

## DENTISTRY

# Tooth Decay Discoveries

**Armed with a clearer picture of the enemy, provided by studies of germfree animals, dentists are now using new approaches, Gloria Ball reports.**

► SCIENCE IS AT LAST on the right path for solving the age-old problem of tooth decay.

Decay will not occur unless specific bacteria are present. This the experimenters have demonstrated by observing rats that have never been allowed to be contaminated by germs.

Heretofore dentists were battling an unknown enemy, trying to prevent an elusive agent from destroying teeth. The leading suspects were heredity, diet and mouth bacteria, some 50 species of which have been found in human saliva.

The first definite clue appeared when scientists at the University of Notre Dame's Lobund Institute discovered that tooth decay does not occur unless bacteria are present. They fed germfree rats a diet that produces ruinous tooth decay in most normal rats. The germfree rats showed no decay.

Scientists at the National Institute of Dental Research borrowed some of the rats, repeated the experiment and got the same results. No bacteria, no decay. Even when food became tightly packed around the teeth and caused splitting, there was no decay.

## Which Bacteria Cause Decay?

The question then was: Which one of the bacteria normally found in the mouth causes the decay?

Two such organisms were found in the rat. Both are streptococci. One is a true enterococcus; the other lies somewhere between an enteric and a lactic strain.

In studies with a line of hamsters that had been free of tooth decay for generations, five more strains of decay-producing streptococci were found. The five together were more destructive than any one alone. In many cases it took the bacteria a long time to produce decay.

But the evidence was irrevocable—tooth decay is infectious and transmissible, and bacteria are the cause.

Like any organism, however, the bacteria find it difficult to prosper and do their work, that of decaying teeth, unless they get enough to eat. Thus a diet high in carbohydrates is an important factor in decay.

There is still a mountain of detective work to be done. Although seven different kinds of bacteria, not one of which is familiar to bacteriologists, have been established as decay producers, it cannot be assumed that the same seven cause decay in man. The fact that one of the rat streptococci has been found incapable of producing decay in the hamster indicates that each species has its own set of enemies.

Since man is not an experimental animal, researchers will have to use a roundabout approach in finding decay producers. To do so, they must first find out what the dangerous bacteria have in common or what peculiar factor allows them to damage teeth.

Presumably, time will separate the innocent bacteria from the guilty, and researchers will be able to name specific organisms that cause decay in the human mouth.

There are two general lines of attack on tooth decay:

The first line of attack involves some rather tricky problems. The strep strains from the rat and the hamster can be knocked out with penicillin and other broad spectrum antibiotics. But such drugs are unsuitable not only because many persons may develop allergic reactions to them but also because they kill off all the other bacteria. This allows other organisms such as yeast and fungi to run rampant. They may cause serious lung ailments, for example, and can cause death.

Perhaps the best antibiotic approach is to use one which has a narrow spectrum of action, kills only the decay-producing

bacteria. Even so, there is always the danger that decay strains will become resistant.

There is another approach—the use of chemicals that interfere with the metabolism of the bacteria. Minute amounts of carbonyl-binding compounds have cut tooth decay by as much as 86% when placed in rat food.

The second line of attack on dental decay, that of toughening the tooth, is already in progress. Nearly 40,000,000 Americans are now drinking fluoridated water, the value of which is no longer debated among dental scientists.

