Original Contribution

Journal scientific and applied research №1, 2012
Association Scientific and Applied Research
International Journal

ISSN 1314-6289

CHALLENGES AND PROBLEMS MODERN ECOTOXICOLOGY FACES

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Abstract: Analyses have been carried out of the basic and specific objectives and priorities of ecotoxicology, its tendencies and differences from toxicology. Proposals have been expressed to include new groups of potential contaminants of the biosphere as an object of study by the ecotoxicology

Key words: ecotoxicology, threats, security

Introduction

Modern strategy of monitoring of the environment toxic pollution in the industrialized countries is based on recent scientific achievements, as two of these are gaining much importance: the ecotoxicological approach to the analysis of anthropogenic impacts on the environment and the use of the concept of risk (analysis, evaluation and risk management). These scientific fields are at the forefront of global trends in development of methodology and quality control on the environment and assessment of the environmental threats. The term ecotoxicology was coined in 1969 by the International Scientific Committee and refers to environmental problems. The main subject of study is the environmental impact of the chemical contaminants on the components of the environment (air, water and soil), i.e. studies are conducted to identify their effects on the populations, biocoenoses, ecosystems, and biosphere. When the concentration of pollutants is far below the toxic level, the so-called remote effects are studied. The transition from the study of single organisms to the study of the impact of environmental factors on levels of organization of the living matter above an organism complicates the conduct of researches. Immediate consequences of the effects of pollutants are studied through their effects on individual organisms through direct toxicity or environmental change. The ecological importance of these contaminants or the lack of it, is manifested by in the indirect impact on populations, which enable the existence of species. Ecotoxicology is the study of changes in ecosystems influenced by various toxic substances and the impact of chemical contaminants on populations, biocoenoses and ecosystems: both direct (poisoning) and indirect (the distribution and transformation of pollutants themselves). It also studies the sources of chemicals, their ways of penetration into the organisms, their impact at population level, biocoenoses and eco-

system [1]. Ecotoxicology operates with categories from general ecology (ecosystem, habitat, biocoenoses, biosphere), general toxicology (poison, toxicity, toxic effect, hazard), but also by its own terms (toxicant, ecotoxicant, superecotoxicant etc.) [2 and others]. Both natural ecosystems and those created by man are studied.

Current status and Problems

All sections of ecotoxicology are based on experiments and one of the main differences between it and classical toxicology lies in the fact that it has a four-subject study:

2. Substances are released into the environment and their quantities, types and status should be known if their corresponding behavior has been studied.

2. Substances are geographically transported and boundaries of the various biota, while their chemical structure may often be transformed and their contents into the environment increases on behalf of the accumulation. The behaviour of various components and their toxicity vary substantially. The nature of these processes for the main pollutants and possible interaction on them are not well studied [3]. The hazard associated with the uncertainty of the ultimate fate of some chemicals is increasing, and this requires it to be established and documentary justified in the shortest time.

3. Chemicals act on one or more bodies, provisionally called targets. To establish this effect, the objects should first be identified and only then the type of impact be examined and the risk be assessed.

4. Classical toxicology examines the impact of toxic substances on individual organisms, while ecotoxicology deals with the impact on populations, communities or ecosystems.

All assessments of end effects of the chemical impact on the environment have only quantified.

The sections of the ecotoxicology can be summarized in the following way:

- influence of poisons on living organisms;
- poison activity mechanism;
- maximum concentrations of chemical compounds in water, soil, air, food.

