

## Public Health 2017: Human semen as an early and reliable tool of environmental effect assessment on human health: Eco food fertility project- Luigi Montano, ASL Salerno

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**Statement of the Problem:** Several studies have revealed a dramatic declination of male fertility in many industrialized countries and infertility is becoming a top priority for the public health. A pilot bio monitoring study of EcoFoodFertility Project a multicenter, multidisciplinary research joining human life-style and dietary habits to the environmental results of exposure to pollutants, was conducted in Campania region (Italy) on a cohort of clinically healthy male residents in the Land of Fires (high environmental impact- HEI) compared with a similar cohort living in the rural area of the same area, Alto-MedioSele (low environmental impact "LEI). **Methodology and Theoretical Orientation:** 110 healthy men were chosen from HEI and LEI regions (age 28±5years). Enrollment aspects were no smoking, no habitual alcohol drinking and no occupational exposure. In both semen and blood we checked 22 trace elements by optical emission spectrometry and total antioxidant capacity (TAC) by spectrophotometry. In a randomly subset of 20 subjects from each group, we checked sperm DNA fragmentation index (DFI) by Sperm Chromatin Dispersion test and antioxidant enzyme activities in the semen (Glutathione reductase, Glutathione peroxidase) by spectrophotometry. **Findings:** HEI subjects showed considerably higher values ( $p < 0.05$ ) for Al, Mn, Cr, Mg, Li, Co, Ca in blood, as well as for Cr, Cu and Zn in the semen, while Fe was lower in the semen of HEI-group ( $p < 0.05$ ). Immotile sperms and the DFI were both quite higher ( $p < 0.026$  and  $p < 0.01$ , respectively) in HEI-group. TAC in blood showed no considerable differences, while TAC, GSR and GpX in the seminal plasma were significantly lower in the HEI-group ( $p < 0.05$ ). The percentage of immotile sperms showed significant ( $p < 0.005$ ) inverse correlations with both TAC and GSH in semen. **Conclusion & Importance:** These results suggest sperm motility, DFI, antioxidant capacity, chemical element pattern are influenced by high environmental pressure and human semen could be used as an early and reliable tool of environmental impact assessment on human health, useful for innovative prevention programs and health surveillance in risk regions.

The risk is that semen quality of a significant proportion of young men in developed countries will impair the fecundity potential causing on a short-term basis just a longer waiting time to pregnancy without to considerably family sizes of modern couples, but on a middle-, long-term basis, strongly contributing (along with socio-economic factors) to the already observed European decrease in the birth rate. While there was a considerable variability in trends in sperm counts over the past 20 years, several recent studies have reported that 20–30% of

young men today have sperm concentration below  $40 \times 10^6/\text{ml}$ , which is associated with reduced fecundity. Among life-style changes that lead to a reduced birth rate, affecting semen criterias and/or semen quality, there are: increased age at conception of both parents (although as a consequence of socio-economic factors), the increase in obesity, physical inactivity and the exposure to environmental and dietary environmental and chemical contaminants, including drugs. Exposure to man-made chemicals, in particular in the workplace, is recognized as major risk factors for male infertility in both epidemiological and experimental studies. Individuals exposed for professional reasons to environmental contaminants reveals a reduction of concentration, motility, morphology and/or sperm DNA damage. In addition, toxicological studies in animal models are showing DNA damages or epigenetic alterations within the germline: exposure to environmental xenobiotic during the fetal development and in early post-natal life, caused congenital malformations or reproductive tissue alterations or declined fertility or symptoms of reproductive syndromes, such as the testicular dysgenesis syndrome, in particular when multiple in utero exposure to chemicals are analyzed. Furthermore, gene expression of genes mediating hormone (e.g. sex steroid hormones) actions is affected by epigenetic alterations even after some generation from the exposure to chemicals showing that the adverse effects can be eventually recorded only in next generations. A milestone in grabbing the pathogenesis of testicular tumor has been the discovery of the fact that its onset in adults results from cancer cells in situ, which are transformed germ cells of the gonocyte type, which have failed to differentiate into spermatogonia during the fetal period.

With the release of the Silent Spring in 1962 the issues related to chemical pollution have begun to become a topic of political and scientific debate by laying the basis of environmental chemistry and ecotoxicology as we know them. Environmental toxicology deals the way in which toxic substances reach the organism and affect human health. At present many chemicals have been detected in tissues and biological fluids of human body.