SCIENCE NEWS

Science Service, Washington, D. C.

MAGNESIUM STARVATION

A NEW kind of starvation due to lack of magnesium, and a hitherto unsuspected relation between the adrenal glands of secretion and magnesium as a constituent of the diet, was described for the first time by Dr. E. V. McCollum and Dr. Elsa Orent, of the Johns Hopkins School of Hygiene and Public Health. Their report was made at the Montreal meeting of the American Society of Biological Chemists. Convulsive death results from the magnesium lack.

Dr. McCollum, a pioneer in the study of vitamins, has thus demonstrated another essential to life itself. Magnesium is familiar as a metal, lighter in weight than aluminum. It also is a part of many chemicals. It is contained in the drugs, milk of magnesia and epsom salts. A very small amount of magnesium is a necessary part of the normal diet. How necessary it is and why has only just been discovered.

Drs. McCollum and Orent found that eleven days of a diet wholly lacking in this element causes convulsions and death in the majority of rats. On the third day of a magnesium-free diet white rats developed bright red ears and tails. In fact, wherever the skin showed through the hair, it was seen to be very red instead of the usual color. Apparently the outlying blood vessels were wide open so that all the blood flowed to the ends of the vessels just beneath the skin.

On about the tenth day of this diet, never later than the eleventh, the rats behaved strangely. Ordinarily they pay no attention to what is going on about them and are undisturbed by noise. But after ten days of the diet, the slightest noise, such as the rattling of a piece of paper or a shadow falling across the cage, agitated the rats so greatly that they whirled around two or three times and collapsed in a clonic spasm. Their breathing was disturbed, their eyes protruded and at the same time the blood rushed away from the vessels just under the skin so that the ears and tails were blanched. The blood rushed to the heart, the small blood vessels contracted, and since the heart could not pump the blood out again it became enormously enlarged. Eighty-five per cent. of the rats died in this spasm, the remaining 15 per cent. living on indefinitely, some for as long as 90 days, a long period in the life cycle of a rat.

When magnesium is omitted from the diet, calcium and phosphorus are drained out of the body, so that not enough is left to make an X-ray of the rat's skeleton. This is the only way known to decalcify the body.

The explanation for all this, Dr. McCollum thinks, is that there is much the same relation between the adrenal glands and magnesium as there is between the thyroid gland and iodine, or the parathyroid glands and calcium. In the convulsions of parathyroid tetany, the nervous system can be quieted by administration of calcium. The symptoms of magnesium deprivation seem to be exaggerations of the adrenal glands' response to fear or anger.

Here is evidence that two more endocrine gland systems are tied up with two inorganic structures. No relation between them has been known before, Dr. McCollum pointed out, referring to the magnesium study and to his previous study on the effect of manganese on the body. Absence of this substance effects the propagation and rearing of the young, even wiping out such a powerful emotion as maternal solicitude.

MILK PROTEIN

THE discovery of a new essential to life contained within the protein of milk was announced by Dr. W. C. Rose, of the University of Illinois, in a report to the Federation of American Societies for Experimental Biology meeting in Montreal.

At present its identity is hidden in the complexity of the brownish, somewhat crystalline powder that Dr. Rose's laboratory records describes as the "active fraction" of casein, the protein contained in milk. Extensive feeding experiments upon white rats led Dr. Rose and his coworkers, Dr. Ruth H. Ellis, W. Windus and Miss Florence Gatherwood, to the finding of the new life essential.

The protein portions of the food given these animals was replaced by highly purified amino acids, which are known to be the chemical building blocks out of which nature constructs the necessary proteins in food. Proteins make up one of the classes of foods in our diet, and they are contained most extensively in meats, milk products and other such foods.

All the twenty known amino acids were used in the diets of the rats. If these twenty chemical compounds were all that makes the proteins of natural food satisfactory for growth and maintenance, then Dr. Rose's rats should have grown well and waxed fat. But they did not. They were not getting something that they needed in their amino acid substitutions for protein.

Starting the search for the unknown food essential, Dr. Rose added small amounts of casein from milk, gliadin from wheat and gelatin from meat to the menu, in order to find where the new essential occurs in nature. The casein helped the rats to grow. By chemical processes this protein was split into pieces until finally a fraction was found that caused the animals to grow normally when just five per cent. of it was added to their purified amino acid meals. This fraction is obtained from the casein by butyl alcohol extraction under appropriate conditions.

Dr. Rose can not yet assign this hitherto unrecognized food factor to a proper place among the vital food essentials, such as vitamins and amino acids. More research will be necessary before this can be done. It may prove to be an amino acid, of which twenty are known to science. Four out of these twenty are known to be absolutely essential to life. These are cystine, tryptophane, lysine and histidine.

