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A Weekly Summary of Current Science

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NEW ARTIFICIAL FAT RELIEVES DIABETES

The invention of a new form of artificial fat that can be digested by diabetic patients was announced recently for the first time by Dr. Max Kahn at a meeting of the medical staff of the Beth Israel Hospital, New York.

At that hospital feeding with the new fat has given relief in thirty cases of acidosis due to diabetes. One man was carried into the hospital for the purpose of having his leg amputated since it was attacked with gangrene. But after the artificial fat had been added to his diet the acidosis was stopped, the sores healed up and four weeks later the man walked out of the hospital on his own two legs.

Dr. Kahn, who has charge of biological chemistry in the College of Physicians and Surgeons of Columbia University and of diseases of metabolism at the Beth Israel Hospital, has been working for a year and a half to make a fat that would not break down into acid products as do natural fats in cases of diabetes. From recent researches in the chemistry of nutrition he came to the conclusion that a fat with an odd number of carbon atoms would serve the purpose. But such a fat could not be found in nature so it had to be made to order.

The investigations to simplify the method of manufacture and the carrying through of the design of the plant apparatus and installation of equipment have been conducted by Prof. Ralph H. McKee, professor of chemical engineering, Columbia University, in his private laboratory at Columbia University and required the services of two assistants for six months. It was through this investigation that the process has been simplified so that instead of material costing $300 or even $100 a pound, it can now be made in a factory and sold for $8 a pound, and probably this cost will decrease still more once production is well under way. A pound will last a patient from a week to three weeks.

A manufacturing plant has been built in Long Island City and recently 200 pounds of the new product was turned out in a week. It has been named "Intarvin", meaning "intermediate fat" because the molecule contains 17 carbon atoms and is therefore intermediate in composition between the ordinary fats carrying 16 and 18 carbon atoms.

Intarvin is a white crumby substance, tasting something like tallow but is not so soft. It is either eaten straight or mixed with a little tasteless mineral oil or made up into a mayonnaise or shaken up with buttermilk or baked in gluten bread. The diabetic patients find the new fat quite eatable and it satisfies the craving for fat common in the disease.

It is a curious coincidence that within the year 1922 two remedies, Insulin and Intarvin, have been invented for diabetes, which, though one of the most common and serious of diseases, has hitherto baffled medical skill. Insulin, which was discovered by Dr. F. G. Banting of the Toronto University, is an extract of animal pancreas which when injected into the veins restores temporarily the power to assimilate sugar. Intarvin is a synthetic fat which is assimilable by diabetics in whom natural fats produce an excess of acid. Neither Insulin nor Intarvin is regarded at present as a permanent cure for diabetes but both restore temporarily the digestive powers, the former for sugars, the latter for fats, but each increases somewhat the ability to handle the other type of food.

After preliminary experiments on animals the new treatment was tried first on a diabetic woman of 47 who had been in the hospital a year awaiting an operation for tumor, but she was so run down that it was not thought safe to operate. She was put on a fat-free diet to free her system from the injurious acids but these still continued to be formed from the body fats. When a few ounces of Intarvin was added to the diet the excess of acids and sugar disappeared within forty-eight hours. She has since been kept free from acidosis for 14 months by use of the Intarvin fat.

Acidosis may be caused by starvation as well as by diabetes so the next experiment was tried on a normal man. A young Swedish prize-fighter was induced by a pecuniary consideration to go without food for 74 hours. It was then found that he was excreting the acid products of unassimilated fat. But when he was given four ounces of the artificial fat mixed with the same amount of seven-times boiled string beans his digestion next day was normal. But when he took butter with the beans he was not able to digest it. Of the artificial fat 95 per cent was digested.

Here is a case of the use of "high brow" science. The discovery of this new treatment for diabetes comes from the study of the structure of the fat molecule and how it breaks down in the body. The molecule of a fat consists essentially of a long chain of carbon atoms connected together. The number of carbons varies with the fat but is always an even number in natural fats. In stearic acid, for instance, which is the principal constituent of beef tallow there are 18 carbon atoms in the chain. All of the carbons carry hydrogen atoms attached, except the carbon atom at one end of the chain which carries oxygen.

