Biomedicine

Transmission, prevalence of AIDS

Although heterosexual transmission of the AIDS virus (HIV) and passage of the virus from HIV-infected women to their newborns account for a small percentage of U.S. AIDS cases, all are considered serious issues by health care officials (SN: 7/25/87, p.60). Among the latest studies dealing with these routes of transmission are two reported last week by researchers in Massachusetts. In one study, scientists at the Massachusetts Department of Public Health laboratory in Jamaica Plain looked at the prevalence of antibodies against the AIDS virus among nearly 31,000 newborns, in order to estimate the number of women infected (newborns share their mothers' antibodies). They report in the March 3 NEW ENGLAND JOURNAL OF MEDICINE that, based on averages from the newborn screening program, 1 of every 476 Massachusetts women (2.1 per 1,000) giving birth has HIV antibodies. The highest prevalence was found in inner-city hospitals (8 per 1,000), the lowest in rural areas (1 per 1,000).

In another study, at Massachusetts General Hospital and Boston University School of Medicine, researchers found HIV antigens inside specific types of cells taken during biopsies of the cervix. The virus had already been isolated from cervical secretions. But the authors say that the latest study – reported in the March ANNALS OF INTERNAL MEDICINE – suggests that cervical cells being sloughed off may be the real culprits in heterosexual transmission, as well as in the infection of infants during delivery.

The case of the buffer's belly

No matter what shape your stomach's in, "constant mechanical shaking" of the abdomen might cause a medical problem, according to a letter in the March 3 NEW ENGLAND JOURNAL OF MEDICINE from physicians at Case Western Reserve University in Cleveland. They report a case of what the journal calls "buffer's belly" in a patient who routinely stabilized the vibrating handle of a floor-polishing machine under his protruding stomach. The maintenance worker developed fever and abdominal pain, found to be due to a ruptured colon abscess that was also attached to the abdominal wall where the handle ordinarily rested. The authors suggest the condition is "an uncommon occupational hazard for overweight maintenance workers. . .[and] overweight construction workers who operate pneumatic jackhammers."

While sleeping brains lie, spines quake

It is not the cold, but rather the effect of the anesthesia that causes the tremors experienced by half the patients anesthetized for surgery each year, say scientists in California and Minnesota. In a small study of nine women recovering from general anesthesia, researchers at the University of California at San Francisco (UCSF) and Los Angeles and at the University of Minnesota in Duluth examined the sometimes-violent shaking in patients seen while anesthesia is wearing off following surgery. The shaking typically lasts 15 minutes, increases blood pressure and can tear sutures.

Since first described in 1950, the postoperative shaking was thought to be simple shivering due to cold in the operating room and a drop in body temperature. But the recent study found that the effects of anesthetics wear off in the spine earlier than in the brain, disrupting the normal control of reflex muscle movement. In a statement released by UCSF, the scientists suggest that, because the tremors seem to be triggered by cold skin, warming the skin with infrared heat lamps should prevent postoperative shaking. The researchers also found that, contrary to popular medical opinion, anesthetized individuals *can* regulate their body temperature, although at a lower level than the average 98.6°F.

Physical Sciences

Matter and antimatter spin alike

Physicists believe that matter and antimatter are precisely symmetric. That is, to every kind of subatomic particle there corresponds an antiparticle with exactly the same mass but with the opposite electric charge. Physicists frequently set up experiments to test this belief.

One way of doing it involves the spins of electrons and positrons. Electrons and positrons have opposite polarity of electric charge, the electron's being negative, the positron's positive. However, the amount of electric charge, the mass and the amount of spin ought to be exactly the same. The latest of a series of experiments done at Novosibirsk in the USSR used the interaction of electron and positron spins with the magnetic field of the VEPP-2M storage ring to test the sameness of the spins.

Each electron or positron is a little magnet, producing a small magnetic field or, as physicists say, a magnetic moment. If the spins are exactly the same, so should be the strengths of the magnetic moments. As the magnetic moments of these particles interact with the magnetic field of the storage ring, their spins precess, or the spin axes describe a little circle.

The experiment started with electrons and positrons with their spins all in one direction. The researchers forced the spin axes into a horizontal alignment by imposing an electric field that alternates at radio frequencies. Then they turned off the electric field, allowing the spins to precess freely in the magnetic field. Any difference in the size of the spins would cause a phase difference that would gradually build up. After one-tenth of a second, which is time enough for 3 million spin revolutions, the alternating electric field was turned on again. It repolarized the spins, but would have preserved any accumulated phase difference. According to a report in the January/February CERN COURIER, the experiment found that electron and positron spins are the same to 1 part in 100 million, supporting the long-held belief in matter-antimatter symmetry.

Ultrahigh-energy gammas and SN 1987A

Astrophysicists have expected that supernovas would be sources of what they call ultrahigh-energy gamma rays. These are gamma rays with the highest energies ever detected from natural sources, 10^{14} electron-volts and higher. Theorists have proposed that protons accelerated in the supernova explosion would produce these gamma rays by interacting with other matter in the neighborhood. Such high-energy protons are the most common objects among the cosmic rays, and many astrophysicists have thought that supernovas ought to be an important source of them.

Gamma rays of lower energy (around 1 million or 10^6 electron-volts) have been recorded from SN 1987A (SN:1/2/88,p.5). These low-energy gamma rays apparently come from processes in the supernova that make the heavier chemical elements. However, the ultrahigh-energy ones, supposedly produced by cosmic ray protons, have not appeared, though a group from the University of Adelaide, Australia, searched six months of records for evidence of them.

In the March 1 ASTROPHYSICAL JOURNAL LETTERS, D. Ciampa, D.J. Bird, R.W. Clay, P.G. Edwards and R.J. Protheroe state that their installation in Buckland Park, South Australia, is probably the only one located so as to be able to record showers caused by gamma rays from SN 1987A. It is an array of sensors laid out to record showers of particles triggered by the ultrahigh-energy gamma rays as they hit the atmosphere. Because the first six months after the appearance of the supernova yielded nothing, the observers say they can set rather low limits on the amount of high-energy protons produced in the supernova and their interactions with other matter in the area.