

PESTICIDES AND FREE RADICAL GENERATION IN THE BLOOD OF MAMMALS

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ABSTRACT:

This article reveals the impact of pesticides on the free radicals in mammalian blood and on the paramagnetic centers. It has been discovered first time that pesticides ability to increase the quantity of free radicals, the influence of pesticides together with nitrates on the change of the paramagnetic centers of blood.

KEYWORDS: pesticides, nitrate, blood, hemoglobin, nitrogen oxide, free radicals, paramagnetic centers, Electron paramagnetic resonance (EPR) spectrometer.

INTRODUCTION:

Pesticides and free radicals are closely related to each other; therefore, pesticides have toxic allergic and mutagenic effects on the mammalian body. According to a number of studies, it is noticed that in those areas where pesticides and nitrates are intensively used, the incidence of diseases is significantly higher than in other areas [1-3]. Pesticides can lead to a decrease in the number of erythrocytes and leukocytes, reduce the content of hemoglobin and total blood plasma protein, and increase the activity of transamination in the blood serum [4,5]. However, the mechanism of the effect of pesticides on move of blood proteins, enzymes, and hemoglobin has not yet been studied. The mechanisms of the formation of a number of radicals and paramagnetic centers, which can take part in the stimulation of peroxidation of lipids that are part of the

membranes of blood corpuscles, also remain unclear.

Pesticides are often found in conjunction with mineral fertilizers. Due to the widespread use of fertilizers, there is a danger of excessive accumulation of nitrates and nitrites in the soil, soil water and food products of plant origin. Nitrates are far from being indifferent to the body of animals and humans. Entering the mammalian body, these substances under the action of the microflora of the oral cavity and gastrointestinal tract can be converted into nitrites [6,7]. The literature contains information about the toxic effect of nitrites on the human body, animals and modeling of the EPR spectra of paramagnetic blood centers on a computer [8-11]. The main toxic effect of nitrites is their methemoglobin-forming activity [12]. However, along with the formation of methemoglobin in the blood, nitrites can be reduced to nitric oxide [13]. Nitric oxide interacts with hemoglobin to form conformers of the complexes [14,15]. Entering the human and animal body, pesticides and nitro compounds can lead to severe toxic effects, the mechanism of which remains largely unexplored.

MATERIALS AND RESEARCH METHODS:

Blood is conveniently viewed in the form of two components of plasma and corpuscles of erythrocytes, white blood cells. In blood plasma, the main paramagnetic centers are ceruloplasmin containing copper, transferrin containing iron, semiquinone forms of blood coenzymes and ascorbic acid. When studying the effect of pesticides on the

paramagnetic properties of mammalian blood, donor human blood and the blood of Wistar rats and hemoglobin were used as the object of research.

The EPR spectra was recorded using a Rubin 3-cm radio spectrometer with high-frequency magnetic field modulation (100 kHz) and a computer-controlled magnetic field sweep.

The following pesticides were used in the experiments: diquat, prometrine, hydrel, cataran, atrazine, zenkor, devrinol, tenoran.

The effect of pesticides was studied on 40 Wistar rats weighing 190-200 grams, they were divided into four groups. The first, second and third groups of animals were injected intravenously with varied doses of pesticides. The fourth group served as a control. The animals were sacrificed by decapitation after the introduction of the substances above after 40 minutes. The blood was dried in 0.6 ml Teflon cartridges and frozen in liquid nitrogen. The amplitude values of the EPR signals were related to the weight of the wet sample and then averaged for the samples of one group.

Hemoglobin was obtained by the method of Antonini and Brunori (Antonini Branori, 1971) [16].

Results and discussion. Free radicals, by definition, are particles that have unpaired electrons. They can be positively charged, negatively charged, and neutral, and all three types of radicals play an important role. Radicals have different reactivity, depending on the temperature and concentration of the surrounding molecules. At very low temperatures, even very active radicals can be immobilized in highly viscous glasses or crystals and can live for a very long time; active radicals are often trapped at low temperatures for electron paramagnetic resonance (EPR) studies.

The effect of intraperitoneal administration of pesticides: diquat, prometrine, hydrel, cataran, atrazine, zencor,

devrinol and tenoran on changes in the content of free radicals, as well as paramagnetic centers of ceruloplasmin and transferrin in the blood of rats, was studied.

It was shown that the pesticides atrazine, zenkor, devrinol, tenoran, do not significantly affect the content and composition of paramagnetic blood centers. At the same time, intraperitoneal administration of diquat, prometrine, hydrel, and which in doses of 50 led in 30-60 minutes to an increase in the content of free radicals in the blood by 2-6 times. The greatest change in the content of free radicals was noted with intra-abdominal administration of prometrine (3-5 times) and diquat (4-6 times). A smaller change in the content of free radicals was noted with the intraperitoneal injection of Hydrel (2-4 times) and which (2-3 times).

In order to understand the nature of the effect of pesticides on paramagnetic blood centers, experiments were undertaken to study the effect of this substance on paramagnetic complexes. The EPR spectra of the complexes are well studied [12-15]. It is also known that conformational changes in complexes under the influence of a number of substances (2,3-diphosphoglycerate, ATP, IGF, sodium dodecyl sulfate) lead to a change in the shape of the EPR spectra.

