

completely decomposed. Pathological investigations, which have been carried out extensively, have been mostly concerned with the character of the metabolic disturbance rather than with its primary cause. Some workers<sup>3</sup> have concluded that the chief disturbance is one of carbohydrate metabolism, others of nitrogenous metabolism. Amongst the latter is Whitridge Williams,<sup>4</sup> who, in 1905 and 1906, expressed the opinion that the ammonia coefficient is valuable in the diagnosis of the severity and the variety of the disease and also as a guide to treatment, more particularly with respect to the question of induction of abortion. In a later paper<sup>5</sup> he admits that he overvalued the significance of the ammonia coefficient. He also says: "In my experience neurotic vomiting is the variety most frequently encountered,"<sup>6</sup> and mentions a case in which the vomiting ceased at once when he decided to induce abortion. He believes, however, that in some cases a primary toxæmia is the cause of the vomiting, but to my mind his arguments in favour of this view are not convincing. Pathological investigations into the changes in the urine have not been made in my cases, chiefly because the work seemed unnecessary for purposes of treatment and prognosis, and also because the vomiting has usually ceased before the investigations could have been carried out.

My clinical experience leaves me in no doubt that all my cases are of neurotic origin, and I believe that all cases of pernicious vomiting of pregnancy are of this variety, and that the more severe cases are later or advanced stages of neurotic vomiting.

#### CONCLUSIONS.

1. Vomiting of pregnancy can be cured quickly as a rule and with a high degree of certainty by the removal of the patient to a hospital or nursing home and by feeding on ordinary diet.
2. Induction of abortion is seldom or never necessary.
3. The so-called toxæmic cases are usually, if not always, a later stage of neurotic vomiting.

#### REFERENCES.

- <sup>1</sup> Tweedy: *Journ. Obstet. and Gyn. Brit. Empire*, 1914, xxvi, p. 216.  
<sup>2</sup> Hirst: *Amer. Journ. of Obstet.*, 1919, lxxix, p. 327. <sup>3</sup> Harding: *Lancet*, 1921, ii, p. 327. <sup>4</sup> H. H. Hofmann, and Givens: *Journ. Amer. Med. Assoc.*, 1920, lxxiv, p. 777. <sup>5</sup> Whitridge Williams: *Amer. Journ. Med. Sciences*, 1906, cxxxii, pp. 343-354. <sup>6</sup> Whitridge Williams: *Journ. Obstet. and Gyn. Brit. Empire*, 1912, xxii, p. 251. <sup>7</sup> *Ibid.*, p. 250.

## SOME COMMON DEFECTS OF DIET AND THEIR PATHOLOGICAL SIGNIFICANCE.

ABSTRACT OF THE OLIVER-SHARPEY LECTURES DELIVERED  
BEFORE THE ROYAL COLLEGE OF PHYSICIANS,

BY

E. MELLANBY, M.D.

### LECTURE I.

PROFESSOR MELLANBY began by saying that up to a few years ago the subject of nutrition was completely dominated by German ideas and German work, more particularly the very great work of Ruebner, whose point of view, briefly, was that if a person ate enough to give rise to sufficient energy that was all that was necessary. Ruebner put forward the generalization known as the theory of isodynamic equivalents—that is to say, that most foodstuffs were equally good so long as they provided sufficient energy for a man's body. That, obviously, was to treat a man like an engine, and to some extent it was justifiable. Almost the only qualification in Ruebner's theory of isodynamic equivalents of foodstuffs was that the food must contain a small quantity—about 4 per cent.—of protein. This theory of Ruebner was completely demolished by F. G. Hopkins in his Huxley lecture,<sup>1</sup> in which the subject of nutrition and dietetics was treated from a more or less philosophical standpoint. Hopkins showed that Ruebner in stating that the energy given by food was its only limiting factor was quite wrong. The energy was the limiting factor in a diet only when that diet was complete—that is to say, when it was a perfect diet—but there could be all kinds of imperfection in diets, such as insufficient carbohydrates, ill-balanced protein, and so on. Hopkins put forward the theory known as the theory of the minimum, which simply meant that every food in order to produce perfect health must have at least a minimum amount of certain constituents.

#### *Lesson from the Eskimo.*

In his own two lectures Professor Mellanby intended to approach the subject, not from the philosophical point of

view of Hopkins, but by way of practical demonstration of certain errors in modern diet and their pathological consequences. Take, in the first place, the primitive Eskimo. This man had perfect teeth, perfectly arranged in very hard, well-formed jaws. His limb bones also were very strong. His diet consisted of muscle tissue and fat. When he killed his animal to eat he saved the blood in order to get sodium chloride in that way. He regarded the glandular structures of the animals he ate as dainties; he ate bone marrow and also the softer parts of the bones, such as the epiphyseal ends and the ribs. But, on the other hand, the modern Alaskan, whose diet depended upon stored goods, such as canned products, both cereals and meats, had teeth which were poorly calcified, and he was just as susceptible to caries as the man in a more highly-civilized community. The same thing was found if one took the African or the West Indian negro in his natural habitat, where his diet consisted of fruit and vegetables and fresh natural products, and compared him with the negro in American cities. In the one case he had beautiful teeth and hard bones; in the other he was apt to show bad teeth, rickets, and general physical deterioration. The Icelanders, again, up to the middle of the last century were free from caries; their diet had consisted of milk, mutton, fish and fowl, and eggs of wild fowl. Now they had a modern dietary, with cereals, sugar, and so on, and had got caries and other degenerative conditions.