When a fat is burned up in the body to provide heat and energy, it is the oxygen end of the chain that is first attacked. Two carbons at a time are broken off until the whole molecule is reduced to carbon dioxide and water. Starches and sugars are normally burned, that is, oxidized, to the same harmless products.

A diabetic patient cannot digest sugars and starches and so is forced to draw upon fats for his nutriment. But he cannot completely break down the fat molecule. Instead of reducing it to its lowest forms, carbon dioxide and water, he can only cut down the chains to four carbons, which leaves in the body a pernicious compound known as aceto-acetic acid. This condition is known as acidosis. The presence of such acids prevents the blood from carrying off the waste carbon dioxide to the lungs for elimination and the patient finally sinks into a state of coma, followed by death.

Since the carbon chain breaks down two at a time it would follow that a fat

molecule containing an odd number of carbons could not break down so as to leave the chain of four carbons that form the harmful acids.

This is the theory on which Dr. Kahn and Dr. McKee have worked. Starting with beef tallow they get out the stearic acid which contains 18 carbon atoms in its molecule. Then by oxidation they cut off one carbon atom from the chain leaving 17, a compound known to chemists as margaric acid. This is then recombined with glycerine forming a neutral fat, which, as the hospital tests have shown, can be digested by diabetics.

Neither margaric acid nor any fatty acid with a long chain of an odd number of carbon atoms occurs in any natural fat or oil. Some such compounds have been made in the laboratory but only a gram or so has been produced as a chemical curiosity. This is the first time that a purely artificial food has been manufactured in hundred pound lots for use as a regular article of diet.

INSULIN, FOUND IN ALL ANIMAL TISSUES, AIDS DISEASES OTHER THAN DIABETES

The Journal of the American Medical Association for August 4 contains two important reports on advances made in the use of insulin, the diabetes remedy discovered at Toronto.

That insulin can be obtained from any tissue in the animal body is the newest discovery of the Toronto group and is reported in a paper by Drs. C. H. Best and D. A. Scott of the University of Toronto.

Insulin has been found of value in diseases other than diabetes, Dr. William Thalhimer of Milwaukee announces in an article.

Drs. Best and Scott tell they were able to get insulin from the liver, spleen and muscle tissue and from the submaxillary, thymus and thyroid glands. The same substance has been found in the circulating blood and in the excreted urine. It was also found that a greater amount of the substance was given off by pregnant women in their urine than by normal men. This fact may lead the way to further observations in the care of certain abnormal conditions in prospective mothers.

Dr. Thalhimer explains how insulin may be of value in treating certain forms of illness that follow operations, anesthesia, pregnancy, and disturbances of the mechanism of the human body that absorbs food. There is a large group of conditions in which symptoms collectively known as acidosis occur. The patients are nauseated, they vomit, and they may die of the intoxication. It has been for some time known that these conditions were related to a disturbance of the ability of the body to take care of sugar, and it has been the custom to treat the condition by injecting glucose solution to make up the deficiency. In many instances, however, this method has not been successful. Dr. Thalhimer injected glucose solution into two such patients and when the symptoms did not improve he injected glucose solution and gave at the same time a dose of insulin, in the belief that the insulin would encourage the taking up of the sugar solution. This proved to be the case and the symptoms promptly improved. Medical men believe that the observations seem to open up a large field of experimentation into the causes of acidosis and into methods of relief of such conditions.

ORIGIN OF ANTHRACITE NOW SHOWN BY MICROSCOPE

Invention of a method for the determination of the structure of anthracite coal and incidentally for the positive identification of coal seams has been announced by H. G. Turner, assistant professor of geology at Lehigh University. The method makes certain for the first time the vegetable origin of anthracite coal.

Although geologists have been fairly sure that hard coal was formed like soft coal from plants which grew in remote geologic ages there was no direct conformation of their surmises until Prof. Turner announced his invention. Soft coal had been sliced into minute sections thin enough for light to pass through and had been subjected to a microscopic examination which showed definitely its vegetable origin but this method had been impossible for use with anthracite because no matter how thin it was cut it was still absolutely opaque.

Prof. Turner found that by first giving the surface of the coal a fine polish, then drying it thoroughly at a temperature somewhat less than red heat, and then heating the polished surface in the flame of the blowpipe or Bunsen burner to a dull red heat for a few minutes it was possible to see through a microscope the structural details of the coal. The final heating burned away some of the coal, leaving a sort of skeletonized surface or etching. This was then observed through the microscope by a beam of light reflected from it, showing with great fidelity the structural details.

