

## Effects of Volcanogenic Pollution on Wild Mice Testes: Histomorphology and Apoptosis

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### Extended Abstract

#### Background

Volcanism is considered an important natural source of pollutants impacting on health and environmental quality (Amaral and Rodrigues, 2011). Furnas volcano (island of São Miguel-Azores, Portugal) produces and releases tons of hazardous gases and heavy metals in a daily basis. Long periods of exposure to these volcanogenic contaminants can have adverse effects in several biological systems (Amaral and Rodrigues, 2011). In a recent study using a wild mice as model, Camarinho et al. (2013) showed that mice exposed to that environment had a higher risk of lung injury.

#### Objectives

This study was designed to assess the effects of chronic exposure to volcanically active environments on wild mice testes (*Mus musculus*) by studying: i) the diameter of seminiferous tubules; ii) the relative volumetric density of different spermatogenic stages, interstitial tissue and Leydig cells; iii) testicular damage; and, iv) the level of apoptosis in the germinal epithelium.

#### Methods

Two groups of wild mice, one exposed to volcanic activity (Furnas village) and a control (Rabo de Peixe village, a site without any type of volcanic manifestation) were compared. Two measurements of the diameter from 60 seminiferous tubules (30 per testis) were obtained per individual. Relative volumetric density of different spermatogenic stages interstitial tissue and Leydig cells was estimated using the M168 Weibel Multipurpose Test System. Testicular damage was based on the percentage of luminal area occupied by spermatozoa and germinal epithelium structural organization and, scored as follows: 1 -  $\geq 50\%$ ; 2 -  $< 50\%$ ; 3 - 0% and 4 - germinal epithelium disorganized. The level of apoptosis in the germinal epithelium of 10 seminiferous tubules (5 per testis) was analysed using the DeadEnd™ Fluorometric TUNEL System.

#### Results

The mean diameter of seminiferous tubules of mice from the volcanogenic polluted site was significantly lower than in the control. The relative volume occupied by spermatozoa (and luminization of seminiferous tubules) of mice from volcanogenic polluted site was significantly lower than in the control. Contrarily, the relative volume occupied by interstitium and Leydig cells was significantly higher in exposed mice. This group also showed a higher degree of testicular damage, as well as a significantly higher number of gametogenic cells (especially spermatogonia and spermatocytes) undergoing apoptosis. Conclusions: Because mice from Furnas live in close contact with the ground or inside holes, chronically exposed to elevated temperatures, hypoxia and metal concentrations, experiencing testicular hyperthermia and hypercapnia, they show a higher disruption degree of the germinal epithelium and, probably, a lower fertility level. Secondary manifestations of volcanic activity, such as soil diffuse degassing areas, can

pose a serious risk of testicular injury in wild mice and, therefore, are of awareness for possible effects in human populations chronically exposed to that kind of environment.

## **References**

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- Camarinho R., Garcia P.V., Rodrigues A.S. (2013). Chronic exposure to volcanogenic air pollution as cause of lung injury. Environmental Pollut, 181: 24-30.