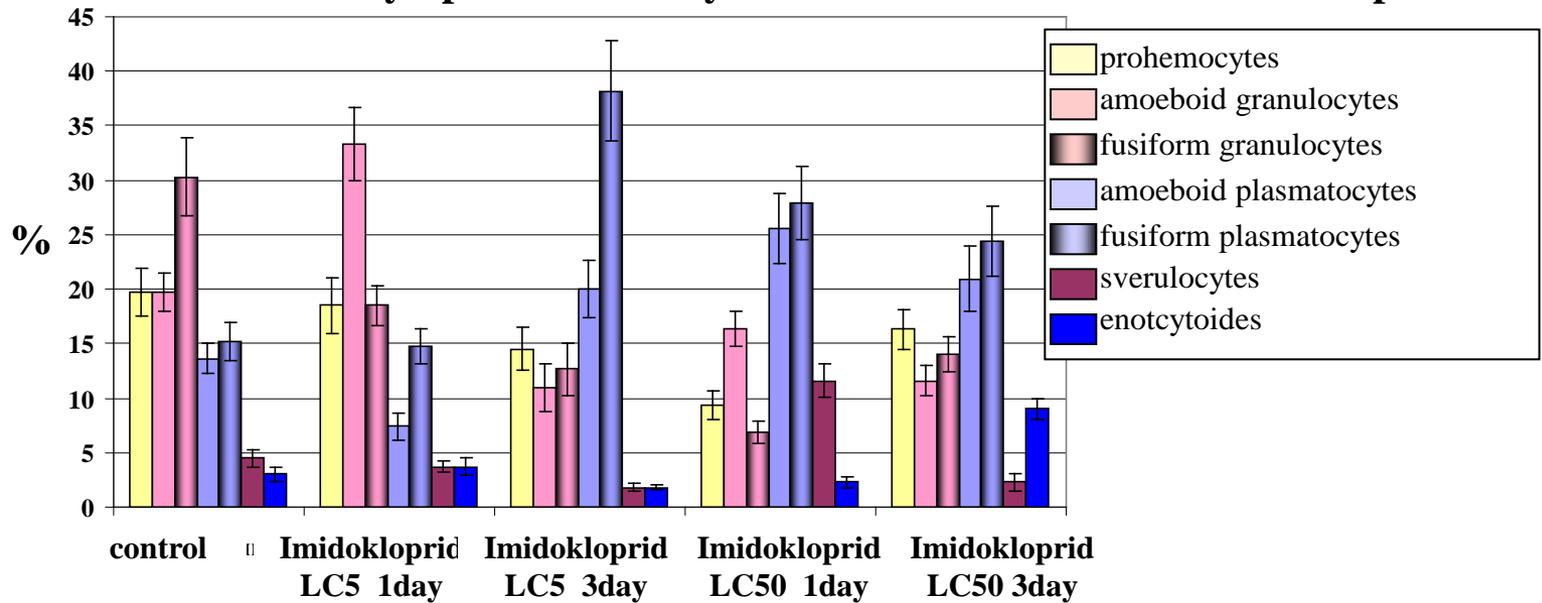
Imidokloprid LC50 3 day

Imidacloprid toxic effect was accompanied by pathological changes of adipocytes: deformation, vacuolization, disruption of membranes and lysosomes, which increased with the concentration of the toxicant.