Photographs have been taken which show absolutely the vegetable origin of the coal. Some pieces resemble fragments of modern woods such as the maple or pine, while others show a pithy structure like bamboo or weeds but unlike most of the trees of the present day. Spores of the great tree ferns of the far away days when the coal beds were being formed have also been found.

An interesting part of the discovery lies in the fact that in most of the samples there has been no deformation of the cell structure such as would be caused by great pressure. Geologists have thought that hard coal was formed by the heating of soft coal under pressure. Prof. Turner's results do not confirm this theory in so far as pressure is concerned. There is evidence that the coal has been heated, but none that it has been compressed.

A practical application of Prof. Turner's invention is expected to be in the new means for identification of different coal beds. Operators lease particular beds for mining and it sometimes happens that through twisting, breaking, or pushing up or down of strata, there is much doubt and confusion as to just which bed belongs to which company. Prof. Turner has found that the coal from different beds has marked differences of structure, having been formed from plants which while of the same geologic epoch grew perhaps at intervals of thousands of years, during which the earlier beds were covered with deposits of rock. In case of doubt as to ownership all that will now be necessary will be to subject the coal to microscopic examination.

READING REFERENCE - The Outline of Science, Edited by J. Arthur Thomson. Chapter IX, The Wonders of Microscopy. New York, G. P. Putnam Sons, 1922.

Dr. Edwin E. Slosson

C H A T S O N S C I E N C E

CATCHING UP WITH CHINA

We Americans may be a little slow in catching on to old ideas, but once we do get them we push them for all they are worth.

Take the soy bean, for instance. That was first introduced to America in 1804, but it was a hundred years before we could be induced to take it seriously. We started in therefore five thousand years behind China and Japan in the cultivation and use of the soy bean, for there it ranks next to rice. But in the last ten years it has rapidly come to the front as one of our major crops and it is likely in the next ten years to go ahead of oats in acreage in some of our states. Wherever corn or cotton flourishes the soy bean can be grown, and few crops have so many strings to their bow. The latest bulletin of the Department of Agriculture lists fifty different uses for soy products, and doubtless Yankee ingenuity can and will add more when we get our minds to working on it.

Even the Japanese have not exhausted their ingenuity in this field, long as they have been at it. A Japanese scientist named Sato has invented a new plastic which he has called, according to American precedent, "Satolite". It is made by precipitating the protein with sulphite, hardening it with formaldehyde, and molding it under heat and pressure into combs, buttons and whatever we make from hard rubber or celluloid or the casein of milk.

The soy bean is rich in protein and fat, and lacking in starch; more like animal than vegetable food in that. You can make a milk out of it by simply soaking the dried beans till soft, then crushing fine in a meat grinder, boiling in three times the volume of water for half an hour and straining through a cloth. If you do not like the flavor you can add vanillin or something else. This vegetable milk sometimes agrees with children when cow's milk does not. It can also be used for cakes and custards.

The soy milk may be made into curds and cheeses of various sorts which form a large part of the diet of orientals, but for which we have not yet acquired a taste.

Soy meal has come into common use in America, not only as a cattle food, but also for bread and pastry mixed with three parts wheat flour.

Soy sauce has long been familiar but quite unknown to us. We did not recognize it under its aristocratic English name and its added flavors. But when the high cost of living drove us to the chop sueys we became acquainted with the cruet of brown salty sauce called "shoyu", and we found, as the Chinese had found thousands of years before, that a sprinkling of it would make tasty a large lot of rice and serve as substitute for meat, both in taste and nutriment. Soy sauce is of several sorts. If you want it strong take the Korean. If you want it sweet take the Japanese. It is made by fermentation and the flavor depends upon the way it is brewed and the length of time it is left to ripen. To suit the palate of a Korean connoisseur the jars must be exposed to the sunshine by day and covered by

night for a period of thirty years. We Americans, when we get to making it, will undoubtedly speed up the process.

