



**EcoFoodFertility:  
a new model for assessing the impact of environmental pollution on human health and improving strategies for primary prevention in the high risk areas**

Ecofoodfertility is a scientific project that has been launched in Campania with the aim of demonstrating a science-based link between environment, food and human health.

A worrying increase in human infertility is underway and its relationships with human exposure to environmental pollution is a long-running issue within scientific community worldwide. Several studies have investigated the environmental impact on human health, with particular concern for fertility health. In most cases, important results in terms of knowledge and risk assessment have been achieved. Nonetheless, nobody heretofore has ever thought about the possibility to utilize human sperm as a “sensor” to monitor developments in environmental quality. The idea was first conceived by the andrologist Luigi Montano, expert in environmental medicine, who works for the local health unit based in Salerno. He founded EcoFoodFertility in 2015 and he is still coordinating it. The project has the objective to utilize the qualitative and quantitative alterations in sperm parameters as a key to understand both the level of environmental quality and its long term modifications. This could help to set out health risks for populations in relation with their living environment as well as diet and lifestyle. It involves a research network of about fifty people, including doctors, biologists, toxicologists, geneticists, veterinarians, engineers, digital experts, epidemiologists, nutritionists, all belonging to several Italian and European research institutes (namely CNR, ISS and IZSM) and universities. EcoFoodFertility has indeed a strong One- Health oriented nature, as it requires different professional figures working together towards the achievement of shared goals. With this respect, Italy can boast a long-standing multidisciplinary approach to public health issues, by providing a public healthcare service that engages professionals in different disciplines, each contributing with his own expertise to improve people’s well-being.

The first phase of the project was completed with the publication in the journal Reproductive Toxicology of the results of a case-control study performed on two homogeneous groups of clinically healthy male volunteers living in two areas of the Italian region named Campania: the first area, so-called “Land of Fires”, is located between Naples and Caserta and is characterized by high environmental pressure; the low risk area is located in the southern part of the region and is known as “Alto-medio Sele”. Both blood and semen samples were collected and tested for heavy metals. The results highlighted some alterations in the pattern of chemical elements in both the male groups as well as in the biological matrices. However, researchers reported that it still cannot be ascertained whether the different concentrations of trace elements directly reflect the environmental exposures, or whether they are a consequence of other factors altering the metabolism of essential and non-essential elements. One of the most noteworthy findings was rather the evidence of qualitative abnormalities, such as reduced motility and increased DNA damage, in the “high risk” group’s spermatozoa when compared with the same “low risk” group’s parameters. A significant negative correlation between the percentage of immotile spermatozoa and the level of semen redOx markers (TAC and GSH) was observed as well, suggesting that these findings could represent early biological indicators of environmental pollution. A lower level of redOx stress markers, along with a lower antioxidant enzymes activity, was found in case’s semen,



but not in blood. This indicates that, in this study, semen appears to respond quicker and more sensitively than blood to environmental pollution.

Anyway, how do environmental pollutants affect human health? There are some exposure routes to human being: air, water, food. The choice of the “Land of fire” as high risk area was not accidental: it covers both the northern part of the metropolitan area of Naples and the southern cities in the province of Caserta and it is sadly known because of the criminal spillage of toxic and nuclear wastes that has taken place starting from the 1970s. Ancient Romans used to celebrate these territories, including Vesuvio volcano and Volturno river that used to provide fertile soils to agriculture, an extensive area that Plinio il Vecchio notoriously renamed Campania felix. Some of these lands have been silently and slowly contaminated owing to both intense anthropic pressure and illegal disposal of toxic waste. Soil remediation is going to require extremely costly and long-lasting efforts. The consequences are quite visible on the health of humans and animals inhabiting these territories, therefore the urge to provide a scientific basis for the association between exposure to environmental pollutants and staggering increase in chronic-degenerative diseases.

The research above mentioned has been presented as pilot study, opening the doors to the next phase of EcoFoodFertility, that is working to implement educational and prevention initiatives. The objective is to encourage people to adopt healthy lifestyles in order to address the detrimental impact of a compromised living environment. From a preventive perspective, it must be stressed that food has a modulatory effect on bioaccumulation of xenobiotic compounds into the organism. Food has gained the twofold significance of either vehicle of contaminants, or key instrument for disease prevention, based on its nutritional composition. It is thus undisputed that a healthy lifestyle should embrace a diet rich in functional and detoxifying ingredients, such as vegetables, representing the main source of antioxidants, required to inactivate the reactive oxygen species, and to prevent oxidative stress conditions in biological cells and tissues.

EcoFoodFertility recognises male fertility as an important health indicator. Due to some cultural backgrounds, men usually tend to underestimate the possibility that their own reproductive capability may be altered over the time as a result of external factors. However, it must be pointed out that reproductive function is not only referred to genotoxic xenobiotics or endocrine disruptors that may affect germ cell's integrity and functionality, but also to heritable genetic and epigenetic alterations. It is therefore important to address properly the challenge of pollution, by urgently implementing environmental rehabilitation programmes. The project deals not only with risk evaluation, but also with risk communication and management which requires integrated action, covering as environmental emissions as food chains and individual life-styles.

So far EcoFoodFertility has been experiencing a broad media attention, and it has been extended to other critical areas in Italy and in EU; recently, Italian Ministry of Health has funded part of the project on three pilot areas (Brescia-Caffaro, Sacco Valley and Land of Fires). The project's success is undoubtedly aided by the fact that EU policies are agriculturally and environmentally minded all along. The preliminary results are encouraging, especially since public support participation serve as an incentive to build up a strong environmental consciousness, an ultimate condition in order to preserve the health and well-being of the environment, as well as present and future generations.



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