Cellular composition of honeybee hemolymph



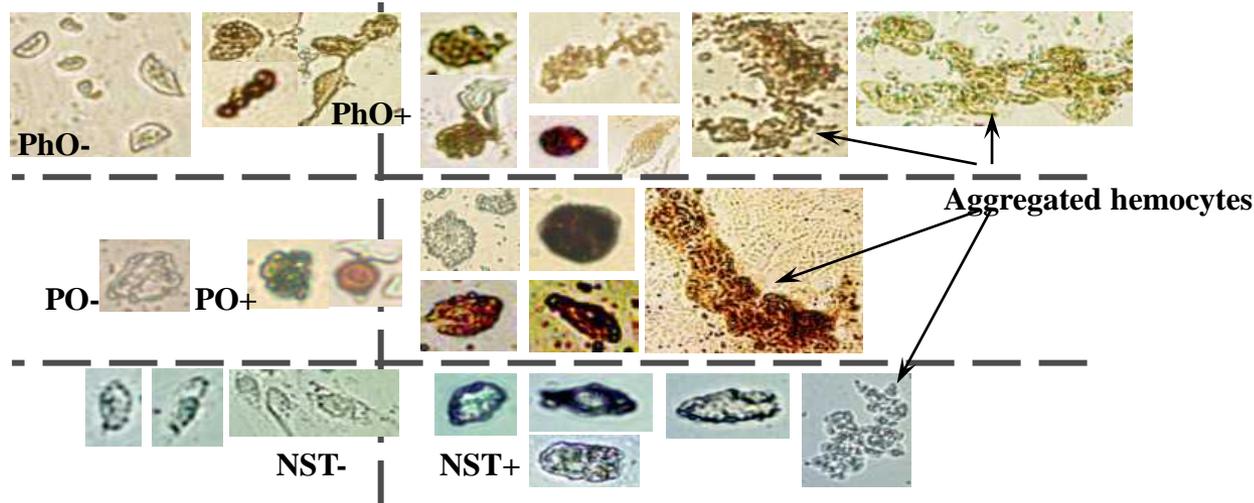
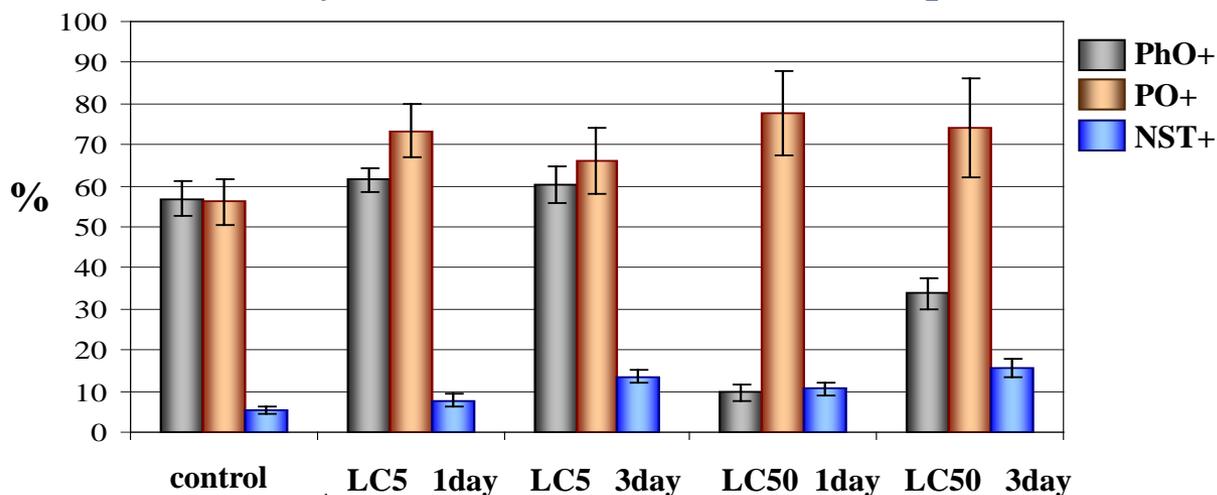
Cellular reaction in the hemolymph of the honeybee under the influence of imidokloprids



Aggregated hemocytes

The influence of imidokloprides has caused changes in hemograms, that is reduction of granulocytes and plasmatocytes resulted in the complex of pathological changes of cells hemolymph.

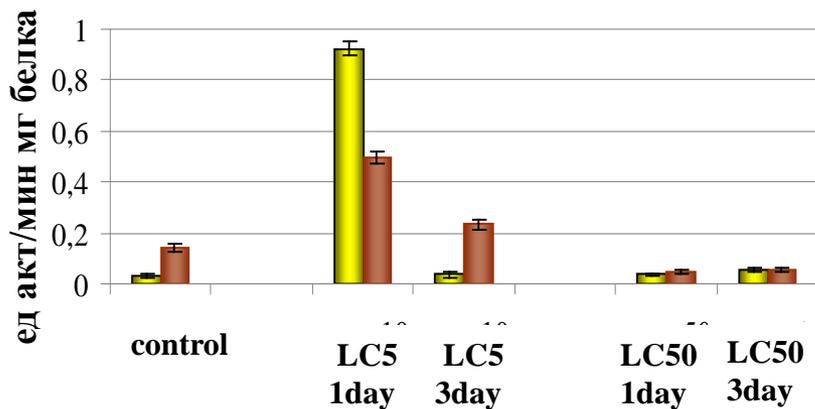
Cytochemical determination of the portion of hemocytes with phenoloxidase and peroxidase activity under the influence of imidacloprid



