VITAMIN D IN DIET: PALATABLE METHODS OF SUPPLY

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It will generally be agreed among dietitians that the vitamin most likely to be deficient in the diet of both rich and poor is vitamin D. Of course, there is evidence that the hospital class of patients show signs of lack of vitamin C and that elementary school children in Cambridge and London and miners in Scotland (and even Cambridge undergraduates) take a diet deficient in vitamin A. But the very widespread prevalence of hypotrophic and carious teeth, and of undoubted though mild rickets, points to the fact that vitamin D has been absent from, deficient in, or deficiently absorbed from the diet of most of us. Nor is this surprising, in view of the fact that relatively few common foodstuffs contain vitamin D and that some of those which do are reputedly unpleasant or are costly. It is not so with the other vitamins. Many quite cheap foods—for example, cabbage—have quite high vitamin A and C potencies, and are by no means devoid of vitamins B₁ and B₂, whereas to obtain vitamin D in any quantity recourse has to be had to egg yolk (expensive) or to fish-liver oils, which are to many people—adults usually—offensive to the taste.

To the generalization that "natural" sources of vitamin D are expensive there are two exceptions: herrings and tinned salmon. As the oil of herrings is credited with 10,000 international units per 100 grammes (Boas-Fixsen and Roscoe, 1937-8) and herrings contain from 6 to 10 per cent. of oil, the herring contains 600 to 1,000 units per 100 grammes (about three and a half ounces). As three and a half ounces is a moderate helping, anyone who has eaten herrings may be considered to have had sufficient vitamin D for that day. Tinned salmon ranges from 200 to 800 units per 100 grammes (Boas-Fixsen and Roscoe, 1937-8) and so again one helping will easily yield a day's ration. A day's ration as herrings costs about 1½d. and as tinned salmon about 4d. If we have recourse to egg yolk the figure will be about 10d. No process of cooking or canning does any harm to vitamin D, so that cooked or canned fat fish can safely be used as a source. Apart from these sources we have little that gives us vitamin D in our diet. English summer butter and New Zealand butter have a maximum yield of 25 to 50 units per day's consumption (put at the high figure of two ounces per day). So if we wish to increase the daily dosage of vitamin D we are forced to use fish-liver oils such as those of the cod and the halibut. Of these cod-liver oil is much the most generally used.

Now these oils have the reputation of being difficult to take, and to most adults and many children are nauseating. This in adults is not surprising, for they were brought up to look upon cod-liver oil as a medicine and not as a food. They were given huge doses of a tablespoonful or more three times a day. The properly brought up modern child, however, has a conditioned reflex for fish-liver oils—looks, indeed, on fish-liver oils not only as a food but a pleasant food. They may

actually be induced to eat an unusual and new dish by using a fish-liver oil as a condiment.

Unfortunately this is not true of most people. There are a large number of people—children and adults—who either cannot or will not consume such oils. The problem is how to get them to take their daily dose. Many prefer a possible and problematic visit to the dentist to the daily consumption of a nauseous medicine. Others, more convinced, take it as capsules at considerably increased expense; others still, in mixtures with malt, orange juice, and the like, or possibly as the artificial vitamin. One way has not been tried—that is, camouflaged in the form of a sauce or mayonnaise. Fish-liver oils can replace a portion of the oils or fats which form part of the ingredients of soups, sauces, savouries, etc., in which ordinary white fish or shellfish provide the foundation. Such comestibles have a fishy flavour, but no one, unless told, will suspect that part of the fishy flavour is due to fish-liver oils. It is important that the person recalcitrant to fish-liver oils should not know, otherwise the dish will be rejected. Unbiased persons, even if they dislike pure cod-liver oil, will agree that dishes made with cod liver are perfectly palatable. The following is a sauce to serve with boiled, steamed, or baked fish:

Put into a small pan one tablespoonful of cod-liver oil, half an ounce of flour, salt, pepper, and a little anchovy essence. Heat slightly. Add to this half a pint of milk (off the boil). Stir till boiling.