One other fact might be pointed out, although, perhaps, it was a digression. The Eskimos, living in their natural habitat, before the introduction of modern diets, got no cancer, and the same was true of the Icelanders. It was only with the introduction of these modern diets that cancer was becoming common in Iceland, and was now found actually among the Eskimo. This was an interesting observation, because here they had two diseases which were really diseases of growth—namely, rickets and cancer—and in one case certainly there was a relation to diet, while in the other it was just possible that there might be a similar relation. He did not mean that cancerous growths might not be forthcoming with a perfect diet, but it might be that the malignancy was due to wrong diet. That, however, was purely supposition, and without experimental basis.

#### *The Change in Modern Diet.*

It was necessary to ask why modern dietary had changed. Largely it was because people were taking more and more to urban life; fewer were actual food producers. The food had to be brought into cities from considerable distances, and preference was given to those foods which could be easily transported and were not readily destroyed by bacteria. Economic conditions were such that recourse had to be generally made to foods which could be easily and abundantly produced at comparatively small cost. The cheapest foods compatible with life were cereals, pulses, foreign meat, and vegetable margarines. But it was not only those who could not afford richer diets who suffered; people who were able to have a certain choice suffered also. It must be agreed that taste was not a very reliable guide to a proper dietary. Some people had a strong belief in physiological aesthetics, which meant that if a person liked a thing it was good for him. The believer in physiological aesthetics would point to the fact that the average man preferred butter to margarine. But, on the other hand, it could also be pointed out that the average man preferred the fat of bacon and pig fat generally to the fat of beef or mutton, and there was no doubt at all that beef fat and mutton fat were very much better, while probably the best fat of all which the laboratory worker came across was cod-liver oil, which the average man disdained. It might also be argued that the average man liked cereals, and ate large amounts of bread and also of sugar, and the value of these things as foods seemed to justify his taste; but how many people as a matter of choice drank milk as a beverage? Those who drank milk did so more or less as a duty, yet it was difficult to think of a food which had greater value.

Altogether, with regard to taste and appetite, it must be said that something had gone wrong. Nature had overdone things. Nature had seen that there were some things which were essential to life, like carbohydrates in the diet, and had laid so much stress on those constituents as to appear to forget that there might be other things which were equally important. The habit of rather excessive meat-eating was another instance. Most people liked meat to an extent which was hardly justified by the part it played in nutrition. An instance of taste going wholly wrong was the desire of many

people for acid and highly flavoured foods. Another reason why modern dietetic conceptions were often wrong was because, until recently, there had not been a reasonable standard for health. A child was found, for example, not only to like cereals and sugars, but apparently to flourish on them, growing fat and contented and lethargic, and the tendency was to regard weight as the criterion of health. The trouble was that the state of under-nutrition was not commonly appreciated. Malnutrition was understood when the child wasted away or developed tuberculosis, but more ought to be known about the state of under-nutrition before any extreme manifestations made their appearance.

#### *Experimental Work on Foods.*

The lecturer went on to detail some experiments on animals in regard to the effect of carbohydrates on growth, and pointed out that more activity was got by increasing the fat in the diet than by increasing the carbohydrates. Foods could be divided into two large groups: the first consisted of products such as milk, butter, cream, cheese, eggs, and green vegetables, like cabbage and lettuce; the other was made up of cereals (wheat, rice, oatmeal, maize, and all the prepared products made up of such things), vegetable margarine, lard, meat (including pork), also sugar, jam, potatoes, and tea, coffee, and cocoa. Of the first group the average man really got very little. An authoritative estimate showed that the amount of milk consumed per diem (including milk products) was equal only to a quarter of a pint a head of the population. Cheese was rather popular, but green vegetables were not commonly favoured, and his experience in hospital was that it was difficult to get patients to eat them at all. The second group of foods he had just catalogued was wrong in several respects; it lacked sodium, chlorine, calcium, anti-scorbutic vitamin, and if the fat of beef and mutton were taken away—and most people did leave such fat on their plates—the diet was also lacking in fat-soluble vitamin. The foods which were rich in calcium and fat-soluble vitamin were egg-yolk, cow's milk, human milk, and green vegetables; foods poor in this respect were white bread, rice (polished), potatoes, margarine, sugar, jam, and lean meat. He mentioned that from 1912 to 1917 the cases of xerophthalmia in Copenhagen increased in number steadily and considerably, but as soon as the Danish Government in 1917 prevented the export of butter, thereby making it available for home consumption, so that there was a sufficient quantity for each person, the whole trouble entirely disappeared. Just as in nature this fat-soluble vitamin was associated with calcium, so in the body there was experimental evidence for believing that calcium and something at any rate closely resembling fat-soluble vitamin worked in harmony—that, in fact, the body could not retain calcium, however much of it there might be in the food, if it did not have at the same time some of this vitamin.

