TOXIN EXPOSURE
Toxins, Toxic Injury

Toxins are small molecules, that are capable of causing disease on contact with or absorption by body tissues interacting with biologic macromolecules.

Risk factor  Male & Female

About Toxic exposure

Humans are subjected to a range of chemical exposures from the environment. Chemicals in air, water, soil and food, occupational exposures and lifestyle factors, all contribute to a complex exposure situation in our daily life. A toxic injury is caused when one comes in contact with any toxin. However, some causes are still unknown or extremely uncommon. Generally, there are two different categories in which a toxic injury may fall into:

- an injury due to an environmental toxin, or
- an injury due to chemical exposure

An environmental toxin is one that is found naturally in our surroundings. (For example, molds. Mold spores may be found both indoors and outdoors.) Although it is possible that an environmental toxin can be produced with human intervention (such as pesticides) it is still considered natural. Injuries due to chemical exposure are often more severe due to the nature of these highly toxic substances. Common toxins that may cause a chemical toxic injury are found in consumer products, pharmaceuticals and industrial products. In addition, consumption of alcohol and tobacco smoking are known to be "toxic for reproduction".

Reproductive toxicity

Reproductive toxicity is a hazard associated with some chemical substances, that they will interfere in some way with normal reproduction; such substances are called reprotoxic. It includes adverse effects on sexual function and fertility in adult males and females, as well as developmental toxicity in the offspring. It is usual to take a practical definition, including several different effects which are unrelated to each other except in their outcome of lowered effective fertility. The Globally Harmonized System of Classification and Labelling of Chemicals (GHS) separates reprotoxicity from germ cell mutagenicity and carcinogenicity, even though both these hazards may also affect fertility.

Symptoms

Every toxic injury or exposure to a toxin has different effects and symptoms. Some toxic effects do not necessarily cause permanent damage and can be reversible. However, some toxins can cause irreversible permanent damage. Depending on the intensity of the poison of the substance it can affect just one particular organ system or they may produce generalized toxicity by affecting a number of systems. A variety of symptoms occur depending on how and where the toxic injuries affect the body. Generally, if the toxins affect the respiratory system the symptoms are coughing, tight chest, difficulty in breathing and nose and throat irritation. Miscarriage or infertility can occur if it occurs in the ovaries or testes. Depression, severe headaches and dizziness are the symptoms for toxins affecting the spinal cord and brain. Visible reactions such as skin rashes, and swelling and eye redness are common. Exposure to asbestos can lead to mesothelioma which is a cancer that can cause serious damage to the lining of the lungs. The symptoms include shortness of breath, cough, night sweats and fever.

Associated diseases

- aplastic anemia
- asbestosis
- berylliosis
- byssinosis
- Hodgkin's disease
- interstitial lung disease
- leukemia
- lymphoma
- manganism
- mesothelioma
- multiple myeloma
- pneumoconiosis
- sarcoidosis
- silicosis
- thrombocytopenic purpura
- toxic encephalopathy
- toxic Hepatitis
- toxic leukoencephalopathy

Complications

Toxic injuries can cause infertility, teratogenic effects, respiratory effects, gastrointestinal effects, cardiovascular effects, hepatic effects, renal effects and neurological effects. They can also lead to various forms of cancer or learning disability. Effects can occur after acute (short-term) or chronic (long-term) exposure, depending on the toxicity of the substance.

Risk factors

- toxic air pollutants
- toxins in food
- toxic workplace

Prevention

- Avoiding direct exposure to toxins will reduce the risk of toxic injury.
- For safety reasons, wear personal protective equipment when working near environmental or chemical toxins.
- Maintain a clean and dry environment to prevent toxic molds in the home and workplace.
- In the event that a toxic injury occurs, victims may have the option to file a specific type of lawsuit called a toxic tort.

How it can affect fertility

Both men and women can be exposed to chemicals and other materials that may be detrimental to their reproductive health while on the job. Heavy metals and pesticides have many negative side effects, particularly for those who work around them. Men working in agricultural regions and greenhouses which use pesticides have higher concentrations of common pesticides in their urine, overall reduced semen parameters, oligozoospermia, lower sperm counts, and sperm concentrations decreased by as much as 60%. Organic solvents may also prove detrimental. Men who work with these substances often experience indirect consequences with their female partner having decreased implantation rates. Welding is another possible source of occupational exposure, and plays a role in reduced reproductive health. There are also consequences for working in factories that manufacture chemicals and heavy metals. Factories that produce batteries where workers are exposed to lead may have negative impacts on reproductive capabilities, including asthenospermia and teratosperma. Lead compounds are considered to be toxic for reproduction given their adverse effects on the normal intellectual and psychomotor development of human babies and children. Hobbies, while not often associated with excessive amounts of exposure, may be just as damaging as manufacturing. Gardeners may be in contact with pesticides; crafters making jewelry, ceramics, and even stained glass may come in contact with lead; painters may also come in contact with lead-based paints. Whether it is manufacture or hobby, using any kind of heavy metal or pesticide likely will result in some exposure, and possibly reduce fertility.

