life sciences

GENETICS

Rabbits inbred in Maine

In the genetics of tissue transplantation, and other specialized areas, the rabbit is the ideal animal model, but work in the past has been hampered by the fact that there were no genetically inbred rabbits to study. But now, after 15 years of trying, scientists at the Jackson Laboratory in Bar Harbor, Me., have successfully inbred two albino lines through 20 generations of sister-brother matings.

Geneticists hold that after 20 generations, truly inbred animals will be identical in 99 percent of their genes. When this is the case, as it is with the Maine rabbits, transplanted tissue is not rejected.

Mice, easily inbred, are commonly used in genetic studies. The problems in inbreeding rabbits have been that within a few generations a "depression" occurs, leading to sterility, small litters, deformed offspring and early death. Dr. Chen K. Chai finds that if breeding is continued in spite of the problems, fitness of offspring improves in later generations.

BIOLOGIC RHYTHMS

Light pollution poses threat

A number of the body's biologic rhythms, particularly those that are regulated by hormones from the sex glands, pituitary and thyroid, are thought to be influenced by the natural daylight-night cycle. Overexposure to artificial light or underexposure to natural light may threaten those rhythms, according to Dr. Richard Wurtman of the Massachusetts Institute of Technology.

From experiments with rats, Dr. Wurtman points to the pineal gland, a tiny structure in the brain, as a hormone regulating agent that is itself influenced by the animal's exposure to light. The pineal, he says, is a neuroendocrine transducer. Its cells take a nerve-type stimulus—in this case, light—and convert it into hormonal output. That hormone, melatonin, in turn triggers or inhibits activity in other glands. In one experiment, rats were kept in natural light for 12 hours and darkness for 12. Melatonin levels varied "with a clear 24-hour rhythm." If the animal was deprived of a single day-night cycle, his hormonal rhythm was disrupted.

TISSUE TESTING

Dye technique salvages kidneys

The bluer a kidney, the more suitable it is for human transplants, according to a team of scientists from the University of California at Los Angeles.

During a critical period between the time a donor dies and the time a kidney is transplanted, its cells begin to die. The rate of cell death varies from case to case and it is difficult to assess damage to the total kidney. As a result, transplant surgeons, erring on the side of caution, may reject available organs.

Now, Drs. Robert Smith, Paul I. Terasaki and Donald C. Martin report a promising new test for measuring cell death. In seven cases to date, they have shown cell activity in kidneys that might otherwise have been considered unsuitable.

A tetrazolium dye is added to a small slice of kidney. In the presence of active, metabolizing cells, the dye turns blue. The greater the cellular activity, they find, the faster the blue stain appears, making response time the gauge of the kidney's condition.

PHYSIOLOGY

Drug and cooling treatment for cancer

Human trials of a technique employing a powerful anti-cancer drug and deep body cooling will begin in Europe this spring.

Dr. Vojin Popovic of Emory University in Atlanta reports the technique works well in mice and hamsters. The drug, 5-fluorouracil, has been used for a decade, but with limited success because doses strong enough to kill cancer cells kill healthy tissue as well. If healthy tissue is cooled, however, it is protected from the drug.

Dr. Popovic cools the whole body, then selectively warms cancerous tissues with special devices including ultrasonic waves. The warmed tumors absorb most of the drug, he finds, while only small amounts get into healthy cells. In animals, transplanted tumors disappeared entirely after a single, one hour treatment. Spontaneous cancers regressed markedly and in some cases also disappeared completely.

BIOCHEMISTRY

Enzyme packages found in spinach

Peroxisomes, tiny enzyme packages that may be a key to control of plant and animal growth, have been discovered in plants. They were previously known to exist in human cells; Dr. N. Edward Tolbert of Michigan State University in East Lansing says, "We are amazed to realize that during the past 25 years no one identified plant peroxisomes."

Though their function in man is unknown, Dr. Tolbert theorizes that their activity in plants and man is similar. In spinach and other plants, he finds, peroxisomes appear to break down glycolic acid molecules that would otherwise play a role in growth. Slow-growing crops, including spinach, wheat and tobacco, are abundant in peroxisomes, while fast-growing crops such as corn have few. It is conceivable, he believes, that plant and animal growth will eventually be regulated by manipulating the quantities of these biological machines in cells.

POLYPEPTIDES

Tumor substance inhibits normal cells

Malignant tumors produce a substance that, transported throughout the body in fluids, prevents recreation of blood and liver cells and interferes with formation of epithelium in the intestines.

The substance, isolated by Dr. Bo Holmberg and coworkers at the Cancer Research Division of Radiumhemmet in Stockholm, is a medium sized polypeptide. It may account for cancer's effects on normal cells. Dr. Holmberg says an antitoxin to this polypeptide could protect healthy organs, and though it would not cure cancer, it could give patients a longer lease on life.