NASA to teach 'epidemiology by satellite'

Boston. The US National Aeronautics and Space Administration (NASA) is about to welcome the first researchers and health officials from developing countries to a programme teaching them to use data from satellites and remote-sensing technology to combat infectious diseases transmitted by insects, rodents and other vectors.

This concept, called 'landscape epidemiology', is based on the analysis of data from Earth-imaging satellites to detect changes in the habitat of disease carriers which may give early warning of impending epidemics.

No new satellites will be needed; instead, scientists can draw on data from existing satellites such as Landsat. Ultimately, some NASA researchers hope, it may be possible to generate 'risk maps' showing the risk of contracting a particular disease on a given day anywhere in the world.

"There may be a new way of fighting diseases by monitoring the risk of infection which, in turn, depends on understanding the ecology of the organism that spreads the disease," says David Peterson, a scientist at the NASA Ames Research Center in Moffett Field, California.

The potential of this approach was described at a conference in Baltimore, Maryland, last November. The event, sponsored by NASA and the Third World Foundation, was attended by health ministers and medical directors from more than 20 countries, including Bangladesh, Belize, China, Ghana, Indonesia, Kenya, Malaysia, Nigeria, Peru and Rwanda. A training programme for scientists from developing countries, which was announced at the conference, is due to begin shortly.

The goal of using satellite data to reduce the spread of vector-borne diseases is based on the results of NASA-sponsored research during the past decade. Satellite images enabled scientists, for example, to spot mosquito breeding-grounds in rice fields near Sacramento, California. They found that 15 per cent of the fields were home to 90 per cent of the mosquitoes.

In Mexico, scientists were able to predict which villages were likely to have the greatest malaria problems on the basis of the presence of two landscape features: a pasture with cows or horses near the village, and a transitional swamp. A study in New York state also identified specific 'landscape elements' strongly correlated with the incidence of Lyme disease.

Using satellites in this way provides an efficient way of locating disease 'hot spots' and 'danger zones', says Maurice Averner, NASA's programme manager for Global Monitoring and Disease Prevention. "Mosquitoes don't breed randomly and indiscriminately. If you can find out what sites they like, you could spray pesticides there at just the right time. That's safer and more cost-effective than spraying everywhere."

The technology can help governments to focus attention on those areas posing the greatest risks, adds Peterson. "It can help us determine when certain medicines will be needed in various places. Based on the information we receive from satellites, we might even consider moving people out of an area temporarily, if the risk of infection is particularly high."

NASA is now planning a series of workshops to inform health officials about the applications of Earth-imaging satellite data to specific diseases such as malaria and dengue fever. NASA Ames specialists will collaborate with researchers from the National Institutes of Health and the Centers for Disease Control on epidemiological studies involving satellite images.

NASA investigators believe satellite images could eventually aid the fight against cholera, encephalitis, hantaan virus, leishmaniasis, Chagas disease, and schistosomiasis.

Steve Nadis