BIOLOGY

DES: Cancer without mutation

How does DES (diethylstilbestrol) cause cancer? In the standard tests with bacteria it does not make the small mutations in genetic material characteristic of most carcinogens. Must DES be activated by some unidentified mammalian component before it can cause mutations, or does DES cause cancer by a different mechanism?

A model system using Syrian hamster embryo cells now provides an answer. DES transforms normal cells in that system into cells that show traits associated with cancer and that can give rise to cell lines that cause tumors in animals. But no mutations in two genes routinely studied were detected in the model system, report J. Carl Barrett, Annette Wong and John A. McLachlan of the National Institute of Environmental Health Sciences in Research Triangle Park, N. C. In the June 19 SCIENCE the scientists say that preliminary results indicate that DES causes errors in the matching and distribution of chromosomes during cell division, causing excessive and missing chromosomes in later cell generations. Such abnormalities have also been reported in vaginal cells of young women exposed prenatally to DES. The scientists conclude, "Studies of the direct transformation of cells *in vitro* by DES may yield new insight into the mechanisms of DES oncogenicity [tumor formation] in target tissues such as the uterus and vagina."

Water conservation, elephant seal style

Long fasts are part of the elephant seal life style. Adult males may go through a three-month breeding season without eating or drinking. Adult females don't eat or drink during the time they tend their new pups. And after being abruptly weaned, a month-old 300-pound seal pup goes for 8 to 10 weeks without food or water. During each of these fasts the seals make do with water released through oxidation of their fat. Luckily the rate of water loss, and thus the need for replenishment, is remarkably low.

The water flux of an elephant seal pup is only 800 milliliters a day, say two biologists from the University of California at San Diego. This rate is only one-third that of most terrestrial mammals of comparable size. Leo Ortiz and Dan Costa have recently measured water loss of weaned seal pups and found that only 60 percent is due to evaporation in the respiratory tract (the rest is lost as urine).

At least two factors contribute to the successful water retention. One is a counter-current heat exchanger, a series of honeycomb-structured nasal bones interwoven with blood vessels. They cool the air from 37°C to 23°C. Water vapor condenses and so stays in the seal instead of being lost to the atmosphere.

The second, and more important, mechanism for reducing an elephant seal's water loss is a slowing of its metabolic rate. The elephant seal can hold its breath for up to 40 minutes after five minutes of deep breathing. Breath-holding, which usually occurs while the seal sleeps, slows the heart beat and closes down peripheral circulation. Ortiz says this "turning down the heat" saves the elephant seal both fuel and water.

Gypsy moth larvae: Allergy not bites

Complaints of rashes, welts and itching have filled emergency rooms in Connecticut and Massachusetts. It is the larvae of the gypsy moth, swinging from their silky strands, that are to blame. Bristly hairs covering the insect's body irritate human skin and can cause a severe allergic reaction with reddening and swelling lasting 5 to 7 hours. The Northeastern Forest Experiment Station gives this dubious comfort: Once the larvae settle down to feeding voraciously on the foliage their encounters with people should subside.

PHYSICAL SCIENCES

Electroweak at high energies

The beginning of what many hope will be a unification of all of physics under a single theory is the amalgamation of electromagnetic phenomena with those governed by the weak subatomic force into the so-called electroweak theory. It is so well regarded that its authors, Steven Weinberg, Abdus Salam and Sheldon L. Glashow received the 1979 Nobel prize for it. This theory has been tested at low energies, and it seems to work.

Now from the PETRA storage ring at the Deutsches Elektronen-Synchrotron (DESY) laboratory in Hamburg comes a report of comprehensive tests at the high energies of which PETRA is capable. In the June 29 PHYSICAL REVIEW LETTERS D.P. Barber and 62 others from the Technical University of Aachen, DESY, Massachusetts Institute of Technology, the National Institute for Nuclear Physics and High Energy Physics in Amsterdam and the Institute of High Energy Physics in Beijing report that the basic numerical parameter of the theory, the Weinberg angle, measures to the same value at PETRA energies as it did at lower energies.

This means that the theory basically works at higher energies. The PETRA measurements involved colliding electrons and positrons so that they annihilate each other and then studying the electromagnetic and weak-interaction behavior of whatever was produced out of the energy generated in the annihilation. At these energies five varieties of quark (u,d,s,c and b) could be produced compared with two available (u and d) in the low-energy experiments. According to a remark in the June CERN COURIER the results indicate that the weak coupling of the heavier quarks (s, c and b) is the same as that of the lighter—that is, the pattern of weak and electric charges repeats going from the lighter quarks to the heavier. The theory hypothesizes this.

A kinky radio galaxy

One of the newly developed classifications for galaxies that show up as radio sources is "head-tail." This has nothing to do with turning somersaults; it means that the main body of the galaxy (the head) is accompanied by a tail or tails of radio-emitting matter lying some distance away in the sky.

Finely detailed radio studies are now making clear that there are physical connections, thin streams of matter, between the heads and the tails in at least some cases. Observations with the Very Large Array radio telescope now place the galaxy 3C129 in this "jet set" category, according to a report by Lawrence Rudnick of the University of Minnesota and Jack O. Burns of the VLA and the University of New Mexico in the June 1 ASTROPHYSICAL JOURNAL LETTERS (just received). These observations exhibit the existence of a stream or jet between the head galaxy and the western tail of 3C129 (existence of a stream to the eastern tail had been demonstrated before) and reveal that both streams have sharply kinked shapes that look symmetrical on a large scale but asymmetrical in fine detail.

The shapes of streams in other cases are quite various, but the kinks of 3C129 prompt particularly ingenious attempts at explanation, one of which, by Vincent Icke of the University of Minnesota, is set forth in another paper in the June 1 ASTROPHYSICAL JOURNAL LETTERS. Icke suggests that the matter that forms the thin streams is being spewed out by some part of 3C129 that precesses, that is, wobbles like a top as 3C129 moves along. It is assumed that 3C129 is a member of a cluster of galaxies (most galaxies are) and that there is a gaseous medium pervading the space of the cluster. The pressure of the intracluster material on the matter flowing into 3C129's jets, the precessing motion of the source of the jet matter and the general motion of the head of 3C129 through the intracluster medium combine to give the streams their kinky shape.