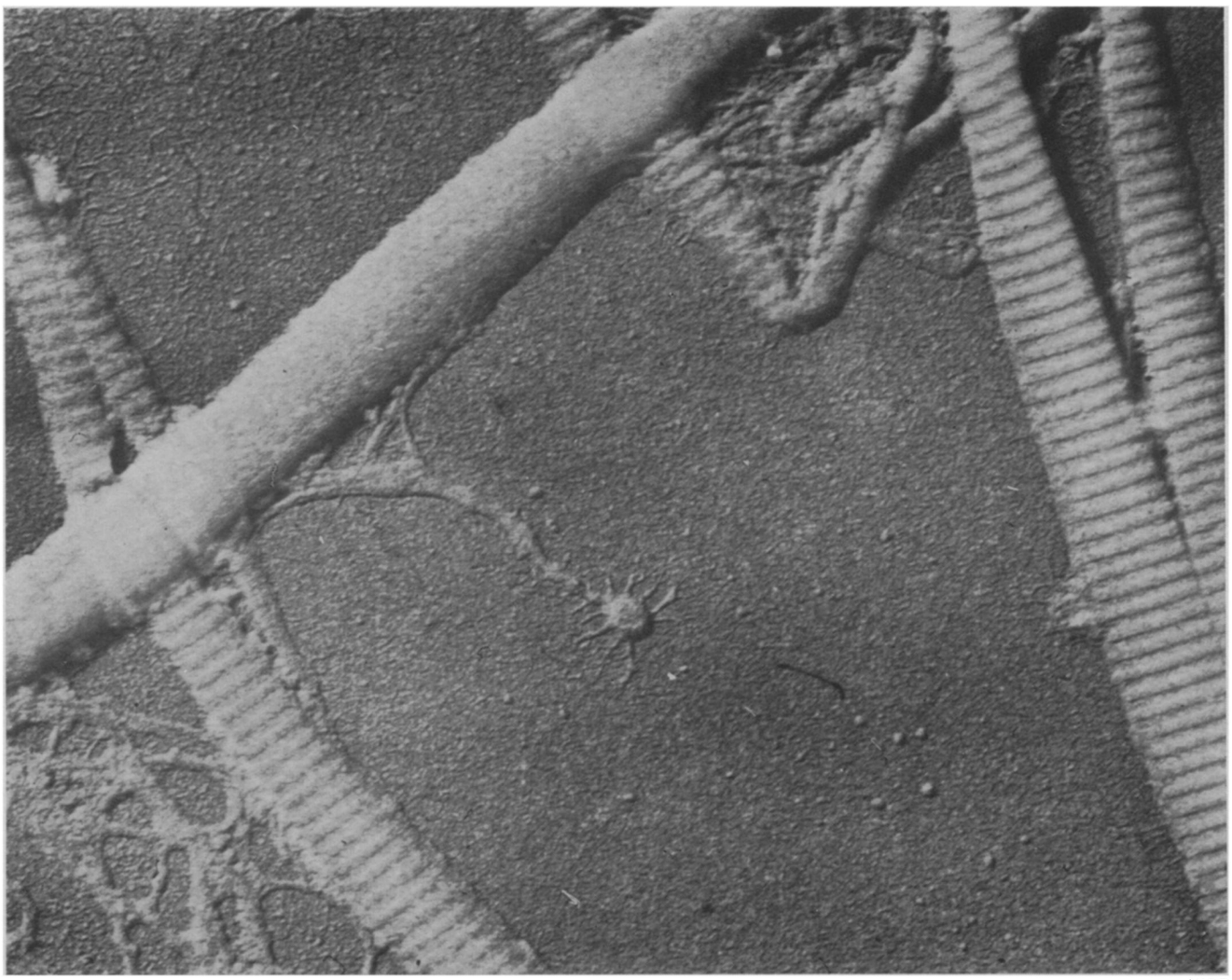


NIDR

Collagen, the most important connective protein, revealed by an electron microscope. It breaks down in gum disease.

PROPHYLAXIS

The new shape of dental research

Emphasis shifts from the dentist's office into homes and basic laboratories

by Faye Marley

George Washington's false teeth were made of wood and ivory and they hurt.

In his day no president or king could get the dental care routinely available today. But the advances in prevention and care so far are neither as useful or as widely used as dentists hope to make them.

Some frontiers of dentistry are moving more and more out of the dentist's office and into patient's homes and laboratories as far from classical dentistry as those of chemists and physicists. Prevention is a key effort; the first Institute of Preventive Dentistry in the United States has just been set up at Georgetown University in Washington, D.C., under Dr. Joseph L. Bernier, former chief of the Army Dental Corps.

A major aim of the National Institutes of Health is the establishment of interdisciplinary research centers in which the coordinated talents of a wide range of disciplines not normally associated with dental problems would be brought to bear on them.

"We couldn't possibly assemble enough dentists to treat all the Americans who need dental care," says NIH Director James A. Shannon. And there is evidence emerging to support his belief that research into the mouth's biochemistry and biophysics, for instance, could develop insights that might make remedial dentistry some day obsolete.

In the United States today:

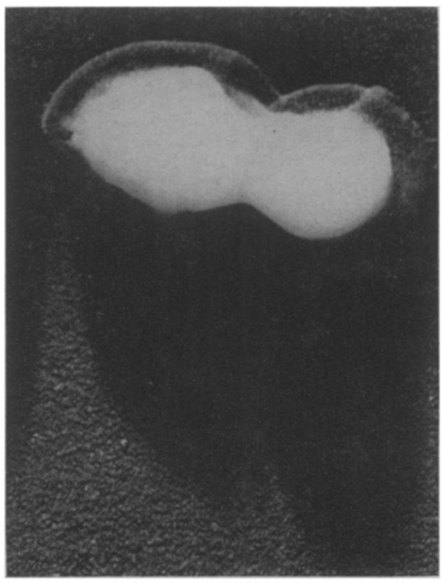
- Half of the children under 15 years old have never been to a dentist.
- Nearly 800 million cavities need treatment.
- The national dental bill is $3 billion annually, but $20 billion is be-

lieved needed for proper treatment of everyone—if there were enough dentists to provide it.