So far the oil is the most in demand of the soy products. The beans contain from 18 to 20 per cent. of a fine pallatable oil, which we have imported at the rate of a hundred thousand tons in a year, but which we are now growing for ourselves. It can take the place in part of cottonseed oil in vegetable substitutes for lard and butter, and of linseed oil in paints. Formerly the oil went mostly to Germany and England but the war made a shift in the currents of Pacific trade and we learned to appreciate its value. But we have a lot to learn yet before we catch up with the orientals in the utilization of this multifarious bean.

READING REFERENCE - Bailey, E. H. S., and Bailey, Herbert S. Food Products from Afar. New York, the Century Company, 1922.

DISCOVER SECOND CLOSEST VISIBLE STAR IN UNIVERSE

A star that is nearer to the sun than any other star visible to the naked eye, except Alpha Centauri, has been discovered at the Harvard College Observatory by examination of its spectrum recorded on photographic plates, according to an announcement by Dr. Harlow Shapley, director.

Its name is Epsilon Indi and it is only some 42,000,000,000,000 miles away from the solar system. It takes light only about seven years to travel from this newly recognized neighbor to the earth. Incidentally, Epsilon is classified by the Harvard astronomers as a decided dwarf so far as stars go.

Alpha Centauri is 4.3 light years away, while brilliant Sirius, now displaced as second nearest star, is 8.8 years away when light traveling 186,000 miles a second is taken as a yard-stick.

READING REFERENCE- Lewis, Isabel M. Astronomy for Young Folks. New York, Duffield and Company, 1922. Hale, George E. The New Heavens, New York. Scribner and Sons, 1922.

AMERICANS SEE APE-MAN BONES LONG LOCKED FROM WORLD

Pithecanthropus erectus, the Java ape-man, the world's most famous prehistoric creature, has come out of retirement. After thirty years denial to his fellow scientists from all nations, Dr. Eugene Dubois, discoverer of this "missing-link" in human evolution, has just accorded to the American School for Prehistoric Studies in Europe, under the direction of Dr. Ales Hrdlicka, of the U. S. Smithsonian Institution, the courtesy of the first opportunity to make a thorough examination of the original fossils of this half million year old being. On their return to Amsterdam, Holland, after an inspection of the original bones at Dr. Dubois' home at Haarlam, the American scientists seemed convinced that this ape-man was more nearly human than formerly believed.

"The examination was in many respects a revelation", declared Dr. Hrdlicka. "When Dr. Dubois published his detailed study, which he tells me he expects to do before the end of the year, Pithecanthropus erectus will assume an even weightier place in science than it has held up to now. None of the published illustrations or the casts now in various institutions are accurate. Especially is this true of the teeth and thigh bone. The new brain cast is very close to human. The femur is without question human."

The remains, he explained, consist of the now for the first time thoroughly cleansed skull-cap, the femur, three teeth, two molars, and one premolar. Besides these, there is a piece of a strange primitive lower jaw, a later, but nevertheless still primitive, type of man found in lime deposits in a different part of the island from that of the other bones.

Dr. Hrdlicka declared that the original relics are "even more important than held hitherto". He predicted that "though all controversial points may not be settled, the specimens will assume even a weightier place in science than they have had up to the present."

Dr. Dubois found these ape-man remains near Trinil in the island of Java in 1891, but since then has steadfastly refused to allow other scientists to examine the originals thoroughly, so that they have had to content themselves with the casts and illustrations which Dr. Hrdlicka now declares to be inaccurate.

Dr. Dubois demonstrated personally and without reserve the precious specimens which have been withheld from other scientists for over a quarter of a century. The cordial invitation for the Americans to see the originals was transmitted through Dr. Arthur Smith-Woodward of the British Museum of Natural History and handed to Dr. Hrdlicka when he arrived in Europe last month.

Dr. Ales Hrdlicka, who was recently accorded the unique privilege of examining the bones of Pithecanthropus erectus by Dr. Eugene Dubois in Holland, wrote in a report of the Smithsonian Institution several years ago as follows:

"On account of peculiar circumstances an attempt to describe first hand the important specimens of Pithecanthropus meets with serious difficulties. It would surely seem proper and desirable that specimens of such value to science should be freely accessible to well-qualified investigators and that accurate casts be made available to scientific institutions. Regrettably, however, all that has thus far been furnished to the scientific world is a cast of the skull cap, the commercial replicas of which yield measurements different from those reported taken of the original, and several not thoroughly satisfactory illustrations; no reproductions can be had of the femur and the teeth, and not only the study but even a view of the originals, which are still in the care of their discoverer, are denied to scientific men."

