SCIENCE NEWS

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PAPERS READ BEFORE THE INTERNATIONAL CONGRESS OF PHYSIOLOGY

ERGOSTEROL, the stuff that gives certain fats and oils their power to prevent rickets when irradiated with ultra-violet light, has been split chemically into two related compounds. One of them retains the old name ergosterol, and the other is called isoergosterol. By highly refined chemical treatment the latter compound can be obtained in an extremely pure state. A mixture of ergosterol and isoergosterol exposed to ultra-violet light behaves in very much the same manner as natural ergosterol, so far as the spectroscope discloses; yet this synthetic mixture failed to prevent rickets in a group of experimental animals, according to experiments performed by Doctors C. E. Bills, E. M. Honeywell, W. M. Cox, Jr., and A. M. Wirick, of Evansville, Indiana. The experimenters conclude that a spectroscopic study of ergosterol can not yet be relied upon to give an index to the curative power of any given sample, but that experiments with animals must continue to be made. They also found that the length of time needed to give ergosterol a certain curative strength varies according to the substance in which it is dissolved. Moreover, the solvent need not be transparent; arachis oil, the one used commercially, is not transparent yet permits a high degree of activation. A further discovery is that activated ergosterol is remarkably non-poisonous. Quantities from 4,000 to 40,000 times as large as the therapeutic dose have been fed to rats before physiological disturbance resulted.

THE soy sauce of China aids digestion, according to Dr. A. A. Horvath, of Princeton University. It contains a number of ferments and other substances stimulating to the digestion of starches and protein and the adsorption of food generally. The soy bean, which is a universal article of diet in China and other countries of the Orient, is the only seed which contains both water-soluble and fat-soluble vitamins. It has the additional advantage of containing a rather large proportion of the vitamin that promotes fertility.

THE brain of an animal suffering from a lack of vitamins resists this particular type of starvation more successfully than the rest of the body. This is indicated by experiments reported by Dr. J. Mosonyi, of Budapest. Dr. Mosonyi selected three groups of white rats as the subjects of his experiment. He gave one group an ordinary diet, with neither excess nor lack of vitamins. A second group got a ration as near to zero in vitamin content as can be devised, while the third received a considerable excess in vitamins. At the end of the experimental period the brains were weighed. There was no notable difference in weight. This is taken to indicate that an excess of vitamins does not make for any notable increase in total brain size, and that in animals whose bodies are rendered subnormal by vitamin starvation the brains are still able to grow to normal size. Although the excess-vitamin diet did not benefit the rats' brains quantitatively, it appears to have had some effect on their chemical make-up, for the nitrogen content of the excess-vitamin rats' brains was noticeably higher than that of the brains of their brothers kept on a "normal" diet.

DR. K. H. CONARD, K. M. Key and B. G. E. Morgan, of London, have tested the effects of a vitamin-free diet, supplemented by measured amounts of vitamin-containing material, on young rats. They found that on one combination, containing an adequate concentration of the necessary growth-promoting vitamin A, their animals nevertheless failed to show normal growth. But when the diet was altered to include a commercial protein material known to physiologists as "light-white casein," growth was as it should be. The new growth factor is still unidentified, but it has been possible to extract it from the "light-white casein" by suitable chemical treatment; and it has also been proved present in lettuce, wheat embryo, milk, grass and a number of other plant and animal foods.

A POSSIBLE connection between anemia and one type of "stomach trouble" was pointed out by Dr. W. N. Boldyreff, of Battle Creek, Michigan. It is one of the best known of physiological facts that the juices of the stomach are highly acid, while those of the small intestine are less acid and finally alkaline. It is also known that red blood-cells are destroyed by acid; this fact was established by experiments in test-tubes, but had never been confirmed by observations on living animals. The possible connection suggested itself to Dr. Boldyreff, and he induced his associate Ephraim Boldyreff to make tests in his laboratory. Acids were introduced into various parts of the digestive tracts of several dogs over a period of some weeks. In all cases it was apparent that the acids were being absorbed through the intestines into the blood-stream, and the count of red blood-cells fell off markedly, giving rise to a condition resembling pernicious anemia. When the acid was no longer administered, the blood of the dogs returned to normal after a few weeks.

THE more butter, bacon and other forms of fat there are in your diet, the less need of vitamin B, the dietary factor that wards off beriberi and similar deficiency diseases, according to a report made by Professor Herbert M. Evans and Dr. Samuel Lepkovsky, of the University of California. Experimental animals on a diet of table sugar and casein, the essential protein of cheese, need considerable quantities of vitamin B. If 10 per cent. of fat is added the vitamin B requirement is lowered, and if the percentage of fat is raised to an even 50, the animals will live for six months without any sign of beriberi, even when deprived of the vitamin.

