

Physical and chemical teratogens

Physical teratogens

1. **Radiation** – Ionizing radiation induces classical embryotoxic effects depending on the dose and duration of exposure
2. **Hyperthermia** (more than 42 °C) – results in reduction or stoppage of DNA, RNA and protein synthesis and prolongation of cell cycle. In the pre-implantation stage, it causes an increase in resorption. In the course of organogenesis, it then causes deformities CNS and skeletal malformations of limbs and joints.

Chemical teratogens

Medication

▪ **Thalidomide**

Causes severe reduction deformities of the limbs (amelia and meromelia) and defects of a whole range of other organs.

▪ **Aminopterin**

Causes anencephaly, hydrocephalus, meningocele, cleft lip and palate. It has been used to induce therapeutic abortions

▪ **Antiepileptics**

Twice the incidence of malformed children compared to assumptions:

▪ Diphenylhydantoin

Causes fetal hydantoin syndrome manifested by craniofacial defects, hypoplasia of nails and fingers, mental and growth retardation.

▪ Trimethadione

Results in ear malformations, cleft palate, heart defects, urogenital defects, skeletal anomalies, mental and growth retardation.

▪ **Hormones**

They were used to prevent spontaneous abortion.

▪ Progestins (ethisterone, norethisterone)

Exposure before the 12th week of pregnancy causes masculinization of the external genitalia in female fetuses.

▪ Diethylstilbestrol

Synthetic estrogen - female fetuses exposed in utero have an increased incidence of vaginal and cervical cancers and other benign female reproductive abnormalities in adolescence. org.; in male fetuses it results in testicular malformation and an abnormal spermiogram.

▪ **Cytostatics**

They have antiproliferative effects, therefore they are not given during pregnancy (only in exceptional cases of treatment of malignancies threatening the life of the mother).

▪ **Isoretinoin** (Acutan)

Synthetic derivative of vitamin A used to treat acne. It causes orofacial clefts, CNS involvement, anomalies of the heart and thymus, neuropsychiatric disorders.

▪ **Antibiotics**

▪ Mitomycin C

It has antiproliferative effects, which is why it is used in the therapy of malignant diseases.

▪ Tetracycline

It affects the mineralization of bones and teeth in their critical period. Exposure to tetracycline causes so-called tetracycline teeth, which manifest as a gray to brown tooth color due to dentinal disruption.

Chemicals in the outdoor environment

They include industrial waste products (dioxins, polychlorinated biphenyls, heavy metals), substances that increase agricultural production (artificial fertilizers, growth stimulants, herbicides, pesticides), etc.

- **Mercury**

Chronic health effects are well known from Japan's Minamata Bay, where mercury was released into the sea in the 1950s and entered the fish eaten by local residents through the food chain; in Iraq in the 1950s and 1970s. In the 1990s, it repeatedly happened that grain (intended for sowing) treated with a fungicide containing organic mercury was used for food.

Causes disorders up to cerebral palsy or mental retardation in newborns, reproductive disorders and damage to the nervous system in general.

- **Food additives** (dyes and preservatives)
- **Professional exposure**
- **Mycotoxins**

Links

Related articles

- Teratogens
- Drugs in pregnancy
- Teratogenesis
- Congenital developmental defects

References

- NOVOTNÁ, Božena – MAREŠ, Jaroslav. *Vývojová biologie pro mediky*. 1. edition. Karolinum, 2005. 99 pp. ISBN 978-80-246-1023-8.