Interview

Health and natural hazards

José A Centeno talks to Kathryn Lees about how Mother Nature affects our health

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José A Centeno is a physical chemist and senior research scientist at the US Armed Forces Institute of Pathology in Washington, D.C., and a member of the editorial board for the *Journal of Environmental Monitoring*. His research in the area of medical geology brings together toxicology, geosciences, environmental medicine and human health.

What is medical geology?

Medical geology is the scientific relationship between natural geological factors and their impact on the development of health problems in humans and animals. The natural environment could be the geochemical composition of rocks or contaminants in water or soil. Medical geology aims to understand how natural geological events, such as dust storms, earthquakes and volcanic eruptions, affect disease and other population health issues.

But medical geology is not a new area: it's been with us for centuries. What is new are the worldwide efforts to improve interactions and research opportunities between environmental scientists, toxicologists, epidemiologists, biologists, earth scientists, public health authorities, pathologists and clinicians to better understand how the natural environment impacts our health.

Recently, the International Medical Geology Association (www.medicalgeology.org) has been launched. This association is a unique opportunity for medical scientists, geoscientists, epidemiologists and toxicologists to share the latest goings-on in medical geology.

What problem poses the greatest challenge for medical geologists?

Earth scientists and medical professionals have long been interested in studies such as water quality, arsenic, mercury and radon. Today, an important research area involves understanding more about how we can map geochemical information and correlate this with environmental epidemiology and disease registry data. If you can overlap local, regional or global geochemical data with disease registry data you could potentially identify what the likelihood is of a particular population developing particular kinds of diseases.

We have disease registry data going back to the 1900s from which we have been able to study, retrospectively, diseases such as the flu pandemic – if you can overlap this health information with geochemical data, it could be a fascinating area.

Is there an undiscovered problem that medical geology could be used to solve in the future?

One of the most challenging problems will be understanding and characterising the environmental and natural factors that contribute to emerging and re-emerging infectious diseases. Infectious diseases are a major cause of human suffering and mortality. Soil-borne and dust-borne human pathogens are potential contributors to the rapid transportation of many infectious agents. Many regional and local measurements have been taken but, in my opinion, the problem is global. An important step in elucidating the role of natural dust as a contributor of disease is to facilitate cooperation among medical professionals, geologists, climatologists and microbiologists, which will assist in characterising the properties of geogenic dusts, their dispersal and the toxicological pathways of infectious agents they may transport.

So, how much of a threat do dust storms pose?

Research shows that there are ecological and health problems associated with geogenic dust. For example, in the south west of the US, the dust has a peculiar fungus in it which is characteristic of the soil in the region. Geochemical disturbances which cause soil disruption, like earthquakes and human activities such as deforestation and construction, release the fungus. In humans and animals, it can cause respiratory problems, which if undetected, can spread to other parts of the body and cause organ damage.

Recent research by leading organisations has shown that cadmium, mercury, arsenic, lead and chromium could be mobilised in dust. As medical geologists, we need to understand the chemistry and the health implications of these elements.

Can science make a difference to these problems or do solutions depend on government cooperation?

It is evident that governments have to be involved in both the short and long term. They have to be involved in every aspect of medical geology and environmental medicine, and develop programmes to improve integration of these areas.

As a way to initiate integration between earth sciences and public health, the United Nations and the International Union of Geological Sciences have recently launched a global activity – International Year of Planet Earth (IYPE). This aims to demonstrate the societal benefits of geosciences and the need for developing international collaborations. IYPE have selected medical geology as one of the ten topics to focus on in geosciences and public health. As a result, there will be emphasis on outreach programmes and on achieving high quality research.

What message do you have for young scientists?

To look for what is not only academically interesting but for what benefits society as well. Scientists should try and work in areas which benefit the public. That's what makes me passionate about what I do.