

INTRODUCTION

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At the end of the twentieth century, emissions of anthropogenic pollutants have become proportional to the magnitude of the natural processes of migration and accumulation of various compounds. Problems directly related to chemical pollution of the biosphere, which often lead to acute toxicological and ecological situations, have suddenly worsened. This has led to the expansion and intensification of various studies on the extent and rate of environmental pollution, the search for effective methods of protecting the atmospheric air, natural waters, soil and vegetation, which are based on reducing the flow of chemical pollutants entering the biosphere with emissions from industry, waste, as well as limiting or eliminating the total toxic effects of various substances and compounds of anthropogenic origin on the plant and animal world, preventing their negative impact on human health.

According to the World Health Organization (WHO) ([Promotion of Chemical Safety Unit & International Programme on Chemical Safety, 1992](#)), out of over 6 million known chemical compounds, up to 500 thousand compounds are practically used; about 40 thousand of them are harmful to humans, and 12 thousand are toxic.

According to [REACH](#) data, there are currently over 140 thousand chemicals that are produced in quantities of over 1 ton/ year, of the more than 142 million substances registered in the [Sci Finder Chemical Abstracts Service \(August 2018\)](#). Most of these compounds could end up, in one case or another, in the environment.

Secondly, it is obvious that chemicals are not found alone in the environment, but as

complex mixtures. Over time, a chemical substance may exist in environment in a low concentration or below the limit of detection, however the mixture of several substances can produce adverse effects.

Moreover, the products of the transformation of micropollutants, formed in the environment or through biological metabolism, are not always known or recorded and may be more toxic and persistent than the initial basic compounds. In fact, about 30 thousand types of new xenobiotic chemical compounds are produced annually.

Thus, there is a need to assess them in terms of the danger to living organisms, populations of organisms and biocenosis.

Ecotoxicology - a new environmental science - appeared at the stage of man's awareness of the need to form knowledge about fluctuations and changes in the state of his environment under the influence of a huge number of foreign and natural substances in the living environment.

Ecotoxicology - a new field of environmental science - has emerged as an interdisciplinary direction, developing in the border areas of toxicology, ecology, biology, geochemistry, soil science and other sciences.

Ecotoxicology is one of the fundamental disciplines of the general professional training of undergraduate, master or doctoral students, enrolled in the study programs of ecology, biology and environmental science, and which allows the future specialist to freely understand and comprehensively evaluate and analyze the effects of xenobiotics and ecotoxicants on the environment and the biological systems regarding these effects.

The theoretical part of ecotoxicology presents modern ideas about the transformation and circuit of toxic substances in ecological systems, the mechanisms for their inclusion in natural cycles, as well as the consequences of changes in the natural flows of substances in the biosphere - the violation of ecological balance and the transformation of elements of the biosphere, the reduction of biodiversity, the risk to human health.

Ecotoxicology lays the foundations for scientific approaches to the problem of adapting different-ranking communities of bodies and specifies the principles of assessing the toxicity of a substance from the point of view of toxicology and ecotoxicology, the characteristics of standardisation and the technicalities of risk estimation.

The practical part consists in forming the knowledge of the methods of environmental monitoring, necessary for the collection of environmental information, and the ability to interpret this knowledge in order to assess the state, sustainability and prognosis of the development of natural complexes.

The main purpose of ecotoxicology is to provide the fundamental knowledge about the sources of harmful substances in the environment, their distribution and effect on living organisms and communities of living things of different organizational ranks, ecosystems and the biosphere.

Thus, ecotoxicology is one of the components of the general professional training of the environmental specialists, regarding the understanding of the problems of evaluation and the comprehensive analysis of the effects on environmental objects and the reactions of certain natural environments to these effects.

Ecotoxicological researches aim to study the migration of ecotoxicants (natural sub-

stances) and xenobiotics (compounds obtained in the process of human activities, which are foreign to the metabolism of living organisms) in ecological systems, the mechanisms of their incorporation into biogeochemical circuit, as well as the consequences of changes in natural flows, the balance and transformation of the elements of the biosphere, the reduction of the biodiversity, the imbalance of ecosystems and the risk to human health.

The history of toxicology is lost in the depths of the centuries. Man faced the poisonous effects of various substances of plant and animal origin in the Stone Age. As the natural environment developed, more and more new toxic substances appeared, including those caused by man that is, as they were produced by man himself, either as intermediaries or as final products of his work activity.

In connection with the development of industry, chemistry and chemical technology, these toxic substances or „poisons” demanded special attention. As a matter of fact, there are no non-toxic substances in the environment. Under certain conditions, in certain doses, nutrients can also become dangerous to living things/organisms, causing damage or impairment of their functions and, ultimately, death. Thus, the toxicity of substances that are completely inert with regard to biological objects can be quantitatively designated as a tendency (but not equal) to zero. In connection with the above mentioned, it is possible to define ecotoxicology as a science that studies a property inherent to almost all the substances around us, both natural and anthropogenic, their circuit and transformation into the living environment and their toxic effects on the communities of aquatic and terrestrial living things, including man.