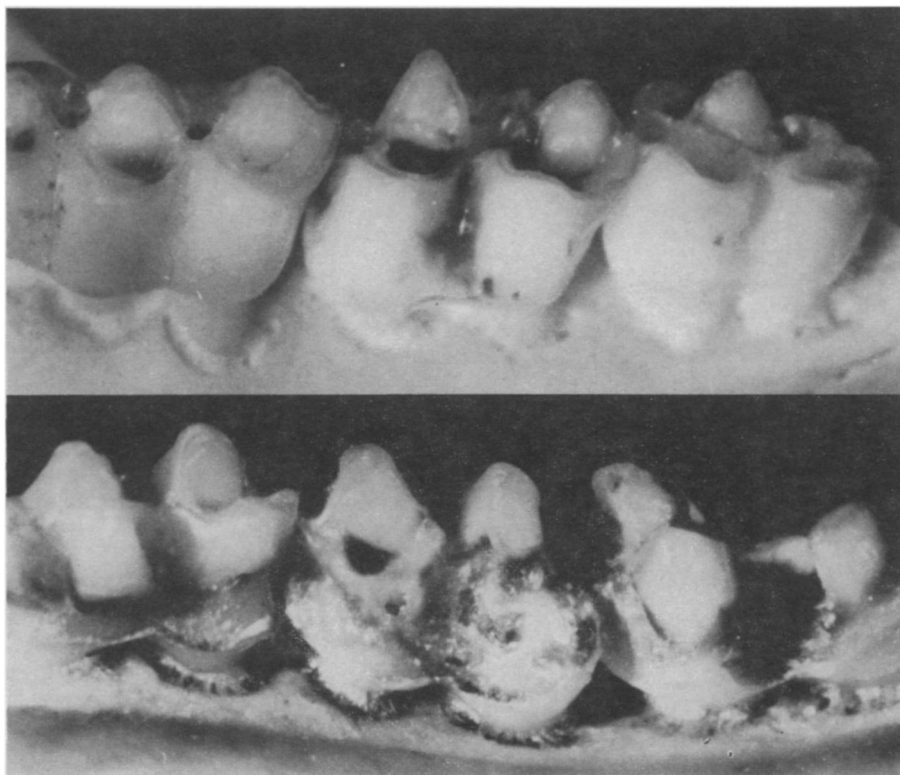
## Fluoridation Recommended

The 1960 report of the 16-member Commission on the Survey of Dentistry in the United States said:

"Fluoridation is convenient, inexpensive (about eight cents per person per year, including amortization of equipment), and absolutely safe. In every locality where it has been installed, the tooth decay rate has been reduced by at least 50%, in some places by nearly 60%."

With more than three-fourths of the population still unprotected by fluoride, scientists at the National Institute for Dental Research are studying another approach that can reach even more persons—phosphated bread.

Mineral phosphates, particularly dibasic



**STREPTOCOCCI AT WORK**—Cavity-free teeth of a hamster (top). After inoculation with decay-producing streptococci, teeth show extensive decay (bottom).

calcium phosphate, drastically reduce tooth decay in rats, and by 1962 dental researchers will know whether it works just as well on humans. At that time, the first three-year period in their study of phosphate-fed children in North and South Dakota will begin to yield some results. If the technique works, bakers and cake-mix manufacturers will be urged to include more of the phosphates in their products.

Despite the fact that tooth decay afflicts 95% of the United States population, tooth decay is not the major cause of tooth loss among adults.

Periodontal disease, also known as gum disease, gingivitis or pyorrhea, causes more tooth loss in adults than all other causes combined.

It is an insidious disease that gets its start when the gums become inflamed and swell away from teeth. Small open pockets form between tooth and gum; bacteria collect in these pockets and produce toxins that eat away the fine filaments that connect the tooth to gum and bone. The tooth foundation is weakened and eventually the tooth is lost.

Bacteria may also enter the blood stream through this route.

For the most part periodontal disease is painless, and this is the biggest reason 22,000,000 Americans are toothless. The disease goes unnoticed and untreated.

#### ZOOLOGY

## Rare Lizard Caught Alive

► THE CAPTURE of an earless monitor lizard in West Borneo has given scientists their first opportunity to study the behavior of this elusive amphibious reptile, so rare that less than ten museum specimens are known to exist throughout the world.

The lizard lived about three months, during which time staff members of Sarawak Museum, Kuching, Borneo, made detailed round-the-clock observations and photographic records. It was found near the Great Caves of Niah, a center of intensive reptile collecting by museum field teams.

The lizard showed a marked capacity for relaxation, and "could literally collapse along the whole length of the body" when resting, Tom Harrison and N. S. Haile of the Sarawak Museum report in *Nature*, 190:1213, 1961.

"A very good swimmer, it could relax on the bottom of a tank for up to half an hour."

This specimen of *Lanthonotus borneensis* Steindachner measured 13 inches, believed average size.

When first caught, it "played dead" and refused to eat. It later responded to raw turtle eggs, consuming the yolks. When the diet was changed to chicken eggs two months later, the lizard died.

Mr. Harrison and Mr. Haile believe the lizard can stay in a comatose state underground for long periods with no food and little air. It apparently uses its strong snout and head, rather than its weak front legs, to burrow into the ground. Earth

Dentists now know that 50% of persons aged 50 have periodontal disease, and by age 65, the involvement is nearly 100%.

