Diagnostic and prognostic significance of non-invasive methods of natural indication of liver pathology in experimental animals

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Abstract. By the given sources of literature, the varieties of crystallography of biological liquids are presented. Application of the given methods for diagnostics of diseases in different spheres of medicine is described. High sensibility of crystallographic methods on determining disease severity is shown.

1 Introduction

Faces of biological fluids are successfully used for additional diagnostics of diseases of the gastrointestinal tract, pancreas, and gallbladder. Facies of gastric secretions allow to detect chronic abdominal ischemia and various diseases of the gastrointestinal tract (duodeno-gastric reflux, esophagitis, gastritis, erosions and ulcers of various departments, etc.). V.G. Firsova et al. noted the possibility of research blood plasma faces to detect the severity of acute pancreatitis. The diagnostic significance of the study of bile faces in calculous cholecystitis has been established. Changes in the crystallographic pattern were revealed blood, urine, saliva of patients with ulcerative processes of the gastrointestinal tract as a result of ozone therapy [1-7].

2 Material research methods

Of the work, it is indicated that the research program included three main directions: the study of working conditions and the health status, the study of the toxicity and mechanism of action of pesticides (Baton EC and Fozalon) on the body of white rats and rabbits in conditions of optimum air temperature.

Experimental studies to study the toxicity and mechanism of action of pesticides were carried out on 138 male white rats and 36 rabbits under conditions of optimum air temperature. Experimental studies aimed to study the toxicity and mechanism of action of the pyrethroid group pesticides most often used in agriculture (especially in horticulture) of the Republic (Baton EC, Fozalon). The experimental part of the work was carried out under

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optimal temperature conditions: exposure to pesticides at the optimum (22.4 ± 2.1 ° C) air temperature. The parameters of toxicity were determined and the effect of pesticides on biochemical processes was assessed - carbohydrate-energy metabolism and the functional state of the mitochondria of the tissue of the liver, colon and blood under conditions of optimal air temperature. The groups of animals were preliminarily adapted to the conditions of the optimum air temperature for 10-15 days. All studied parameters in experimental animals were compared with those of animals in the control group. The control animals were kept in the vivarium under the same conditions as the experimental ones.

The chronic effect of pesticides on the animal organism was studied in sublethal (3/4 LD50) and toxic (1/20 LD50) doses. Experimental animals daily for 30-90 days were injected into the stomach with an emulsion of pesticides under conditions of optimal air temperature. After the end of the experiments, the rats were decapitated and the liver was quickly removed for research.

The obtained data were subjected to statistical processing on a personal computer using the Microsoft Office Excel - 2010 software package with built-in statistical processing functions. The indicators "M", "m", "t" were calculated. The statistical significance of the differences between the compared indicators was assessed by the Student's test ($P < 0.05$).

When studying the results of crystallographic analysis of biological fluids in experimental animals, a correlation was established between structural changes in crystallograms and morphological changes in the liver. So, when examining urine parameters in healthy animals, it was found that micro preparations of dried animal urine are characterized by a low uniformity of the distribution of structures, which indicates a significant randomness of the process of crystal formation of this biological environment in normal conditions (Fig. 1).

Fig. 1. Crystallography of urine in intact animals: normal diet.

If in intact rats it is possible to assume the destruction of the actual mineral genesis, then on day 90 after pesticide inoculation, on the contrary, the participation of the protein component of the biological environment in the studied feature of crystal formation is possible. This is confirmed by a slight increase in the severity of the marginal zone in the faces of rabbit urine, which indirectly indicates the presence of a protein component in this bio substrate, with an insignificantly higher level of the parameter ($p > 0.05$), identified with the number of centers of initiation of crystal formation in the dehydrated sample (Fig. 2).

