SCIENCE NEWS

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EXPERIMENTAL BIOLOGY AND NUTRITION

VITAMIN E, called the fertility or anti-sterility vitamin because rats need it in order to bear young, is apparently not a diet need of farm animals. The studies showing this were reported by B. H. Thomas, C. Y. Cannon, S. H. McNutt and G. Underbjerg, of the Iowa State College, to the meetings of the American Institute of Nutrition, held recently in Baltimore in conjunction with the meetings of the Federation of American Societies for Experimental Biology. It was pointed out that the effect of Vitamin E deficient diets has not hitherto been determined for farm animals. Feed mixtures that lacked vitamin E and that kept rats from bearing young were given to goats, sheep and rabbits. Male and female goats were able to reproduce through several generations unhampered by the lack of the rat anti-sterility vitamin. The same occurred with rabbits. Young lambs fed on a diet lacking the anti-sterility vitamin are nevertheless showing unmistakable signs that they will shortly bear young. Studies of rats in the past has yielded much valuable information on diet and vitamins that has been applicable to farm animals and to man. Apparently the effects of special diets are not invariably the same in rat nutrition as in other animal nutrition.

NUTRITION workers are stressing more and more the importance of eating a plentiful supply of vitamins and are finding more and more evidence that a minimum amount is nearly as bad as no vitamins at all. The latter leads to serious disease, such as rickets, scurvy and beri-beri. A minimum amount of vitamins may prevent these, but this minimum supply is not enough to prevent minor degrees of ill health. Further evidence along this line was reported by Drs. A. U. Orten, C. G. Burn and A. H. Smith, of Yale University. Slightly subnormal growth, respiratory infections and a relatively high mortality occurred, they found, among rats that were in a chronic state of mild vitamin A deficiency. Tooth disorders occurred, tumors developed, and the normal harmless bacteria of the lining of the digestive tract were displaced by potentially disease-causing bacteria. Similar evidence for the need of an abundant supply of the scurvy-preventing vitamin C was presented by Drs. C. G. King, A. Sigal and R. R. Musulin, of the University of Pittsburgh. Guinea-pigs fed minimal amounts of vitamin C did not develop gross signs of scurvy, but their tissues were more sensitive to injury by the toxin of the diphtheria germ and other bacterial toxins than the tissues of the guinea-pigs that received ten times as much vitamin C.

A NEW method of learning more about the aging process with facts that already upset some common ideas about old age and length of life were reported by Drs. C. M. McCay, L. A. Maynard and G. Sperling, of Cornell University, at the meeting of the institute. Long life, it appears, goes with a slow rate of growth, rather than with rapid growth as has been commonly believed. "The life span is flexible," according to Dr. McCay, "and the extent to which it can be increased is an unknown value." The method consisted in retarding the growth of young white rats by cutting down their daily supply of calories. The normal life span of these animals is about 600 days. Some of the animals had their growth retarded for 1,000 days, by which time all the normal animals of their generation were dead. The retarded rats, however, tended to remain young in appearance in contrast to those that grew normally, the latter passing through the usual period of old age.

ARTIFICIAL radioactivity may replace the surgeon's knife and other methods of treating cancers of the thyroid gland and simple goiters due to overgrowth of the tissue of that gland. This future application of one of the latest developments of modern physics was reported by Drs. Saul Hertz and Arthur Roberts, of the Harvard Medical School at the meeting of the Federation of American Societies for Experimental Biology. The application of artificial radioactivity to the conquest of cancer is one of the aims of the atom-smashing experiments being conducted by physicists on a wide front. One of the difficulties with the use of radium and x-rays is that of getting the cancer-destroying rays into the cancerous tissue without harming healthy tissues. Radium needles, million-volt x-ray machines and elaborate ray-screening methods have been developed in the hope of overcoming this difficulty. Since some chemicals make their way to certain parts or tissues of the body and are deposited there, the physicists hoped that by giving these radioactivity, they would have a way of getting the cancer-destroying rays into the tissues where they are needed. The research reported is one of the first forecasts that this aim may be accomplished. Iodine is one of the substances that can be made radioactive by the cyclotron. When this radioactive iodine is injected into a vein, almost all of it makes its way into the thyroid gland. This was discovered by injections of radioactive iodine into the veins of rabbits and presumably would be true in the case of man as well. Radioactive iodine in the thyroid gland should act like radium needles or seeds, giving off beta rays that can destroy cancer and check overgrowth of other cells. When greater supplies of radioactive iodine can be made, it should be possible to use it in treating patients.

A CLUE as to why and how sulfanilamide, the new chemical remedy for a variety of infectious ailments, achieves its spectacular cures has been found by Drs. H. A. Davis, L. C. Harris, Jr., and H. C. Schmeisser, of the University of Tennessee. The chemical, it appears from their studies, activates the system of cells that destroy micro-organisms or other harmful cells. Included in this group are cells of the spleen, of the liver, of lymphoid tissue and the macrophages of the general tissues of the body. All

these cells have the function of protecting the body from harmful foreign material, including disease germs, by enveloping the invading enemy cells and destroying them. The exact action of sulfanilamide and the related Prontosil has been something of a mystery, since the chemicals have not shown much direct germ-destroying power themselves. Solutions of the chemicals put in a test-tube with disease germs did not kill the germs to any extent, even though the chemical when given as medicine cured the disease caused by the germs. The new clue to how sulfanilamide acts in the body to overcome germ infection was found by study of the tissues of white rats that had been given daily injections of the chemical over a period of three months.

