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DIET IN GENERAL PRACTICE* WITH SPECIAL REFERENCE TO THE AMOUNT OF FOOD GIVEN

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The results of treatment by diet are often very different from those aimed at. Sometimes this is because the main idea has been obscured in a mass of comparatively unimportant detail, but more often it is because alteration in one direction has led to deficiency in another. Such errors cannot be avoided unless the constituents of a normal diet are constantly kept in mind, and for this reason these will first be briefly given.

The Normal Diet and its Constituents

For a diet to be normal it must contain enough food. Perhaps it is because this is so obvious that it is so often forgotten. The actual amount required by different people varies much more than books on physiology lead one to suppose. The diet for an "average man" approved by a committee of the Royal Society consists of 100 grammes of protein, 100 grammes of fat, and 500 grammes of carbohydrate. This has a total energy value of 3,400 calories. Many people can maintain health on a much smaller allowance of food or of protein than this, and the tolerance and requirement of fat also vary greatly. The amount of carbohydrate varies very widely, too, but it should always be enough to ensure normal metabolism of fat, and for this the ratio of carbohydrate to fat should not fall below that indicated by Woodyatt's formula, $F = 2C + \frac{1}{2}P$. Finally, in considering quantity it must be remembered that excess may be as harmful as lack.

The importance of vitamins seemed at one time to be overstressed. Recent work, however, by Harris (1935, 1936), Archer and Graham (1936), and others has shown that minor degrees of vitamin deficiency are all too common, and that they often occur in patients on special diets in which the normal vitamin requirement has been overlooked. Diets given in gastric cases are extremely liable to be deficient in vitamin C, and low-residue diets in vitamin B, unless this particular danger is realized and the deficiency corrected. In all diets, therefore, the possibility of such deficiency must be considered.

Every diet must contain certain inorganic constituents, and of these iron, iodine, calcium, and sodium are the ones of which a deficiency may occur. When it does it may result from failure of absorption or excessive loss rather than from actual deficiency in the diet. Wits and others have shown how rapidly many forms of anaemia respond to large doses of iron, but that such response only occurs when the amounts given are far and above those taken

normally. Lastly, every normal diet should contain sufficient roughage, hard food to develop the jaws and keep the teeth healthy, and water.

Deficiency through Dieting

Restriction of diet in one direction may lead to deficiency in another, and the most common of these untoward effects is the result of reducing the food to an amount below the optimum necessary for health. In some cases the reduction is so severe that actual weakness from lack of food occurs. This may happen with diets given for various conditions. In the artificial feeding of infants with diluted milk it is very easy to bring the caloric value too low without realizing it, unless calculations are made to check this. The following is an example of such a mistake.

A premature infant weighing six pounds failed to put on weight. She had been given six feeds in the day, each feed amounting to three ounces, consisting of one part milk and two parts water and half a drachm of sugar; half a drachm of cod-liver oil emulsion was also given daily.

For rough-and-ready reckoning it should be remembered that the child of 6 months or under requires approximately 50 calories per pound, and that one ounce of cow's milk or human milk produces 20 calories, one drachm of sugar 15 calories, and one drachm of fat 30 calories. In this case the calorie requirements were 300. The child was actually getting six ounces of milk, 120 calories; three drachms of sugar, 45 calories; and half a drachm of fat, 15 calories; total, 180 calories, or about 120 short of the theoretical requirement. The replacement of water by another ounce of milk per feed, bringing the total calories up to 300, rapidly produced a normal gain in weight. Minor deficiencies through too great dilution of milk are not uncommon, but they can easily be avoided if such a method of calculation is used. When breast-fed children fail to thrive the cause is often too little milk. In such cases the importance of test feeding to find out exactly how much food is being given cannot be over-emphasized.

Diets for gastric and duodenal ulcer cases afford another example of quantity deficiency, particularly those given in the early stages, consisting mainly of milk. In order to maintain strength and weight and promote healing it may be well to give 2,000 or more calories a day. One pint of milk produces approximately 400 calories, so that five pints will be necessary if the diet consists entirely of milk. This diet is difficult and trying for the patient, and so far as the ulcer is concerned there is no reason why more concentrated fluid feeds, variously flavoured and thickened,

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should not be given. Cream and olive oil, for example, are high-calorie foods of great value. The difference between a diet of, say, 1,000 calories and one of 2,000 may be that between healing and failure to heal; while the lower diet, if continued for long, may make convalescence slower than it need be. Discretion must be used, particularly at the very beginning of treatment, but fuller diets are nearly always well tolerated.

