Copper, Fits, Legs, Yeast, Brains

General Science

Following are reports by Watson Davis of some of the more important papers presented at the meeting of the Federation of American Societies for Experimental Biology, Ann Arbor, Mich., April 12 to 14.

Copper, the red metal, is an essential factor in the diet to keep the blood red and the body vigorous, a group of University of Wisconsin chemists headed by Dr. E. B. Hart announce.

Copper may become acknowledged as one of the more essential requisites in human nutrition and livestock feeding. The Wisconsin experiments indicate that it exerts a tremendous influence on anemia in rats, a disease similar to anemia in children who have been fed exclusively on milk. The malady in both rat and child is caused by a deficiency of hemoglobin in the blood stream.

A shortage of iron has been credited with being responsible for the disorder, and although iron compounds are still limiting factors, their effectiveness, according to Wisconsin investigators, depends on the presence or absence of copper. The investigations covered four years, and Dr. Hart was assisted by his colleagues, Drs. H. Steenbock, C. A. Elvehjem, and J. Waddell.

Because milk is notoriously low in iron and hemoglobin is rich in the mineral, it has always been assumed that the way to correct anemia was to add iron to the milk diet.

In the case of animals this plan proved ineffective. The daily feeding of iron, administered as chloride, sulfate, acetate, citrate, or phosphate, all prepared from pure iron wire, did not check the decline in the hemoglobin content of the blood. Rats suffering with anemia were not improved.

COPPER MADE THE DIFFERENCE. On a diet consisting of whole milk, pure iron and liver, the rat on the right recovered completely from a severe attack of anemia, while his litter mate, at the left, was fed the same diet, but without the liver. The liver is rich in copper

DR. E. B. HART, head of the Department of Agricultural Chemistry at the University of Wisconsin, whose researches show the value of copper in the treatment of anemia

However, when a supply of iron was obtained by feeding dried liver, or the ash of dried liver, corn, or lettuce, the hemoglobin was raised to normal and the stricken rats immediately restored to health. In ashing the foodstuffs, the investigators noted a pale, bluish color, the typical hue produced when copper compounds are burned. Observation of this peculiar color, in addition to the fact that copper is known to be present in the respiratory pigment, hemocyanin, of certain crustacea, led the chemists to use copper sulfate as a supplement to pure ferric chloride in the whole milk diet.

Striking cures resulted. Rats, so anemic that their days appeared to be numbered, recovered immediately and the hemoglobin in their blood was brought to normal.

Human Possibilities

"What about pernicious anemia in man?" the chemists asked. Patients suffering with anemia have been told to eat liver, advice which has evidently made a wide impression, judging from the rise in price of what was once poor man's meat. However, some sufferers find liver unpalatable, especially when eaten in large quantities. Harvard university scientists have prepared a liver extract which has proved exceedingly efficacious in abating the disease. In the Wisconsin experiments, this product was ashed and fed the anemic rats. When fortified with ferric chloride, it also proved effective in correcting the ailment. Thus this product which has been most successful in treating man corrected the deficiency in rats.

Copper's role in plant and animal tissues is not clearly understood. It is found in milk, in small quantities. Its function in producing hemoglobin is, Dr. Hart stated, idle to speculate. Hemoglobin may not contain copper, at least no evidence to the contrary has yet been produced. In this connection, copper may act as a catalyzer, an agent which starts an action without being changed itself. It may promote the building of hemoglobin. Iron functions in a similar manner in the production of chlorophyll, the green pigment of vegetation, although it is not a constituent of the chlorophyll molecule.

Experiments with the use of copper in the diets of anemia patients will be undertaken in the near future at certain leading hospitals. If this inorganic substance plays the part in the human system that it does in the life of white rats, nutrition specialists will probably give as much consideration to the copper content of foodstuffs as is now paid to some other elements, such as phosphorus, calcium and iodine. Future experiments at Wisconsin will also approach the problem from this standpoint, as the copper content of animal feeds is known to vary widely.

Tests Pick Athletes

Picking the varsity athletic squads by scientific tests conducted with impartial unemotional instruments registering to the thousandth of a second will soon be common practice in American universities if the possibilities of experiments of Prof. Walter R. Miles of Stanford University reported to the medical meetings here are appreciated by the coaches and the athletics-enthusiastic alumni.

Prof. Miles disclosed how he took a chronometer of special design upon the football practice field last fall and picked out the one man of the squad who because of his (*Turn the page*)

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slowness of charging had already been selected independently by the coach for replacement. Prof. Miles' test took twenty minutes while the coach declared his decision was reached only after two years of observation of the squad. The football squad lined up as if for an actual scrimmage. The head of each man pressed against a trigger which when he plunged forward dropped a golf ball on a rapidly revolving paper covered screen drum thus recording accurately the lag of each man in getting into action. Men of varsity ability charged in less than four hundred thousands of a second after the signals were given. It was predicted here this morning that the same methods can be applied with advantage to other sports.

