

O is the next oftenest used, with T a close third, J, X and Q being the least used.

With the multiple alphabet cipher, a series of cipher alphabets are used one after the other, the order being given by means of the key word, but the same alphabet is used over and over at regular intervals. While more difficult than the single alphabet, the cipher expert, or "cryptanalyst", can interpret such a message without the key. However, if a key as long as the message itself is used and the letters in it are selected at random, it is practically impossible to translate it. This is the system used in the machine, and the key is another tape, so that the transposing of the letters is done automatically.

As a further improvement, a way was found to obviate the use of a tape as long as the tape of the message itself. This was accomplished by using two loops of tape which combined give the key. One loop is one character shorter than the other, so that as the two tapes pass through the machine at the same rate of speed, they must go around many times before the same combinations are repeated. This gives the effect of a very long tape.

Mr. Vernam stated that the apparatus could also be used for radio, or if necessary the code tape could be sent by mail without fear of its being interpreted by an unauthorized person.

ULTRA-VIOLET LIGHT NECESSARY IF MILK IS TO PREVENT RICKETS

Batteries of quartz-tube ultra-violet lamps may become a necessity in stables where dairy cattle are fed in winter, if the experiments performed at the Maine Agricultural Experiment Station by Dr. John W. Gowen and his associates may be taken as an indication. The experiments show that milk from cows receiving a "dose" of ultra-violet light from mercury vapor lamps contains the substance that prevents rickets in children and young animals, while the milk from cows kept away from sunlight and not treated with ultra-violet light was powerless to prevent the ailment.

In the experiments, Holstein-Friesian cows of nearly the same age and calving date and receiving like treatment as to feed, temperature, etc., were placed side by side in the same barn.

"Throughout the experiment these cows did not leave the barn. For one month none of the cows received ultra-violet light. For the second month two cows received ultra-violet light fifteen minutes a day generated from a Cooper-Hewitt alternating current light at three feet above their backs. For the third month these cows received ultra-violet light for thirty minutes a day under the same conditions. In the meantime Rhode Island Red chickens were allowed to develop rickets, shown both clinically and by X-ray photographs. They were divided into two lots, one lot of three chickens receiving milk from the ultra-violet cows, the other of two chickens, milk from the control cows. Both lots received all the milk they wished.

"The chickens have now been under treatment fifty days," Dr. Gowen stated. "The lot receiving milk from cows exposed to ultra-violet light are in good condition with no appearance of rickets in X-ray plates. The lot receiving normal milk has moved progressively toward more extreme clinical and X-ray rickets. The

experiment has been repeated, using the milk from these same cows on White Leg-horn chickens showing clinical and X-ray rickets. Five chickens were in each lot. After thirty-eight days treatment four of the lot receiving milk from the ultra-violet cows are almost cured of rickets, showing only a very slight stiffness. The fifth chicken shows some stiffness. Four of the lot receiving the normal milk show constantly increasing symptoms of the more advanced stages of clinical rickets.

"These results point to the conclusion that more of the substance necessary to cure rickets is absorbed by the cow exposed to ultra-violet light and secreted by her in her milk. The cows prevented from receiving ultra-violet light are not able to secrete this anti-rachitic substance in sufficient quantities to cure or allay the progress of clinical rickets. The results thus point to an environmental factor transmitted by the cow to her offspring through the medium of her milk. It further suggests that the high incidence of rickets in children during the late winter months is due to their mothers' not receiving enough ultra-violet light either during pregnancy or while in lactation. Furthermore, it would appear that cows' milk produced especially for baby feeding should be from cows which have access to ultra-violet light either from the sun or some other source."

BLOOD CELLS AND GLANDS CONTAIN CURE FOR RICKETS.

New cures have been found for rickets, a serious disease of children and young animals due to defective bone structure, in three substances commonly found in the bodies of all animals. They were reported by Dr. Andor de Bosanyi in a recent issue of the Bulletin of Johns Hopkins Hospital.

Rats afflicted with rickets were fed on a diet containing hemoglobin, which is the red coloring matter found in blood corpuscles. When the diet contained from five to six per cent. by weight of this material the rats were quickly cured of their rickets.

A previous experimenter had stated that a substance very similar to hemoglobin would cure rickets when the subject treated was exposed to light. In order to determine whether or not light had any influence in the cure caused by the hemoglobin, rachitic rats were fed the diet containing hemoglobin for eight days in a light-proof compartment. There was found to be quite as marked healing as in the presence of light.

Adrenalin, a substance secreted by glands lying immediately above the kidneys, and known to be a very powerful heart stimulant, was next given to the rats. Very weak doses were given at first and the strength of the dose increased until after four or five days the rats were taking at one dose an amount which would have proved fatal before. Healing of the rickets then began and proceeded rather rapidly until all symptoms disappeared.

The third curative substance was found in histamine, which is a decomposition product of proteins, those complex nitrogenous compounds that form the foundation of all living things. Rats on a histamine diet were cured of rickets in from six to eight days.
