

### Vitamin A as an Anti-Infective Agent.

WHEN the fat-soluble vitamins were first differentiated, it was soon recognised that animals maintained on synthetic purified rations deficient in fat-soluble A not only ceased to grow after a variable time, but also were very prone to develop various infections. One of the most obvious and common of these was an infection of the conjunctiva, which is known as xerophthalmia; hence the usual signs of vitamin A deficiency looked for were cessation of growth and this eye disease. When vitamin D was differentiated from vitamin A, the question arose as to whether the signs of fat-soluble vitamin deficiency were due to lack of vitamin A or vitamin D. It was found that both are necessary for proper growth; but except for some recent observations by Goldblatt and Benischek, the relationship between these vitamins and infective processes has not been fully worked out. The results of these authors suggested that vitamin A was the more closely related to the prevention of infection.

H. N. Green and E. Mellanby have therefore made a study of the effects upon rats of maintenance upon a diet deficient solely in vitamin A (*Brit. Med. Jour.*, p. 691, vol. 2, 1928). The animals were fed a synthetic ration well balanced as regards protein, fat, carbohydrate and salts, and containing vitamin B (marmite), vitamin C (lemon juice), and vitamin D (irradiated ergosterol in the form of 'Radiostol' solution,  $\frac{1}{2}$  to 1 drop daily each animal). Some rats were kept on a diet deficient in both vitamins A and D, whilst another group were given vitamin A in the form of dried cabbage (0.5 gm. daily), butter (0.1 gm. daily), or cod-liver oil (5-10 mgm. daily). The results obtained were quite clear-cut. On the diets lacking vitamin A the animals lived for 58-169 days; during most of the time they ate their food well and showed moderate growth; during the last week or so of life, however, the appetite failed, weight was lost, and finally death ensued. In almost all these animals (93 in all) some, and generally many, organs were found infected with micro-organisms. The presence of vitamin D in the ration made no difference to the results: it appeared, indeed, to hasten the onset of the infection, probably owing to its stimulating effect on growth whereby the stores of vitamin A were caused to disappear more rapidly.

In all the animals lack of fat and general visceral atrophy were striking features: in addition, 91 of the 93 showed evidence of infection in some part of the body. Only 38 per cent developed the characteristic lesion of xerophthalmia in this series, other types of infection having been found more commonly: thus 72 to 90 per cent, according to the period of survival, showed abscesses at the base of the tongue, in the accessory salivary glands, and 44 per cent or more gave evidence of infection of the urinary tract. Other sites of infection were the intestines (21 per cent), the lungs (9 per cent), and the nasal sinuses or middle ear (20 per cent); once an abscess in the wall of the left ventricle of the heart was seen.

These observations should be contrasted with the results obtained in 50 animals fed on the same diet plus one of the sources of vitamin A mentioned above for periods as long as, or longer than, those the deficient rats survived. In none was any sign of bacterial infection observed: three cysts of the liver, of parasitic origin, were noted; otherwise the tissues were perfectly healthy.

It appears, then, that vitamin A plays a significant part in maintaining the resistance of the body to infection, and it is probably more directly related to resistance to infection than any other known food

factor. If these results can be applied to man, it appears possible that various infections may be ultimately traced to deficiency of vitamin A in the diet. It is known the xerophthalmia occurs in man in conditions of deficient intake of fat-soluble vitamins, but the condition is rare, and only occasionally is the deficiency so gross as to lead to its appearance. More important is the possible relationship between inflammatory processes of the nasal sinuses, middle ear disease, and pneumonia, and vitamin A deficiency. At present it is impossible to be certain about such a relationship, but it is generally agreed that the usual sources of vitamin A, milk, butter, eggs, and green vegetables often find little place in a modern dietary. Making due allowance for differences in requirement between rat and man, but remembering that xerophthalmia can occur in both under similar types of nutritional deficiency, we might expect that a more adequate consumption of vitamin A by human beings might decrease the incidence of at any rate some of the commoner suppurative processes. The possibility of a dietary deficiency should also be borne in mind in their treatment.

### Condition of Plaice in the North Sea.

IN *Min. Agric. and Fish., Fishery Investigations*, Ser. 2, vol. 10, No. 3, 1927, Miss D. E. Thursby-Pelham reports on the condition of the plaice stock in the North Sea in 1925 as compared with 1923, and on the changes that took place in 1924 and 1925. The investigations by the Ministry have been continued year by year and tend to indicate that the plaice stock, which showed a marked increase both in size-distribution and abundance immediately after the War, and such a rapid decline under intense fishing in succeeding years, is still in a condition of flux.

The landings of plaice during 1923, 1924, and 1925 were below those of any previous year since the inception of reliable statistics in 1906. In 1925 the position with regard to the actual quantity landed, and abundance as evidenced by the catch per 100 hours' fishing, was better than in the two previous years. Less fishing, moreover, was carried on during that year, and therefore the effect of the increased abundance on the landings was not so marked as would have been the case if fishing had been carried on with its former intensity. This improvement, however, was entirely due to increased quantities of 'small' plaice, since both 'large' and 'medium' continued to decline both in actual quantities landed and in abundance.

The decline in size as evidenced by the statistical categories has been continuous since 1922 from year to year, but was not so marked during the year March 1925-February 1926 as in previous years. The evidence may indicate that the size-distribution of the plaice stock is becoming stabilised.

The question arises as to the extent to which the small size of the plaice caught may be attributed to over-feeding, and to what degree it is due to natural fluctuations. It would appear, from the very limited available evidence, that the great abundance of 'small' in 1925 was due to natural fluctuations. The same is true to some extent with regard to the scarcity of 'medium,' but it would seem that, in addition, the heavy fishing since the War has played a considerable part in the decline in abundance of this category. Miss Pelham expresses the opinion that the extent of the effect of fishing should be more easily adjudged in and after 1926, when it will be seen whether the very abundant 'small' of the last few years have remained uncaught in sufficient quantities to augment the 'medium' and the 'large.'