In patients with chronic nephritis and high blood pressure it is not unusual to find that all red meat has been forbidden. If the diet previously has been a very full one and has contained much red meat it is clearly rational to reduce this in order to throw less strain on the kidneys, liver, and heart, but in so doing it must be remembered that to cut off the main source of protein drastically is often to cause a feeling of weakness and depression that is worse and more disabling than the actual symptoms of the disease. Moderate restriction is sound, but the benefit resulting from drastic restriction is at the best nebulous, and is not justified if it produces symptoms. Many patients who have been thus severely treated feel fitter and better in every way when their burdens are lightened. If a patient has been accustomed to take meat three times a day he will probably feel better if he is allowed it once a day rather than not at all.

Diet in Diabetes

In the treatment of glycosuria, whether diabetic or not, excessive dieting is one of many pitfalls. It is very important to make a correct diagnosis before symptoms are masked by what may be excessive, even unnecessary, restriction. Many cases of glycosuria are innocuous and do not need treatment, but are dieted unnecessarily: the symptom has been blindly treated without an investigation of its cause. The following is an extreme example of this mistake.

A man of 40 was sent to the out-patient department suffering from mild hyperthyroidism and chronic pulmonary tuberculosis. Sugar had been found in his urine, and because of this finding his loss of weight had been attributed to diabetes mellitus, and a diet of 100 grammes of carbohydrate, 75 grammes of protein, and 150 grammes of fat given. The glycosuria was actually a symptom of hyperthyroidism, and with his raised metabolism, chronic infection, and restricted diet he was going rapidly downhill. A change to a high-calorie diet with plenty of carbohydrate led to rapid improvement and ultimately complete recovery.

Except in severe cases of diabetes mellitus it is important that investigations of blood sugar and urine should be made before the diet has been altered, so that the correct diagnosis may not be masked by treatment. Once the diagnosis of diabetes mellitus has been made the test of good treatment is whether the patient feels absolutely fit, is able to do full work, and maintains a constant weight. If a normal blood sugar and freedom from glycosuria can also be maintained so much the better; but fitness and efficiency are more important than these, and some of the latter standards may have to be sacrificed. Extreme introspection or neurasthenia is too heavy a price to pay for a normal urine, and in such cases some laxity is preferable. It is desirable, however, that freedom from ketosis should always be maintained.

In diabetics, as in normal people, there is extreme variation in the amount and type of food required, and the best diet for a particular patient must ultimately be found by trial. In patients over 45 the question whether insulin is necessary often arises. In such borderline cases the diet which they can take and still be sugar-free is barely enough

to keep them fit and active. Again decision is by trial and error, but it is a pity to allow patients to struggle on without insulin, under-nourished but sugar-free, when with insulin they could take a fuller diet and feel well. When they develop an infection many such patients will have glycosuria and need insulin; they should therefore be taught how to use it, so that they may take it at once without fuss should occasion suddenly arise. In old people with diabetes it is undesirable to reduce the blood sugar suddenly either by diet or by insulin. Many feel better with a permanently raised blood sugar, and the danger of over-dieting even when glycosuria is present must not be forgotten.

Diet in Other Conditions causing Obesity

In contrast to the diets in which inadvertently too little food is given I would direct attention to those in which the aim is reduction of weight. "Reducing" diets have a wide application, not only for the treatment of obesity as such but in the treatment of other conditions in which a moderate increase in weight often escapes notice. It is of those "other conditions" that I want particularly to speak.

From a theoretical standpoint increase in weight seems likely to lessen physical capabilities in certain directions. The mere addition of a stone means that more work has to be done, throwing extra strain on the circulatory and respiratory systems for which there is no return. To those of sedentary occupation or inclination this may tip the scales on the side of increasing weight and decreasing activity, a vicious circle which, once started, may be difficult to break. The deposit of superfluous fat, particularly around the hip and shoulder girdles and in the abdomen, leads often to degeneration of posture, which predisposes to bad breathing and visceroptosis. Bad breathing, a lax abdominal wall, and diminished activity interfere with the return of blood to the heart. This is normally brought about by muscular movement of the limbs, the descent of the diaphragm during inspiration—which, when the abdominal wall is of good tone, raises the intra-abdominal pressure and drives blood towards the heart—and the negative pressure in the great veins towards the end of inspiration. This effect is shown by the tendency of such patients to develop varicose veins and haemorrhoids. And yet how often does one see varicose veins treated but no attempt made to correct the obesity posture or visceroptosis. Further, the output of the heart is dependent on the venous return, so that the whole circulation is likely to suffer. Increased deposit of fat and diminished activity also has its effects on joints, muscles, fasciae, and tendons, allowing adhesions to form which interfere with the blood supply, so paving the way for chronic rheumatic affections, such as "lumbago," "neuritis," and "sciatica."

