

ABC of Nutrition

A STEWART TRUSWELL

THERAPEUTIC DIETS

For the purpose of describing therapeutic alterations to diets a "normal" or average diet provides for a *hypothetical 65 kg man* something like:-

Energy 2500 kcal (10·5 mJ)

Protein 10% of energy or 1 g/kg or 65 g

Fat 35% of energy or about 100 g

Carbohydrates 55% of energy or 340 g

and 86% of these absolute figures for the hypothetical woman, but the same percentages of energy for the constituents.

The naming of diets

Diets are sometimes described eponymously (Giovanetti diet) or as belonging to a specific disease (renal failure diet). But neither type of name is recommended. Diets named after their (supposed) originator give no clue about their composition and diets do not necessarily relate to diseases. A "renal failure diet" may also be used for hepatic encephalopathy or rare inborn errors of the ornithine cycle.

"Cholesterol lowering diet" is ambiguous. Several diets may lower the plasma concentration of cholesterol—low fat, vegetarian, increased fish oil ($\omega 3$ polyunsaturated fatty acids) or seed oil ($\omega 6$ polyunsaturated fatty acids)—and it is not necessary to lower the *dietary* cholesterol.

Sodium

100 mmol Na (2·3 g) is a mild low sodium diet
50 mmol Na (1·2 g) is a moderate low sodium diet
25 mmol Na (0·6 g) is a strict low sodium diet

Protein

50 g/day (0·75 g/kg) is a mild protein restricted diet
30 g/day (0·5 g/kg) is a moderate protein restricted diet
20 g/day (0·33 g/kg) is a severe protein restricted diet

A patient's diet may need to be changed as part of his or her management:

- (1) For essential or lifesaving treatment—for example, in coeliac disease, phenylketonuria, galactosaemia, hepatic encephalopathy;
- (2) To replete patients who are malnourished because of diseases such as cancer and intestinal diseases;
- (3) As helpful treatment, alternative or complementary to drugs, as in diabetes mellitus, mild hypertension, dyspepsia;
- (4) To provide standard conditions for diagnostic tests—for example, for measuring faecal fat, urinary 5-hydroxyindoleacetic acid. Also, an elimination diet is the mainstay in diagnosis of food sensitivity;
- (5) To deal with the side effects of some drugs—for example, diets with increased potassium for patients taking long term diuretics or diets with restricted tyramine for patients taking monoamine oxidase inhibiting antidepressants.

Prophylactic diets like those described in the article on nutrition for adults (dietary goals or guidelines for the general public) often combine mild restriction of energy, fat, and sodium with a moderate increase of dietary fibre.

Therapeutic diets ask patients to make one or more of the following changes: reduce or (virtually) eliminate one or more components, increase one or more food components, change the consistency of the diet, or change the feeding pattern. These are all changes to the patient's usual diet (which, of course, varies somewhat from day to day) or in comparison with a hypothetical "normal" or average diet for the country, culture, age, and sex.

The prescription for a diet should state:

- the nature of the modification,
- the degree of each modification,
- the planned duration of these,
- any compensation for essential nutrients compromised by the modifications.

The degree of the modification is as important as the dose in pharmacotherapy. People talk loosely about a "low salt" diet but its sodium intake can range from 25 to 100 mmol/day compared with a normal British sodium intake of over 150 mmol/day.

Likewise with protein, a protein restricted diet may vary from 20 to 50 g/day compared with the standard of about 65 g/day (1 g/kg).

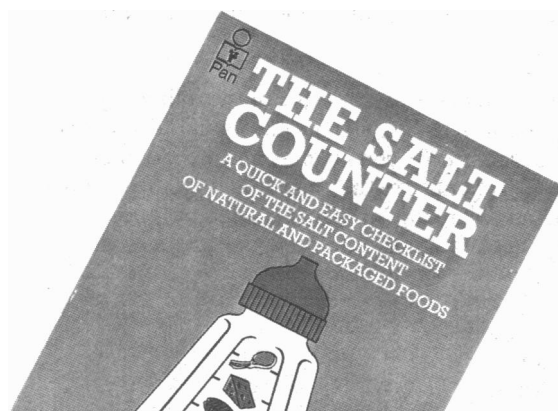
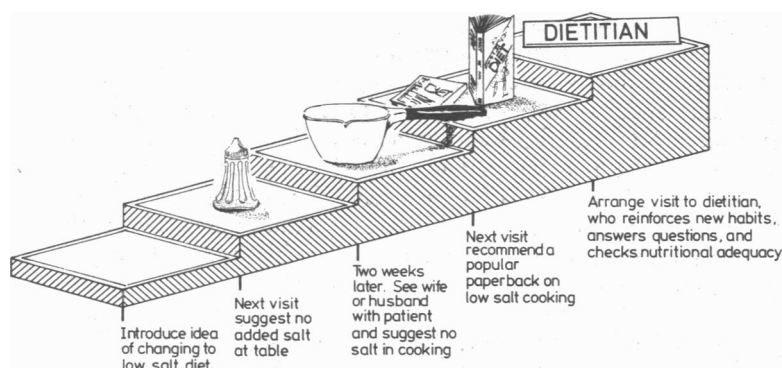
The dietary prescription has to be adjusted for the individual patient:

- for the foods he dislikes and likes;
- for any sensitivity or intolerance to food;
- for any religious food prohibition (including Ramadan for Moslems, the month when all eating has to be at night);
- for vegetarians;
- to include foods eaten away from home;
- for occupation, income, and level of education;
- for his need for variety in foods (some insist on variety; others like the same foods from day to day);



- for the patient's motivation and degree of obsessionality;
- for his calorie (energy) expenditure and needs;
- for the duration of the diet. If a diet is necessary for only a week or two then it is not serious if it provides less than the recommended daily amount of (say) calcium or magnesium, but if the diet is continued these elements must be provided, by supplements if necessary;
- for the patient's prognosis. A strict diet may not be justifiable for someone with a short life expectancy;
- when two or more dietary prescriptions are combined. Sometimes these are more or less incompatible—for example a low calorie plus high potassium diet or a high calcium plus lactose free diet (supplements would have to be used for these).

