BIOMEDICINE

Counter-revenge against Montezuma

Until recently, preventives against "Montezuma's revenge" — traveler's diarrhea in Mexico or other developing countries — were touch and go at best. Avoiding fresh fruits and vegetables, drinking carbonated water, tea, beer and soft drinks instead of tap water, and putting water-purification tablets in tap water before drinking it were among the often unsuccessful measures taken. Now a more sure-fire preventive against this *Escherichia coli*-caused disease (SN: 9/17/77, p. 190) is reported in the April 6 New England Journal of Medicine. It consists of daily doses of an antibiotic called doxycycline.

David A. Sack, R. Bradley Sack and co-workers at the Johns Hopkins Medical Institutions had 39 Peace Corps volunteers take a daily 100 mg dose of doxycycline or a placebo during the first three weeks they were in Kenya. The subjects were then observed for two weeks. Nine of the 21 persons taking the placebo, but only one of the 18 taking the antibiotic, experienced traveler's diarrhea during the treatment period or for one week after they stopped taking the drug.

Doxycycline has several outstanding characteristics, the researchers explain — a long half-life, which means that only one daily dose is needed (an advantage to travelers), and a unique means of excretion, through the intestine rather than the kidneys, which places the drug smack at the site of the infection.

Umbrellas as lethal weapons

On March 12, 1976, a New York city taxi driver got into a fight with a young policeman and struck him in the eye with the tip of his umbrella. Two off-duty policemen came to the rescue of their colleague. While realizing that he had suffered an eye injury, they didn't think it was serious, so they drove him home rather than to the hospital. Soon afterward, he collapsed and died; an autopsy showed that he had received a sharp puncture wound in his eyelid, causing a fatal brain hemorrhage.

This is but one example of an increasing number of fatal eye-brain wounds inflicted by umbrellas, guns, missiles, tent-pole spikes, fish spearguns and sundry other sharp objects, Andrew Carothers of New York University Medical Center reports in the March 20 Journal of the American Medical Association. "This type of injury is generally not appreciated as having fatal consequences," he says. But he urges his fellow physicians to use the latest diagnostic techniques, such as computerized tomography (SN: 3/13/76, p. 171), to examine victims of eye wounds for brain hemorrhage.

Measles and SSPE viruses not same

Measles virus has been implicated as a cause of subacute sclerosing panencephalitis (SSPE), a slowly progressive degenerative disease of the human central nervous system, because the physical characteristics of SSPE viruses bear a striking resemblance to those of the measles virus. However, it looks as if the SSPE virus and the measles virus are not the same, according to two separate reports in the March 30 Nature.

Steven L. Wechsler and Bernard N. Field of Harvard Medical School compared viral proteins found in cells infected with measles virus and in those infected with SSPE virus. They report that the proteins are significantly different in molecular weight. William W. Hall and his co-workers at the University of Würzburg analyzed viral messenger RNA's in cells infected with measles virus and in cells infected with SSPE virus. They report that the viral mRNAs from the two groups of cells do not weigh the same, either. So it appears that, while the SSPE virus and the measles virus may be related, they are not identical.

PHYSICAL SCIENCES

Superheavy Chemistry

If superheavy elements (elements with atomic numbers of 110 or greater) are to be discovered, it is likely that they may be found in chemical combinations. It is assumed that the superheavies will form compounds analogous to those of the known elements in whatever column of the periodic table a given superheavy happens to occupy, but the details of their physical chemistry must be calculated in order to give scientists the exact parameters by which to identify them. (For more on superheavy elements see p. 236.)

In the March 27 Physical Review Letters A. Rosén of Chalmers University of Technology in Göteborg, Sweden, and B. Fricke and T. Morović of the Gesamthochschule in Kassel, West Germany, report that it is now possible to make realistic, that is, relativistic, calculations of the possible energy states of molecules containing superheavy elements. The three theorists use the example of the hexafluoride of element 110, designated $(_{110}X)F_6$, to show that the difference between relativistic calculations and nonrelativistic ones is significant. It is as much, for example, as results from taking into account the difference between a free atom and one bound in a crystal. To separate the hexafluoride of element 110 from its surroundings it will still be necessary to do the same sort of chemical separation as is done for the analogous compound, platinum hexafluoride, but then the newly calculated energy levels will permit spectroscopists to know that they really have element 110 and not platinum.

Rosén, Fricke and Morović say that similar calculations could be done for any molecule in which a superheavy element might be involved. This one was chosen as an example because it has been suggested as one that might be useful in extracting element 110 from a target that had been bombarded by heavy ions.

Unified field theory and cosmic rays

Physics now recognizes four different kinds of force. In order of discovery they are gravity, electomagnetism, the strong interaction and the weak interaction. Why there should be four, or any plural number, is one of the standing mysteries. Metaphysically, force is a single concept, and physicists have traditionally sought a theory that would transcend the differences and exhibit an underlying unity.

In the context of present-day theory this means that the existence of four kinds of force that affect different objects with different strengths is a characteristic of the present, low-energy, state of the universe. As experiment reaches higher energies, which, cosmologically speaking, is the same as going back in the history of the universe, the differences should disappear and the unity become manifest. In other words, the universe was originally hot and unified, and as it aged and cooled, the differences now apparent condensed out, so to speak.

At exactly what energy the unity appears depends on the mathematics, in particular which of the many available Lie groups truly represents the relations among the subatomic particles. Most theorists have calculated that the level of unity lies far above the energies of current experiments or any natural phenomena now available, but in the April 3 Physical Review Letters, Victor Elias and Jogesh C. Pati of the University of Maryland and Abdus Salam of the International Center for Theoretical Physics in Trieste propose the application of a Lie group with properties different from those customarily employed. They show that if their choice of group is made, the unifying energy level is about a tenth of that usually supposed and that therefore some of the unifying effects may be available to study in the cosmic rays or in accelerators to be built in the future.