CURRENT SCIENCE—50 YEARS AGO

VITAMIN A DEFICIENCY AND NIGHT BLINDNESS*

THE relationship between night blindness, or dark adaptation, and vitamin A deficiency remains inconclusive despite tests with various optical instruments to determine the status of vitamin A nutrition from the values of threshold measurements, according to a note recently issued by Messrs. Bausch & Lomb, Rochester, New York.

The phenomenon known as dark adaptation, the ability to see in relative darkness after exposure to light, has been studied extensively. Fundamentally the process is a photochemical reaction in which visual purple, the light-sensitive pigment in the rods of the retina, is desensitized to dim light by exposure to bright light and resensitized to dim light through regeneration in darkness.

Photometric tests conducted by Palmer and Blumberg in a routine survey of 585 school children showed a great variation in successive tests of the same individuals. These findings were interpreted as indicating that very little dependence could be placed on results based on single tests of children and that methods for classifying photometric measurements to represent different degrees of vitamin A deficiency were inadequate.

This opinion has been confirmed by the recent study of Dr Carroll E. Palmer. in a paper presented before the Child Hygiene Section of the American Public Health Association.

Selecting a group of school children whose dark adaptation tests indicated vitamin A deficiency, borderline subnormal, and a few normal, Dr Palmer separated them into two groups, one for a series of feedings and the other as a control. Preliminary to the feeding study, each child received three light threshold tests to obtain data on the reliability of the readings. Following this each child was given a test every week for five weeks, during which each child in the feeding group received an average of 18,000 International Units of vitamin A daily, or a total of 630,000 I.U. in five weeks, in the form of halibut liver oil capsules. The control group received daily supplements of 0.05 International Units of the vitamin in similar capsules.

A series of visual threshold readings were made following a standardized exposure of the subject's eyes to bright light. Readings were made at 25 sec and at 10 min, following exposure to bright light. Adaptation occurs in two parts, the first begins at once; it is rapid and attributed to cone function. The second part occurs later and is due to rod function. The intensity range covered by the rods and cones during dark adaptation depends upon the colour of the light, its area and retinal location, and the intensity of the preceding light adaptation.

Palmer's analysis showed marked improvement in the averages of the threshold measurements in successive tests on both groups of children. In the first preliminary test both the feeding and the control group indicated vitamin A deficiency. The average for the group that was subsequently given large doses of vitamin A was a little lower than that for the control group.

On the fourth preliminary test, however, the averages for the two groups were identical. During the five weeks of supplementary feeding, the averages for both groups continued to increase. At the end of the experiment approximately 45% of both groups gave readings below what is considered normal. The two groups were essentially alike at the end of the feeding period.

"As a result of these findings, particularly in view of the enormous variability of the measurements," reports Dr Palmer, "it is not possible to attribute the improvement in the measurements conclusively to the supplementary vitamin feeding."

The shortcomings of the photometric technic with any instrument at present available, indicate that no interpretation of vitamin A deficiency by this means is dependable.

Dr Palmer reports that "The possibility exists that few or no children with vitamin A deficiency were actually included in his study". "These latter impressions," says he, "are further supported by the findings of the present investigation that a large proportion (45%) of the children who originally and subnormal or borderline readings failed to give normal adaptation measurements at 25 sec even after receiving vitamin A concentrates.

"If such a large proportion of apparently healthy children fail to give normal measurements after

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supplementary feeding, it seems that the proposed photometric standards for dark adaptation measurements may be incorrect or too rigorous."

Dr Palmer concludes that the photometric technic in its present form cannot be considered a reliable or satisfactory method for detecting mild forms of vitamin A deficiency in children. "Careful evaluation of all the evidence now available reveals that conclusive results, either favourable or unfavourable, have not yet been obtained."

In addition to the inadequacy of present instruments and methods, night blindness, or slow adaptation, may be a corollary to various pathologic conditions which create variations in the readings.

NEWS

INTERNATIONAL TASK GROUP MEETING ON THE HEALTH EFFECTS OF CHLOROFLUOROCARBONS

Immediate and effective international cooperation is essential to further reduce stratospheric ozone depletion caused by the accumulation of chlorofluorocarbons (CFCs') used in various human activities.

This is one of the major recommendations made by a Task Group of the International Programme on Chemical Safety (the World Health Organization (WHO), The International Labour Organisation (ILO) and the United Nations Environment Programme (UNEP), which met in Munich (Federal Republic of Germany) from 21 to 25 November to review the direct and indirect health effects of halogenated chlorofluorocarbons. The report of this meeting will be published in the WHO Environmental Health Criteria Series.

Chlorofluorocarbons are very stable chemical gases still widely used in sprays and refrigerators, among other things, causing an accumulation in the environment. Increasing concern has been voiced recently about the reaction of chlorofluorocarbons with the ozone in the upper stratosphere and the concommitant increase of ultraviolet B radiation striking the surface of the earth. According to the specialists, the projected increased level of ultraviolet irradiance due to ozone depletion is anticipated to have the potential of exerting substantial effects on human health and the environment.

It has been estimated that, depending on the release of chlorofluorocarbons in the stratosphere, a 1% depletion of the ozone layer would increase the number of skin cancers (non melanoma) by 3%, while a 5% ozone depletion would increase cases by 16%, which would mean about 200,000 new skin cancer patients a year. An increase in UVB irradiation would probably also increase the incidence of melanoma, the most dangerous and lethal skin cancer. Apart from the effects on the skin, possible immunotoxic and occular effects led the Task Group to the conclusion that urgent measures should be taken to further reduce stratospheric ozone depletion.

Unlike the indirect effects already mentioned, the direct effects of halogenated chlorofluorocarbons are negligible. The available toxicological data show a low acute and chronic toxity and indicate no mutagenic or carcinogenic potential. Health risks to human beings are mainly confined to occasional high exposures that may occur when handling these substances.

The conclusions of this WHO meeting confirm that although chlorofluorocarbons are very useful, stable and safe chemicals for industrial applications, their continuing use is a definite indirect threat for human health and the environment. Just another example: experiments have shown that about two thirds of 200 species of crops are sensitive to ultraviolet radiation. One of them, soybean seeds showed a 10% decrease in their protein and oil content when exposed to UV levels simulating a 25% ozone depletion.

The accumulation of chlorofluorocarbons is without any doubt a major environmental problem with serious potential consequences for the health of mankind. WHO is therefore determined to follow the issue carefully and to promote international cooperation to reverse the trend of stratospheric ozone depletion. (Press Release, WHO/48; World Health Organization, Media Service, 1211 Geneva 27, Switzerland)