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CLINICAL AND BIOCHEMICAL EXAMINATION OF THE HEALTH OF WORKERS TO REVEAL SIGNS OF INTOXICATION

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Abstract: This work is devoted to the study of the clinical and biochemical state of workers in horticulture and vegetable growing. The influence of environmental factors, chemical factors on the health of workers is analyzed. Subjective complaints and biochemical parameters of blood were determined. Along with this, studies were carried out on the health status of workers. The research results are analyzed and the corresponding conclusions are presented.

Keywords: hygiene, working conditions, intoxication, liver.

Introduction

Introduction One of the main problems of toxicological hygienists is the disclosure of the biological activity of toxic substances depending on the chemical structure. The mechanism of action of pesticides is one of the essential tasks of toxicology and hygiene. And, if there is still no sufficiently accurate explanation of the action of individual toxic substances, then this should be largely attributed to the fact that researchers paid more attention to complex reactions of the body, representing the integration of individual processes, and not to the primary processes that are played out under the influence of pesticides. in cell organs [5,7]. Biochemical studies make it possible to reveal not only the nature of the disease, but also to determine the degree of its severity, as well as to identify early preclinical changes in the human body. Therefore, biochemical studies are now widely used in the treatment of diseases, substantiation of hygienic standards, and preventive medical examinations.

The main tasks facing experimental and clinical biochemistry in solving hygienic problems are close to elucidating the toxic effect and mechanisms of the impact of harmful factors on the body of animals and humans, studying the pathogenesis of occupational diseases, developing diagnostic criteria, identifying pre-pathological, pathological conditions of the human body.

Experimental biochemistry has more opportunities in studying the mechanism of the functional action of harmful factors on the animal organism, since in animal studies it is possible to determine biochemical changes not only in fluids and some tissues, but also in all organs and tissues of the body. At present, a large amount of material has been accumulated on the change in various biochemical parameters in the bio-environments of the human body under the influence of harmful factors, such as pesticides used in agriculture against pests and plant diseases. However, a systematic generalization and analysis of the accumulated materials has not yet been carried out. The lack of generalizing materials makes it impossible to conduct a comparative assessment of various biochemical parameters in terms of their specific prevention, treatment and sensitive diagnosis of occupational diseases.

In addition, the lack of information about the nature of the changes caused by pesticides in the human body is one of the most significant obstacles to the

development of rational measures for the prevention and treatment of possible poisoning.

The growth of chemicals of agriculture stimulated the development and establishment of hygiene and toxicology of pesticides. Having much in common with other branches of hygiene and toxicology, hygiene and toxicology of plant protection chemicals has distinctive features, its original features, methods and approaches in solving theoretical and practical problems.

The relevance of the work is the disclosure of the mechanisms of the toxic effects of pesticides on the functional state of the body, while the most important role belongs to biochemical research. Identification of the peculiarities of the effect of pesticides on metabolic processes creates the prerequisites for substantiating methods and means of directed action on the violation of metabolic processes through specific prevention and treatment, early diagnosis of the initial signs of poisoning, which makes it possible to substantiate the principles of regulation of biochemical processes in contact with pesticides.

Objective of the study

Clinical and biochemical assessment of the health status of workers in the processing of fruit crops

Material and methods

The working conditions of workers at pesticide application sites were studied, the control group consisted of people (healthy) who worked without contact with pesticides 16 people, 408 workers and 264 patients. Of the 264 patients, 142 patients received traditional treatment and 122 patients who were prescribed biologically active drugs. The significance of differences (P) of the averages was determined using the indicator according to the table.

Results

In accordance with the results of hygienic studies there are and field surveys of workers working with sprayers, tractor drivers, hose operators and hand sprayers coming into contact with pesticides (Fozalon, Baton EU) during orchard treatment.

The studies included the analysis of subjective data describing the state of health, objective data (determination of liver, cardiovascular system, respiratory, gastrointestinal tract functions). Examinations were carried out on 408 people - drivers, sprayer tractor drivers, hose and manual handlers; 16 control group people with no contact with pesticides (tractor drivers, MTS managers, accountants, gardeners with no contact with poisons). On examination - medical examination - they were found to be healthy.

