

SCIENCE NEWS

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RESEARCH ON TUBERCULOSIS

THE world's first poisonous sugar has been discovered lurking within the tuberculosis germ. Although it is harmless to uninfected animals it is death to those suffering from tuberculosis. Produced by the tubercle bacillus itself it is probably the stuff that slowly poisons the victim of the white plague.

Such is the latest news from a great cooperative research effort directed at a greater knowledge of the disease and an eventual use of this knowledge in saving human lives. To the National Tuberculosis Association meeting at Atlantic City on May 28, Dr. William C. White, of the Hygienic Laboratory of the U. S. Public Health Service at Washington, brought his test results that showed the deadliness of the new polysaccharide isolated from tuberculosis germs by Dr. R. J. Anderson, of Yale University.

Never before in medical or chemical history has a sugar been shown to be poisonous. But a small amount of this white, innocent-looking sweetish substance injected into a tuberculous animal causes its death in four to five hours. A well animal similarly treated shivers, then runs a temperature, its white blood cells decrease, showing that the sugar has some effect on the healthy body even if the consequences are not tragic.

This is the second startling discovery in the course of cooperative research by twenty-one organizations and dozens of scientists under the general directions of the National Tuberculosis Association. Last month Dr. Florence R. Sabin, of the Rockefeller Institute for Medical Research, New York City, showed that a germ-free fat obtained from a chemical analysis of the tuberculosis germ and similar in composition to food fats, will cause the characteristic tubercles of the disease. This inaugurated a new technique in disease study.

As a necessary preliminary to these discoveries of new rôles for sugar and fat, Professors Treat B. Johnson and R. J. Anderson, at Yale, undertook large-scale chemical separations of bacteria into their component compounds. H. K. Mulford Company and Parke, Davis and Company grew many pounds of various sorts of tubercle bacilli under rigorous conditions to supply the raw materials for the separations.

Out of these researches there may arise a new conception of life itself. It may prove that sugar is the basic life material. Heretofore fats and proteins have been considered the most characteristic substances that enter into living matter. Sugar seemed to enter into the composition of living things somewhat incidentally.

But these researches upon tuberculosis show that even the various strains of tuberculosis germs have their own radically different sugars. The avian bacillus yields a sugar chemically and physiologically unlike that in the human or bovine sort. Recent research upon the sugars contained in the germs causing pneumonia, the pneumococci, shows that each germ of this group has its own sort of sweet.

So there is beginning to be built a new theory of the chemical nature of life, founded on sugar specificity. Even the green leaf of the growing plant in which the sunlight builds carbohydrates may have its secrets unlocked by a continuation of the investigations that the tuberculosis work has pioneered.

Other phases of the National Tuberculosis Association's cooperative attack on the fundamentals of the disease were discussed at the meeting. Among the organizations joining with the association in its attack are: the U. S. Public Health Service; the U. S. Bureau of Animal Industry; the National Research Council; the American Sanatorium Association; the Henry Phipps Institute, Philadelphia; the Edward L. Trudeau Foundation, Saranac Lake; the Rockefeller Institute for Medical Research; the University of California; the University of Cincinnati; the University of Chicago; Cornell University Medical School; the Johns Hopkins University; the University of Nebraska; the University of Pennsylvania; Vanderbilt University; the University of Wisconsin; Yale University; the H. K. Mulford Company and Parke, Davis and Company.

BIOLOGICAL EFFECTS OF IRRADIATION

IRRADIATION probably never will be employed to develop favorable mutations and thereby speed up evolution, in the opinion of Dr. Halsey J. Bagg, of the Memorial Hospital, New York. Dr. Bagg expressed this belief in a communication to the New York Academy of Sciences.

He described his experiments in exposing rats and mice to X-rays, showing a variety of deformities which had been produced, including the elimination of one kidney in the first generation and the total absence of kidneys in the second generation after exposure. The rodent offspring with no kidneys lived about one hour after birth.

Dr. Bagg said he has seen no favorable variations as a result of exposure to X-rays and concluded that exposure of the germ-plasm in human beings to irradiation should be carefully guarded against.

Dr. Charles Packard, of the Crocker Institute of Cancer Research, New York, read a paper describing his experiments to determine whether irradiation affected rapidly growing tissues to a greater extent than normally growing tissues. His experiments dealt with mitosis or cell division process in the early stages of development of fruit fly eggs.

Batches of approximately 1,000 *Drosophila* eggs each were examined at temperatures of 13 degrees, 23 degrees and 28 degrees Centigrade. At the first temperature mitosis was observed to occur every 50 minutes, at the second every 20 minutes and at the last every 12 minutes. The results of exposure to X-rays in all instances were approximately the same, the variation being not more than 3 per cent.