For many years, the tartar that forms on teeth has been suspected of causing lesions that give periodontal disease its start. And it was thought that bacteria were necessary for tartar formation.

But this is not true. Tartar can and does form in the mouths of germfree rats. Chemically and microscopically it is just like tartar from normal rats except that it has no bacteria trapped in it.

Many different methods of dissolving tartar from the teeth have been tried but anything that dissolves tartar also dissolves tooth enamel. At present, dentists treat and try to prevent periodontal disease by scraping the tartar off, teaching their patients how to brush their teeth properly and to keep their mouths reasonably clean. In cases of advanced disease, gum surgery is needed.

Dentistry has come a long way from the days when the suggested remedy for toothache, in the first century B.C., was to eat a whole mouse twice a month.

But in spite of anesthetics and high-speed drills, Americans, like people the world over, are still notorious cowards about facing the dentist.

• *Science News Letter*, 80:26 July 8, 1961

sticking to its skin helps make it difficult to notice when it is moving.

The observers said it seemed to enjoy being handled and became tame, showing "no inclination to bite either the handler or anything else," food included. They doubt if the lizard is poisonous.

This was the first specimen to be collected in recent times. Others are being sought at Niah. The Borneo lizard and two American lizards form the family Helodermatidae.

• *Science News Letter*, 80:27 July 8, 1961

#### MEDICINE

## Simple New Cancer Test Based on Enzyme Action

► A SIMPLE new laboratory test for detecting cancer has been reported following clinical tests.

Based on earlier studies showing that the activity of the enzyme lactic dehydrogenase (LDH) was associated with the presence of cancer, the research was done by a University of California School of Medicine student in San Francisco. Russell J. Erickson of the Cancer Research Institute received his M.D. degree this June.

The test could help physicians treat patients who have a symptom called effusion (in which there is an abnormal, unexplained escape of fluid into various parts and tissues of the body), a possible sign of cancer.

The scientist said the study indicates that difficult-to-diagnose cancer also can be de-

tected in patients with tuberculosis and cirrhosis, a liver ailment.

LDH acts as a catalyst in the chemical processes of the body as all enzymes do, the researcher reports in the *Journal of the American Medical Association*, 176:794, 1961.

Also reported in the *JAMA* is an analysis of the dangers of influenza epidemics for those over 65 years of age, for pregnant women and for persons with certain chronic diseases connected with aging. Vaccines are believed 60% to 65% effective in preventing flu. Drs. Theodore C. Eickhoff and Robert E. Serfling, with Ida L. Sherman, all of the U. S. Public Health Service's Communicable Disease Center, Atlanta, Ga. (p. 776)

• *Science News Letter*, 80:27 July 8, 1961

#### TECHNOLOGY

## Electron Accelerator For Overseas Research

See Front Cover

► AN ELECTRON accelerator will soon be shipped to irradiation service centers in Tokyo and Paris for scientific research. It will also be used for sterilization of sutures and other pharmaceutical products, such as scalpel blades, drugs and bandages and to pasteurize foods.

A close-up view of the accelerator rings of the Dynamitron, produced by Radiation Dynamics, Inc., Westbury, N. Y., is seen on the cover of this week's *SCIENCE NEWS LETTER*. The rings feed the power into the vacuum tubes. Electrons are "sprayed" at very high speeds into the materials to be tested or processed.

• *Science News Letter*, 80:27 July 8, 1961

#### CHEMISTRY

## Demand for Chemists Exceeds the Supply

► THE NUMBER of jobs open for chemists in this country continues to greatly exceed the number of chemists looking for jobs. Dr. B. R. Stanerson, deputy executive secretary of the American Chemical Society, reported to the American Institute of Chemists.

The ratio of "column inches" of positions open to "column inches" of positions wanted in *Chemical and Engineering News* reflects the changes in the chemical manpower status. The average number of interviews per job applicant at the Employment Clearing House at the national meetings of the American Chemical Society provides another barometer of the ratio of supply to demand.

The "column inch" ratio was approximately one to eight in May of 1931. This past May this ratio was approximately five to one, which ratio has been rather constant for the past 20 years.

Dr. Stanerson predicted that the average demand-supply picture would continue to be "good" to "very good." The most wanted chemists will continue to be highly educated and imaginative people.

• *Science News Letter*, 80:27 July 8, 1961