During treatment of orchards with pesticides Fozalon, Baton EU and other pesticides, the respondents complained of headache, heaviness in the head, increased fatigue, poor sleep, decreased appetite, bad taste in the mouth, scratchy throat, nausea, abdominal pain (aching or cramping), liquid stools. These phenomena were more pronounced in those cases when personal hygiene rules were poorly observed; most often these complaints were made by persons working on hose and hand sprayers during fruit orchard treatment.

To find out the functional state of the liver, the following specific functions were also examined: pigmental, antitoxic, carbohydrate, cholesterol formation and protein synthesis.

The content of general cholesterol in blood serum was studied in 408. persons. In 205 persons its content was the average norm (4,2-6,88 mmol/l), in 203 persons it was elevated (7,62,5 ml/l). - Its content was elevated (7.62-8.10 μ mol/l). In 9 people it was significantly elevated (Table 1). It should be noted that hypercholesterolemia in a number of cases occurred in persons with a long history of work with pesticides.

Table 1

Biochemical parameters of blood serum of persons working with pesticides (Fozalon, Baton EC) during the treatment of orchards against plant pests

№	Biochemical indicators	Control group N=16	Experienced group N=408	Deviations in percentage	Reliability "R"
1	Cholesterol (mmol/l)	4,41±0,17	5,95±0,13	134,9	<0,001
2	Total bilirubin (μ mol/l.)	9,11±0,35	6,51±0,41	181,2	<0,001
3	Free bilirubin (μ mol/l.)	3,43±0,15	5,34±0,2	155,7	<0,001
4	Total protein (g/l)	74,23±1,31	69,28±1,16	93,3	
5	Creatinine (μ mol/l)	6,36±3,41	78,54±1,46	118,3	<0,05
6	Urea (mmol/l)	5,68±0,17	7,67±0,23	135	<0,001
7	ALT (μ mol/l/l)	0,47±0,01	0,59±0,02	125,5	<0,01
8	AST (mmol/l/h)	0,36±0,01	0,56±0,02	155,6	<0,001
9	Glucose (mmol/l)	4,78±0,2	5,01±0,14	104,8	
10	Pyruvate (μ mol/L)	125,6±4,53	158,3±4,42	126,1	<0,01

The concentration of total bilirubin in the blood serum was examined in 408 people, of which only 227 had moderate hyperbilirubinemia from 9.67 to 18.2 mmol/l, on average it was 112.5±0.41 μ mol/l (control 9.11 ±0.35 mmol/l). The content of free bilirubin decreased to 155.7%. When analyzing cases with elevated levels of bilirubin (total and free), it turned out that some workers with pesticides (122 people) had clinical signs of chronic hepatitis, cholecystoangiocholitis, thus, pigment dysfunction was combined in most cases with clinical symptoms and liver damage and bile ducts.

In 408 people, total protein, creatinine, and urea were determined in the blood serum of those working with pesticides. At the same time, the content of total protein decreased to 93.3%. The concentration of creatinine and urea increased and amounted to 118.3 and 135%, respectively. Violation of the content of total protein, creatinine and urea in the blood serum indicates a violation of the protein-synthesizing and excretory functions of the liver and kidneys.

When determining the activity of alanine and aspartate aminotransferases, a sharp activation of blood serum enzymes in persons working with pesticides was established. With these increases in transaminases, one can judge a violation of the permeability of liver cells due to swelling of the liver hepatocytes.

In the study of the concentration of glucose in blood serum upon contact with pesticides, minor changes were revealed and amounted to 5.01 mmol/l, in the control group 4.79 mmol/l. A particularly sharp increase was observed in the content of pyruvic acid and amounted to 126.1%. Consequently, when working with pesticides in horticulture, workers have a violation - the accumulation of unoxidized products of anaerobic glycolysis - pyruvate.

Thus, according to the results of the survey, violations of a number of liver functions were revealed in persons working in the treatment of pesticides against pests (mainly Fozalon, Baton EC). Changes in antitoxic function were most frequent, changes in bilirubin content (total and free), cholesterol, as well as ALT and AST activity were often observed. It should be noted that the violations of the functional state of the liver, as a rule, were moderately pronounced, with the exception of cases of a significant decrease in the antitoxic, synthetic and excretory functions in some individuals.