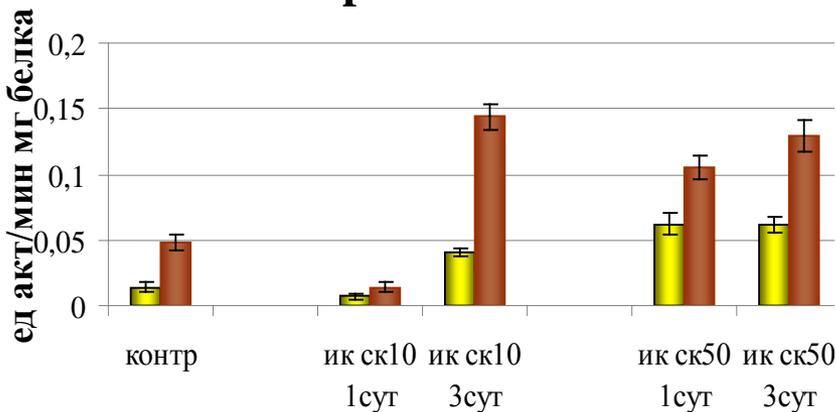
Imidacloprid effect at the medium lethal concentration caused significant reduction of the proportion of phenoloxidase positive hemocytes, probably due to reduction in the number of granulocytes subjected to lysis and aggregation. The insecticide action also caused an increase in proportion of peroxidase positive hemocytes.

Phenoloxidase activity and antioxidant enzymes in intestines and hemolymph of the honey bee under the influence of imidokloprids