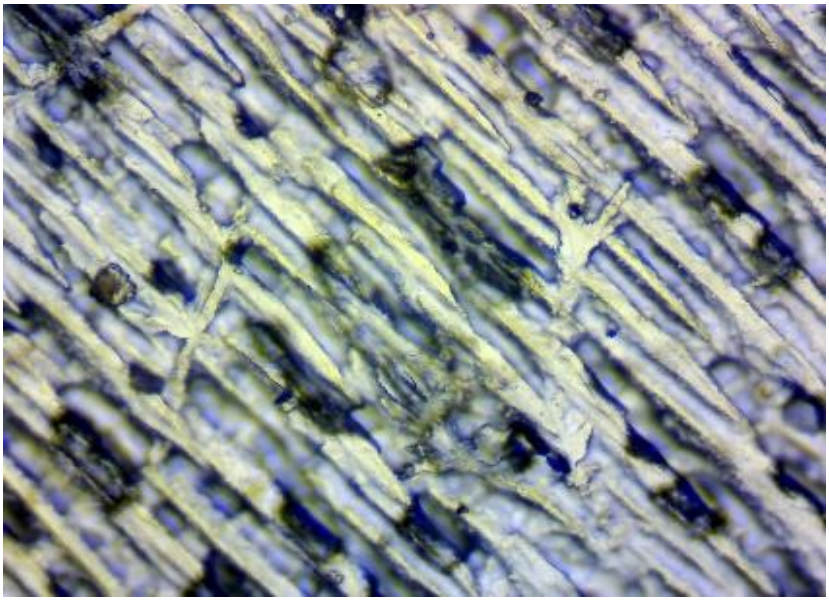

Fig. 2. Crystallography of urine without treatment: 90 - day of inoculation.

In experimental animals, being on the prophylactic use of biological active substances for the purpose of hepatoprotective action, crystallography differed from toxic affected animals. Where a more vivid picture of a less pronounced protein and mineral component was noted (Fig. 3).

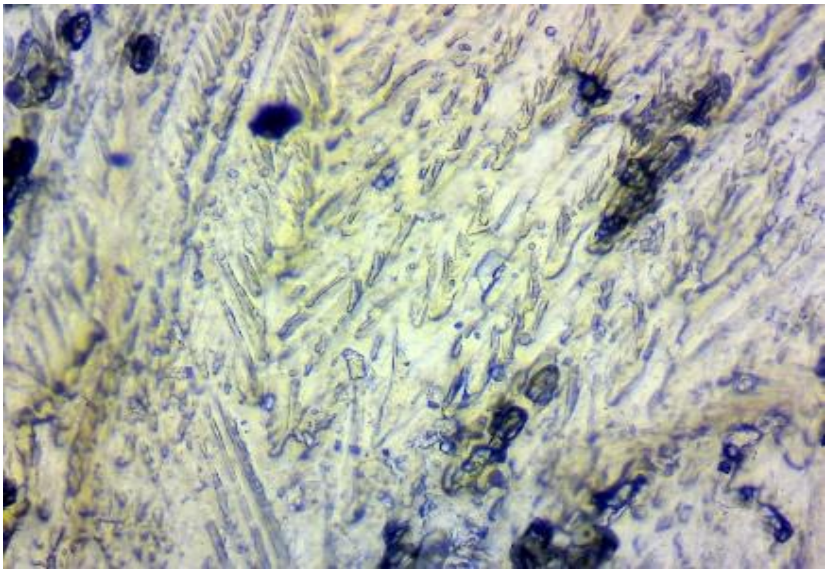

Fig. 3. Crystallography of urine during treatment: 60 days during treatment.

In addition, a crystallographic study carried out by wedge-shaped dehydration of the blood of experimental animals showed that normally symmetric radial cracks and very few single, three-horny crystals are observed (Fig. 4).

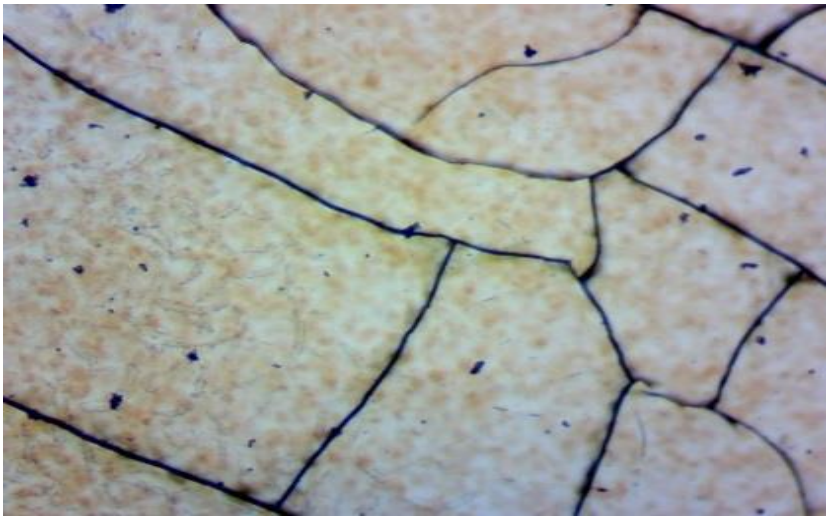

Fig. 4. Crystallography of blood in intact animals: common diet.

