patients who report obvious symptoms of severe acidosis over the telephone are advised to come in the next morning because of the lateness of the hour; or a responsible physician is not personally checking upon the patient at least hourly until ketosis has largely subsided.

It would seem that our batting average in diabetic coma could be greatly improved if our program included these two vital factors:

(1) Organization of a competent team responsible for all such patients in any given institution.

(2) Following one of the many reasonable systems of management of the disorder.

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Man's Requirement for Vitamin C

The British, who have done such outstanding work in nutrition since the days of John Lind,[1] have carried on this tradition with the publication of a significant study by a subcommittee of the Medical Research Council.[2] The Chairman was Sir Rudolph Peters, and among the committee members was Professor H. A. Krebs of the University of Sheffield.

Twenty conscientious objectors were studied. They received a diet containing less than 1 mg. of vitamin C daily. Three received a 70 mg. supplement of the vitamin daily; seven received 10 mg. daily; and 10 remained unsupplemented.

Clinical signs of scurvy developed in all 10 unsupplemented subjects. The first changes noted were enlargement and keratosis of hair follicles after about 17 weeks of deprivation. Some follicles later became hemorrhagic and developed into characteristic scorbutic spots. Gum changes were seen after 26 weeks of vitamin C deficiency.

Among the other signs noted were pains in the back and limbs, exacerbation of acne, ecchymosis, and knee joint effusion. However, considerable variation in degree was observed. Conventional tests of "capillary strength" failed to show a correlation with the states of vitamin C depletion.

Perhaps the most interesting finding was that 10 mg. of vitamin C daily given to six of the scorbutic subjects removed the clinical signs in all. The skin lesions disappeared in about two months and the gum lesions in three months on this small supplement.

It is significant that the concentration of vitamin C in the white cells appeared to be a useful guide to the state of vitamin C nutrition. The lowest values were reached 3 to 6 weeks before clinical scurvy developed, whereas the *plasma* vitamin C level was practically zero as long as 100 days before clinical scurvy developed.

In the scorbutic subjects, no change in hemoglobin, red or white cell count, or bleeding time was noted.

Experimental wounds were made in the skin of these volunteers and the rate of healing was studied by many techniques, including histologic examination. Delayed healing developed in the deprived group after a long period of time, but not in the early stages. It never developed in the two supplemented groups.

As the report indicates, the fact that a supplement of 10 mg. daily cured clinical scurvy and the fact that 10 mg. of vitamin C daily protected these subjects for periods up to 424 days suggest that the minimum protective dose (as indicated by the signs of scurvy) was in the range of 10 mg. daily. However, certain tests of physical fatigue suggest that the group receiving 70 mg. daily had a better overall performance record than did the 10 mg. group. It is to be expected that the prevention or cure of scurvy is possible on doses less than those necessary for "optimum health."

To satisfy the ill-defined additional needs associated with various human activities and

stresses, the Council recommends trebling the minimum protective dose of 10 mg., thereby confirming the 30 mg. per day requirement recommended in 1938 by the League of Nations Health Organization.

This estimate is less than half the 75 mg. per day recommended by the National Research Council in this country. The latter recommendation is essentially the amount necessary to maintain saturation. However, as the British investigators put it, "as long as there is no evidence to support the view that an intake of more than 30 mg. daily has beneficial effects, there is no basis for recommending an intake greater than that amount."

This excellent study prompts three comments. First, it should be recognized that these observations were made on healthy volunteers. There still is the clear possibility that the presence of a severe illness, associated with general or chronic malnutrition, may alter human metabolism so that the requirement for vitamin C is different from that of these healthy subjects who were ingesting an average of 2900 calories, 100 Gm. of protein, and adequate amounts of minerals and other vitamins.

Secondly, since six months elapsed before even the earliest skin changes appeared in these vitamin C-deprived subjects, shorter periods of deficiency undoubtedly are unrecognized in our present state of imperfect knowledge. This suggests either that "subclinical" scurvy is an entity, or that intakes much below 30 mg. daily are not necessarily detrimental to health.

Thirdly, this study points up the need for future research in the mysterious region between *minimal* and *optimal* needs. Certainly this study has defined the minimal requirement for healthy adults (on otherwise adequate diets). Is there something to be gained in exceeding this amount? Is "saturation" of the tissues necessary? How much is needed for that undefinable state of optimum health?

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