One tablespoonful of such a sauce will yield from 40 to 200 units of vitamin D according to the potency of the oil, which, of course, should be known. The usual restaurant serving is about one tablespoonful. Most people would take more.

The following is a recipe for a mayonnaise:

Put in a basin one yolk of egg, add half a saltspoonful each of salt, pepper, and mustard, and half a teaspoonful of sugar. Mix well. Add slowly, whisking well either with a wooden spoon or small whisk, four ounces of cod-liver oil. When half the oil is added, whisk in one tablespoonful of lemon juice and one tablespoonful of Worcester sauce. Add the remainder of the oil, whisking well. Now add sufficient lemon juice or vinegar to flavour. Lastly, stir in one or two tablespoonfuls of milk to make the mayonnaise the desired consistency.

One tablespoonful of this mayonnaise will contain from 1,700 to 8,500 international units of vitamin D. Although so potent it is merely a pleasantly flavoured fishy mayonnaise which could be taken with any fish salad without its source being in the least suspected. The recipe, as a matter of fact, is too potent in vitamin D, and it would be well to substitute for the four ounces of cod-liver oil four ounces of a mixture of olive oil and cod-liver oil—three parts of olive oil to cod-liver oil—so that the vitamin D potency is reduced to about 425 to 2,125 I.U. per tablespoonful.

The principle of using fish-liver oils as an ingredient in any dish which already has fish in it can be extended to hors d'œuvres, soups, batters, pies, potted fish, and savouries. The following is a recipe for fish soup:

Ingredients.—One cod's head (small), a small piece of carrot, a small piece of turnip, half an onion, a bunch of herbs, one and a half quarts of water, two ounces of cod-liver oil, one and a half ounces of flour, half a pint of milk, and one tablespoonful of chopped parsley.

Method.—Remove the eyes from the cod's head, and wash it well. Place in a pan with the water, vegetables, and herbs. Heat. Just before boiling skim well. Simmer

slowly for one hour. Strain the stock off. Meanwhile mix the oil and flour till smooth. Add to the stock and bring to boiling point. Add parsley and serve.

The dosage of such a soup is naturally more vague than that of the former recipes, but half a pint will contain more than 375 I.U., and may contain 1,500 if a potent oil has been used. In fact, for ordinary purposes it would be well to substitute one ounce of an ordinary fat for one ounce of cod-liver oil, and so reduce the potency of the soup by one-half.

A batter to be used in deep-fat frying of fish, or for cod's roes, croquettes, etc., is the following:

Ingredients.—Two ounces of flour, one ounce of bread-crumbs, seasoning, one tablespoonful cod-liver oil, and milk to give coating consistency.

Method.—Mix flour, breadcrumbs, and seasoning in a bowl. Make a well in the centre and add the oil. Add enough milk to produce a coating consistency; beat for a few minutes, and set aside to cool for fifteen minutes.

The above recipes should give the average dietitian or the intelligent cook sufficient ideas of how to incorporate sources of vitamin D into the diet of people who are recalcitrant to fish-liver oils when served neat.

REFERENCE

Boas-Fixsen, M. A., and Roscoe, M. H. (1937-8). *Nutr. Abstr. Rev.*, 7, 823.

SYMMETRICAL PERIPHERAL GANGRENE IN CARDIAC FAILURE

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Fishberg (1938) has recently called attention to the occasional development of symmetrical peripheral gangrene in cardiac failure. In view of the rare occurrence of this phenomenon and of the problems raised in an attempt to explain its pathogenesis, the following case would appear worthy of record.

