PROPOSAL TITLE: Atmospheric Pollution Evaluation in Mt. Etna Volcano (Sicily – ITALY) Area and Implications for Human Health

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Scientific Disciplinary Areas:
- Aerobiology; Allergology; Chemistry; Medicine; Meteorology; Volcanology.

Companies; local, regional or national Administrations; Professional Bodies; School involved in the proposal:
PRELIMINARY PROPOSAL ABSTRACT
(maximum length - one page)

We propose a research taking into account the environmental pollution deriving from airborne volcanic ash (from Mt. Etna - Sicily) and its effects on human health. Several studies on the effects of indoor and outdoor environmental pollution on public health have been carried out in various countries in the last twenty years. Environmental pollution is clearly considered one of the most important causes of allergic reactions such as asthma and rhinitis; it can also be responsible for serious pathologies such as lung cancer and it can increase mortality (Dockery et al. 1993; Baxter et al., 1999; Durand and Grattan, 1999; McConnell et al., 1999; Custovic et al., 2002). It is known that prolonged exposure and the nature of the pollutant are key factors affecting human health. In fact short periods of exposure can only provoke mechanical transitory effects, generally if the metal content of the particles is very low; it is also known that the presence of metal in the particle can favour an increase in particles toxicity (Hatch et al., 1985). Various studies reported an increase in pulmonary response to volcanic ash (Vallyathan et al., 1983; Yano et al., 1986).

Since the second half of the XX century Mt Etna has been considered one of the most active volcanoes in the world due to its exceptional activity (Patanè et al., 2004). This activity consists of abundant emissions from the four summital craters and from open eruptive fractures at various altitudes on its flanks. The dimensions of the volcano (40 km from north to south and 38 km from east to west and the present-day 3314m altitude) attenuates the effects of highly explosive eruptions since the city belt is located more than twelve km from the summit craters. Such distance is however not sufficient to protect the urbanised areas from cinderitic and vaporitic emissions even during periods of relative quiescence; in fact a certain activity of micro-particulate emissions (solid particles with micrometric dimensions) from the summital craters remains. Although the upward currents concur to direct such emissions towards the advanced layers of the atmosphere, the meteorological conditions can push the volcanic plume downwards, forcing it into a sinusoidal trajectory, thus involving also the distant inhabited areas, as recorded during the 2002 eruption.

We would carry out a multidisciplinary study characterizing the chemistry and radioactive content of airborne micro-particulate involving urbanized areas with the aim to individuate their effect on the human health. To reach this purpose we will: use instruments to measure presence and quantity of airborne volcanic ash, pollen grains and fungal spores; adopt techniques used in the haematological analysis to measure Immunoglobuline E (IgE) and Eosinophyl Cationic Protein (ECP); perform flow cytometric analysis of the basophil activation markers CD63 and CD203.

This study will be completed by monitoring the weather conditions using a net of meteorological stations situated at different locations on Mt Etna and monitoring the volcanic plume directions by an array of video-cameras situated on the different flanks of the volcano.

References


