Biology

The bugs beneath us

For the better part of this century, biological dogma had life clinging to a very thin skin on the surface of the earth, essentially extending only as deep as the root zone. Improved tools and techniques have pushed that limit down to 25 or 30 feet in the past decade (SN:11/26/83,p.348). Now a multi-institution effort sponsored by Du Pont and U.S. Department of Energy has found life 850 feet below the earth's surface.

"There is life down there, and it is very diverse," says Carl Fliermans of Du Pont's Savannah River Laboratory in Aiken, S.C. The numbers are high enough to affect the chemistry of the environment: Some of the samples contained as many as 10 million organisms per gram of soil.

But even more surprising than the high concentrations is the diversity of the microorganisms, according to David Balkwill of Florida State University in Tallahassee. Many varieties of bacteria and fungi have been seen, and there have been indications of amoeba. And the diversity — which doesn't appear to decrease with depth — may force a reappraisal of the environment that lies between soil and bedrock. "You expect the species to fall off as the environment becomes more severe," says Balkwill. "Maybe it's not becoming more severe."

The downward extension of life may also change our ideas about the way pollutants behave in deep aquifers, say the researchers, since previous models didn't include a biological component. The deep subsurface organisms may be degrading some chemicals; if they're not already, genetic manipulation may get them to start. "[At these depths] we're talking about aquifers that are used by the public for drinking water," says Fliermans. "Do you have organisms that are already adapted for these aquifers, and can they clean up aquifers that man has polluted?"

Adds Balkwill, "If genetic engineers can get organisms that already live at those depths to digest specific chemicals, they'll have a better chance of success than if they try to make surface species adapt to a new environment as well as a new diet."

Catching cats with FeLV

Quick, think of something mean to say to your cat. Scientists have found that the tears of a cat can be used to diagnose feline leukemia virus (FeLV).

FeLV is a viral infection that is often fatal. Though a vaccine is now available, it's not always effective. Since FeLV is extremely contagious, owners must have their cats checked periodically. For some owners — especially cat breeders — the logistics of rounding up numerous cats for blood tests and the expense of trips to the vet can be prohibitive. So researchers have been looking for a simpler method for obtaining test specimens.

Though infected cats are known to shed the virus in body excretions and secretions, no one knew if concentrations were high enough in tears to make them useful in detection. Eleanor Hawkins, then at the University of California at Davis, and a group of colleagues found that tears collected from infected cats are a good source of antigen for the tests now used on blood samples. While the tear method is not as accurate as a blood test — it may miss as many as 20 percent of the cats with FeLV whose infection would be caught by a blood test — it is a good alternative for owners who otherwise would not test their animals, says Hawkins.

The test "is a simple procedure whereby veterinarians or nonprofessional people can collect specimens for . . . testing at home or in the office," the researchers write. The test strips, which remain reactive after they are air-dried, can be sent through the mail. Some laboratories may accept the test strips from owners, but Hawkins recommends going through a veterinarian: "It's not a straightforward disease."

Biomedicine

Joanne Silberner reports from Toronto at the Sixth International Congress of Immunology

Immunology of autism

Autistic children generally do not respond or communicate. But while their behavior is suppressed, their immune systems are stimulated, according to Robert Moulias and his colleagues at the Faculté de Médecine Pitié-Salpétrière in Paris.

They determined the levels of antibody production and white blood cell function in 16 autistic children who were periodically admitted to psychiatric hospitals and 20 nonautistic children hospitalized for non-immune-related conditions, and compared these with laboratory standards for healthy children. The autistic children's immune response, the researchers found, surpassed the standard level, while the hospitalized children's values were lowest.

This result, says Moulias, "was quite a surprise. We expected the reverse because frequently hospitalized children generally have a lower immune response."

Moulias suggests two possible explanations for the data: The neurotransmitter disturbances of autism may somehow throw off the immune system, or the immune system disturbance they saw could be a factor in causing autism.

Networking AIDS

According to the network theory of immunology, after the immune system starts pumping out an antibody, it will eventually "see" the antibody and begin pumping out an antibody to that first antibody. In the process, the immune response gets muted. Since a fatally muted immune response is a hallmark of AIDS, researchers Sybille Müller, H.C. Chang and Heinz Kohler investigated what happens to repeatedly immunized animals and compared that to what occurs in AIDS patients.

People get AIDS after being exposed not only to the virus but to foreign material — blood or semen — as well. To mimic that exposure, the scientists, all of Roswell Park Memorial Institute in Buffalo, N.Y., challenged mice with multiple injections of cells from a different strain of mice. The mice were constantly mounting an immune response to the foreign cells. When the mice were injected with a molecule from a bacterium, they produced fewer antibodies than did a control group, and the ratio between two types of immune system cells, T helpers and T suppressors, decreased. Both the suppressed ability to respond and the change in the T cell ratio occur in AIDS.

"Just by manipulating the immune system you can have an AIDS-like effect even without infectious particles," says Müller. Repeated infections or exposures to foreign substances, she says, may thus make high-risk group members more susceptible to attack by the AIDS virus.

Vaccinating against cancer

It's difficult to spur the immune system to fight cancer — since cancers arise from normal cells, the body often doesn't see anything foreign about malignancies. Some researchers have reported initial success with irradiated tumor cells combined with an immune system booster, and others are working on an "antibody cascade" system (SN:4/6/85,p.213). Volker Schirrmacher and his colleagues at the German Cancer Research Center in Heidelberg, West Germany, think that using a tumor-cell vaccine made by infecting the cells with nonlethal viruses may do the trick.

The researchers worked with a highly malignant tumor in mice — just one cancer cell from such a tumor can establish itself and kill a mouse in two to three weeks. After removing the initial tumor, they infected the tumor cells with a virus and then irradiated them. Half of the mice receiving an injection of these cells survived; all of the mice receiving surgery alone died. The virally infected cells present the tumor cells to the immune system in a new way, Schirrmacher says, alerting it to the presence of even non-virally-infected tumor cells.