Relative Cardiac Insufficiency in Obesity

Proger and Dennig (1932) have made an experimental study of the factors responsible for the so-called relative cardiac insufficiency in obesity. They compared three obese with three normal patients, with the following results.

The vital capacity in the obese was from 12 to 25 per cent. below normal, according to whether height or surface area standards were used. The respiratory minute volume, while the same in both groups at rest, showed an average increase of one-third in the obese during mild exercise. The respiratory rate per minute in the normal and obese during mild exercise was 17 and 18 respectively. The oxygen

consumption was definitely greater in the obese during exercise, and was more than could be accounted for by the greater work associated with the extra weight or higher respiratory rates. The resting pulse rate tended to be higher in the obese.

If obesity produces these effects in patients whose hearts are healthy its effect on those with a weak or damaged myocardium becomes clearer. The opinions of many distinguished physicians might be quoted in support of the view that obesity tends to shorten life. Rolleston (1932) says: "The long-lived are usually spare and seldom fat, having been this since middle age." It is also supported by life insurance figures. MacLaren (1929) says that cerebral apoplexy, Bright's disease, nephritis, cardiac disease of uncertain nature, and diabetes mellitus all give a much higher mortality in those over weight. It is supported as well by the biologist. Robertson and Ray (1920) have shown, in white mice, that those with relative paucity of tissue accretion in late life tend to be long-lived. From the evidence there is little doubt that in many the tendency to put on weight is a degenerative change. This is a particularly important point, because in numerous cases it can be prevented.

The Causes of Obesity

Before considering treatment of obesity, however, it is essential to discuss its causes. Du Bois (1927) has divided cases into two main groups: endogenous or constitutional, in which there is frank endocrine abnormality; and exogenous, in which no such cause can be recognized. These groups merge into each other, and while the extremes can be recognized there are a large number of cases in which it is impossible to say how far the exogenous or the endogenous factors predominate. The tendency to put on weight is one of the most variable characteristics in different people; one can eat as much and do as little as he likes and his weight does not vary; another has but to eat an extra potato or omit his daily walk and his weight rises. Such tendencies often run in families, and may be likened to other hereditary metabolic disorders such as diabetes or gout. Whatever may be the primary cause, it is certain that in most people gain or loss depends on supply and demand, the amount of food absorbed and the amount of energy used. The effect of variation of food and exercise differs so much in different people that it is impossible to predict with certainty the result of a particular regime in a particular patient, and the effect must be determined by trial and error. In nearly all cases, however, a decrease in the fat-forming elements of the food—carbohydrate and fat—with increased exercise will cause a loss of weight, but the degrees of each required must be found by experiment.

A word must be said here on the use of thyroid gland in obesity. This is valuable when there is hypothyroidism and in some patients who put on weight at the menopause. When, however, there is no thyroid deficiency thyroid extract should only be used as an adjunct to treatment by diet, massage, and graduated exercises, and in most cases it is unnecessary. If these measures fail, then a careful trial of thyroid is advisable. Treatment of obesity with thyroid alone is usually unsuccessful unless the dose is pushed, and then it may be dangerous. Poulton (1931) suggests that many obese subjects, far from possessing a low metabolism, have it slightly raised. To give thyroid in such conditions without reducing weight may mean that still more work is thrown on a heart which has already too much to do. The patient remains fat and feels very ill.

Method of Reducing Weight

Reduction of weight may be said to depend on the application of these principles. Fat formation is prevented by having less fat and carbohydrate in the diet, and metabolism is stimulated by giving protein and increased exercise. Only if these methods fail should artificial stimulation of metabolism by thyroid be resorted to. In actual practice this means that the diet is made up mainly of lean meat, fruit, and green vegetables, with only enough sugar, starch, and fat to prevent feelings of weakness or hunger. In putting patients on such a diet it is wise to begin slowly so that adjustment to the change may be gradual: the degree of change depends on the individual, but once a diet is found that produces a steady fall in weight there is no need to make it more drastic. The scales are the best guide.

