Biomedicine

HIV-2: A less virulent cousin of HIV-1

A new report confirms the milder nature of HIV-2, a close cousin of HIV-1. Both HIV-1 and HIV-2 cause AIDS, a disease that decimates the immune system and causes death.

Researchers first demonstrated the existence of HIV-2 in a 1985 study conducted in the West African country of Senegal. Since that time, virologists have shown that HIV-2 is more prevalent in West Africa than HIV-1. And preliminary reports indicated that this virus is less virulent than HIV-1, which is responsible for the vast majority of AIDS cases in the United States.

Now, a study of 574 prostitutes in Dakar, Senegal's capital, quantifies more precisely the characteristics of HIV-2.

U.S. and African AIDS researchers started their study by monitoring prostitutes who were registered by the Senegalese government and therefore were tested frequently for sexually transmitted diseases, such as AIDS.

The researchers discovered dramatic differences when they compared women who became infected with HIV-1 during the study to those infected with HIV-2.

Five years after infection, one-third of the women infected with HIV-1 had progressed to AIDS. In contrast, none of the HIV-2-infected women had developed the disease.

Another key indicator of HIV-2's less vicious nature showed up in a laboratory test of the immune system. Each year, about 10 percent of the women infected with HIV-1 showed an abnormally low number of CD4 T lymphocytes, a type of white blood cell destroyed during the disease process. People with decimated CD4 T lymphocytes often develop the opportunistic infections that lead to death. Annually, just 1 percent of the HIV-2-infected prostitutes experienced such a plunge in CD4 counts. The study appears in the Sept. 9 SCIENCE.

For people infected with HIV-2, long-term survival without developing severe illness or AIDS may prove the rule rather than the exception, says lead author Richard Marlink of the Harvard School of Public Health in Boston. Additional studies of the differences between the two viruses may provide clues about how to fight HIV-1, he adds.

Teaching the Sabin vaccine a new trick

Researchers have taken the decades-old Sabin polio vaccine and fashioned it into a vaccine that may one day help protect people against HIV-1. Raul Andino of the University of California, San Francisco, and his colleagues took this poliovirus vaccine, which is live but weakened, and inserted genes that code for two crucial HIV-1 proteins.

When the researchers injected their modified vaccine into monkeys or mice, they found that it grew in the mucosal membrane, the delicate tissue lining body canals or cavities, such as the intestines.

The animals showed an immune response to the two HIV proteins. The researchers hope that the vaccine will spur the production of specialized T cells, white cells that can destroy viral invaders. However, the scientists don't know whether that response will protect the animals, or humans for that matter, from an actual challenge by HIV-1. The researchers also don't know whether this vaccine would produce a response against HIV-2.

Still, if it works, the vaccine may prove an ideal way to shield the mucosal surfaces from the AIDS virus, the researchers believe. "Many other candidate vaccines for HIV don't provide this kind of immunity," says Andino. The team published its findings in the Sept. 2 SCIENCE.

The researchers ultimately would like to devise an all-purpose vaccine using weakened polioviruses and adding genes whose protein products might elicit immunity against a variety of microbes.

Earth Science

The word about ozone

The world's top atmospheric scientists mixed bad and good news when they released a report last week on the state of the ozone layer. The international panel of 226 researchers confirmed that record ozone depletions have occurred in recent years and should worsen in the next few years as concentrations of chlorine and bromine pollution peak in the stratosphere. On a brighter note, a 1987 treaty has started to curb use of the pollutants and should permit the ozone layer to recover over the next 50 years, provided that countries uphold the provisions of the agreement.

The Ozone Assessment Panel — sponsored by the United Nations' Environment Program and the World Meteorological Organization — noted that concentrations of ozone around the globe reached record lows in 1992 and 1993. The springtime Antarctic ozone hole also set records in 1992 and 1993 for the biggest area and the lowest ozone values. Since then, global ozone concentrations have partially recovered, to a point more in line with the expected slow rate of deterioration. Many researchers believe the extreme changes resulted from volcanic debris lofted into the stratosphere by Mount Pinatubo's eruption in 1991 (SN: 4/24/93, p.260). These particles of sulfuric acid helped speed up ozone destruction by chlorine and bromine, according to the panel.

While amounts of these pollutants continue to increase in the atmosphere, the rate of buildup has slowed in recent years, thanks to international controls mandated by the Montreal Protocol of 1987 and subsequent amendments. As the concentrations grow, ozone depletions should worsen. But stratospheric amounts of these chemicals should actually start to drop after peaking in 3 to 5 years, permitting the ozone layer to begin a slow recovery, the panel reports.

Antarctic algae weather UV rays

A group of Australian researchers reports that algae living underneath the sea ice along the coast of Antarctica show little evidence of damage caused by the annual ozone hole.

In past experiments, oceanographers have demonstrated that ultraviolet radiation hinders the growth of tiny marine plants, called phytoplankton, in Antarctic waters. These results concerned researchers because the ozone hole — which forms each September over Antarctica and then dissipates in November — allows extra amounts of ultraviolet radiation to reach Earth's surface. But the experiments could not determine whether 15 years of ozone holes have actually harmed phytoplankton in the wild.

Andrew McMinn of the University of Tasmania and his colleagues looked for changes by pulling up cores of sediments from Antarctic fjords near the Amery Ice Shelf. Using the decay of radioactive lead to date the sediment layers, they tracked the waxing and waning of algae species over the last 600 years. Their results suggest that the mix of algae species living beneath the sea ice does not show any unusual shifts following the first appearance of the Antarctic ozone hole in the late 1970s. McMinn and his colleagues report their findings in the Aug. 18 NATURE.

The results do not give all Antarctic phytoplankton a clean bill of health, however. The species in these fjords may suffer less than others because the ozone hole develops at a time when extensive sea ice covers the water, blocking some of the ultraviolet light. Phytoplankton may fare worse if they live at the edge of the sea ice or in icefree regions.

The researchers also note that they see evidence of a decline in some species of sea-ice algae; but the changes do not exceed the swings that occurred long before the ozone hole, so they cannot blame the hole for the population decreases.