SCIENCE NEWS

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VITAMIN B

PROFESSOR C. A. ELVEHJEM, of the University of Wisconsin, discoverer of pellagra-curing nicotinic acid, the third B vitamin, reported to the chemical research conference, which was held at Gibson Island, Md., under the auspices of the American Association for the Advancement of Science, that Vitamin B has now been chemically sliced into ten different vitamins or factors and that the end is not yet in sight. He stated that the boundaries of the B complex are still unknown. The B complex is "the group of water-soluble vitamins found in yeast." Liver and whole grains are also richly supplied with this vitamin.

Oldest of the B vitamins is the chemical now known as thiamin, which prevents and cures the nerve disorder, beriberi. Next in line is riboflavin, recently discovered to be essential for human health, but known much longer as one of the B vitamins through discoveries of the dire effects on laboratory animals of a lack of this substance. Nicotinic acid, preventive and cure for pellagra, was the third B vitamin to be cut out of the group by chemical dissection.

The spectacled eye factor is the picturesque way Professor Elvehjem described one of the newest members of the B group. Rats lacking this vitamin develop the condition described as spectacled eyes. Pantothenic acid, acclaimed recently as a vitamin essential for all living forms, is the same vitamin that prevents a skin disorder in chicks. The anti-gray hair member of the B group is apparently a rat vitamin only. Another rat vitamin is B_6, also called Factor 1, and fortunately is now identified chemically and available in synthetic form. The chemical identification is fortunate because it helps to clear up some of the confusion about these vitamins. Factor W, for rats, and Factor U, for chicks, and another substance known at present as vitamin M, apparently complete the list of the 10 B vitamins so far known.

How many and which of them, outside of thiamin, riboflavin and nicotinic acid, are essential in the diet has not been entirely settled. The difficulties of chemical separation of the B vitamins from each other suggests that people eating plenty of the food sources, such as whole grains, liver and other fresh meat, and yeast, can not fail to get all the B vitamins.

The members of the group already available as chemical substances, thiamin and nicotinic acid, for example, are valuable for patients too sick to eat and assimilate the vitamin-containing foods.

FROZEN SLEEP

FROZEN sleep may replace ether as anesthetic for surgical operations of the future. Instead of putting a smelly mask over the patient's face and telling him to "breathe deep" the surgeon of to-morrow may gently chill his patient to insensibility before getting to work with scalpel and needles. After the operation is over, the patient will be warmed back to consciousness without any unpleasant anesthetic after-effects.

Scientific evidence that this picture of future surgical operations is a distinct possibility appears in a report from Dr. G. H. Parker, emeritus professor of zoology of Harvard University. In an article in SCIENCE he states that frozen sleep has long been used in the Harvard laboratories for operations, even extensive ones, on fishes, amphibians and reptiles.

Use of the same method of inducing unconsciousness before operations on humans is suggested, Dr. Parker says, by "press reports of a kind of cold hibernation induced in human beings by a slight lowering of their bodily temperatures." This refers to the use of cold hibernation in treatment of inoperable cancer reported by Drs. Temple Fay and Lawrence W. Smith, of Temple University, Philadelphia, to the American Association for Cancer Research and the American Medical Association in April and May of this year. Without advocating the method as a cancer cure, but only as an aid in treatment, interest was aroused by the achievement of safe hibernation in humans through refrigeration methods which cooled the body three to four degrees below its normal temperature of 98.6 degrees Fahrenheit. Of the many investigators whose interest was aroused by reports of this use of frozen sleep, Dr. Parker is apparently the first to go on record with a practical suggestion for its use in fields other than cancer treatment.

The Harvard method of inducing frozen sleep, as Dr. Parker describes it, is similar to that used by cancer patients. At Harvard the fishes or reptiles are immersed for 10 to 15 minutes in water and cracked ice or cracked ice alone. They are then laid on cracked ice for the operation.

The Philadelphia doctors put their patients in a room cooled to about 50 degrees Fahrenheit, used an air-conditioning unit to keep the body temperature below 95 degrees Fahrenheit, and surrounded patients with ice bags and coils in which ice water circulates. The patients were kept in this frozen sleep for several days. Before turning on the cold, however, the patients were put to sleep with sleeping medicines.

The animals at Harvard, Dr. Parker says, recover quickly and satisfactorily from their frozen sleep at the ordinary temperature of the laboratory and "the animals so treated may be almost at once tested in a particular way without waiting for the gradual disappearance from their systems of an anesthetizing drug."

SPECTROSCOPICAL ANALYSIS OF VIRUSES

THE first spectroscopic analysis of viruses, ultra-microscopic disease-producing entities, and their constituent proteins and nucleic acids, has been made by Dr. George I. Lavin, of the Rockefeller Institute for Medical Research.

Dr. Lavin investigated three plant viruses—the classic tobacco mosaic virus, the latent mosaic virus and the tobacco ringspot virus, all of them crystallized in the pioneer researches in this field by Dr. Wendell M. Stanley and Dr. Hubert S. Loring of Princeton.