Preventive care is aimed at the two major tooth troubles: decay and disease of the gums.

Research at the National Institute of Dental Research and elsewhere has shown that decay in teeth is caused by a combination of diet, certain kinds of bacteria and tooth susceptibility. All three factors must be present to cause caries.

Although in some places there are still hot battles over fluoridation of water, fluorides have been shown to protect teeth from their first eruption to adult years. Biophysical studies are beginning to show why.



NIDR

Villain: streptococcus from a cavity.

Fluoride appears to reduce decay by hardening the crystalline structure that X-ray and electron microscope studies reveal make up dental enamel.

Studies of bone, which also contains crystals, show that high fluoride content tends to make the crystals more perfect and more stable. Fluoride also replaces the hydroxyl ions in the calcium phosphate of bone, making the bone itself less soluble.

But drinking fluoridated water and brushing with fluoridated toothpaste after every meal are not enough. Direct applications of the chemical to the teeth are needed. Now a technique has been developed to take this operation, formerly done in the dentist's chair, into the home.

Last year about 350 preschool children of Coast Guard families stationed at Governor's Island, N.Y., began to participate in a study to check the effectiveness of a fluoride-gel-filled mouthpiece used a few minutes a day for three days a week. The technique was first tested on hamsters.

Half of the children, ranging from two to five, are using the mouthpieces, and the other half are going through the same procedure except that there is no fluoride in the gel.

A preliminary examination indicates that most of the two- and three-year-olds are free of tooth decay, whereas the five- and six-year-olds average two decayed or filled teeth. The investigation will last three years, and will show whether or not children beginning the study without decay stay that way.

In Cheektowaga, N.Y., an 80-percent reduction in tooth decay was reported in the past two years among several hundred junior high school students using the mouthpieces. Both of these studies are being conducted by Dr. Harold R. Englander of the Public Health Service's NIDR.

Also being studied are comparisons of the fluoride-mouthpiece technique in Charlotte, N.C., where the water supply is fluoridated, and in Cheektowaga, where it is not.

The mouthguard has the advantage of being in intimate contact with teeth and gums for a definite time; the fluoride is forced into pits and fissures without being diluted by saliva.

In view of the serious shortage of dentists and auxiliary personnel, Dr. Englander points out, the mouthpiece-fluoride technique holds great promise, since it enables a dental hygienist to supervise and treat many more children than is possible with current methods.

A potential rival of stannous fluoride in treating children's teeth is phosphate. In 1963, Dr. Finn Brudevold of the Forsyth Dental Infirmary, Pittsburgh, reported promising results after seven years of preliminary research with a combination of fluoride and phosphate that cut dental decay 70 percent.

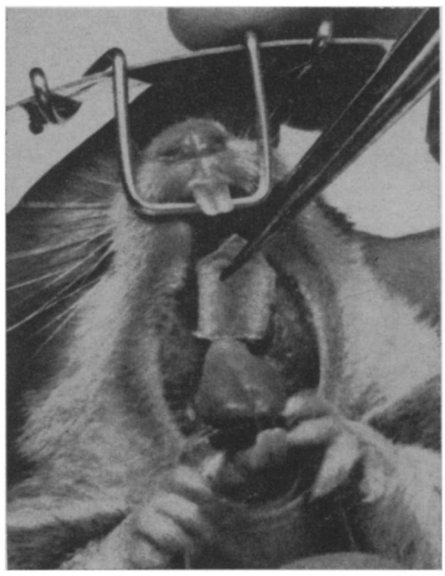
And in early 1967, following earlier Scandinavian experiments, Dr. Joseph C. Muhler of Indiana University's School of Dentistry reported success in giving phosphate-treated cereals to schoolchildren in a controlled study of 500. The phosphate acted in the system rather than in direct contact with the teeth, resulting in 20 percent to 40 percent fewer cavities in the cereal-eating group. Other tests have included phosphate-treated chewing gum and similar combinations.

The National Institute of Dental Research has not yet approved phosphate as a proven method of preventing caries, but is planning a workshop this fall to assess the present state of knowledge in relation to phosphates.

The other basic problem, periodontal or gum disease, shows up all over the world, regardless of nutritional or economic status.

Studies in some 30 different countries have shown that altitude and climate are also irrelevant. However, increased gum disease parallels advancing age, and it is more prevalent in the absence of oral hygiene.

Microbiologists at the institute have shown that a microorganism when inoculated into hamsters produces periodontal disease, and that the condition can be transmitted from infected animals to uninfected ones.



NIDR

Hamster opens wide for fluoride.

The stubborn calculus, or tartar, that forms deep on the teeth below the gums and which is at the root of periodontal disorders has been found to be essentially mineralized bacterial deposits. Virtually all the mouth's microorganisms are subject to such mineralization. However, calculus does not form when the major salivary glands are removed, showing that saliva has some part in the process.

A major area of study involves the maturation of collagen, the most important part of connective tissue which is damaged in periodontal disease. In research on the biochemical and physiochemical bonds that hold the constituents of collagen together, NIDR scientists have shown that defects in molecular crosslinking patterns could strongly influence the tissue breakdown that occurs in gum disease.