THE scientific game of tag being played with heavy hydrogen (deuterium) and heavy nitrogen since the discovery of these new substances is being extended to follow the course through the body of protein from foods such as meat and eggs. Reports of how this can be done were given by Drs. R. Schoenheimer, G. L. Foster, D. Rittenberg, S. Ratner and A. S. Keston, of Columbia University. So far it has been found that the amino acids, which are the building stones of proteins, can take up these new heavy substances. Since this means that the deuterium- or nitrogen-tagged particles of amino acids can be easily located, investigators will probably be able to learn much more about what happens to proteins in the body, from the time they are eaten until the various protein constituents have gone through the processes of digestion and conversion into new body tissue.

ALMOST any school child can tell you that insulin is the life-saving and life-maintaining remedy for diabetes and that it helps the body use the sugar in food. No one, however, can tell you exactly how insulin accomplishes this effect. The newest suggestion comes from Drs. Samuel Soskin and R. Levine, of the Michael Reese Hospital and the University of Chicago. They find that insulin acts something like a ferment in some intermediate step of the chemical processes that sugar and starches undergo in the body before they are burned for immediate energy or stored. Its action, they state, "resembles that of an activator or coenzyme." Insulin, they found, has only a relative effect on the rate at which sugar and starches are used by the body. The rate depends on the amount of sugar in the blood, whether insulin is present or not. Insulin increases the rate of sugar utilization and storage (as glycogen), but these two processes of utilization and storage go on, although more slowly, in the absence of insulin. Insulin is needed, it appears, to keep the rate from being so slow as to make the individual sick.

CATARACTS of the eyes of old people and of diabetics seem to be linked with the way the body uses food substances. Research bringing sugar and proteins into the picture was reported by Drs. Helen S. Mitchell and Gladys M. Cook, of the Massachusetts State College. Cataract occurs in rats within two weeks if they are fed a diet in which one fourth of the ration is galactose, Dr. Mitchell found in earlier studies. Galactose is a sugar not found as such in nature, but formed in the body from milk sugar. Proteins from egg albumen, lactalbumen, beef muscle, fish muscle and soy bean meal can prevent the development of the galactose-caused cataract, Dr. Mitchell and her associate have now found. Egg albumen was most effective and the amount necessary to prevent completely cataract formation was 45 per cent.—nearly half —of the diet. Practical application of the research, such as definite dietary regulations for cataract prevention, has by no means been reached yet, but may be hoped for, it appears, after further study along these lines.

FUTURE victims of poisonous over-doses of certain modern sleeping potions may be rescued by having their blood literally washed out with a salt solution. Discovery of this new type of antidote for barbiturate poisoning was reported by Drs. R. A. Cutting and T. Koppanyi, of Georgetown University Medical School. The method was demonstrated by moving pictures. The discovery was made in the course of an investigation of what happens to water and chlorides when large amounts of salt and sugar solutions are injected into the veins. This form of treatment is commonly used to nourish a patient who can not eat or can not retain food. These studies were made on animals that had been anesthetized by barbiturates such as sodium phenobarbital. Recovery from the anesthetic occurred in one third to one half the usual time when the animals had been given the salt or sugar solutions. Following this accidental discovery, the possibilities of the blood-washing-out method as an antidote for barbiturate poisoning were investigated. Prolonged massive infusions of the salt solution brought about recovery within eighteen hours in animals that had taken twice and three times the fatal dose of the sleeping potions. In order to achieve this antidotal effect, much more of the solution is given than the amounts generally used now when salt or sugar solution is given for other conditions. To wash out the barbiturate, an amount of fluid equal to from one fourth to three fourths of the body weight is given, according to the severity of the condition. When used for other purposes, from one pint to one quart of sugar or salt solution is given by vein. The theoretical importance of the study, Dr. Koppanyi said, is probably greater than the practical.—JANE STAFFORD.

THE SHAPE OF RUBBER MOLECULES

THE springiness of rubber arises because its molecules have curved shapes roughly resembling the old-fashioned springs on a wagon. After rubber molecules are stretched out straight they will spring back elastically as do the curved wagon strings. Such, in summary, is the new theory of the structure of the important, but baffling, behavior of rubber, as indicated in the technical report presented at the meeting of the rubber division of the American Chemical Society, by Dr. Eugene Guth, of the University of Notre Dame. He pointed out that "The most important and perhaps universally known property of rubber is its high elasticity, which is reversible. Another interesting property is that rubber, when stretched, becomes hot. This phenomenon is easily observable by