Female Infertility

One well-known group of substances which are toxic for reproduction are teratogens – substances which cause birth defects – of which (S)-thalidomide is possibly the most notorious. Another group of substances which has received much attention (and some controversy) as possibly toxic for reproduction are the so-called endocrine disruptors. Bisphenol A (BPA), an Endocrine disrupting chemicals (EDC) widely used as an industrial chemical.
The European and US Food and Drug Administrations concluded that the current BPA levels may have no risk to the general population. However, basic scientists contested that the entire population may suffer adverse health effects from current BPA levels.

BPA can interfere with endocrine function of hypothalamic-pituitary axis, such as by changing gonadotropin-releasing hormones (GnRH) secretion in hypothalamus and promoting pituitary proliferation. Such actions affect puberty, ovulation and may even result in infertility. Ovary, uterus and other reproductive organs are also targets of BPA. BPA exposure impairs the structure and functions of female reproductive system in different times of life cycle and may contribute to infertility. BPA affects reproduction-related gene expression and epigenetic modification that are closely associated with infertility. The detrimental effects on reproduction may be lifelong and transgenerational.

**Male Infertility**

Occupational activities involving exposure to specific chemicals or expositions to toxicants may impair male reproductive health and cause infertility in humans. Chemicals could adversely affect male reproductive system by, either disrupting the gonadal endocrine axis or, the spermatogenesis process. Any of those mechanisms would result in poor semen quality. Recent studies suggest that sperm DNA integrity may be altered by environmental exposure to some toxic chemicals. DNA fragmentation may be an excellent marker for exposure to potential reproductive toxicants and a diagnostic tool for male infertility.

Taking care of a current fertility problem may provide better fertility in the future.

**Prognosis**

Many drugs have effects on the human reproductive system: these may be desired (hormonal contraception), a minor unwanted side effect (many antidepressants) or a major public health problem (thalidomide). However, most studies of reproductive toxicity has focused on occupational or environmental exposure to chemicals and their effects on reproduction. It may be noted that both consumption of alcohol and tobacco smoking are known to be "toxic for reproduction" in the sense that the term is used here. Taking preventative steps such as visiting your doctor and using contraception may help fertility.

Find more about related issues

**Diagnoses**

**Anovulation**
Failure of the ovaries to release an oocyte over a period of time generally exceeding 3 months.
Learn more at: [www.fertilitypedia.org/therapy/diag/anovulation](http://www.fertilitypedia.org/therapy/diag/anovulation)

**Endometriosis**
A state in which pieces of the tissue alike to the lining of the uterus (endometrium) grow in other parts of the body.
Learn more at: [www.fertilitypedia.org/therapy/diag/endometriosis](http://www.fertilitypedia.org/therapy/diag/endometriosis)

**Globozoospermia**
A rare abnormality of sperm morphology, with the majority of sperm cells being round-headed, which leads to male infertility.
Learn more at: [www.fertilitypedia.org/therapy/diag/globozoospermia](http://www.fertilitypedia.org/therapy/diag/globozoospermia)

**Repeated implantation failure**
The absence of implantation after three or more transfers of high quality embryos or after placement of 10 or more embryos in multiple transfers.
Learn more at: [www.fertilitypedia.org/therapy/diag/repeated-implantation-failure](http://www.fertilitypedia.org/therapy/diag/repeated-implantation-failure)

**Therapies**
MACS
Sperm preparation technique for ART eliminating apoptotic sperms depending on their surface antigens in magnetic field.
Learn more at: www.fertilitypedia.org/edu/therapies/macs-1

International pictogram
The international pictogram for chemicals that are sensitising, mutagenic, carcinogenic or toxic to reproduction.

Sources

“ Toxic tort” (https://en.wikipedia.org/wiki/Toxic_tort) — sourced from Wikipedia licensed under CC BY-SA 3.0

“Toxicity” (https://en.wikipedia.org/wiki/Toxicity#Health_hazards) — sourced from Wikipedia licensed under CC BY-SA 3.0

“Combined Toxic Exposures and Human Health: Biomarkers of Exposure and Effect” (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3083662/) — by Silins and Högberg licensed under CC BY 3.0


“Bisphenol-A and Female Infertility: A Possible Role of Gene-Environment Interactions” (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4586663/) — by Huo et al. licensed under CC BY 4.0

“Lifestyle factors and reproductive health: taking control of your fertility” (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3717046/) — by Sharma licensed under CC BY 2.0

“Reproductive toxicity” (https://en.wikipedia.org/wiki/Reproductive_toxicity) — sourced from Wikipedia licensed under CC BY-SA 3.0

“GHS-pictogram silhouette” (https://en.wikipedia.org/wiki/Reproductive_toxicity#/media/File:GHS-pictogram-silhouette.svg) — by unknown licensed under CC0 1.0