The crux of his technique, as explained at the Conference on Spectroscopy at the Massachusetts Institute of Technology, was the use of a continuous light source, in preference to the more usual source, and fractionation or splitting of the complex biological substances with which he was dealing, a procedure which may well revolutionize accepted spectroscopic methods of attacking intricate medical and biological problems.

Nucleic acid is apparently a rather prominent constituent of some viruses at least, for Dr. Lavin found it in all three of the plant viruses with a particularly high concentration in the tobacco ringspot. The presence of indole-acetic acid was also indicated.

That the amino acids which go to make up a protein may at times be hitched together in a very peculiar way was indicated by Dr. Lavin's study of papain, a protein-splitting enzyme, in which he was unable to find the amino acid, tyrosine, until after the enzyme had been hydrolyzed by Dr. J. S. Fruton.

He has also used the spectrograph to analyze urine, photographing fractions prepared by Drs. K. Dobriner and C. P. Rhoads so precisely that he was able to identify a number of physiologically important materials. Two years ago he made the first spectroscopic analysis ever done of an enzyme, pepsin.

In all, Dr. Lavin has investigated proteins both containing and deficient in aromatic amino acids and with varying concentrations of nucleic acid, problems which are virtually hopeless chemically. He has also examined the protein fraction of pneumococci, the causative agents of pneumonia.

SPECTROSCOPIC STUDIES OF HEMOGLOBIN

THE first studies ever made of hemoglobin, the red, oxygen-carrying material of the blood, within its natural environment of the red blood cells themselves, were reported to the Conference on Spectroscopy by Dr. David L. Drabkin, of the University of Pennsylvania.

Previous spectroscopic researches in this knotty but highly significant field have been limited to investigations of concentrated solutions of the pigment, prepared by actual destruction of the red cells themselves. Thus much of our knowledge has been drawn from studies not of the substances in their natural environment but of their solutions obtained by extraction, a procedure possibly risking chemical change.

Dr. Drabkin dealt with a rather complicated turbid suspension of the red blood cells which gave a distorted picture requiring interpretation. His results constitute the first accurate deductions ever made on biological material. Preliminary studies indicate that the spectra of hemoglobin and its derivatives are the same within the blood cells as those obtained extracellularly.

The method has already found an additional application, in facilitating accurate determination of hydrogen ion concentration within the red blood cells. This is done by intracellularly converting the hemoglobin to methemoglobin, its oxidized form, and using the well-known indicator properties of this latter compound. Dr. Drabkin said that this unique method of using the main cellular constituent to determine reactions within the cell appears "most promising." Heretofore such methods as puncturing the cell with a micro-needle, which injures the cell, have been used.

Dr. Drabkin also reported progress in a spectroscopic study of protein denaturation which may throw considerable light on the structure of the complex protein molecule. Urea, he found, may play an important role in the denaturation process, for whereas hemoglobin is denatured no more rapidly in alkali than in concentrated urea solution, the presence of both reagents speeds the process some sixty-fold.

THE WING BEATS OF INSECTS

STUDIES of the almost incredibly fast beatings of insect wings, in some cases as high as 350 strokes per second, are in progress at Harvard's Biological Laboratories as the first step in a comprehensive research program aimed at understanding the physiological processes which sustain this exceptionally vigorous activity.

The investigation, directed by Dr. Leigh E. Chadwick, is aided by the high speed stroboscopic and photographic technique perfected by Professor Harold E. Edgerton, of the Massachusetts Institute of Technology. With exposures as fast as a 25,000th of a second, sharp, stop action photographs can be obtained of the whirring wings or the insects can be observed visually, either stopped altogether, at slow motion or even in reverse.

Outstanding among Dr. Chadwick's preliminary findings is the first conclusive answer to an old scientific argument, whether the speed of the wing beat varies among species, among individuals of the same species or even in the same individual under different external conditions. Dr. Chadwick finds there is considerable variation in all these cases.

Different individuals of his most useful subject, drosophila the fruit fly, for example, vary in wing speed from about 9,000 beats per minute to possibly 13,000 under normal conditions. Increasing temperatures skyrocket the rate from 6,000 at 50° Fahrenheit (10° Centigrade) to double that at 84° F. (29° C.) Fatigue naturally lowers the rate, even at high temperatures, but the fruit fly can usually manage two or three hundred thousand strokes before exhaustion.

Wing speeds of moths and butterflies also vary widely among different species. The common big yellow swallowtails, for example, average about six beats a second, while hawk moth speeds run as high as 90 per second. The honey bee averages between 160 and 220 per second, the bumblebee, 240, the common house fly about 160. Dragon flies, at 30 per second, have the peculiarity that the rear set of wings precedes the front set in the beating, in contrast to the case for other types of insects.

To appreciate these tremendous speeds, compare them with high-speed physical exercises of other animals: man can do a fast one-finger piano trill at about 10 beats per second; the leg of a scratching mouse does about 20 per second; the wings of a hummingbird, much too rapid to be seen, go about 50 beats per second.

Dr. Chadwick is also studying the effects of atmospheric pressure on wing-speeds and correlating his findings with

oxygen consumption as a clue to internal physiological activity. Associated with him in the study are three research students, Carroll M. Williams, Darcy Gilmour and O. P. Pearson.