When exposed to irradiation for five minutes about 25 per cent. of the eggs died, when exposed for ten minutes about 50 per cent. died, for fifteen minutes about 65 per

cent. died and for twenty minutes about 75 per cent. died. He concluded that the theory that protoplasm is sensitive to irradiation according to the rate at which cell division takes place was not supported by his experiments.

EXERCISE FOR DEAF EARS

FROM Russia comes a report of treating deafness by giving the ears exercise in responding to sound. The director of the deaf and dumb institute at Leningrad, Professor Skrizki, has been working for three years at the institute with several pieces of apparatus which he has developed. This apparatus has been exhibited at the All Russian Congress of Zoology, Anatomy and Histology, where it attracted great interest.

The procedure used at the institute is first to record the ability of an individual to catch any sounds, high or low. Apparatus for this purpose registers sound-waves that vibrate as slowly as 106 times a second. These waves produce extremely low-pitched tones. From this point the apparatus registers waves up to 12,000 vibrations a second. If the hearing of the patient responds to any of these vibrations, sound-waves of increased intensity are transmitted to the ears of the patient through ear-phones. The effect is described as being like a curative massage, stimulating the auditory nerve into activity.

After this type of treatment, other apparatus is used in order to concentrate on the precise sound-waves to which the deafened person can respond. Thus, in some individuals the sensitive auditory nerves, bones and membranes respond only to sound-waves of high intensity, far higher in pitch than the human voice ever reaches. This would seem to be a remnant of hearing of little practical use. It is compared to a little "island of hearing" in the great range of unheard vibrations. The attending physician confines his treatments to the island of hearing, massaging or exercising the auditory nerve with the vibrations to which it responds. Under this treatment, it is reported that the islands of hearing grow larger and that improvement has been noted in individuals born deaf and in others who were deafened as a result of scarlet fever and other diseases.

A German engineer, Herr Muelwert, of the physical institute in the Technical High School at Darmstadt, has developed a method of treating chronic deafness by sound-waves that vibrate so rapidly they are inaudible to human ears. The usual frequency, he states, is 30,000 vibrations per second, as this has proved most uniformly suitable. The dosage is registered by a meter which enables the physician to control the dosage of the inaudible vibrations.

Such experiments with high-frequency sound-waves as treatment for deafness are beginning to attract attention in this country and specialists are receiving eager inquiries from deafened persons. So far, these experiments have not been duplicated in this country.

ATLANTIC STEAMSHIP LANES

THOSE who sail to Europe now will go over track B. This route, more northern than the A track that liners have been using for several months, is now in operation,

according to an announcement from the U. S. Navy's Hydrographic Office. By fall, ships will take a still more northerly route.

Altogether there are three pairs of tracks for ships plying between New York and Europe. The southernmost one, Track A, brings the ships to a point at 39 degrees 30 minutes north latitude and 47 degrees west longitude. From this point, the so-called "corner of the North Atlantic," the ships turn to the northeast, and proceed on their way. By so doing they avoid the ice on the Grand Banks, south of Newfoundland. During some winters the ocean is free enough from ice that this track never has to be used, but during the past few months the ships have been following it. The west-bound route is somewhat farther north.

Beginning May 18, for east-bound ships, and May 25, for west-bound ships, Track B is to be followed. When traveling eastwards, the corner is at 40 degrees 30 minutes north latitude, and westwards at 41 degrees and 30 minutes. A number of icebergs are over the southern part of the Grand Banks, not far from the west-bound track, but the ice patrols, the U. S. C. G. cutters *Tampa* and *Modoc*, are keeping track of them and issuing warnings by radio. By September 1, the ships will take a still more northerly route, known as Track C, and will probably continue on it until about the end of January, when the ice again begins to come south.

Ships from Canadian ports to Europe are unable to avoid the ice as their course takes them south of Newfoundland, around Cape Race and over the Grand Banks. To the east of the banks there is now a large number of icebergs, so it is necessary for these ships to keep a careful watch. By July 1, however, they will take the most northern route, called Track G, which goes north of Newfoundland, through the Straits of Belle Isle.

MILLION WATTS POWER

BROADCASTING stations with a million watts power, twenty times as much as the most powerful stations licensed to-day, were forecast by Edgar H. Felix, New York radio consultant, speaking before the Institute of Radio Engineers.

"It is quite within the scope of the engineer's imagination to visualize ultimately a broadcasting system comprising transmitters of a million watt power," said Mr. Felix. "Compared with other systems in daily use this is by no means a large unit; the power bill for such a broadcasting station might run from fifty to one hundred dollars an hour. We use several hundred times that power in transporting week-end excursionists to a single metropolitan bathing beach, and certainly radio broadcasting is of at least comparable importance in our daily lives. While a million watts represent a substantial increase in the power of broadcasting, such power need not be feared as a dangerous monster.