The lecturer next described a basal diet for certain experiments on the production of rickets in dogs. The diet consisted of separated milk, white bread, yeast, orange juice, lean meat, and sodium chloride. If for the fat such a thing as linseed oil were used, rickets was produced; if cod-liver oil were used, there was no rickets. He had not been able definitely to affirm that this antirachitic vitamin was actually the fat-soluble, but it almost certainly was. Fats might be divided from the point of view of antirachitic action as follows:

<i>Good.</i>	<i>Moderate.</i>	<i>Poor.</i>
Cod-liver oil.	Lard.	Linseed oil.
Beef suet.	Coconut oil.	Olive oil.
Butter.	Rape.	Palm-kernel oil
Egg-yolk.	Cottonseed oil.	Babassu oil.

The hardened fats—hardened to make them tasteless and used for adding to margarine and so forth—were also very poor from the point of view of rickets prevention. Among the useful fats from this point of view was yolk of egg, which contained something absent from the white.

Diets deficient in fat-soluble vitamin had been found—as the result of experiments by Mrs. Mellanby on dogs—to give rise to a poor growth of the jaws and alveolar process, irregular placing of the teeth, delayed eruption and slow eruption, thin and defective enamel, teeth light in weight for their size, poor development of the gingival margin, as well as, generally speaking, a diminished resistance to disease. Dogs fed on cod-liver oil had good teeth, those fed on butter were moderately good from the dental point of view, though in certain respects defective, while those fed on linseed oil showed very bad formation of teeth and the tooth substance

as shown by a microscopical examination was defective. It had not been proved that this experimental production of badly formed teeth solved the problem of caries. Mrs. Mellanby had not produced caries in these animals, and the fact remained to be proved. One could only say that it was probable that animals or children with badly formed teeth would be more susceptible to caries. He showed microscopical slides to illustrate the remarkable changes of dentine according to the type of fat used.

#### REFERENCE.

<sup>1</sup> BRITISH MEDICAL JOURNAL, December 4th, 1920, p. 862.

## CALCIUM DEFICIENCIES: THEIR TREATMENT BY PARATHYROID.

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In a previous paper evidence was brought forward to show that in the circulating blood of the normal individual the calcium is present in two forms, ionized and combined.<sup>1</sup> When coagulation of the blood occurs, the calcium in the exuded serum is found to be all in the ionized form, the normal amount present being about 10.5 mg. of calcium per cent. In certain ulcerative conditions<sup>2</sup> it was found that there occurred a deviation from the normal in the calcium content of the serum, some of the calcium being present in the combined form. In all cases of varicose ulcer when the blood was examined this abnormality was found, and in the belief that this might be concerned in maintaining the chronicity of the ulceration measures were taken to increase the ionic fraction of the calcium in the serum. The intramuscular injection of ionized calcium salts had a definite effect in promoting the commencement of healing in the ulcers; the oral administration of calcium had none. But the injections did not appear to have the power to cause complete healing, and it was not till parathyroid substance was given orally that complete healing was obtained. Further, it was observed that healing of the ulcer and rise in the ionic calcium content of the serum ran approximately parallel. From these observations it was concluded that the toxic substance produced by the varicose condition in some way injured the parathyroid glands, and also combined with some of the ionized calcium of the blood. In this way the calcium balance of the blood became disturbed, and the parathyroids were not able to rectify it. Finally, the decrease in the plasma of one of its normal constituents would tend to lower the resistance of the tissues, so that the ulceration, started by slight local trauma, would tend to occur within the varicose area, where nutrition of the tissues is least effective.

The present paper forms an account of the application of these views to a considerably wider field of disease. The conditions dealt with may be classed generally as chronic states of a toxic or infective origin, and, though they have this common factor, they are classified in medical thought and literature as separate and usually unconnected diseases. It is therefore necessary to lay some stress on the mode of action of parathyroid substance, so that the appearance of a claim to its action as a universal panacea may be avoided.

The mode of action of parathyroid is essentially physiological; it is most probably a double action—a more or less specific action on calcium metabolism combined with, or resulting in, a generalized stimulation of metabolism as a whole. It is an aid in the fight against infection of the chronic type, not by its specific action on the infecting organism, but because it places the tissue cells under the most favourable conditions for an adequate resistance; and among the factors concerned in this process not the least important is the maintenance of a proper calcium balance in the plasma. If the tissue resistance is adequate it is immaterial whether the agent that is actively harmful is of bacterial origin or otherwise. If a deficiency of ionic calcium in the serum is a factor in the decrease of tissue resistance, then parathyroid therapy should be of value in those cases where such deficiency exists; and it is explicitly stated that parathyroid is not a specific method of cure for such conditions, but rather a rational method of assisting the cellular