The following example shows the method in practice:

A woman, aged 50, with obesity; weight 14 st. 6 lb. There was no evidence of endocrine abnormality. On July 3, 1937, she was put on a diet of lean meat and fruit and green vegetables, with 140 grammes of carbohydrate per day. By July 31 there had been no change in weight, and the carbohydrate was reduced to 80 grammes. On August 14 her weight was 14 st. 5 lb., so the carbohydrate was further reduced to 60 grammes. On October 16 her weight had fallen to 13 st. 4 lb.

Increase in exercise should also be gradual. Graduated exercises, designed where necessary to improve breathing and posture, should if possible be taught and supervised by a qualified masseuse, supervision being relaxed as the patient becomes proficient. It is essential that such exercises should be done regularly at home every day. Other exercises, such as walking for prescribed distances, cycling, or riding, are valuable, and the degree to which these are necessary must be found by trial in each case. The scales and the patient's feelings are again the best guides. In patients with excessive abdominal fat a surgical belt is often a great aid to increased activity.

In ten consecutive patients with uncomplicated obesity treated as out-patients at Addenbrooke's Hospital during the last year for periods ranging from twelve to forty-eight weeks the average loss of weight was 25 lb. each. Reducing diets and graduated exercises were used in all cases, and in only two were small doses of thyroid given in addition.

Occasionally patients do not respond, and these often come from families in which there is a strong familial tendency to obesity. Before beginning treatment careful inquiry into the family history will be of importance as a guide to prognosis.

Effects of Treatment by Weight Reduction

Treatment by weight reduction is often of the greatest value when obesity occurs either as an incidental association or as the result of some other condition, and perhaps unnoticed by the patient at all. Sometimes the actual increase in weight above the normal is comparatively slight and would pass unobserved in a healthy patient. In association with a weak myocardium or a raised blood pressure, however, it becomes profoundly significant, because it may be the one factor which is treatable, and may turn the scales in favour of recovery. Some conditions in which the possibilities of weight reduction should always be considered are: chronic bronchitis, myocardial weakness and degeneration, high blood pressure, viscerop-tosis, and fascial rheumatism. In such the methods used are the same as those in simple obesity. Their application is, however, a much more delicate problem. Changes

of diet and exercise must be made more slowly and must be carefully adjusted to the individual case. Before beginning treatment it is best to make a patient describe in detail his diet and daily life. This provides a basis which may be gradually modified on the lines mentioned. In cases of heart disease and high blood pressure it may be best in the early stages to use massage as a prelude to increased activity.

Illustrative Cases

The following are examples showing some types of case to which the above methods are applicable:

Case 1.—A general practitioner, aged 47. The patient gave a history of chronic bronchitis with increasing winter cough for five years; breathlessness on exertion, getting worse for six weeks; and pain over the praecordium on exertion, with fluttering sensations in the chest. Examination in April, 1936, showed the presence of chronic bronchitis and some emphysema. Clinically his heart was found to be enlarged and one inch to the left; there were a tick-tack rhythm and frequent extrasystoles; the resting pulse rate was 90. There was slight cyanosis; the blood pressure was 140/90, and the electrocardiogram normal. His weight was 13 st. 12 lb.; height 5 ft. 7 in. The diagnosis was chronic bronchitis and myocardial weakness. Treatment consisted in gradually reducing the diet and increasing exercise, reducing smoking, and ordering the wearing of an abdominal belt. On May 20 the patient was much better and his weight was reduced to 13 st. 5 lb. On July 7 there were no symptoms; his weight was then 12 st. 2 lb., and he was doing much of his practice on a bicycle. The improvement has since been maintained.

Case 2.—A man aged 62 complained on July 31, 1937, of increasing breathlessness on exertion and slight giddiness of several months' duration. Examination revealed arteriosclerosis, a blood pressure of 190/110, and a pulse rate of 46. An electrocardiogram showed a 3:1 heart-block. His weight was 14 st. 3 lb. After ten days' treatment with massage, mild graduated exercises, and a reducing diet his weight had fallen to 13 st. 4 lb. The symptoms of breathlessness and giddiness had disappeared, and he felt much better.

