A meeting of the Society was called to order by the President, Dr. Lewis Webb Hill, Boston, at 8:15 P. M., on May 6, 1932, who spoke as follows:

This meeting represents an attempt to arrive at conclusions concerning the rational use of vitamin preparations in pediatric practice. There is one man whose work on deficiency diseases and allied subjects has been so brilliant and so applicable to the everyday work of each one of us that any such meeting as this could not be complete without his presence—Dr. Alfred Hess of New York.

DIET, NUTRITION AND INFECTION*  
BY ALFRED P. HESS, M.D.†

It is a commonplace that the relationship is intimate between composition of the diet and susceptibility to infection. However, the extent of this relationship and its importance in clinical medicine has only just begun to be realized; in fact we are still uncertain as to the limits of altered susceptibility. From the standpoint of disease, diet, nutrition and resistance to infection should be regarded as an etiologic unit rather than as a triad. In appraising diets, therefore, it is a point of view, that not only the several vitamins should be considered, but the various inorganic and organic constituents which likewise may be implicated in bacterial infection. It must be appreciated somewhat farther afield, however, to consider these various aspects of the subject, so that I shall confine myself to the role of some of the vitamins, basing my conclusions mainly on observations made during the past ten to fifteen years in a child-caring institution. As my experience has been concerned chiefly with the antirachitic, antipruritic and antiscorbutic vitamins, in other words with vitamins D, A and C, I shall limit my comments to these specific nutritional factors. Furthermore, I shall take into consideration only clinical data, to the exclusion of experiments on animals.

After an experience of several years with the effect of ultraviolet rays in the prevention and cure of rickets, an effort was made to lessen the incidence of infection in the institution by means of irradiation with the mercury vapor lamp. As is well-known, respiratory infections constitute one of the last vestiges of institutionalism in hospitals and asylums for children and, during the winter months, plague and torment their foster-parents. Our first attempt, undertaken in 1926,

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contains a specific vitamin in exceptional concentration. It is sad to contemplate that this source of vitamin A could well have been at the disposal of Denmark during and immediately after the War period and could have averted the many cases of blindness which resulted from a deficiency of this specific factor. A similar comment is pertinent in regard to the bone disorders which occurred in Germany, Austria and Poland during the War. From our experience in Denmark we have seen that the specific properties of solar and artificial ultraviolet rays were appreciated at that time.

In regard to vitamin C, I shall refer only to the bearing of this vitamin on infections, more particularly of the respiratory tract. In 1947, in a paper on the pathogenesis of infantile scurvy, I emphasized the fact that a lack of the antiscorbutic factor which leads to scurvy, at the same time predisposes to infections. This enhanced susceptibility has been confirmed by Abeis, Ludwig Meyer and many others. It exists even before the scurrite signs are manifest in the stage which is better termed "latent scurvy" than "precursors" as the abnormal scorbutic state already exists. Similar susceptibility to infections goes hand in hand with adult scurvy. This was pointed out years ago by Lind and others in connection with scurvy in the mercantile marine and among the soldiers in times of war, for example, in our Civil War and in the Crimean War.

But I wish to emphasize quite another aspect of infection in connection with infantile scurvy. In 1949 I called attention to the "widespread occurrence of nasal diphtheria in infantile scurvy", remarking that "we have encountered nasal diphtheria—at typical bloody mucous discharge—so frequently in connection with scurvy that this local infection occurs among a group of infants they should be carefully examined for latent or mild scurvy." At the same time I drew attention to the fact that "clinical tests showed that the blood contains antitoxin (diphtheria) to afford protection." These were the days previous to the use of toxin-antitoxin. Much to our surprise, some of these cases gave a negative Schick test in spite of the definite clinical signs of naso diphtheria. In two instances the diphtheria bacilli were tested on guinea pigs and found to be virulent. Not long after these observations an infant died from diphtheria of the larynx which developed although the Schick test was negative. At postmortem a typical membrane was found on the larynx.

Since this time, there has been little opportunity to investigate this subject, as diphtheria has been banished from our institution by the routine use of toxin-antitoxin. Recently, however, we have met with three cases of nasal diphtheria which developed soon after their admission to the institution. These cases were characterized by the typical bloody nasal discharge. In two instances the cultures showed virulent bacilli, in one which was obtained in December, 1936, the bacilli from the nose were virulent. In spite of this fact, not only was the Schick test negative, but tests carried out in February, 1931, with increasing doses of toxin 1/50-1/40-1/20-1/10-1/5 M.L.D. all failed to induce a skin reaction. As the result of these experiences we infer that a lack of the antiscorbutic vitamin exerts a local effect on the mucous membrane which diminishes its immunity, but at the same time may not be accompanied by a lowering of systemic immunity. It is probable that a similar phenomenon holds true in connection with a deficiency of vitamin A and that the marked changes in the epithelium described by Weg, bring about a local diminution in resistance. Susceptibility to infections of the skin and of the respiratory tract which occur when this deficiency is marked may be largely a manifestation of a local pathological change.

CONCLUSIONS

The antiscorbutic factor, whether given as ultraviolet irradiation, as irradiated ergosterol, or as cod liver oil does not increase the immunity of infants to respiratory infections.

Respiratory infections are not due to a lack of vitamin A and generally cannot be lessened by giving a diet rich in this factor even when supplemented with cod liver oil.

The average infant seems to receive an adequate amount of vitamin A in its milk, judging by the fact that absence of the eyes is exceedingly rare, and that no gain in weight or increase in immunity is brought about by adding vitamin A to the diet. The same seems to hold true for older children and adults, in view of the infrequency of night-blindness, the first sign of this deficiency.

A lack of vitamin C may induce heightened susceptibility to infection of the respiratory tract. It may, however, induce merely local susceptibility without appreciable loss of systemic immunity. This peculiar phenomenon is manifested by the occurrence of typical naso diphtheria, associated with virulent diphtheria bacilli, but a Schick reaction negative to highly potent solutions of toxin.

REFERENCES