

## **Effect of Environmental Pollutants on Human Semen**

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*With the increased release of numerous chemical substances into the biosphere, careful assessment of health effects of polluted environment must be made for maintaining and enhancing the quality of human life on this earth. Significant number of malformed children are born each year (Hoar 1986). Sixty-five to 70% of all birth defects have an unknown etiology. More than one-third of early human conception and upto 15% of recognised pregnancies are terminated by spontaneous abortion (Clegg et al 1986). The extent of the effect of environmental pollution on human reproductive performance is for the most part unknown. Of the approximately five million chemicals in existence, humans could be exposed to a sufficient quantity of an estimated 53900 for toxicity to be of potential problem (National Academy of Science 1984). Methods that do not require autopsy or surgery such as semen analysis would be attractive for assessing the effect of environmental toxicology on quality of human life. Therefore, the present study was conducted to observe the effects of heavily polluted environment of industrial area of Ludhiana and relatively clean, pollution free environment of Chandigarh on the human semen quality. It was believed that the function of the male reproductive system may often be the most sensitive to toxic effects.*

### **MATERIALS AND METHODS**

*All semen donors (age 35-45 years) were healthy clinically. They had come for vasectomy operation to various hospitals. They had normal testes and genitalia as examined by a gynaecologist. Subjects were instructed to abstain from ejaculating for two days prior to each donation. Subjects were of middle income group. Only non-smokers and non-drug addicted persons were sorted*

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out. Twenty semen donors were those who were working and residing in heavily polluted industrial area of Ludhiana city, Punjab, India for a minimum of atleast one year. Forty semen donors (one years continuous stay) were from Chandigarh, Punjab, India which does not have pollution creating industry in the city. Spermatozoa were fixed by adding a few drops of semen on to a small amount of buffered saline solution for 8 hrs. A drop of this formol saline solution fixed semen was placed on a microscope slide under a cover glass. Acrosome morphology was evaluated with phase-contrast microscope and was categorised into normal acrosome and damaged acrosome. Fructose and citric acid were estimated in the semen samples according to the methods of Mann (1964) and Mann and Lutwak-Mann (1976). Student's 't' test was employed for analysis.

## RESULTS AND DISCUSSION

The average ( $\pm$ SE) normal acrosomes were  $95\% \pm 2.0\%$  in semen from the semen donors of city Chandigarh. In the semen of persons residing continually for one year in the heavily polluted industrial area of Ludhiana the average percentage of normal acrosomes was  $70\% \pm 5\%$ . The fructose concentration was significantly higher ( $P < 0.05$ ) in the semen of men from polluted industrial area of Ludhiana than in the semen of men from city Chandigarh (Table 1), whereas citric acid was significantly lower ( $P < 0.01$ ) in semen of persons from the polluted industrial area of Ludhiana as compared to that from the men from Chandigarh. The determination

Table 1. Concentration of different markers of the male accessory sex glands in men from polluted industrial area of Ludhiana and relatively clean city Chandigarh

	Polluted industrial area of Ludhiana	Relatively clean city Chandigarh
Fructose	$370 \pm 12^*$	$200 \pm 40$
Citric acid	$320 \pm 70^{**}$	$600 \pm 20$

Values are mean  $\pm$  SEM in mg/100 ml semen; \* $P < 0.05$ ; \*\* $P < 0.01$ .

of different markers in semen is to check the state of the accessory sex glands. In this regard, fructose levels are used to verify the functional state of the seminar vesicles and citric acid to assess the prostate function (Eliasson 1968; Mann and Lutwak-Mann 1976). These tests are often utilized for diagnosing certain pathological conditions of the human reproductive tract,

that can produce alterations in the chemical composition of the semen. In conclusion, this study shows that sperm morphology and markers levels of seminal vesicles and prostates are greatly affected by the heavily polluted environment of Ludhiana city, as compared to the relatively clean city Chandigarh of Punjab, India.

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