READING REFERENCE- Wells, H. G. The Outline of History, New York, Macmillan Company, 1921. Hrdlicka, Ales. The Most Ancient Skeletal Remains of Man in Smithsonian Report for 1913. Washington, Government Printing Office, 1914.

TO OBSERVE EARTH'S MAGNETISM DURING SUN ECLIPSE

Because it is believed that the sun influences to some extent the magnetism of the earth, scientists from the Department of Terrestrial Magnetism of the Carnegie Institution of Washington and other magnetic observatories in all parts of the world will carry on special tests during the eclipse of the sun, Sept. 10, Dr. Louis A. Bauer, director, and J. A. Fleming announced today.

Capt. J. P. Ault and H. F. Johnston will join the Mount Wilson Observatory expedition within the belt of totality of the eclipse at Point Loma, Calif. This party will observe the declination, inclination, and horizontal intensity of the magnetic needle and also make atmospheric electric observations. Observations will also be made at Mount Wilson Observatory which will be just outside the area in which the sun is totally darkened. In Central America, probably Nicara gua, W. A. Love, of the department, will make observations. The U. S. Coast and Geodetic Survey will also send a special party to San Miguel Island off the California coast to obtain a record of the magnetic effects of the eclipse and special observations will be made at its regular magnetic observatories.

Since the darkening of the sun is likely to affect the magnetism of the earth at points outside of the small area where it casts its shadow, scientists at magnetic observatories at Sitka, Alaska; Meanook, Alaska; Tucson, Arizona; Agincourt, Ontario; Cheltenham, Maryland; Vieques, Porto Rico; Honolulu, Hawaii; Cuajimalpa, Mexico; Huancayo, Peru; Kakioka, Japan; and La Quiaca, Argentina, will be on the alert for phenomena.

Observations at past eclipses indicate that the magnetic effect of an eclipse is much the same as the change noted when day turns to night.

GASES FROM MOTOR TRAFFIC MENACE HEALTH, DOCTORS FIND

Exhaust gas from the heavy motor traffic of our cities is a definite menace to the health of those who use the streets, investigation in New York and New Haven, Conn., by Drs. Yandell Henderson and Howard W. Haggard of Yale University reveals. They announce the findings of what is said to be the first complete study of this problem in the August 4 issue of the Journal of the American Medical Association, and as a safety measure, strongly recommend that all automobiles be equipped with exhaust pipes to the top of the car.

The exhaust gas of automobiles is apt to be much more poisonous than any ordinary form of smoke because of the carbon monoxide, produced by incomplete combustion.

When a Ford car is standing still with the motor running the exhaust gas is distributed in a cone or horn shaped space in back of the car and they found that the head of a man standing a few feet back of the car is surrounded by an atmosphere containing from 4 to 6 parts of the deadly carbon monoxid in 10,000 volumes of air. When the car is moving at 10 miles an hour this cone is elongated so that the occupants of a car following at a distance of about 30 feet are surrounded by exhaust gas diluted to a concentration of 1 or 2 parts of carbon monoxid in 10,000 of air. A damp, still day renders conditions worse while a high wind improves them.

In the investigation made in the streets of New York it was found that high concentrations of the poisonous gas exist back of omnibuses and trucks with tops, and in general when a stop back of several cars occurs.

The investigators conclude that the contamination of the air in the more congested streets of American cities during hours of heavy traffic exceeds at times the upper limit of a well founded health standard. To reduce the danger, they urge the equipment of all automobiles with a vertical exhaust pipe at the back of the car, exhausting over the top of the car. In some cities it is already the custom to equip bakery wagons with such exhausts. The same measure will aid in proper ventilation in garages for the heated gas will remain near the ceiling.

HUNTERS SEARCH WORLD WILDS FOR PLANTS TO CURE LEPROSY

The uttermost parts of the world are being combed by American plant hunters to help cure leprosy. Seeds yielding large amounts of chaulmoogric acid, which has proved so efficacious in the treatment of that dread disease, have recently been received by the U. S. Department of Agriculture, from the forests of Sierra Leone, West Africa, and from Upper Chindwin, Northwest Burma.