Case Report

A man aged 64 first sought advice for rapidly increasing dyspnoea in September, 1937. He had suffered from a chronic cough for many years, but recently had been expectorating sputum which was pink in colour. With rest in bed he improved considerably, but in February, 1938, the dyspnoea became more severe and he suffered from "attacks" of dyspnoea and "faintness" associated with pain in the chest. He was admitted to hospital on February 28 with severe congestive failure, too ill to give a satisfactory history. He was cyanosed, extremely dyspnoeic, with congestion of the veins of the neck, enlargement of the liver, and oedema of the legs and lumbo-sacral region. The heart was considerably enlarged, the apex beat being in the sixth space in the anterior axillary line. There was an apical systolic murmur and a rather faint and indefinite aortic diastolic murmur. The blood pressure was 175/85. Rhonchi and rales were audible all over both lungs. He did not respond to treatment, and three days after admission petechial haemorrhages were noticed on the face, neck, and hands. At this stage both legs and feet became gangrenous, the whole area below the middle of the leg being cold and plum-coloured. The upper limit of the gangrenous area was sharply defined, though there was no definite line of demarcation. In view of the petechial haemor-

rhages and the sudden onset of the gangrene a tentative diagnosis of bacterial endocarditis with a saddle embolism of the common iliac arteries was made. The patient died that evening.

POST-MORTEM EXAMINATION

Chest.—There was some clear fluid in both pleural cavities, most marked on the right side, and both lungs were fixed to the pleura at the bases and posteriorly by old adhesions. The right lower lobe showed some bronchiectasis, and there was a diffuse fibrosis extending throughout both lower lobes. In places this resembled chronic fibroid phthisis, but no active tuberculous areas were found. Both lungs showed acute oedema. Histologically there was also a terminal haemorrhagic and purulent bronchopneumonia. The heart was greatly enlarged, weighing 23 oz., the enlargement being mainly due to left ventricular hypertrophy, though both ventricles were dilated. All valves were normal. The coronary arteries showed some atheroma, but this was not severe.

Abdomen.—There was some free fluid in the peritoneal cavity. The alimentary canal revealed patchy congestion, and the contents of the ileum were blood-stained. The spleen was small and hard. The liver showed atrophic cardiac cirrhosis and a very severe degree of "nutmeg" change. It weighed 35 oz. The kidneys were normal in size and had a smooth surface; there was some thickening of the arterioles and some fatty change in the cortex. On section the renal arterioles showed hypertensive hyalinization, but both intimal and medial changes were more marked in the arteries of the spleen. The aorta presented a moderate degree of atheroma, but the iliac, femoral, and popliteal arteries showed no obstruction on either side. The skull was not opened. The *post-mortem diagnosis* was congestive cardiac failure resulting from hypertensive heart disease, pulmonary fibrosis, and bronchiectasis.

Discussion

The occurrence of this symmetrical peripheral gangrene with no occlusion of the arteries supplying the part obviously calls for some explanation. The suggestion put forward by Fishberg is that with severe congestive cardiac failure a selective vasoconstriction occurs (? reflexly) as a result of the extreme diminution in cardiac output, so that a smaller amount of blood is distributed to the limbs and a larger to the brain and the other more important viscera. This view is supported by such cases as the one now recorded and by the observation that in the terminal stages of congestive cardiac failure the antecubital and external jugular venous pressures may be grossly different. Fishberg records an instance where the jugular pressure exceeded 20 cm. of water while the pressure in the antecubital vein was under 1 cm. of water. With improvement, which is rare, he has noted that the antecubital pressure rises to that in the jugular vein.

The murmurs heard during life would appear to have been caused by relative incompetence of the mitral and aortic valves due to the great enlargement and dilatation of the left ventricle.

Summary

A case of congestive cardiac failure, the result of hypertensive heart disease, is described in which symmetrical peripheral gangrene of the lower limbs developed shortly before death.

The mechanism of this is discussed, and it is suggested that this is due to a vasoconstriction which leads to a redistribution of the circulating blood in an attempt to protect the vital organs from the effects of the diminished cardiac output.

We are indebted to Dr. R. H. Parry, medical officer of health for the City of Bristol, for permission to publish this case.

REFERENCE

Fishberg, A. M. (1938). *J. clin. Invest.*, 17, 510.