BIOLOGY

Yeast protein starts frog cell cycle

The most basic processes in the cell cycle seem to have changed little during evolution. Research by S. Michal Jazwinski and Gerald M. Edelman indicates that proteins from yeast cytoplasm can initiate DNA synthesis in the nuclei of frog spleen cells. The work, reported in the November PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, may open the way to understanding the initial events that commit a resting cell to entering the cell division cycle.

The cell cycle involves both the nucleus and cytoplasm of a cell. Jazwinski and Edelman with John L. Wang, in their work at Rockefeller University, previously developed a cell-free system where they can mix nuclei from one type of cell with cytoplasm from another. They found that the DNA from cells at rest, such as adult frog spleen, are stimulated to begin replicating when those nuclei are mixed with cytoplasmic extracts from proliferating embryo or tumor cells.

Now Jazwinski and Edelman report that yeast extracts are also effective stimulators. Yeast is particularly useful in study of cell division because Leland H. Hartwell and coworkers at the University of Washington isolated mutants that are defective in many different steps of the cell cycle.

Jazwinski and Edelman mixed cytoplasmic extracts from different yeast mutants with the frog spleen nuclei. Extracts from yeast deficient in the initiation of DNA replication had little stimulating activity.

The precise function of the yeast products involved in initiation of cell division is still unknown. But Jazwinski and Edelman believe that study of the extracts using the cell-free system "opens up the prospect of reducing certain features of cell cycle control to molecular terms."

Once-a-day photoreceptor shedding

The light-sensitive membranes of a vertebrate retina are continually renewed by an orderly process. Disks of membrane form at the base of the rod-shaped outer portion of photoreceptor cells and move outward as more disks are made. At the tip of the rod cell, groups of disks break off and are rapidly degraded. To keep the length of the outer segment constant, synthesis and disposal of disks must be closely coordinated.

Two laboratories working on frogs and on rats report in the Dec. 3 SCIENCE that the shedding of rod cells is not continuous, but occurs in a burst soon after the onset of light in the morning. The processes responsible for this daily peak appear to differ between the two types of animals.

Scott Basinger, Rosemary Hoffman and Michael Matthes of Baylor College of Medicine found that in frog retinas about 25 percent of the outer segments each shed 10 percent of their membrane disks during the first two hours of light. When the frogs were kept in the dark beyond the normal time of light onset, no shedding was observed.

The experiments on rats by Matthew M. LaVail, currently at the University of California Medical School in San Francisco, also showed a burst of shedding within the first hours of morning light. In the rats, which renew their outer segments more rapidly than do frogs, rods shed, on the average, 10 percent of their length each day. LaVail found, in contrast to the results from frogs, that rat disk shedding followed a circadian rhythm. A burst of shedding occurred daily at the normal time in rats kept dark for three days after months of a 12-hour light, 12-hour dark cycle. In the long run, even in rats, light is necessary for an accurate balance of membrane synthesis and degradation. LaVail and Barbara Battelle found that the outer segments of the rods of rats kept dark for more than 10 days were 25 percent longer than normal.

TECHNOLOGY

Talking to computers

Two papers delivered at the annual meeting of the Acoustical Society of America in San Diego summarized recent achievements in attempts to develop computers that can understand human speech. With a vocabulary limited to about 1,000 words, and speakers with clear enunciation and standard dialect, some computers can do pretty well.

Dennis H. Klatt reported on a five-year project sponsored by the Defense Department's Advanced Research Projects Agency. Called HARPY, the system can answer correctly about 95 percent of such queries as, "How many articles on chess are there?" Speakers first have to record a set of 20 special sentences to permit the computer to determine voice characteristics.

Physicists from Bolt, Beranek and Newman, Inc., reported on that company's HWIM (for Hear What I Mean?) system. With a more flexible grammar system and format, HWIM can understand about half of the questions put to it, using a vocabulary of 500 to 1,000 words.

The speakers agreed that computers with broader flexibility will come in time. The biggest problem, perhaps, is the subtle variation in even simple statements that can radically change a meaning. The difference between "ice cream" and "I scream," for example, can be devastating for a computer.

ATF-1017: New miracle fiber?

A new synthetic fiber may soon make possible a line of clothes that combine the attractive features of both traditional materials and previous acrylics. The new product—now prosaically called ATF-1017—reportedly absorbs body moisture almost as well as wool and cotton, yet dries nearly as quickly as conventional polyesters. The fiber is being produced by Bayer A.G. of West Germany and is described in the Dec. 6 CHEMICAL AND ENGINEERING NEWS.

Wool and cotton absorb moisture well, but they can swell up, lowering ventilation. The new material absorbs more water without swelling and does not feel damp as quickly. Wool feels damp after absorbing roughly 13 percent of its weight in water, cotton, after 11 percent. The new fiber can absorb 19 percent of its weight in water before feeling damp.

The secret of the new fiber is the large number of tiny capillaries that run along its strands. Each strand is covered by a sheath that protects the capillaries but permits moisture to pass through. The new material can thus absorb nearly six times more water for each unit of its own weight than cloth made from previous synthetics. Marketing trials are currently in progress.

Uranium hunting with trace metals

Geologists at Duke University have announced development of a method for locating deep-lying deposits of uranium by analyzing trace metals from surrounding rocks. William J. Furbish and Edward L. Schrader say their method will gain importance as higher-grade ores are depleted over the next two decades.

Chemical prospecting has been used successfully before to find uranium in sedimentary rocks, but Furbish and Schrader say theirs is the first method that works in volcanic rocks. Core samples obtained by drilling are analyzed chemically for traces of certain metals that sometimes occur in rocks near uranium deposits. Geiger counters would be of little help because of particle absorption in the thick rock overburden. In such cases, says Schrader, the new method "will take a lot of the chance out of finding uranium."