Case 3.—A woman, aged 52, had had increasing noises in the head and breathlessness on exertion for eight months, with a recent gain in weight. Examination revealed arteriosclerosis and a high blood pressure (200/110). Her weight on July 17, 1937, was 12 st. 8 lb. Treatment consisted in reducing the diet and the prescription of half a grain of thyroid extract each day. After three months her weight had fallen to 10 st. 8 lb., the blood pressure was 200/94, the symptoms had disappeared, and she felt well.

Case 4.—This patient, a woman aged 44, complained of pain in the back on exercise and a "bearing-down feeling" in the stomach. On examination her doctor found sugar in the urine. When seen on June 1, 1937, she was very obese, her weight being 16 st. 9 lb. There was a heavy deposit of fat round the shoulders and hips, and the abdomen was protuberant. The urine gave 2 per cent. of sugar, but no acetone. The resting blood sugar was 2 per cent. Treatment took the form of massage and exercises to reduce weight and improve posture and breathing, with a reducing diet, and an abdominal belt was worn. After three months' treatment the symptoms had gone, the urine was sugar-free, the resting blood sugar 0.12 per cent., and the patient's weight 14 st. 6 lb.

Case 5.—A woman, aged 51, stated that following an attack of influenza in February, 1937, she developed shortness of breath and precordial pain on exertion. These symptoms persisted. When examined on May 19, 1937, her heart was not enlarged, but the quality of the sounds was poor; the blood pressure was 150/80. The abdominal wall was lax, with visceroptosis. Her weight was 10 st. 10 lb. and she was rather fat. Treatment was by means of an abdominal belt, massage, and exercises to reduce weight, and a moderate reducing diet. After five months' treatment her weight was 10 st. 1 lb. She was better in every way and her symptoms had almost gone.

Conclusion

By treatment on the above lines it is often possible to delay the effects of degenerative processes that occur after middle life. To be successful, however, such treatment must be begun early and must be thorough. If it is left too late comparatively little can be done. Both the recognition and the treatment are in the hands of the family doctor, whose opportunities are unrivalled.

REFERENCES

- Archer, H. E., and Graham, G. (1936). *Lancet*, 2, 364.
Du Bois, E. F. (1927). *Basal Metabolism in Health and Disease*, p. 238, London.
Harris, L. J., et al. (1935). *Lancet*, 2, 1399.
— and Leong, P. C. (1936). *Ibid.*, 1, 886.
MacLaren, J. P. (1929). *Medical Insurance Examination*, 2nd ed., p. 193, London.
Poulton, E. P. (1931). *Proc. roy. Soc. Med.*, 25, 347.
Proger, S. H., and Dennig, H. (1932). *J. clin. Invest.*, 11, 789.
Robertson, T. B., and Ray, L. A. (1920). *J. biol. Chem.*, 42, 71.
Rolleston, Sir H. D. (1932). *Medical Aspects of Old Age*, p. 69, London.

COAL-TAR NAPHTHA FOR THE DESTRUCTION OF BED-BUGS*

APPLICATION IN DWELLING-HOUSES AND TENEMENTS

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Attention was first directed to the use of heavy naphtha for the destruction of bed-bugs in a note by us in the *British Medical Journal* (1937, 1, 459) and the *Lancet* (1937, 1, 530). Toxicity experiments with heavy naphtha carried out by Professor G. R. Cameron at the University College Hospital Medical School indicated that danger to man from this substance was not to be apprehended. Extended research employing a wide range of heavy naphthas confirmed the results of the original experiments.

To ensure that only suitable naphthas shall be used the following specification has been drawn up:

Specification for Heavy Coal-tar Naphtha

- 1. Colour.**—Shall not be darker than a freshly prepared solution of 1 ml. of N/10 iodine in 1,000 ml. of distilled water.
- 2. Specific Gravity.**—Not less than 0.835 and not greater than 0.910.
- 3. Water.**—Shall be free from water and other visible impurities at 15.5° C.
- 4. Distillation Range.**—Method as defined in B.S.I. Specification No. 479 for coal-tar naphthas. Up to 160° C. not more than 5 ml.; up to 190° C. not less than 90 ml.
- 5. Flash-point (Abel).**—Not less than 105° F.
- 6. Tar Acids and Tar Bases.**—Not more than 0.25 per cent. of tar acids and 0.25 per cent. of tar bases.

Heavy naphtha complying with this specification may be obtained from all the principal tar distillers throughout the country at prices ranging from 1s. 6d. to 2s. 6d. per gallon, depending partly on the quantity purchased.

* A report to the Bed-bug Infestation Committee of the Medical Research Council.