Along with the development of advanced technologies, unparalleled opportunities have been reached in all areas of production and processing of raw materials. However, the risk of environmental contamination with toxic substances has also grown enormously. This defines the complex and multidimensional tasks of modern ecotoxicology:

Characterization and ecotoxicological assessment of chemical, physical and energy pollutants on populations, biocoenoses and ecosystems;

- Development of methods for early diagnosis of the causes of adverse changes in ecotoxicological effects and rapid eradication of these changes;
- Development of concepts for prevention, in view of the exclusion of possible changes in populations, biocoenoses and ecosystems due to expected adverse ecotoxicological impacts;

• Establishing a system for monitoring air, water, soil and living organisms and ecotoxicological forecasting;

Modern technogenic catastrophes, as the latest one at the plant for production of aluminum in Hungary, determine a couple of new tendencies in the development of the ecotoxicology:

• identification of pollutants, their forms and components in the ecosystems where they could be found;

• study of the effects of the pollutants' impact, biochemical, physiological and anatomical in particular, on individuals or small groups of individual species, to isolate the targets of impact;

• study of the effects of the pollutants' impact at population level, compared with the effects of species and the most important effects for those species;

• quantitative study of the migration of chemicals in ecosystems, including toxic substances which reach the target by air, water, food, soil, time of circulation of some of their concentrations in these environments, physiology and metabolism of the target organism.

• study and assessment of the combined effects of chemicals' impact for the quantitative and integrated assessment of their environmental impact.

Besides the xenobiotics (all unknown substances found in the body) a special place has to be assigned to these chemical elements and compounds found in nature, but their content in the abiotic components of the environment is increased as a result of the technogenic human activity. They are included in the trophic chains and they affect extremely adversely and even detrimentally the living organisms.

Another category, which has adverse effects on organisms, populations and biocoenoses, is the group of energy pollutants, which like the chemical contaminants, have an accumulated effect. Furthermore, they have an indirect effect exercised through changes in separate units of the trophic chain. Pollution by sulfur, nitrogen and carbon oxides, particulate emissions, ash, slag, oil, chemical solutions and pre-release exploitation washing, regeneration and sludge water from workshops for chemical water purification are just some of the problems. The strong variability of these emissions hampers the accuracy of their findings and prognosis, and the situation gets much more complex in emergency cases. Thermal pollution, as well as the potential threat of radiological emergencies and the related radioactive contamination with hazardous radionuclides has to be a component of the ecotoxicological analyses.

Poisons of biogenic origin such as microbe and fungal toxins, toxins of higher plants, toxins from animals and others should not be attached to the group of chemicals at ecotoxicological monitoring. This is particularly important as it is known that genetic engineering makes active attempts to obtain microorganisms that produce toxins in greater quantities than those found in nature. Combination of known pathogens with genes that produce toxins from other organisms leads to the possibility that the

initial microorganism maintains its pathogenicity and by replication it produces toxins, which lead to different symptoms [4]. Bitechnologies allow for the introduction of factors into many organisms, which make them resistant to antibiotics

Genetic engineering is trying to create viruses that can modify hereditary information or to cause malignant degeneration of certain cells. Some authors speculate that it is aimed at inventing specific weapons, which can destroy certain areas or nations [5].

The debate for and against GM foods is ambiguous, but definitely it is impossible to predict the long-term consequences for the environment and the human organisms that have eaten such foods. They have qualities completely unknown to the species and it is possible that modification of organisms have unexpectedly negative consequences to people. Therefore, it is reasonable to approach the issue by imposing a ban on mass production of genetically modified products until long-term studies prove they are safe. This is also an area which needs to be in the spotlight of ecotoxicology. The large number of pollutants and their diversity makes the control on them practically impossible. This requires the separation of a group of priority components and the substances need to be included in it.

Conclusion:

Humans and the environment are exposed to an increasing risk of ever growing production, trade and consumption of chemicals, chemical and hazardous substances. Threats to human security and well-being are increasingly associated with the adverse environmental status. Therefore, sustainable management of these potential pollutants throughout their life cycle is extremely important, in order to prevent the cause of technogenic accidents and catastrophes. Better knowledge of health and environmental impacts of chemical and toxic substances, planning and implementation of effective preventive measures in relation to human health and the environment during their manufacture and use, as well as measures to prevent major accidents and mitigation of their consequences, pose serious challenges that need to be addressed both at national and international level. In this sense, it would be reasonable to include new groups of substances in the objects of ecotoxicology - genetically modified organisms, energy pollutants, microbial, fungal toxins, toxins from plants and animals. In this case only both prevention measures and real protection will be fully effective and appropriate.

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