

Heavy metals in the volcanic environment and thyroid cancer.

Vigneri R¹, Malandrino P², Gianì F², Russo M³, Vigneri P⁴.

Author information

- 1 Endocrinology, Department of Clinical and Experimental Medicine, University of Catania, Garibaldi-Nesima Medical Center, Via Palermo 636, 95122 Catania, Italy; Humanitas, Catania Oncology Center, Via V. E. Dabormida, 64, 95126 Catania, Italy; CNR, Institute of Bioimages and Biostructures, Via P Gaifami 18, 95126 Catania, Italy. Electronic address: vigneri@unict.it.
- 2 Endocrinology, Department of Clinical and Experimental Medicine, University of Catania, Garibaldi-Nesima Medical Center, Via Palermo 636, 95122 Catania, Italy.
- 3 Endocrinology, Department of Clinical and Experimental Medicine, University of Messina, Via Consolare Valeria 1, 98100 Messina, Italy.
- 4 Medical Oncology, University of Catania Medical School, Policlinico Via S. Sofia 78, 95123 Catania, Italy.

Abstract

In the last two decades **thyroid** cancer incidence has increased worldwide more than any other cancer. Overdiagnosis of subclinical microcarcinomas has certainly contributed to this increase but many evidences indicate that a true increase, possibly due to environmental factors, has also occurred. **Thyroid** cancer incidence is markedly increased in volcanic areas. Thus, the volcanic environment is a good model to investigate the possible factors favoring **thyroid** cancer. In the volcanic area of Mt. Etna in Sicily, as well as in other volcanic areas, a non-anthropogenic pollution with heavy metals has been documented, a consequence of gas, ash and lava emission. Soil, water and atmosphere contamination, via the food chain, biocontaminate the residents as documented by high levels in the urines and the scalp hair compared to individuals living in adjacent non-volcanic areas. Trace amounts of metals are essential nutrients but, at higher concentrations, can be toxic for living cells. Metals can behave both as endocrine disruptors, perturbing the hormonal system, and as carcinogens, promoting malignant transformation. Similarly to other carcinogens, the transforming effect of heavy metals is higher in developing organisms as the fetus (contaminated via the mother) and individuals in early childhood. In the last decades environment metal pollution has greatly increased in industrialized countries. Although still within the "normal" limits for each single metal the hormesis effect (heavy metal activity at very low concentration because of biphasic, non linear cell response) and the possible potentiation effect resulting from the mixture of different metals acting synergistically can explain cell damage at very low concentrations. The effect of metals on the human **thyroid** is poorly studied: for some heavy metals no data are available. The scarce studies that have been performed mainly focus on metal effect as **thyroid** endocrine disruptors. The metal concentration in tissues has been rarely measured in the **thyroid**. Heavy metal accumulation and

metabolism in the **thyroid** or the carcinogenic activity of different doses and different speciation of metals has not been investigated. These studies are now warranted to better understand **thyroid** biology and heavy metal role in human **thyroid** carcinogenesis.

KEYWORDS: Biocontamination; Endocrine disruptors; Heavy metals; **Thyroid** cancer; Trace elements; Volcanic environment

PMID: 27794445 DOI: [10.1016/j.mce.2016.10.027](https://doi.org/10.1016/j.mce.2016.10.027)

[Indexed for MEDLINE]

Publication type, MeSH terms, Substance

LinkOut - more resources