The data obtained indicate the need for careful medical monitoring of persons who systematically work with pesticides.

When studying the state by the method of questioning and objective examinations, methods were used that directly or indirectly reflect various aspects of the functional state of the liver and the cardiovascular system and other organs. To determine some biochemical parameters of blood in persons working with pesticides to identify certain aspects of the mechanism of metabolic processes, approaches to the specific prevention and treatment of chronic intoxication with pesticides Fozalon and Baton EC were developed on this basis. At the same time, we conducted blood tests in workers on the following indicators: the content of glucose, glycogen, pyruvate, lactate, the level of total protein, bilirubin (total and indirect bilirubin).

During the examination (during the period of work with pesticides), the majority of workers (408 people in total) complained of headache (149 people), increased fatigue during work (28 people), sleep disturbance (16 people), loss of appetite (8 people), dizziness (23 people) and general weakness (36 people). Many of them associated the appearance of these complaints with work. The frequency of complaints increased with the increase in work experience with pesticides.

It was found that the most frequent changes were observed in the workers - the vegetative parts of the nervous system (38 people). At the same time, general and local hyperhidrosis (18 people), red and persistent dermatographism (21 people),

tremor of the hands and eyelids (18 people) were noted.

Sensitivity disorders, disorders of motor and reflex functions were not found in the majority of workers. Only 7 people had a mild increase in tendon reflexes. There were no coordination disorders.

In general, among the complaints and established objective changes among workers and machine operators involved in the processing of cotton with pesticides, violations of the neurological status prevailed. Moreover, many of them showed symptoms of impaired excitability and tone of the autonomic nervous system (38 people), in 14 examined phenomena, asthenia was not observed, only autonomic dysfunction was detected. It should be emphasized that some workers (14 people) had horizontal nystagmus. Digestive disorders were often noted.

Examination of the abdominal cavity revealed pain in the liver and epigastral region. Soreness and enlargement of the liver were observed mainly in persons with a long (10-16 years or more) experience of working with pesticides. Violation of cardiac activity in some workers and sprayers was characterized by recurrent pains in the region of the heart. In 10 people, muffled heart tones were revealed, in 3 - in the region of the apex of the heart, an unsharp systolic murmur of a functional nature was heard. Changes in blood pressure were detected more often than other indicators of the functional state of the heart. The maximum blood pressure in persons exposed to pesticides was 90 - 130 mm Hg. Art., according to the arithmetic mean indicators, it tended to decrease - 105.3 ± 3.6 ; and in control workers - 122.6 ± 3.4 mm Hg. Art. (table 2)

Table 2.

Frequency and nature of complaints of persons working with group pesticides pyrethroids (cypermethrin, karate) and control

Complaints	Workers with pesticides (408 workers)		Control group (192 people)	
	No. of complaints	% from total number	No. of complaints	% from total number
Heads. pain, heaviness in the head	149	36,5***	8	4,2
Dizziness	23	5,6***	6	3,1
Fast fatiguability,	28	6,9***	4	2,1
General weakness	36	8,8	4	2,1
Irritability	24	5,9	2	1,0
Sleep disturbance: - drowsiness	16	3,9**	0	0,0
- insomnia	10	2,5	0	0,0
Decrease in appetite	8	2,0	0	0,0
Nausea and vomiting	8	2,0	0	0,0
sweating	14	3,4	0	0,0

Stomach ache	14	3,4**	0	0,0
Pain in the region of the heart	14	3,4	2	1,0
Noise in ears	6	1,5	2	1,0
Pain in the limbs	14	3,4**	4	2,1
Feeling the heartbeat	10	2,5	4	2,1
Soreness in the liver	10	2,5*	2	1,0
Liver enlargement by 1.5–2 cm	4	1,0**	0	0,0
Pain in the epigastric region	4	1,0*	0	0,0
Bloating	8	2,0*	0	0,0
Dyspepsia	8	2,0	0	0,0
Total examined people	408	100	192	100

Note: * - differences with respect to the control group are significant (* - $P < 0.05$, ** - $P < 0.01$, *** - $P < 0.001$); P - differences with respect to the data at optimal temperature (22°C)

Persons engaged in plant pest treatment were divided into groups according to their experience with pesticides (Table 2.2). We found that one year of experience significantly reduced blood pressure. For those with 2 to 10 years of work experience, the maximum blood pressure decreased to 110-113 mmHg for workers with 11 years or more to 118.3 ± 2.0 , but for those with 16 years or more it was $122.91.89$ i.e. comparable with the control group ($123.91.36$ mmHg). The level of minimum arterial pressure also decreased depending on the length of service, although less significantly than the maximum BP (Table 3).