THE NEW COURSE OF THE YELLOW RIVER

THE treacherous, silt-laden Yellow River, "China's Sorrow," will go on a flood rampage in a few weeks in the no man's land between contending Japanese armies and Chinese guerillas which will exceed the war in destructiveness, Norman D. Hanwell, of the American Council of the Institute of Pacific Relations, predicted. He stated that the river's new course, which it carved out for itself last year in one of its periodic shifts, is too small to take care of the flow of water from summer rains. Twelve million people in the province of Kiangsu, in one corner of which Shanghai is located, will eventually be dispossessed and forced to move because the land on which they live is below sea level and is also in the river's way.

"There is little hope that the river can be returned to the bed from which it so recently fled," according to Dr. Hanwell. "On former occasions efforts to force the river back to its 'proper' bed were under way long before it was able to form a definite new channel of its own. In addition, those charged with the responsibility of controlling the rampant river had certain facilities at hand which are no longer available. Access to transportation facilities and materials necessary for curbing the river are now cut off by the war. The most serious breach remains, it is reported, in the 'no man's land' between the Japanese and Chinese 'lines.' So long as hostilities continue . . . it appears unlikely that effective countermeasures can or will be taken to avert an otherwise almost inevitable catastrophe."

Last year the Yellow River caused enormous destruction when it changed its course, usurped the beds of two other rivers and ended up by flowing through the Grand Canal into the Yangtze River. The Yangtze, itself in flood due to melting western China snows and dykes cut by fighting armies, backed up and overflowed Lake Poyang as a result.

ITEMS

ADMINISTRATOR CLINTON M. HESTER, of the Civil Aeronautics Authority, said in an address at St. Louis that airlines of the United States hung up an all-time year-round safety mark of 42,000,000 passenger miles per passenger fatality during the year ending June 30. While the nation's domestic lines were piling up 630,000,000 passenger miles, only 15 passengers lost their lives in four accidents. Mr. Hester's figures do not include American flag lines operating abroad. The best previous year-round record is about a third as good.

THE U. S. Antarctic Service, the newest government bureau, denied that its first project, the forthcoming Federal expedition to the Antarctic, is being made to claim South Polar region lands for the United States. It is stated by Roger Hawthorne, its press representative, that the expedition is being made for purposes of exploration and study. Land can be claimed only by formal proclamation of the State Department. The expedition will, however, make reports of its findings upon which the department may wish to act. The new Federal agency, of which Admiral Byrd is executive officer, has no definite plans beyond the expedition, although it is expected to be a semi-permanent government bureau. It may station men in the Antarctic for the next several years, if the expedition and the status of international claims for the region make it advisable.

A NEW highly purified diphtheria antitoxin, developed in England, is reported in the *Journal* of the American Medical Association. Animal experiments indicate that this refined antitoxin is more rapidly and completely absorbed from subcutaneous tissues than is the American antitoxin. The Wellcome Laboratories, England, have developed a method of large-scale purification of diphtheria antitoxin based on a fractional enzymic action. "The possibility that such enzyme purifications may be generally applicable to antiserums demands prompt investigation," according to an editorial appearing in the *Journal*.

BEES will fly in Russian greenhouses to pollinate flowers, just as they do out of doors, according to Tass, the Soviet telegraphic news agency. Experiments in the greenhouses of the Agricultural Exhibition of the Soviet Union showed that when bees were used for the pollination of hothouse cucumbers the crop was increased by forty per cent. over that obtained through the hand-pollination method.

THE first studies of remote interstellar "atmosphere" were announced at the meeting of the American Association for the Advancement of Science in Milwaukee by Dr. Otto Struve, director of Yerkes Observatory and of the new McDonald Observatory in Texas. It was at the latter institution that the studies were made, with a powerful new instrument known as the nebular spectrograph. Three-hour exposures were necessary, using specially sensitized photographic plates, to get "snapshots" of the faint glow of these gases of space, split up into the lines that tell of their chemical nature. Sixty-five such spectral photographs have been made. These gases, and indeed all kinds of drifting matter in the deeps between the stars, are of course very thinly spread out. Dr. Joel Stebbins, of Washburn Observatory, stated that light traveling through one mile of the earth's atmosphere loses more of its intensity than it would in passing through a quadrillion miles of interstellar space.

A STAR that periodically half hides itself behind a puff of smoke, like an automobile with a dirty, soot-choked muffler, was described by John A. O'Keefe, of the Yerkes Observatory, at the recent meeting of the American Association. This star, an inconspicuous member of the constellation Northern Crown, is a variable, that is, it undergoes periodic fluctuations in brightness. Five years ago another astronomer, E. Loreta, suggested that the star produced its own dimmings by puffing out clouds of obscuring matter. Mr. O'Keefe's studies indicate that these clouds are probably composed of carbon dust—in effect, smoke. The star apparently expels the carbon in the state of a vapor or gas, which speeds out to a distance of about four times the star's diameter and then condenses into solid particles.