

Teratology

Teratology is a scientific discipline that studies the causes and mechanisms of developmental defects. It is directly related to the terms teratogenesis, which is a process inducing the development of a developmental defect, and teratogen, which is an agent inducing the development of a defect. All these terms have their basis in the Greek word *teras/teratos*, which means monstrosity.

The concept of developmental defects is also related to the term teratology. A developmental defect is a gross deviation from the normal structure of the body or organs that arose during embryonic development. Many such deviations are incompatible with life and lead to prenatal elimination of the fetus or embryo.

A developmental defect that was not prenatally lethal and is registered at birth is a congenital developmental defect. It is often the cause of permanent damage to health and reduced vitality.

A deviation from the usual structural constitution that does not impair health and survival is called a developmental deviation.

History

Birth defects have appeared since the beginning of human existence. Evidence can be found in old stories and artistic expressions of many civilizations. Congenital malformations were associated with the intervention of a god or the devil, and individuals affected in this way were either worshiped or condemned or even liquidated.

Development of experimental teratology

- The origins of teratology as an experimental scientific field date back to the end of the 19th century, when experiments were conducted and documented to demonstrate the teratogenic effects of temperature and certain chemicals in the development of reptiles, birds and fish. At that time, however, it was still assumed that mammalian embryos were protected by the mother's organism and that they were not in danger.
- The first reports of birth defects in mammals were published in the 1920s, when the teratogenic effect of excess vitamin A in the mother's diet was demonstrated.
- In 1929 Goldstein and Murphy proved that ionizing radiation is a human teratogen.
- In 1941, Gregg drew attention to the connection between the increased incidence of congenital malformations and the rubella epidemic in Austria.
- A rapid development of teratology only happened after the discovery of the effects of **thalidomide** in the 1960s in Germany. Thalidomide was recommended to mothers in the early stages of pregnancy as a sedative and hypnotic at the time. Soon after, a significant increase in the number of children born with severe limb malformations was noted. Such developmental defects are rare in the population, so the increased frequency has attracted attention. Before Lenz in Germany and McBride in Australia independently discovered that thalidomide was to blame, about 8,000 malformed babies were born. This case was followed by a rapid development of teratology. The *basic principles of teratogenesis* were formulated and safety measures were developed.

Basic principles of teratogenesis

They were formulated in 1959 by J.G. Wilson in his work *Environment and Birth Defects*^[1], but in the following years they were further elaborated.

1. *sensitivity to teratogenesis is determined by the genotype of the embryo and the way it interacts with environmental factors*
 - sensitivity to teratogenesis is individually specific
2. *sensitivity to a teratogenic agent varies depending on the developmental stage of the embryo at the time of exposure*
 - a critical period is a period when it is possible to disrupt the development of a given organ through external intervention
 - after the critical period has passed, it is no longer possible to induce a structural defect in the given organ
 - the critical period is determined by the period of organ morphogenesis
3. *teratogenic agents act on developing tissues and cells in a specific way*
 - the period of sensitivity is the period of sensitivity of the cells of the developing organ to the acting agent and depends on the nature of the teratogen
 1. generally cytotoxic teratogens
 2. specific teratogens

Links

Related articles

- Congenital developmental defects

- Teratogens
- Mutagenic and teratogenic environmental factors

External links

- Teratology on the Wikipedia pages (en) (<https://en.wikipedia.org/wiki/Teratology>)
- list of teratogens on the site A.V. Spirova (http://www.evol.nw.ru/~spirov/hazard/teratogen_lst.html)
- Teratology Society Website (<http://www.teratology.org/>)

Reference

1. WILSON, James G. *Environment and birth defects*. 1. edition. New York. 1973. 305 pp. ISBN 0127577505.

Used literature

- NOVOTNÁ, Božena - MAREŠ, Jaroslav. *Vývojová biologie pro mediky*. 1. edition. Praha : Karolinum, 2005. 99 pp. ISBN 80-246-1023-X.