DR. REUBEN L. HILL, nutrition expert of Logan, Utah, has developed a test at the Utah State Experiment Sta-

tion by which the toughness of the curd formed by the normal coagulation of milk can be measured. There is reason to believe that this quality of toughness in milk curds is a more important factor in choosing baby's milk than the fat content, previously the item most stressed in picking out suitable infant's food. Not more than ten per cent. of cows, according to the tests made by the investigator, give milk with curds soft enough for delicate babies to digest. By the use of the new curd test it is possible to find cow's milk that closely approximates mother's milk, an invaluable asset for young and sickly babies that have to be fed by a bottle. Such milk, he added, when fed to infants, requires little if any modification or dilution, a condition that does away with the troublesome mixing of the complicated formula on which many modern babies get their start in life.

THE question as to whether a white man can live on meat alone and remain healthy has again been given a critical scientific test and decided in the affirmative, by Dr. E. F. DuBois, W. S. McClellan, H. J. Spencer and E. A. Falk, of the Cornell University Medical College. Two Arctic explorers were kept under observation for the period of a year, during which time they ate nothing but meats of a number of varieties, and drank nothing but meat broths, black tea and water. During the first month of the experiment the men lost five or ten pounds apiece, but after that their weight remained constant. Increased blood-pressure, the traditional consequence of a high meat diet, did not develop; neither did the kidneys show any evidence of damage. There were no signs of lack of vitamins or any other injurious results. The men remained physically and mentally normal throughout.

INSULIN is given to diabetic patients for the purpose of reducing the dangerous concentration of sugar in the blood; yet the first effect of an insulin injection is to increase the amount rather than decrease it. Professor Max Buerger, of the University of Kiel, Germany, explained that the increase of sugar is not due to the piling up of glucose, the most abundant of the carbohydrates in the blood, but comes from the release of glycogen, the so-called "animal sugar," which is stored in the liver. Professor Buerger demonstrated both by clinical observation and by various laboratory experiments that one of the initial effects of the injection of insulin is the release of a part of this stored carbohydrate reserve.

SYNTHETIC "milk" made out of vegetables was the means used by Dr. Ernst Tso, of Peking, to give six Chinese babies a start in life. The great scarcity of cow's milk in Oriental countries led Dr. Tso to search for a substitute. A milky liquid made of finely ground soy beans and water furnished the base for the vegetable milk. Fifty per cent. of the total calories of the diet are from this "milk." Additional foods given to the babies were cane-sugar, corn or rice starch, cod-liver oil, calcium lactate, sodium chloride and cabbage water. The last item contributed the scurvy-preventing vitamin C, present in orange juice. Six infants, one from birth and the others a few weeks old, were successfully fed six to ten months on this diet. Their weight curves follow closely the average weight curve of healthy nursing infants in the United States as well as the average weights of several hundred Chinese breast-fed infants who visited the college dispensary for minor complaints. Their mental and muscular development and nutritional status in general appear to be as good as in normal infants reared on milk diets.

WHEN we develop a fever, is the immediate cause of our discomfort to be sought in the activity of the adrenal glands? Dr. Ulf von Euler, of Stockholm, believes that these small but highly important organs, situated just above the kidneys, are the originators of fever as well as of many of the more normal functions of the body. The symptoms of fever can be produced by injecting adrenalin into the blood, and human and animal subjects with overactive adrenal glands are feverish. Tests on the stimulation of frog's and rabbit's muscle with the blood of fever patients and with adrenalin show a close parallelism in effect. Finally, it is impossible to cause fever in an animal which has lost its adrenal glands.

DR. CHI CHE WANG, Bernice Huddlestun and Irving Graef, of the University of Chicago, made two series of experiments on eight children between the ages of four and twelve years. In the first series the children received half the amount of protein or meat element in their diet that they had in the second. Metabolic studies showed that without exception the rate of growth was more than doubled during the high protein period, the average gain being 82 grams per child per day as against 29 grams for the low protein diet. These results were substantiated by similar results obtained from a study made on rats.

DR. SANFORD M. ROSENTHAL, of Washington, D. C., reports that as a result of studies upon dogs and rabbits, it was found that the rate of digestion of raw starch, as measured by the increase in blood-sugar, is markedly inhibited by acids. One cubic centimeter of 3.6 per cent. hydrochloric acid will almost completely prevent the intestinal digestion of raw starch for from one to three hours. This amount of acid does not affect the rise in blood-sugar following glucose feeding. In human beings similar findings were obtained with cooked starches. Cooked starches in man caused a rise in blood-sugar as marked as though glucose were given, but in nine normal adults 50 to 75 grams of raw starch caused no change in blood-sugar. This principle was applied to diabetics and the starch was fed as such, or as raw carrots, turnips or nuts. The increase in blood-sugar was much less than that ordinarily detected after a starch meal.

