

Ecotoxicology

Ecotoxicology is an interdisciplinary scientific field combining the knowledge of science studying ecosystems (ecology) and science studying the interaction of chemical substances with living organisms (toxicology). Ecotoxicology deals with the study of the effects of harmful substances on the ecosystem, studies toxic effects in nature, in organisms, especially effects in populations and communities, monitors and predicts the fate and effects of foreign substances in the environment.

First definition of ecotoxicology (1969): René Truhaut: the study of the adverse effects of chemicals with the aim of protecting natural species and communities. Rachel Carson (1962): the memoir The Silent Spring highlights the use of pesticides, especially DDT and other agrochemicals. The book led to the establishment of the US Environmental Protection Agency (EPA) in the USA. Introduction of methods describing the toxic effects of human-produced substances on the environment and the organisms contained therein. Systematic implementation of fish toxicity testing methods. In addition to direct toxic effects, the effects of bioconcentration and bioaccumulation are studied – increases in the concentration of foreign substances in the tissues of organisms as a result of exposure from the environment.

2004 EC ratification: Persistent Organic Pollutants Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution. The aim of the protocol is to limit, reduce or eliminate the discharge, emissions and losses of persistent organic pollutants that have significant adverse effects on human health or the environment due to long-range transboundary air transport.

In 2006, Regulation No. 166/2006 of the European Parliament and the EC Council was issued, establishing the **European Register of Releases and Transfers of Pollutants**. It represents a publicly accessible database of pollutant releases into the air, water and soil, information on wastewater, information on pollutant releases from dispersed sources.

In 2003, the proposal for a new framework for legislation covering the safety of chemicals **REACH (Registration, Evaluation and Authorization of Chemicals)** was accepted by the European Commission and approved by the European Parliament. Enterprises and firms that import more than 1 ton of a chemical compound per year will be forced to register this chemical in a central data bank. The aim is to improve the protection of the health of nature, including people, to increase the innovation capacity and the ability of the chemical industry to compete in the European Union. The new measures concern not only new chemical substances introduced to the market, but also substances that have been used for a long time. The program aims to ensure that by 2020 at the latest, only chemical substances with known properties and in a way that does not harm human health and the environment are used.

Ecosystem

- A functional system of living and non-living components of the environment, which are connected to each other by the exchange of substances, the flow of energy and the transmission of information.
- A functional system of living and non-living components of the environment that influence each other and develop in a certain space and time.
- The basic unit of the biosphere consisting of living organisms (plants, animals, microorganisms) and the surrounding abiotic environment (physical and chemical factors).
- The energy flow leads to a clearly defined trophic (food) structure, biotic diversity, substance cycling (to the exchange of substances between living and non-living components) and the exchange of information within this system.
- The primary source of energy for ecosystems is the Sun.

Ecology

- Name from the Greek oikos (house) and logos (science, debate).
- A scientific discipline from the field of life sciences (biological discipline) about the relationships between organisms (individuals), between groups of organisms (populations and communities) and between organisms and their abiotic or inorganic environment (physical – chemical factors).
- It deals with monitoring the influence of harmful (toxic) foreign substances on free-living organisms in their environment.
- It deals with the effect of harmful substances from the environment on humans, either directly from the components of the environment (water, air, soil), or through natural or human-controlled (food production) food chains.

Differences between toxicology and ecotoxicology		
	Toxicology	Ecotoxicology
Target	Protect people from toxic substances	Protect populations of individual species
Target organism	The person is well characterized, minor errors in test extrapolations. Both test organisms and humans are warm-blooded.	Individual species are very different (cold-blooded animals, plants, microorganisms), the level of uncertainty when extrapolating results is high
Tests used	Tests used Model tests (on animals)	Direct testing of species sensitivity
Toxicity measurement	Simple dosage and toxicity measurement (LD 50)	Non-uniform dosage and measurement of ecotoxicity (depends on the type of organism)
Mechanisms of action	Well-characterized mechanisms of action of toxic substances in the body	Less information about biochemical mechanisms
Standardization of methods	Well-standardized test methods	Many methods, few standards, therefore it is difficult to predict effects in ecosystems

Differences between ecology (biological and chemical) and ecotoxicology	
Ecology	Ecotoxicology
Very broad scope of study (relationships between organisms, their communication and relations between organisms and the environment)	Narrow Interest - Organisms vs. environment, or negative effects of environmental changes
Rather, he studies "physiological" (natural) states - the effects of environmental factors - temperature, humidity, light	He studies non-physiological states – unnatural substances in the environment, excessive exposure to physical stressors (noise , radiation, buildings)
Ecology is based on field (ecological) studies	More information on individual species, field studies only in limited quantities

Links

related article

- Metal contamination
- Industrial substances
- Introduction to toxicology

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