LIQUID HELIUM

AN extremely cold piece of tin conducts electricity a hundred thousand times better than tin at ordinary temperatures, it was confirmed by physicists of the National Bureau of Standards when they liquefied helium gas for the first time in the United States.

Helium is the most difficult gas to turn into a liquid. A coil of tin through which electricity was passing was used as one method of proving that a temperature within three degrees Fahrenheit of the lowest temperature ever created by man had been achieved. The greatest cold, called absolute zero, is 459.4 degrees below zero on the Fahrenheit scale. The lowest temperature reached in the Bureau of Standards experiment was minus 456 degrees Fahrenheit, while helium liquefied at minus 450 degrees.

Dr. H. C. Dickinson, Dr. F. G. Brickwedde, W. Cook, R. B. Scott and J. M. Smoot, working in constant danger of their lives, and late at night, won a friendly race with the Johns Hopkins University and the University of California for the honor of being the first institution in America to liquefy helium.

Helium is the rare gas of the air, first discovered in the sun, which is obtained from natural gas in sufficient quantities to float in the air the giant airships of the American Navy.

To turn it from a gas into a liquid, liquid hydrogen is made by compressing this highly inflammable gas to 2,200 pounds per square inch, cooling it with liquid air, then allowing it to expand in order to further cool itself. Then helium is compressed to 200 pounds per square inch and the liquid hydrogen is used to cool the helium. When the helium, already intensely cold, is allowed to expand it gets so cold that it becomes liquid, the goal of the experiment.

Helium was first liquefied at Leiden, Holland, where the late Professor Kammerlingh Onnes carried out his work in low temperature research. The Berlin Imperial Institute and the University of Toronto have also made liquid helium.

ATOMIC NUCLEI

DRS. J. C. CHADWICK, J. E. R. Constable and E. C. Pollard, of the University of Cambridge, have bombarded a variety of atomic nuclei with fast moving alpha rays from polonium, a radioactive element. They found that energy is done up in packets or quantized in the nucleus as elsewhere in the atom.

"What is happening in the inner core of the atom?" is the question that is being asked now in many laboratories of physics. The nature of the electron layers that form the bulky outer coat of the atom is well known, but the very small nucleus which gives matter its weight is still a problem. Protons, electrons and alpha particles are the constituents of the nucleus. The protons are themselves nuclei of the smallest atoms, that is of hydrogen, while the alpha particles are helium nuclei. Protons have been ejected from certain atoms by Dr. Chadwick by bombarding them with the rapidly moving alpha particles from the polonium, an element very like radium.

Two things may happen. The destructive alpha particle may be swallowed up by the second nucleus or it may escape again. In both cases Dr. Chadwick found proton rays were produced. If the alpha particle penetrates the target nucleus, protons of only two or three definite speeds are produced. Thus only limited and fixed amounts of energy can come from the nucleus at these times and fresh evidence is found for the quantum theory which has been so powerful in probing the structure of the atom. Non-penetrating collisions, however, lead to protons whose speed depends on the speed of the guilty alpha particle. As might be expected more of such protons are found moving along the line of motion of the hitting alpha particle than in other directions. The proton speed groups have given proof of the existence of energy levels in the nucleus, at least so far as the protons are concerned. Nothing is yet known about the behavior of the electrons in the nucleus.

COOPERATION OF ENGINEERS IN ANTHROPOLOGICAL WORK

COOPERATION between scientists and engineers, road-builders and other professional men conducting large-scale digging operations, in a search for remains of early man in America, was arranged at a conference held recently in Chicago under the auspices of the National Research Council.

Because some of the most important of the old-world finds of ancient man were made in quarries, gravel pits and other utilitarian excavations, it was believed by the organizers of the program that a well worked out plan, enlisting the assistance of interested engineers and contractors, might be productive of equally important results on this continent.

Since the early history of man was tied up closely with the coming and going of the glaciers of the Great Ice Age, it is believed that the most promising places to look for evidences of early human existence will be deposits of gravel and other material left behind by the retreating ice. Professor Fay-Cooper Cole, of the University of Chicago, introduced the general subject of early man in America, and Dr. W. C. Alden, of the U. S. Geological Survey, discussed the spread and movements of the great ice sheets in the Middle West.

What the engineer or road-builder may do, to be of the greatest service to science, was suggested by Dr. M. M. Leighton, chief of the Illinois State Geological Survey. He said, in part: "Engineers and operators in charge of all kinds of excavation work such as road-building, sewer construction, dredging ditches, quarrying and clay, sand and gravel industries are in position to make valuable contributions to science with regard to the geological history of man in America, by preserving *in situ* suggestive evidences of human occupation, whether it be skeletal remains or the relics of his activities, until the scientific evidence of the geological position and age can be determined by a geologist and notifying the state geologist of that particular state regarding the potential discovery; such leads should be followed by prompt examination on the part of the state geologist or some capable geologist whom he may designate.