The African seeds are from the wild Gorli shrub. It is thought that owing to the nature of this plant that it will produce the valuable seed in a shorter time than is required by the forest trees from which the present supply of chaulmoogra oil is obtained. Experiments with the shrub seed may be undertaken by those who are establishing plantations for the production of the acid.

The seeds received from Burma are those of thetrue chaulmoogra tree which is native to that region. According to Wilson Popenoe, of the Bureau of Plant Industry, which is making these importations, "The world wide demand for chaulmoogra oil, a product used in the successful treatment of leprosy, has rendered essential the thorough study of the various trees from which it can be obtained, and has made highly important their establishment in all parts of the world where leprosy occurs." "To these ends the Department of Agriculture has twice sent J. F. Rock, one of its agricultural explorers, to the native home of the chaulmoogra tree, and has secured through him considerable quantities of seed.

Several thousand seedlings are now being grown in the government greenhouses at Bell, Md. These will be distributed as soon as they are large enough to withstand shipment.

STUDY POCKET MOUSE AND GHOST RABBIT

The pocket-mouse - a rodent about three inches long with pouches in its cheeks in which it stores grain for long journeys - is being studied in its native fields this summer by Theodore Sheffer, a hunter for the U. S. Biological Survey.

This peculiar animal, one of the few pouched creatures on the continent, infests farms of the state of Washington. Sheffer will concentrate his study on its food habits to devise some means of eliminating it.

Another Washington man, Dr. W. P. Taylor, will work out this summer from Tucson, Ariz., studying the life habits of the jack rabbit. In the Arizona ranch country there is a ghost jack rabbit - as startling a creature as one would want

to meet on a summer's day, scientists here say. It is a flash of pure white, leaping from what a moment before was a patch of dead leaves or bushes.

The ordinary jackrabbit, familiar in most sections of the country, has fur about the color of the earth and grass it crouches upon. The "ghost rabbit" differs in that it has white sides which are concealed when it crouches but which alone are evident when it springs up and runs. Dr. Taylor will work in cooperation with Dr. Charles T. Vorhees of Arizona who has made an exhaustive study of both types of rabbit. The creatures have proved especially destructive to ranch crops during the past few years.

Dr. Taylor also will try to determine this summer the exact quantity of forage eaten by a prairie dog in a given period over a given area. This will be figured in tons, giving some idea of the destructiveness of these little animals.

Another peculiar animal which is engaging the attention of the Biological Survey is the white tailed squirrel, known as the Kaibab squirrel. Almost nothing is known about it because of its limited range - one of the smallest covered by any North American animal. It is found only in the Kaibab plateau in northern Arizona. The creature seems to have been cut off from all migrations by the great canon to the South and by the impassable deserts on every other side. Forest rangers throughout the Southwest have been instructed to watch for specimens outside this region but thus far have reported no success. One variety of squirrel, with slight traces of white on its tail, is prevalent throughout the white pine region of the South and Southwest and has been mistaken frequently for the Kaibab.

Dr. W. P. Bell, assistant biologist of the bureau, has started on an extensive tour of the West and Southwest during which he will compare notes with the hundred or more hunters kept in the field to track down stock killing animals.

TABLOID BOOK REVIEW

WOOD DISTILLATION.- By L. F. Hawley, In charge, Section of Derived Products, Forest Products Laboratory. The Chemical Catalog Company, Inc., 1923. 141 p. $3.00.

This, the latest volume, of the Monograph Series of the American Chemical Society, covers a new field of great and growing importance. By heating wood in closed retorts we get, besides charcoal, a great variety of acids, alcohols and other carbon compounds that are finding uses in modern life. There is no comprehensive and up-to-date book on the subject except this which is largely based upon the experience of the author in the U. S. Forest Products Laboratory at Madison, Wisconsin.

From an eight ounce package of Sudan grass sent to this country from Khartum in 1909 what is now a $10,000,000 a year forage crop found in many states of the Union has been developed.

The name "pekoe" of orange pekoe tea is derived from the Chinese words "Pak ho" which mean "white hairs" and refers to the small white pieces in this tea which look like stems but are the finest part of the leaf.