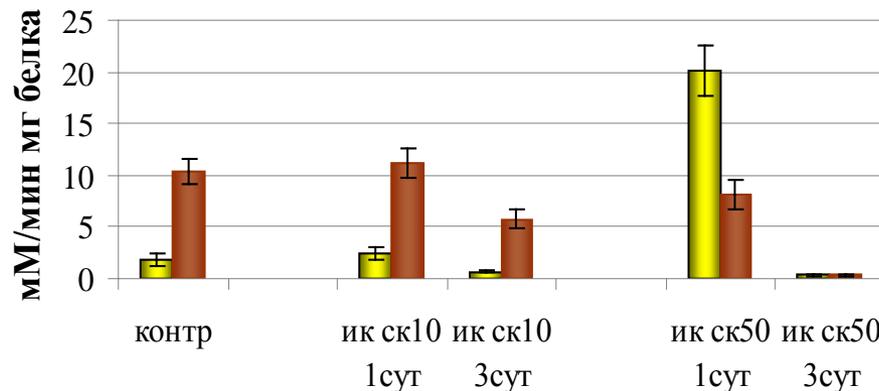
phenoloxidase



peroxidase

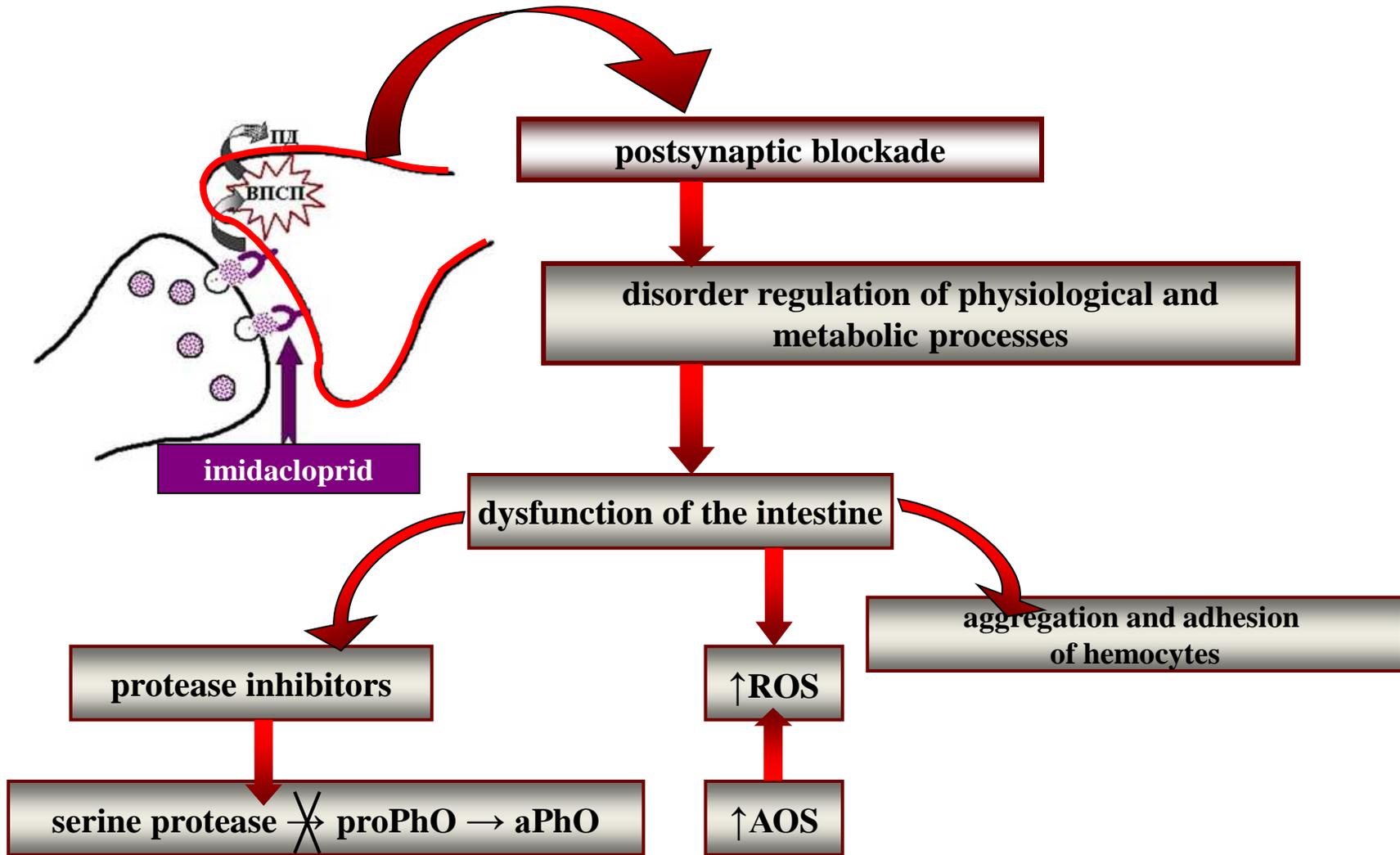


catalase



hemolymph
 intestines

Cytochemical analysis results are confirmed by the data of spectrophotometric determination of protective enzymes activity. Under the influence of imidokloprids bee phenoloxidase activity decreases and the activity of antioxidant enzymes increases. In general, the observed pathological processes in honey bee intestine and hemolymph under the influence of imidokloprides similar to those that occur during the development of intestinal infection in insects.



Conclusions:

The neurotoxic effect of imidokloprid causes the following destructive processes in the cells and tissues of individual immune systems of honey bees:

- disorder in regulation of physiological and metabolic processes - the pathological changes in the intestine, inhibition of function stinging apparatus, the destructive processes in the cells of the body fat, which increase with the concentration of the drug;**
- the body's reaction to an insect's own decaying cells and tissues;**
- aggregation, adhesion and lysis of granulocytes removing a significant proportion of blood protective cell;**
- the generation of reactive oxygen metabolites as a result of phenoloxidase activity oppression in the protective cells of hemolymph.**

The neurotoxic effect of imidokloprid even in sublethal concentrations entails a breach of the functioning of individual immune systems of honey bees, significantly reducing viability of the insects under pathogenic load, confirming neurogenic stimulation of the immune system.



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