"The whole procedure could be encouraged by the establishment of a geological minute-man service similar to the archeological minute-man supported by *Science Service,* whereby moderate sums covering the cost of the field examination may become instantly available. These forms of cooperation should prevent any further loss of critical scientific data bearing on the geological history of man in America."

Assurance of willingness to cooperate on the part of engineers and operators was given by Mr. C. M. Conner, of the American Roadbuilders' Association, Washington, D. C. He suggested a brief practical outline of the knowledge a cooperating engineer will need, under four heads: what is sought and how to identify it; where it is likely to be found; whom to notify of the find, and how to protect the find. Mr. Conner also told of an important archeological find made by a contractor operating on a National Highway job in Mexico, on which he was then serving as engineer.

Representing the Smithsonian Institution, which has done pioneer work in research on the possible presence of prehistoric man in America, Dr. M. W. Stirling told of the work of his colleagues, especially Dr. Aleš Hrdlička and Dr. J. W. Gidley, the latter of whom has made discoveries in Florida which strongly suggest the possibility of man's presence while such animals as the mastodons and ground-sloths were still in existence. To the argument that the comparative lack of human bones and especially of man-made implements indicates that no men were here in early times, Dr. Stirling opposed the suggestion that the earliest men may have been so primitive that they were not yet tool-users. And even if paleolithic man is not found in America, he added, it is still of great interest to know who the very earliest comers were and what was their stage of cultural development.

ITEMS

ASTRONOMERS at the Mount Wilson Observatory have recently observed a marked increase in the number of spots on the face of the sun. On April 10, a total of twenty-six spots were counted in three groups, while the day before the number was even higher, thirty-seven. They have been plentiful all week as compared with last week when the number ranged from only three to thirteen. An increase in the number of sun-spots is associated with impaired radio reception, it has recently been discovered by Dr. Harlan T. Stetson, of the Perkins Observatory, Ohio Wesleyan University. It is Dr. Stetson's prediction that the spots will gradually decrease and radio reception improve throughout the rest of the year.

THE new 69-inch telescope of the Perkins Observatory of the Ohio Wesleyan University, Delaware, Ohio, is expected to be in operation by June. The large mirror, to be the third largest in the world, is now being ground and polished at the factory of J. W. Fecker Company, Pittsburgh. Dr. Harlan T. Stetson has been advised that the extremely accurate "figuring" of the giant piece of glass is progressing more rapidly than in the case of other large telescope mirrors because of the high quality of the boro-silicate glass cast by the U. S. Bureau of Standards. This mirror is the first large telescope disc to be made in America. As the telescope mounting has already been installed by the Warner and Swasey Company, Cleveland, the new 69-inch telescope will be the first large telescope to be made completely in America.

HEATING the soil in seed-beds by electricity, to hasten sprouting and early growth of plants in early spring, has been tried on an experimental scale in Sweden and Germany and is considered economically promising by Oskar Schwenninger, a Berlin engineer. The heating units are cables of suitably high resistance, insulated and buried about a foot under the surface of the ground. It has been found possible to maintain a good germinating temperature in the soil when the air temperature is near freezing.

DR. WILLIAM B. BREBNER, of Washington University, St. Louis, has reported to the American Association of Pathologists and Bacteriologists progress in the understanding of the nature of infantile paralysis or poliomyelitis. Working with monkeys, the animal that is most closely related to man in its reactions to medical treatments, Dr. Brebner was able to produce immunity against the virus of poliomyelitis by the injection of the virus of the disease directly into the spleen of the animals. This was a purely experimental procedure since an operation, impractical in the case of a human patient, is necessary in order to make the injection into the spleen. However, blood from the immunized monkeys showed resistance to the active virus of the disease and this was taken as an indication that the procedure may prove of some use in suggesting ways of protecting against this disease.

"TASTEBLINDNESS" is the only term that can be found to describe the reaction of those who can not taste para-ethoxy-phenyl-thio-urea, for those who can taste it find it intensely bitter. This curious difference in perception has been discovered by Dr. Arthur L. Fox, of the laboratories of E. I. duPont de Nemours and Company. He has tried this very complex organic compound on every one who would volunteer to taste it, and has found that approximately three fifths of his "victims" declare it intensely bitter, while the rest say that it "has no more taste than sand." Para-ethoxy-phenyl-thio-urea is a close chemical relative to another compound, known as "dulcin," which is several hundred times as sweet as sugar. To make dulcin, one atom of sulphur is dislodged from the molecule of para-ethoxy-phenyl-thio-urea and an atom of oxygen substituted for it. Dr. Fox has found that this curious "tasteblindness" is displayed by the same persons to other compounds as well, all of them of the thiourea group. But so far as known, dulcin tastes sweet to everybody.