stretching a small band quickly and applying it to the cheek. In my theory the high extensibility of rubber is explained by the flexibility of the long rod-like rubber molecules. (A rubber molecule may be as long as the 300,000th part of an inch, whereas an ordinary molecule is only about 1/100,000,000th of an inch long. Along this chain are many smaller molecules in constant rotational motion. This motion is caused by heat and is known as the Brownian movement. In unstretched rubber the long molecules are in a curved form because such a curved form is the most probable form of a flexible chain and nature prefers most probable forms over all others. For example, in throwing a flexible string into the air it falls, in most cases, in a curved form and almost never in a straight form. Therefore one can reasonably assume that the most probable form of rubber's flexible chain molecule is also a curve. To stretch such a chain requires work and this energy is transformed into heat. This explains the heat generated by a stretched rubber band. The retractive force is due to the tendency of nature to prefer the most probable form, that is the curved chain. This same mechanism for the retraction of stretched rubber also explains why stretched rubber contracts, when heated. The reason is that the heat movement is stronger at higher temperatures and therefore causes an even stronger tendency to the curved form."

Dr. Guth stated that "In many ways the elasticity of rubber is analogous to that of a gas. Pressure of a gas compressed in a vessel is caused mainly by the heat movement of the gas molecules which have a tendency to expand the gas. The gas-like elasticity of rubber in a tire casing and inner tube is responsible for the harmonious relation of the rubber and the air. There are more than 100,000,000,000 chains of flexible molecules in a cubic inch of rubber. These chains are connected with bridge-like structures so that ultimately we have an elastic network of molecules. The theory is a statistical one: first, because a chain contains many smaller molecules and, second, because rubber is built up of numerous long molecules. It is well known that large numbers can only be dealt with by means of statistical methods. The theory should lead to a better understanding of the properties of rubber which, in turn, will provide a guide in the development of new natural and synthetic rubber products and in the fashioning of rubber in a way to render it more efficient for the use it is intended."

THE PRODUCTION OF MAGNESIUM METAL FROM SEA WATER

A NEW process for the production of magnesium, feathery-like metal whose successful and cheap extraction would presage an industrial revolution, has been patented in Washington by a German inventor. Differing from previous extraction processes in that it starts with magnesium chloride, a constituent of sea water, instead of one of the common magnesite ores, the process uses hydrogen to combine with the chlorine of the magnesium chloride. Metallic magnesium is the result. The patent has been awarded to Karl Ebner, who comes from a small town near Frankfort-on-the-Main, Germany. He has assigned the patent to the American Lurgi Corporation, of New York City. The relatively low furnace temperature of 1,200 to 1,500 degrees Centigrade is all that is necessary to make the process operate, Mr. Ebner asserts. He contrasts that with the high temperatures required in other processes. The production of magnesium has been the goal of research workers all over the world for, with its extremely low weight and other desirable qualities, it can be used in the manufacture of alloys even superior to aluminum alloys. Of further interest is the fact that bauxite, the ore from which aluminum is extracted by present processes, is not counted a common ore. "The magnesium is recovered by condensation from the gaseous products of the reaction leaving a mixture of hydrogen and hydrochloric acid, which hydrogen, after separation of the hydrochloric acid, may be returned to the process."

ITEMS

RISING more than a million miles from the surface of the sun, the highest solar prominence ever recorded was observed at the Mount Wilson Observatory on March 20, the Carnegie Institution of Washington announced. Reports of measurements made by Dr. Edison Pettit on photographs of the prominence indicate that a gigantic mass of erupting calcium and hydrogen gas rose nearly vertically from the sun at speeds first of 40 miles per second, then 80 miles per second, and when last noted, 124 miles per second. Photographs of this eruption were taken by J. O. Hickox. When last observed the solar prominence had risen to 970,000 miles above the surface of the sun. Clouds interfered with further observations. The greatest height hitherto observed for a prominence is 621,000 miles, recorded at the McMath-Hulbert Observatory at Lake Angelus, Mich., on September 17, 1937.

FIFTEEN gun barrels, firing .30 caliber bullets through an oil well casing hundreds of feet below the surface, promises to increase oil production in many fields where several rock strata bear oil. During drilling, each oil stratum encountered is recorded on the well log. Later, when the well is cased to the bottom, the cannon is lowered to the level of each oil stratum, and fired, punching holes in the casing to let in the oil from that bed. Controlled electrically from the well head, this cannon may be lowered as much as two miles below the surface, and fired when it is opposite any desired rock bed. Accurate revolution counters tell the operators exactly how far below the surface the cannon is at any time. Using this method, many oil sands can be tapped by one well, saving the almost prohibitive cost of drilling one well for each oil horizon, or waiting until one horizon has stopped producing, then pulling part of the casing, until the next higher one is exposed.

AN ingenious suction method for simultaneously slowing the landing speed of a high-speed plane and for increasing the lift of its wings is described in a patent granted to Major Alexander P. de Seversky, of New York, designer of high performance military aircraft. Ports placed near the leading edge of the wing connect with suction ports on the under side of the wing toward the rear. Suction thus created simultaneously slows the ship and cuts turbulence on the upper side of the wing, thus increasing lift.