Table 3

Blood pressure values in persons exposed to pesticides depending on length of service

Length of work experience with pesticides, year	Total no. of workers (N=)	Maximum (mm.Hg)		Minimum (mm.Hg)	
		M±m	%	M± m	%
Up to 1 year	N=24	$111,5 \pm 3,49^{**}$	90,0	$67,0 \pm 1,26^{**}$	94,2
2 - 5	N=232	$109,8 \pm 1,83^{***}$	88,6	$64,1 \pm 0,77^{**}$	90,1
6 - 10	N=96	$112,5 \pm 1,97^{***}$	90,8	$66,7 \pm 1,41^*$	93,8
11-15	N=26	$118,3 \pm 2,00^*$	95,5	$67,5 \pm 1,88$	95,0
16 and up	N=30	$122,9 \pm 1,89$	99,1	$70,8 \pm 1,30$	99,6

Mean experience, group	N=408	115,0±2,23**	92,8	67,2±1,52	94,5
Control group	N=192	123,9±1,36	100	71,1±1,16	100

Note: * - differences with respect to the control group are significant (* - $P < 0.05$, ** - $P < 0.01$, *** - $P < 0.001$); P - differences with respect to the data at optimal temperature (22°C)

Thus, in pesticide workers with 1 to 10 years of work experience, the maximum and minimum blood pressure decreased significantly; with more than 11 years of work experience, the change was insignificant. This suggests that workers with less work experience had a more responsive vascular tone to pesticide exposure than those with more work experience. It is possible that age is of importance in the latter.

The dynamics of changes in minimum arterial pressure in pesticide workers once again confirmed that exposure to pesticides has a hypotonic effect on vascular tone. Studying the frequency of similar complaints in the control group we found the frequency of only 4 types of complaints (headache, tinnitus, pain in the extremities and pelvic pain) in the control group was the same or higher than in the main group. All other complaints in the main group were registered 1.5-5 times more frequently than in the control group.

A number of changes in the content of metabolites of metabolites in the blood were revealed in persons working on a tractor sprayer and auxiliary works. Moreover, these changes were most pronounced in persons with up to 10 years of work experience.

Thus, we found that in workers exposed to pesticides the carbohydrate metabolism was significantly impaired, expressed in increased glycolysis and reduced rate of redox process, which, with increasing length of service, led to the accumulation of pyruvic and lactic acids, reduced glucose content in the body. Only with more than 16 years of work experience there was a decrease in the indicators compared with the previous work experience group.

Increased concentration of pyruvic acid in the blood of workers is the result of increased anaerobic glycolysis and reduced redox processes in the body.

Thus, besides pesticides, tractor-sprayers are simultaneously affected by noise, vibration and increased ambient temperature. Spraying pesticides-pyrethroids is carried out under conditions of high air temperature, reaching 38-42°C in the working area during the day.

Conclusions

1. In the air of the working zone are created increased levels of MPC of used pesticides by several times.

2. Possible complaints of pesticide intoxication include headaches, heaviness in the head, increased fatigue, poor sleep, reduced appetite, unpleasant taste in the mouth, scratchy throat, nausea, abdominal pain (aching or cramping) and liquid stools.

3. Serum total bilirubin concentration reveals moderate hyperbilirubinemia as well as impaired pigmentation function combined in most cases with clinical symptoms of liver and biliary tract lesions.

4. The content of total protein is reduced with the toxic effects of pesticides. Creatinine and urea concentrations are increased.

5. Sharp activation of serum enzymes in persons working with pesticides is connected with violation of liver cell permeability due to edema of hepatocytes.

6. In contact with pesticides a sharp increase in pyruvic acid is detected.

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