SCIENCE NEWS

Science Service, Washington, D. C.

COPPER AS AN ANEMIA PREVENTIVE

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, announced recently at the meeting of the American Society of Biological Chemists.

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.

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.

"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 rôle in plant and animal tissue is not clearly understood. It is found in milk, in small quantities. Its function in producing hemoglobin is, as Hart states, unknown. 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.

THE BORAX INDUSTRY

EXPLOITATION of the kernite (also called rasorite) deposits in the Mohave Desert, Kern County, California, probably will result in killing off the mining of other borate minerals elsewhere in this country and in other countries so that the United States will have a complete monopoly, according to Dr. Waldemar T. Schaller, of the U. S. Geological Survey.

So far as is known, kernite, an entirely new mineral, exists nowhere else in the world. The deposit lies but three to four hundred feet beneath the surface, is more than 100 feet thick and extends at least 500 feet in every direction. It was discovered in 1926 and mining operations were begun approximately a year ago.

Kernite is virtually pure sodium borate. The material mined is over 75 per cent. pure mineral, the remainder being clay. To prepare it for the market it is only necessary to dissolve it in water, filter off the clay, and permit recrystallization to take place. Marketable borax is sodium borate plus ten molecules of water. Kernite is the same sodium borate plus four molecules of water. During the refining process six molecules of water are added so that one ton of kernite makes 1.4 ton or nearly a ton and a half of borax. There is probably no other commercial mineral that increases its marketable bulk in such a fashion through the process of refining.

Previous to the discovery of kernite the world's borax supply was derived principally from the minerals borax, colemanite and ulexite. Italy procured it from volcanic steam containing boric acid. In each case the process involved was complex and expensive. In this country borax was formerly secured from mineral deposits in and near Death Valley, under dangerous circumstances, and

had to be hauled from the mines by the familiar "twenty-mule team," to a distant railroad.

The kernite mines are within four miles of the Santa Fé main line and a spur track, built at small expense across the intervening alluvial flat, has made transportation simple. It is estimated that enough of the mineral already has been blocked out to supply the market for some time and millions of tons for future needs require only to be shoveled out of the ground, dissolved in water, and recrystallized.

CAMOUFLAGED TRAPS

CAMOUFLAGE patterns are now used for mouse traps. At the office of the United States Biological Survey in Washington, clever devices, designed to catch the most wary of mice, are on exhibit.

For the field mouse who robs the corn crib there is a trap made by hollowing out the center of a corn cob and wiring it. The mouse who boldly chews the papers on your desk makes his last predatory excursion the night he examines what appears to be an ordinary steel wire paper-clasp.

One clever trap will reset itself and capture as many as six or eight mice in an evening. When the mouse enters, the small metal door falls shut. Seeking a way out, he ascends a miniature passageway which leads to a plunge in a half-gallon can of water. The trap is so constructed that it automatically resets itself when the victim plunges into the water.

Still another trap, one that any boy could make, is fashioned out of an ordinary tin can. The top has been carefully cut all the way around, rewired in place and equipped with a simple spring. When set, it appears to be nothing more harmful than the usual tin can whose top has been incompletely mashed in. But when the mouse investigates he finds that the top springs into place with surprising quickness, leaving him locked inside.

These traps, and many others designed for larger and more dangerous prey, such as mountain lions and wolves, have been collected by the survey during its long campaign to eradicate predatory animals. Economic experts of the bureau estimate that rodents alone, such as mice, rats, prairie-dogs, ground-squirrels and jack-rabbits, are responsible for a crop-production loss of approximately $500,000,000 each year. In addition some of them, such as rabbits and rats, have been found to be carriers of disease and therefore dangerous from the standpoint of public health.

LOSS IN INDUSTRY FROM COLDS

COLDS and their relatives, such as pneumonia, influenza and bronchitis, are responsible for more lost time in industry than any other group of diseases.

Statisticians of the U. S. Public Health Service have found that over half, 54 per cent. to be exact, of the illnesses of the men employed by a large industrial firm throughout a period of ten years were caused by colds and other respiratory infections. Furthermore, the reports of a group of sick-benefit associations show that 47 per cent. of the illnesses lasting eight days or longer among male members were due to the same causes.

"From the effect upon the absence rate in industry, no other disease group," declared Dean K. Brundage, assistant statistician in the Public Health Service, "approached in importance the respiratory diseases. Among employees of the industrial firm described above, diseases of the respiratory system caused more absences from work than all other diseases put together. The sickness records of the company revealed an annual loss of 3.23 calendar days of disability from respiratory diseases per male employee, compared with 6.92 calendar days of disability from all causes of sickness per man on the pay roll.

"In view of the frequency of disability and the amount of time lost from work on account of the respiratory diseases even a small degree of success in their prevention would contribute enormously to the sum total of physical and mental energy, to the number of days that the industrial population is physically able to work, and, accordingly, to an enhanced national prosperity."

Careful scientific analysis of records, it is believed, will cast some light on the causes of these two prevalent infections. One of them, lobar pneumonia, is being subjected at the present time to special investigation by the Public Health Service in an attempt to evaluate the more important factors influencing its incidence and high death rate.

THE TARANTULA

THE common tarantula of the southwest achieves a ripe old age and can easily go without food for periods as long as a month or six weeks.

Professor W. J. Baerg, of the University of Arkansas, well-known authority on spiders, has kept tarantulas in his laboratory under observation for nine years, until the life cycle of this member of the spider family, not previously known to science, is now fairly clear.

