Biology

Many bacteria riddled with viruses

A painstaking new study in which researchers sliced through thousands of ocean-dwelling bacteria and photographed the cross-sections indicates that a large percentage of the microscopic cells harbor viral infections. The research confirms a growing suspicion among scientists that viruses play a much more important role in marine ecology than previously believed.

Until recently, researchers assumed that most aquatic bacteria succumbed to "grazing" by protozoans. But last summer, Norwegian researchers identified unexpectedly high numbers of viruses in both marine and freshwater environments (SN: 8/12/89, p.100), leading them to hypothesize that viruses may cause much of the bacterial death in these waters. The potential implications of large-scale viral infection in aquatic bacteria are substantial — including higher-than-expected carbon and nitrogen turnover at the bottom of the food chain and an increased possibility of virus-mediated genetic exchange among bacterial cells. But there remained no direct evidence that many bacteria were actually becoming infected.

Now, Lita M. Proctor and Jed A. Fuhrman of the University of Southern California in Los Angeles provide that evidence in a series of electron micrographs. They report in the Jan. 4 NATURE that 15 to 30 percent of the marine bacteria they sliced and photographed were infected with viruses. Infected bacteria contained 10 to 100 or more mature viruses each.

The researchers note that their photographic technique missed large areas of each cell that may harbor viruses. All told, they estimate that as many as 70 percent of marine bacterial cells could be infected. And on the basis of other reports of bacterial mortality rates from viral infection, they conclude that such infections may account for a surprising 30 to 60 percent of bacterial mortality in ocean environs.

Scientists seek sources of sexy smells

Researchers have garnered another clue to the puzzling role of odor in mate selection and pregnancy outcome in mice. Though the finding may not prove sufficiently relevant in humans to justify returning your holiday-gift colognes, it serves as a reminder of some of the subtle mechanisms that can influence reproductive decisions.

Scientists have known for years that a female mouse, given a choice of two mates — one genetically identical to her and one slightly different — will usually choose the male featuring some genetic difference. This holds true even if the difference amounts to nothing more than a minor variation in only one out of thousands of genes. Researchers know that this discrimination is odor-induced, and that odors can affect a mouse's physiology even after mating. For example, if a recently mated female is caged near a male featuring a slightly different genetic makeup (and thus a slightly different smell) than that of the male she just mated with, she often will spontaneously abort — a phenomenon called pregnancy block. Genes capable of inducing pregnancy block seem to be present on several chromosomes.

Kunio Yamazaki of the Monell Chemical Senses Center in Philadelphia and his colleagues now report they can induce pregnancy block in mice by exposing the females to two males that differ genetically from each other only in a portion of their Y chromosome. That's surprising, says co-worker Edward A. Boyse of the University of Arizona in Tucson, because the tiny Y chromosome, whose function appeared essentially limited to gender determination in mice, seems not to display the genetic variability thought necessary to code for complex phenomena such as odor types. Their report appears in the December PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (Vol.86, No.23).

Biomedicine

Sizing up the hazards of cocaine use

A Canadian team has detected cocaine metabolites in hair samples taken from adult cocaine users and from newborn infants exposed to cocaine in the womb. The finding, they say, may help efforts to gauge the effects of maternal cocaine use on a developing fetus by enabling scientists to spot exposed infants and to identify pregnant women who have used cocaine during preganancy.

Studies of cocaine's reproductive risks have been hindered by the lack of a surefire method for identifying cocaine users. Previous research has shown that current methods of detecting drug use are unreliable. Urine tests, for example, miss about 50 percent of cocaine users, and many people deny illegal drug use when interviewed.

Researchers led by Karen Graham and Gideon Koren of the University of Toronto studied hair samples taken from 16 adults who admitted using cocaine but who had negative urine tests for benzoylecgonine, a cocaine metabolite. In all 16 hair samples, the team found benzoylecgonine in amounts that mirrored the frequency of drug use. For example, in samples from occasional cocaine users, the average concentration of benzoylecgonine was 624 nanograms of the metabolite per gram of hair analyzed. In samples from people who reported heavy cocaine use, the team found 8,775 nanograms of benzoylecgonine per gram of hair. Hair samples from the 21 controls, who said they had never used cocaine and who had negative urine tests, showed no evidence of benzoylecgonine. The researchers report their findings in the Dec. 15 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION.

Hair clipped from the scalps of seven newborns whose mothers admitted using cocaine during pregnancy contained an average of 5,430 nanograms of benzoylecgonine per gram of hair tested. That finding may help clinicians diagnose and treat infants who have been exposed to cocaine during gestation. These infants can have cocaine-related medical problems but are difficult to diagnose, Koren says. The research suggests doctors must perform hair analysis within the baby's first two months, he says, because infants quickly lose their downy fetal hair, sprouting new hair that may show no trace of cocaine or its metabolites.

In an accompanying editorial, David N. Bailey of the University of California, San Diego, cautions that the practice of analyzing hair for cocaine may never become standard practice in most U.S. hospitals. The method used by the Canadian team is too costly, complicated and time-consuming to become a routine method of drug screening in most clinical laboratories, Bailey says.

In a related study published in the Dec. 16 LANCET, Koren concludes that researchers who find no link between maternal cocaine use and fetal health problems have trouble getting their data out to the scientific community.

Koren and his colleagues studied all abstracts on cocaine use during pregnancy that were submitted to the Albuquerque, N.M.-based Society for Pediatric Research between 1980 and 1989. Of the nine abstracts reporting no adverse effects, peer reviewers accepted only one (11 percent) for presentation at the society's annual scientific meeting. Of the 49 abstracts describing reproductive risks from cocaine use, reviewers accepted 28 (57 percent).

When Koren's group compared the rejected abstracts from both categories, they found that researchers conducting the negative studies (those finding no link between health problems and maternal cocaine use) were more likely to verify cocaine use and to include a large control group.

"This strengthens the suggestion that most negative studies were not rejected because of scientific flaws, but rather because of bias against their message," the authors contend.