THE physiological reason for the physical and mental misery of a morphine addict when he is suddenly deprived of the drug has been sought by Doctors H. G. Barbour, B E. Russell, S. H. Flowers, E. S. Dunham and L. G Hunter, of Louisville. An animal to which enough mor

phine has been administered to make its condition comparable to that of a human addict will have the water distribution in its tissues rather notably disturbed. There is less than the normal amount of water in the interior organs, such as the liver, kidneys and brain. Conversely, there is an increase in the water content in those organs through which contact is maintained with the outside world, such as the skin, stomach and intestine. The blood also suffers an increase in water content. But when the accustomed daily doses of morphine were suddenly stopped, a remarkable redistribution of water in the body occurred. The blood, spleen and surface tissues all showed a loss, while the previously water-shy organs became edematous—that is, were gorged with water to an abnormal extent. The animals thus deprived developed trembling fits, a loss of calcium in the blood, disturbed temperature regulation and other physiological disturbances. The experimenters regard the edema of the brain —which might be roughly termed a condition of "water on the brain"—as especially significant, in that it might explain the psychological symptoms seen in morphine addicts who have been subjected to too sudden a "cure."

DR. WALTER R. MILES, of Stanford University, in a study of the effect of different drugs on the whole animal body in contrast with many recent biological experiments with drugs on separate muscles and organs, trained some laboratory rats to run through a complicated maze to reach their food. After about a month, when he thought they were perfect, he tried the effect of injecting small quantities of different drugs just before his rats were ready for a meal. Alcohol made locomotion difficult, but the rats still knew how to find their nourishment. John Barleycorn had no effect, at least in laboratory doses, on memory; but the rats couldn't walk straight. Another drug, hyoscine, a rather powerful depressant sometimes used for insomnia, produced just the opposite effect. They could walk perfectly but could not remember where to go and acted as if they were exploring the maze for the first time. No drug yet tried has been found to produce a performance which is an improvement on the normal.

THE more morphine you take the first time, the less effect a second dose is likely to have. This, in summary, is the result of the researches of Dr. Carl F. Schmidt and Dr. A. E. Livingston, of the University of Pennsylvania. The idea of building up resistance to the effects of poisons by taking small but gradually increasing doses is erroneous. Working with dogs, they found that a tolerance to morphine developed much more slowly when minute doses were given than when large quantities were administered. And when very large doses were given at the outset the resistance to subsequent doses was still more accentuated.

DR. DAVID I. MACHT, of the Johns Hopkins University, has experimented on the use of living plants as laboratories in which various animal poisons may be differentiated by their effects on the plants. Drugs of vegetable origin are frequently more poisonous to animals than to plants and *vice versa*. A toxin discovered by Dr. Macht in the blood of pernicious anemia patients is not present in secondary anemia and similar blood disorders. The effect of this poison on plant seedlings has furnished a convenient diagnostic test for distinguishing pernicious anemia from related blood disturbances at certain stages of its development so that curative treatment can be started earlier than would otherwise be possible. A toxin just discovered in the blood of lepers serves to differenentiate leprosy from blood sera of tuberculosis and syphilis and led to an important discovery in regard to its therapy. Further observations to be reported are on the blood of malaria, eclampsia sera, and on the extreme toxicity of certain animal poisons—of the toad, bee, ant, and, particularly, snake venoms.

MERCURY injected into the system greatly increases the sensitivity of the autonomic nervous system, the webwork of nerves that controls a large part of the functions of the internal organs. This clue to the action of one of the most dangerous classes of poisonous compounds is supplied by Dr. William Salant, of the Cold Spring Harbor Biological Station. Dr. Salant administered doses of mercury salts to anesthetized cats, and tested the nerve action with a slight electric current. The sensitivity of the nerves increased progressively with additional doses up to a certain maximum, and then fell off aagin.

THE chronic and uncontrollable rage that is characteristic of some insane patients may be due to a direct mechanical injury to a certain tract in the base of the brain. Experiments on cats pointing in this direction have been made by J. F. Fulton and F. D. Ingraham, of Oxford University. By surgical procedure under anesthesia, lesions were caused in the brain area under investigation. The cats recovered from the operation without difficulty, but they were changed cats. Gentle stroking, which before would send them into pleased purring, now evoked only signs of the most violent anger: spitting, scratching and biting. Since the structure of all mammalian brains is basically alike, the experimenters are of the opinion that their results will be of use when applied to the clinical difficulties of human beings.

THE old popular notion that blood gets "thin" when it is heated has received confirmation in the physicist's laboratory, although the heat required to make it so is a great deal more than the ordinary mortal could stand. P. Lecompte du Noüy, of Paris, has made very exact measurements of the viscosity, or "thickness" of the blood-fluid at different temperatures. Blood-serum heated progressively from a temperature of about 77 degrees Fahrenheit to one of 158 degrees reaches its lowest point of viscosity, or in every-day English becomes "thinnest," at 133 degrees, or a little more than halfway from the freezing-point to the boiling-point of water. There seems to be a physico-chemical basis for this phenomenon, for the power of the serum to change the angle of polarized light remains unaltered by heatings below that critical temperature, and then suddenly and sharply displays itself.