Huckleberries for Diabetes

The search for a diabetes remedy that can be taken through the mouth is being undertaken by many of the investigators who talked before the Federation of American Societies for Experimental Biology. Hundreds of thousands of diabetics are being kept alive by insulin, an extract of the pancreatic gland which was isolated a few years ago at the University of Toronto. Insulin must be administered by daily hypodermic injections and the diabetic sufferers would rejoice if they could take their medicine as a powder or a pill. Four such preparations were discussed. One of them, called myrtillin, made from huckleberry leaves was described by its discoverer, Dr. Richard C. Wagoner of Allentown, N. J. His attention was directed to this source when studying at Vienna by a professor who said: "I wish you would get me some huckleberry leaves. I have a mild case of diabetes and my old aunt says huckleberry tea will cure it. This is nonsense, of course, but my aunt would give me no peace till I try it." So Dr. Wagoner got the leaves and found it did reduce blood sugar. During the last three years Dr. Wagoner has found the same substance in the green leaves of many plants. Diabetics who would have needed a high insulin dosage before starting on myrtillin are able to go now without insulin and show normal blood sugar. Myrtillin will act even in a test tube outside the living body. Dr. J. A. Morrel of Toronto experimenting with a similar huckleberry leaf preparation "myrtomel" also finds that it reduces materially the amount of insulin required.

On the other hand, Dr. W. G. Karr of the University of Pennsylvania gets better results in diabetes from synthalin, a German coal-tar preparation. Another German medicine for the same purpose, glukhorment, is, according to Dr. Fritz Bishoff of Santa Barbara, identical in composition with synthalin.

Dyes for Disease

A new method of fighting disease by injecting brilliantly colored dye into the toxin ridden body was announced to the scientific world by Profs. P. J. Hanzlik and E. M. Butt of Leland Stanford University, Calif.

Botulism food poisoning, difficult at present to combat, diphtheria, cobra venom, strychnine and other toxic agents were protected against when the California scientists injected a dye, known as congo red, into the muscles of guinea pigs, rabbits and pigeons. Most promising results were obtained with botulism and diphtheria in which cases eight out of ten of the infected animals were cured whereas without treatment all would have died.

A new principle in disease treatment by chemotherapeutic methods was disclosed by these experiments. When more fully developed in the laboratory and then applied to man, this research may further tighten man's defenses against the germ world. Other dyes where found partially effective in offsetting poisons and the toxic substances that harmful organisms produce in the body. Prof. Hanzlik attributed the beneficial properties of the dyes to the fact that they have the power of absorbing the toxins or poisons and preventing them from damaging the cells and tissues of the body. Only those dyes that are very finely divided and colloidal in nature are effective.

With this new dye treatment of disease there comes the possibility that one remedy can be devised that is effective against a number of diseases. Heretofore the physician has not been able to aim at more than one disease at a time with the same ammunition. Diphtheria must be subdued with an anti-toxin especially made for that disease alone. But congo red has been found by Prof. Hanzlik to be effective against diphtheria and a number of other poisonings of the animal machine. It is non-specific. It may be a step toward the day when several diseases can be treated out of the same bottle in the drug store.

The Puzzle of "Fits"

A step toward an understanding of the nature of epilepsy, one of the most baffling of all human ills, was reported by Dr. Lawrence O. Morgan, of the University of Illinois College of Medicine. By surgical procedure, Dr. Morgan produced lesions in certain parts of the cerebrum, or forebrain, in dogs. The animals recovered from the operation, and their conduct most of the time was normal. But periodically they went into fits, which in all essential respects were identical with those characterizing human epilepsy. An examination of the brains of four human beings who in life had been subject to epileptic seizures showed abnormalities of the region of the brain corresponding to the areas where the artificial injuries had been produced in the dogs.

Changing Legs

Transplanting legs and hearts from one animal to a distantly related species was the feat reported before the anatomists by Dr. W. M. Copenhaver, of the University of Rochester. The animals involved were two rather remote relatives of frogs and toads, more nearly akin to salamanders. One was the Mexican axolotl, the other a European creature called the triton. They are rated as rather distant zoological cousins. At an early stage in their existence the beginnings of legs were removed from the axolotls and planted on the tritons in place of their own limbs. They were a little slow in taking hold, but after they did they made up for lost time, becoming larger than the tritons' own legs which had been left in place on the opposite sides of their bodies.

Dr. Copenhaver also grafted axolotl hearts into triton bodies. Here also the transplanted hearts grew bigger than the normal hearts of unoperated tritons of the same size. Moreover, they did not seem to become wholly "naturalized" in their new homes, for their pulse persisted at something like that of the normal rate for the axolotls from which they came.

The brain of the tiny hummingbird is more primitive and lizard-like than those of most of its feathered kindred, and resembles in many of the details of its structure the brain of the great dragon lizard of the East Indies, *Varanus komodensis*, which created a sensation when brought to this country a short time ago. So declared Dr. E. Horne Craigie of the University of Toronto. There are also certain similarities in structure between the hummingbird's brain and the brain of the parrot.