And with liver damage, against the background of toxic hepatitis, due to a violation of protein synthesis, a change in the qualitative composition of the bile, a decrease in the branching and radiality of dendrites is noted, as well as a decrease in the frequency of occurrence of three horny dendrites (Fig. 5).

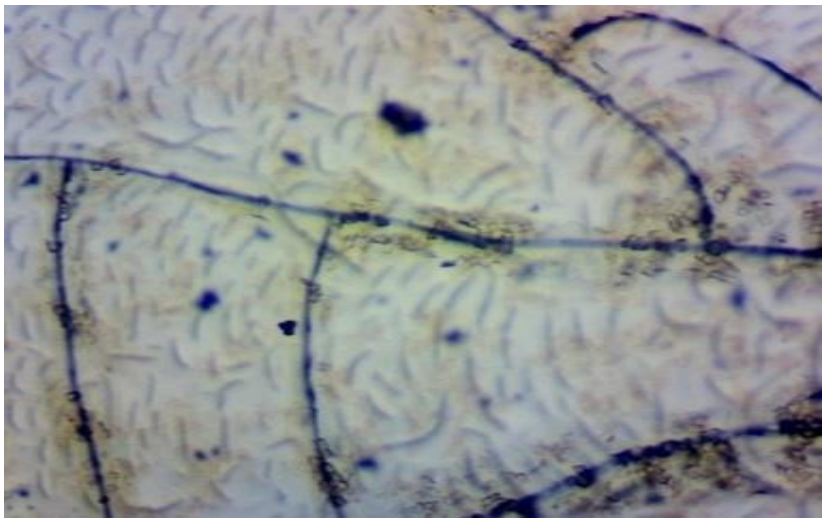

Fig. 5. Crystallography of blood without treatment: 90 days after priming.

It should be emphasized that the crystallographic study of the gels of experimental animals gives a characteristic picture. Normally, in healthy rabbits, wedge-shaped dehydration of the bile showed that they more often have a silvery, “plait” -type structure, plaques, scallop, ciliate, circular waves of crystals (Fig. 6).

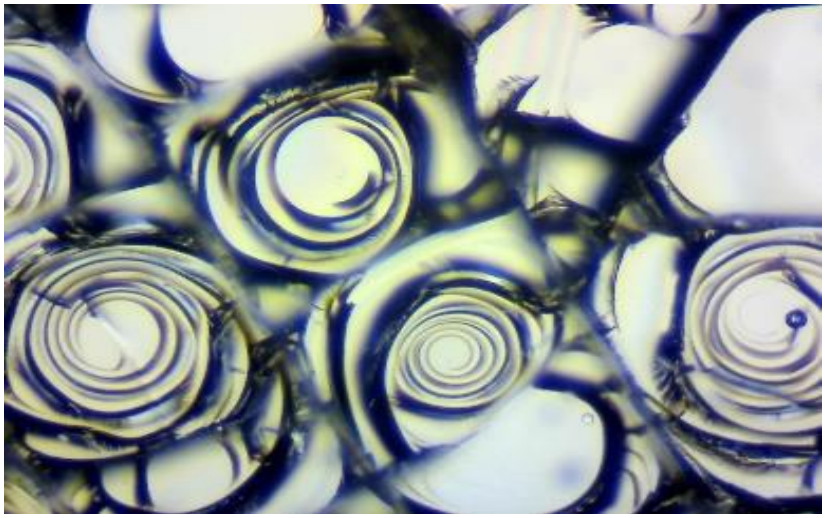

Fig. 6. Crystallography of gellies in intact rabbits: the usual diet.