Therefore, it could be expected that the complexes can be an experimental model for studying the possible effect of pesticides on the protein parts of the blood pigment. In addition, as mentioned earlier, pesticides can enter humans body and animals against the background of nitrate - nitrite intoxication. Therefore, the course of this form of intoxication may have its own characteristics. We aren't aware of any published data on the effect of pesticides on paramagnetic blood centers under conditions of nitrate-nitrite intoxication. In this regard, the complexes formed during nitrate - nitrite intoxications

could be not only an experimental model for studying the effect of pesticides on proteins, but also have a completely independent significance for studying the binary action of pesticides and nitro compounds.

CONCLUSION:

For the first time, the effect of pesticides on the EPR spectra of animal blood was shown, and it was also revealed that the EPR spectra of blood significantly depend on the presence of nitrites in the environment. Thus, an increase in the combined action of pesticides and nitrites has been found, which makes it possible to organize a service for monitoring the action of harmful environmental factors.

References

- 1) Reutov V.P., Sorokina E.G. The problem of nitric oxide in biological systems: from NO-synthase and nitrite reductase systems in mammals to the nitric oxide cycle, the principle of cyclicity and the mechanisms underlying numerous diseases // Eurasian Scientific Association. 2016.Vol. 1. No. 1 (13). S.49-55.
- 2) Zhuravlev V.F., Tsapkov M.M. Toxicity of nitrates and nitrites // Gigena and sanitation. 1983. No. 1. S.62-66. 3. Berdiev U.B., Reutov V.P. Influence of pesticides (diquat, hydrel, basagran, prometrin, which, atrazine, tenoran, zencora, devrinol) on changes in the content of free radicals, as well as paramagnetic centers of ceruloplasmin, transferrin and Hb-NO complexes in mammalian blood // Eurasian Scientific Association. 2019.T.12. No. 2 (58). S.97-100.
- 3) Apostol S. Modificatoins hematologiques dans 1 es intoxications provoques des pesticides // Arch. Union med. Balkan. 1983. V.21. No. 1-2. P.127-131.
- 4) Berdiev U.B. Study of the effect of pesticides on changes in the content of free radicals in the blood of mammals // Khorazm Mamun academy akhborotnomasi. 2020. No. 5/1. S.7-10.
- 5) Krushinsky A.L., Kuzenkov V.S., Dyakonova V.E., Reutov V.P. Inhibitors of neuronal and inducible NO synthases enhance the protective effect of short-term adaptation to hypoxia in Krushinsky-Molodkina rats // Izvestiya RAN. Biol. 2015. No. 1. S.77-8
- 6) Gusakova S.V., Smaglyi L.V., Birulina Yu.G. et al. Molecular mechanisms of action of NO, CO and H₂S gas transmitters in smooth muscle cells and the effect of NO-generating compounds (nitrates and nitrites) on average life expectancy // Advances in physiological sciences. 2017. T. 48. No. 1. P.24-52.
- 7) Azhipa Ya.I., Kayushin L.P., Nikishkin E.I. Electron paramagnetic resonance spectra of iron-containing complexes arising in animal tissues under certain types of hypoxia. // Biophysics. 1969.T.14. issue 5. S.852-856.
- 8) Berdiev U.B., Reutov V.P., Vishnevsky E.I., Kayushin L.P., Sheksheev E.M. Application of the automated method of EPR spectroscopy to study the effect of pesticides and nitrites on the paramagnetic properties of mammalian blood // Biophysics. 1990. Vol. 35. # 2. C.382-383.
- 9) Berdiev U.B. Development of automated EPR spectroscopy methods for assessing the state of the body by blood paramagnetism: Author's abstract. dis. Cand. physical-mat. sciences. M. : MNO "Forum" Agency of Bioinformatics and Human Ecology. 1991.28 p.
- 10) Berdiev U.B., Kuznetsov Yu.P., Kuklin P.G., Reutov V.P., Sheksheev E.M. Modeling of EPR spectra of paramagnetic blood centers on personal computers such as IBM PC / XT / AT M. : Institute of Chemical Physics RAS. 1989.31 s.

11) Reutov V.P., Sorokina E.G., Okhotin V.E., Kositsyn N.S. Cyclic transformations of nitric oxide in mammals. M.: Science. 1997. 156s.

12) Reutov V.P. Investigation of the mechanisms of the regulatory and toxic effects of nitrites and NO-generating substances in biological systems: Author's abstract. dis. doct. biol. sciences. Moscow: Institute of Higher Nervous Activity and Neurophysiology RAS. 2004. 79 p.

13) Reutov V.P., Azhipa Ya.I., Kayushin L.P. Oxygen as an inhibitor of hemoglobin nitrite reductase activity // Izv. An USSR. Ser. Biol. 1983. No. 3. C.408-418

14) Menshchikova E.B., Zenkov N.K., Reutov V.P. Nitric oxide and NO synthase in mammals under various functional states // Biochemistry. 2000. Vol. 65. No. 4. P. 485-503.