"A system of broadcasting with transmitters of this order of power would require somewhat altered receiver design. Obviously we should employ less sensitive receivers, and instead of an exposed aerial system we should use an adjustable pickup means shielded from incoming

impulses to a degree determined by the field strength of the nearest broadcasting station. Stations of such power could serve the centers of population with antennas located at some distance from congested centers. It is quite conceivable that receiver development could keep pace with progressively increased powers of the order suggested.

"Allocations of wave-lengths under these conditions would be simplified because the high-grade service range of such stations might well be as much as five hundred miles. Ninety such stations spread geographically over the country would give ten or twelve program choices at any point, and may be compared with present conditions where perhaps less than 40 per cent. of the area of the country is within the wide high-grade service range of any broadcasting station. Furthermore, the initial and maintenance cost of receivers would be lessened, and quality of reproduction improved, with the consequent result that the radio-listening public would be enormously increased. This, in turn, would have a healthy effect on the economic position of the broadcaster.

"But such a system of broadcasting would also be considerably more costly than the present annual maintenance expense of approximately thirty or thirty-five million dollars. It might cost one hundred fifty million to two hundred million a year or more to maintain ninety stations of this order of power."

This is one way of reducing the annoyance of man-made interference, from electrical apparatus in the home, power lines, etc. If the signals are sufficiently powerful, then such relatively weak interference will have little effect.

Now, however, and until such unprecedentedly powerful stations are built, the solution of the interference problem must rest principally in proper design of electrical apparatus.

"The real difficulty lies in the modernization of household equipment such as electric fans, oil burners, cash registers, electrical refrigerators, vacuum cleaners and violet-ray machines," he said. "All these must be designed with elimination of radio interference in mind. It is difficult to estimate the cost to the electrical industry of the necessary modification of such devices to accomplish this objective, but as nearly as can be estimated, the equipment of all vacuum cleaners, washing and ironing machines, oil burners and sewing machines with chokes and filters so that they can be operated from the same power circuit as a radio receiver of the sensitivity at present used without noticeable interference would have cost the electrical industry ten million dollars for 1928."

ITEMS

FOUR factors responsible for the gratifying decline in the tuberculosis death rate during the last thirty years are the elevated standard of living, improved sanitary control, more adequate hospital facilities and public health education, according to Dr. Louis I. Dublin, statistician of the Metropolitan Life Insurance Co., who recently addressed the National Tuberculosis Association. Continuation of the public health and social service activi-

ties responsible for much of the decline will probably further decrease the tuberculosis death rate to a negligible point. The lowest tuberculosis death rate was recorded for the year 1928. The decline since 1900 has been steady and ever-accelerating. Thirty years ago tuberculosis brought death to nearly two and a half times as many persons per 100,000 as now.

SILICA or quartz dust will aggravate tuberculosis of the lungs more than any other known dust, Dr. Leroy U. Gardner, of the Saranac Lake Laboratories, reported to the National Tuberculosis Association meeting. The great hardness of the silica dust is responsible for its greater aggravating effect. Silica or quartz dust is harder even than the dust from granite or carborundum. The mechanical stimulus of these hard particles causes changes in the cells and eventually restores an environment favorable to the growth of bacteria. Inhalation of the quartz dust affects the disease even when it is in an advanced stage of healing. It appears to encourage the growth of tubercle bacilli and creates conditions favorable to their spread. Experiments with coal dust failed to produce any aggravation of the disease, so that the effect is directly due to the silica dust and not to dust itself.

GIRLS as well as boys will compete in the next playground miniature aircraft tournament to be held in various cities throughout the summer with finals in Louisville next October. A trophy donated by Miss Amelia Earhart will reward the best model airplane maker among the girls of the nation. Girls will also be allowed to compete with boys for the general trophies of the national contest. Orville Wright, Colonel Charles A. Lindbergh and other aviation authorities are sponsors of the national contest to be held by the Playground and Recreation Association of America.

SENATOR JOSEPH E. RANDELL, Democrat, of Louisiana, believes that the "National Institute of Health" may become a reality before the end of the present Congress. "For several years," he states, "I have been sponsoring a bill to create a National Institute of Health in Washington, to create a system of fellowships in this institute, and to authorize the government to accept donations for use in ascertaining the cause, prevention and cure of disease affecting human beings and for other purposes. This measure was first introduced by me on July 1, 1926, reintroduced December 9, 1927, again reintroduced May 21, 1928, and passed the Senate during the closing days of the last session. It was caught in a legislative jam in the House and hence will have to be again introduced at this session. Its passage by the Senate has encouraged me greatly and I am confident the bill will become a law before the end of the present Congress." The U. S. Public Health Service would administer the funds of the institute according to the Ransdell bill, and the present hygienic laboratory would be used as a nucleus for the buildings and laboratories. The bill has been introduced in the House by Representative William Sirovitch, a doctor and a Democrat from New York.