When, as with toxic liver damage, on the 30th day, smoothing of the outlines and clarity of crystallographic forms was noted. The disappearance of ciliated crystals and crystals of the "cord" type was noted (Fig. 7).

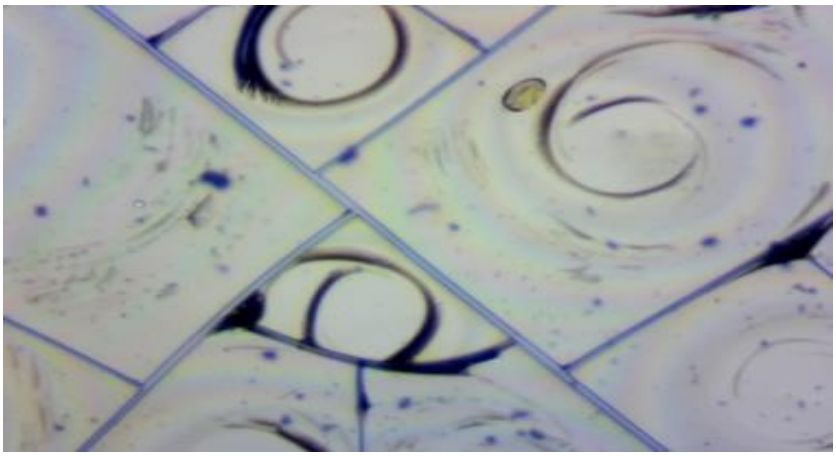

Fig. 7. Crystallography of gellies without treatment: 30 days after priming.

A characteristic crystallographic picture was also noted when studying bile in rabbits receiving biological active substances. In this case, the clear boundaries, crystals of the "rope" type, and ciliary forms of the crystals were retained (Fig. 8).

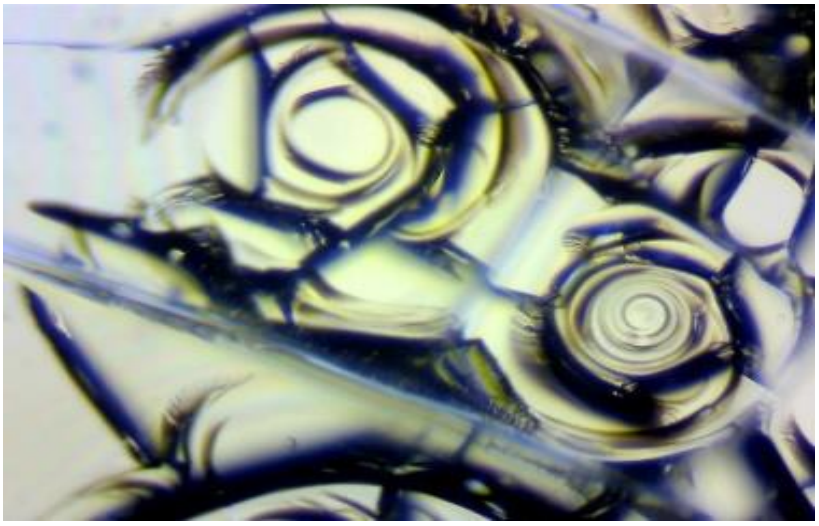

Fig. 8. Crystallography of bile during treatment: 30 days.

Thus, when conducting experiments with the use of hepatotoxic chemicals in laboratory conditions, to assess the degree of toxic effects on the liver and organism in general, a non-invasive diagnostic method is recommended for 30 days. It is necessary to carry out crystallographic studies of biological fluids (urine, blood, bile in dynamics). The latter is the simplest and most common diagnostic method. Persons whose work is associated with contact with chemical factors are recommended a daily one-time intake during the working hours of the complex, hepatoprotectors for 20 and 30 days during the period of work with hepatotropic chemical factors.

3 Conclusion

For the first time, it was revealed that when conducting experiments with the use of hepatotoxic chemicals in laboratory conditions, to assess the degree of toxic effects on the liver and organism in general, a non-invasive diagnostic method on the 30th day gives specific signs and is an indicator for early diagnosis of liver pathology. In response to this, it is necessary to conduct crystallographic studies of biological fluids (urine, blood, gall) in dynamics.

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