



# MALE INFERTILITY AND OCCUPATIONAL HAZARDS W.S.R.TO HEAVY METAL TOXICITY

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## Introduction

Reproductive hazards from metal exposure in males are one of the fastest growing areas of concern in toxicology today. Exposure to different heavy metals causes irreversible toxic effect on male reproductive system.

Heavy metals produce cellular impairment at structural and functional level in male reproductive system .the rapid industrialization and overgrowing urbanization, the toxic effects of heavy metals on male reproductive system has become a major health concern in globe.

The evidence of past twenty years have shown disturbing trend in male reproductive health hazards due to careless use of these chemicals which cause detrimental effects on different organs. A combination of genetic, environmental and lifestyle factors contribute to adverse effects on the reproductive health in men.

## Possible Causes of Male Infertility

- Problems with sperm production
- Testicular injury and disease
- Obesity
- Malnutrition
- Overheating

- Tight fitting clothing
- Smoking and alcohol
- Drugs
- Environmental toxins
- Radiation
- Heavy metals

A number of environmental factors such as exposure to toxins or chemicals, cigarette smoke, heavy metals (like lead, mercury, arsenic), pesticides, solvents, synthetic oestrogen in poultry farm etc. can reduce sperm count either by affecting testicular function directly or by affecting a hormone system, all interfere with sperm formation and protection.

Person mainly get exposed to heavy metals in environment (food, water, air) and at workplace like industries. There are mainly lead, arsenic, mercury, cadmium, barium, selenium like metals which come in contact with human being at their workplace (industrial heavy metals).

#### **Adverse effect of heavy metals on male reproduction**

The potential toxicity of metals i.e. lead, cadmium, chromium, selenium, arsenic caused alteration in sperm morphology, count, motility as well as biochemical disruption of enzymes and hormones.

<b>Sr no.</b>	<b>Metal</b>	<b>Sources</b>	<b>Adverse effect</b>
1	Lead	Acid battery plant refinery, smelter, fuel combustion industry, printing press.	<ol style="list-style-type: none"> <li>1. Deposition of lead in testes, epididymis, vasdeference, seminal vesicle and seminal ejaculate.</li> <li>2. Adverse effect on sperm count and retarded the activity of alive sperm.</li> <li>3. Morphological abnormality of sperm (mainly tail abnormality)</li> <li>4. Decrease in certain key seminal constituents like, fructose and succinic dehydrogenase which indicate the male reproductive functional impairment in reproductive system</li> <li>5. Decreased libido.</li> </ol>
2	Cadmium	Tannery, smelters, battery crushing unit,	<ol style="list-style-type: none"> <li>1. Specific action at stage of spermatogenesis.</li> </ol>

		ceramics, plastic stabilizers and fertilizers.	2. Deleterious effect on the vascular structure of testis that may be the result of varying degrees of cadmium induced ischemia.
3	Chromium	Refractory ,pigment and stainless steel factory,welding	Lowers the sperm concentration and motility.
4	Selenium		Adverse effect on testis .testicular degeneration along with leading cell atrophy.
5	Mercury	Refinery, plastics, paints, fuel combustion, photography, cosmetics	<ol style="list-style-type: none"> <li>1. This metal is spermatosteroidoand fetotoxic agent.</li> <li>2. Mercury chloride exhibited structural alteration of testicular tissue along with biochemical change.</li> <li>3. Depletion and clogging of different spermatogenic cells.</li> </ol>
6	Arsenic	Alloying element, used as herbicides,	Impairment of spermatogenesis

### Mechanism of metal action

Metals may affect the male reproductive system directly, when they target specific reproductive organs, or indirectly ,when they act on the neuro-endocrine system.

These effects can be long lasting and irreversible if sertoli cells are disrupted during foetal development .the number of sertoli cells determines the number of sperm produced in adulthood ,because each sertoli cell can support only a finite number of germ cells that develop into sperm. Sertoli cells proliferate during the foetal, neonatal and pre-pubertal period and each of these periods is particularly sensitive to the adverse effect of metals.

The disruption of spermatogenesis in men at any stage of cell differentiation can decrease the total sperm count, increase the abnormal sperm count, impair the stability of sperm chromatin or damage sperm DNA.

Accumulation in epididymis, prostate, vesicular seminalis or seminal fluid, metals may impair progressive sperm motility .metal can cause hormonal imbalance by affecting the neuro-endocrine system , disrupting the secretions of androgens from leading cells.

## Factors influencing health outcomes of human exposure to metals

Men are usually exposed to many metals and other agents that act together resulting in adverse health effect or increased sensitivity to these effects. It is often difficult to correlate specific metal exposure to specific effect because of the complexity of these relationships.

Many factors can influence health outcomes of human exposure to metals. Some of them are metal speciation (chemical form), dose, timing, routes and duration of exposure, dose response relationship, bioavailability and distribution and accumulation of metals in various organs. Response to metal exposure also depends on age, sex, health status, dietary habits, use of medications and/or supplements, physical activity and concomitant exposure to other metals and / or chemicals.

The signs and symptoms of metal toxicity depend on the duration of exposure, type of metal, condition of workplace, socio-economic status and history of disease.