The male tarantula is approximately eleven years old before he attains maturity, declared Professor Baerg in a report to appear in a forthcoming issue of the *Quarterly Review of Biology*. Since a tarantula only locates his food by touch and sits serenely at the door of his burrow in the earth, waiting for his dinner to walk by in front of him, he is equipped to withstand long periods of starvation. Consequently the period at which the spider attains all the attributes of adulthood is probably determined in a measure by the amount of fasting his lethargic habits have caused him to endure. The same statement probably holds good for the female as well.

"They locate their prey entirely by sense of touch," Professor Baerg explained. "Thus a cricket may come within a centimeter of where the tarantula is waiting, and be perfectly safe; however, as soon as one touches the other, the cricket is very speedily brought in reach of the fangs and consumed." Grasshoppers, cockroaches and caterpillars vary the spider menu in the laboratory, but if they are kept in a cold room they will not require any food from early in October until late in March.

For many years scientists were puzzled because, in spite of diligent search, no males were seen out-of-doors in the field except at the mating season in September and October. Professor Baerg's hand-raised tarantulas, however, have furnished the answer. During the eleven years it takes the male to grow up, he changes his skin 22 times, and only after the last is distinguishable from the female. Soon after the mating season the males decline and die, rarely surviving to see another season.

The females, on the other hand, present a very different picture. After attaining sexual maturity at 12 or 13 years of age they continue to live on till they are at least 20 and probably much older.

Professor Baerg's observations, he pointed out, have not been made on one individual tarantula from hatching time until death, but on several of various ages that have been under observation at different stages of development.

PLANT ROOTS

WHEN you pull up a radish from your spring garden you are gathering in materials that were once scattered around through the soil to distances of more than a foot on either side of the little pungent globe in your hand, or buried two feet or so underneath it. Later on, when you gather your first ears of sweet corn, you will be getting the benefit of work done by roots through a circle five feet in diameter and three or four feet deep. Roots are the world's greatest miners.

The wide-spread activities of the roots of garden vegetables, hitherto suspected but never intensively examined, have been the subject of research by Professor John E. Weaver and Dr. William E. Bruner, of the University of Nebraska. Their work has involved much hard digging in the literal as well as the figurative sense, for a five-foot trench had to be excavated alongside of each plant studied, and the details of the roots' travels followed with hand tools.

Annual vegetable crops like radishes, beans, melons and turnips will occupy in their few weeks of growth a great deal more space in the soil than their tops occupy in the air, and their roots will drill a great deal deeper than their stalks go high. Longer-lived plants, such as rhubarb and asparagus, do not send their roots a great deal deeper, but tend to solidify their holdings, by penetrating the soil much more thoroughly with their bushier branching systems. A four-year-old rhubarb plant, for example, was found to occupy a cylinder of soil eight feet in diameter and eight feet deep, with some of the longer roots straggling downward an additional two or three feet. A ten-year-old plant of horseradish reached out only eighteen inches or so on either side of its crown, but its roots drilled downward to a depth of more than fourteen feet.

CALIFORNIA TREES

YELLOW pine trees from all over the United States are being tested and cross-pollinated at the Eddy Tree Breeding Station, at Placerville, Calif., in an effort to obtain choice varieties of forest trees that will grow faster than the present wild stocks and hence produce a crop of timber in fewer years. Nursery plantings made last season include seedlings of 49 species and 9 varieties, from seed obtained in 17 different countries; and extensive additions are now in hand as part of this season's program.

The program of the station includes gathering tree stocks from as many different localities as possible, comparing geographic races of the same species, selection of the best individuals in native stands as breeding stocks, and artificial pollination both within given species and between species in an effort to produce hybrid varieties. Cross-pollination thus far has yielded hybrids of Western yellow pine with Swiss mountain pine and with the digger pine of California.

The second tree genus on which the experimenters intend to work is the black walnut. They now have a stock of the black walnut species of northern California established, but have not yet reached out for the Eastern and Old World walnuts, due to their preoccupation with the pine work. Eventually they wish to add other timber trees to the two now on their experimental schedule.

The work of the station is under the direction of Lloyd Austin, a graduate of the University of California.

ITEMS

COLLECTORS of old china will be interested to know that the authenticity of certain types of old porcelain can now be determined by chemical tests. Under the direction of Dr. Alexander Scott tests have been worked out in the laboratory of the British Museum that have helped classify several doubtful pieces in the museum collections without disfiguring the specimens. Old patent acts were consulted to determine the chemical composition of Old Bow and Chelsea china, while tests were then resorted to to detect the presence of various phosphate components known to have been used in its composition.

THE people of the United States are to be the beneficiaries of a patent obtained by E. N. Bates, of the U. S. Department of Agriculture, on a seed-cleaning machine operating on an entirely new principle, which the inventor calls an "aspirator." The device consists essentially of a funnel-shaped hopper into which the grain, seeds or other material is poured. From this it is allowed to fall in a thin circular stream into a chamber beneath, flowing over a wide, cone-shaped valve. As the grain trickles down, a current of air is sucked upward through it by a motor-driven fan. In this air current all dust, light seeds, bits of straw and chaff and, in general, all particles lighter than the seeds being cleaned are carried off into a side chamber, where they are deflected into a receiving cup. The cleaned grain meanwhile falls into a receiving pan on its own side. Mr. Bates has constructed two different types of his aspirator, one for large-scale use on a threshing separator and the other for laboratory use in seed-testing and similar work. The machine is covered by Public Patent No. 1524012. Under the terms of American patent law, any article so patented may be manufactured and used in the United States by any citizen without the payment of royalty.