Strategy



Essential, or lifesaving, diets should be looked after in collaboration with a dietitian.

For some diseases—for example, gout, mild hypertension, dyspepsia, and hyperlipidaemia—drugs or diet are alternative or complementary treatment options. Drugs appear to act more quickly, are easier to administer and more reliable, and take less of the doctor's time, but they may cause more side effects. Diet appears more natural and safer but it will take longer to explain. Sometimes the best choice is a synergistic combination so the dose of drug can be low (hence fewer side effects) and the diet not too irksome.

We know from results with obese people who are on weight reducing diets and from studies in diabetics that most people do not follow the diet prescribed. It is difficult and time consuming to explain what is intended and how it may be done.

It is difficult too for a patient to make major changes to his or her food habits. Minor changes are much easier to incorporate and easier in some places in the day's food sequence than others. Each family and each individual has different feelings and ideas about foods. Some foods are given up more readily than others.

Outside hospital a therapeutic diet is a strange association of an occasional talk by the doctor or dietitian with daily action by the patient and his or her family in the supermarket, kitchen, dining room, works canteen, and pub.

Techniques



Essentially the doctor has a list of foods rich in the component to be changed and of foods with medium and low amounts of it. The trouble with scientific food tables, such as Paul and Southgate's *The Composition of Foods*, is that they give the content of nutrients per 100 g whereas what matters is the content per usual serving or portion.

The patient, with his or her spouse, can produce a list of what the family usually eats and how it is cooked. Ideally the next series of steps is for the doctor and these two to work out the most comfortable way for them to incorporate the doctor's prescription into the family's food patterns. This cannot be completed at one session. It requires trial and error, questions and compromises.

There are two fairly easy ways of changing the diet.

- Firstly, a food that tastes and functions like the original but has a different composition may be substituted. Examples are: polyunsaturated margarine for butter; sunflower (etc) oil for dripping; skimmed or 2% fat milk for whole milk; salt free bread for ordinary bread; wholemeal bread for white bread; high fibre breakfast cereal for a low fibre brand.

Typical serving sizes, approximate weight in grams

Bread (1 slice) 28 g	Cheese (1 portion) 30 g	Potato (1 medium, raw) 90 g
Crispbread (1 slice) 18 g	Egg (1, edible portion) 50 g	Lettuce 30 g
Biscuits about 10 g each	Meat (chicken or beef) little or no bone 120 g	Parsley (chopped) 5 g
Breakfast cereal 30 g	Meat (with bone, eg, chop) 180-200 g	Fruit (1 apple, 1 banana peeled, raw) 100 g (approx)
Butter or margarine (for 1 slice bread) 5 g	Bacon (1 strip, raw) 30-40 g	1 grape 5 g
Oil (1 tablespoonful) 20 g	Liver 100 g	Nuts 30 g
Cake (portion) 40-50 g	Sausage (one) 60 g (approx)	Pepper 0.2 g
Jam (for 1 slice bread) 10 g	Fish (fresh and canned) 110-120 g	Wine (glass) 110 g
Marmite (for 1 slice bread) 3 g	1 Fish Finger 25 g	Spirits 28 g
Milk (for 1 cup tea) 30 g	Macaroni and other pasta (for main course) 100 g (before cooking)	Beer (½ pint) 285 g
Milk (6 oz glass) 230 g	Vegetables (eg, peas, cauliflower) 60 g (before cooking)	Carbonated soft drink 240-330 g
Cream (1 tablespoonful) 20 g		Coffee powder 3 g
Sugar (1 level teaspoon) 5 g		
Yoghurt (1 carton) 230 g		

Checking compliance and effectiveness

From an authoritarian viewpoint patients often do not properly comply with the doctor's instructions. This can be checked by asking revealing questions, by calling into the home at meal times, or by biochemical tests.

But for an intelligent patient who thinks that dieting is his or her own responsibility and that of his or her partner, with the doctor as one of their sources of information, what needs to be checked is the effectiveness of what they are doing.

Whatever the viewpoint or words used the same objective tests are available.

- Change of body weight for reduced or increased energy diets.
- Increase of faecal weight for high (wheat) fibre diets.
- 24 Hour urinary sodium and potassium for dietary changes of sodium or potassium.
- 24 Hour urinary nitrogen for high or low protein diets, and also as general check on food intake (on average protein intake is 10-15% of energy intake).
- Plasma fasting triglyceride fatty acid pattern to indicate consumption of polyunsaturated fat.
- Blood urea, urate, glucose, cholesterol, or haemoglobin for respective diets prescribed to moderate these.

- Secondly, a simple addition may be made to less important parts of the day's diet. Examples are: a sprinkling of bran on the breakfast cereal to increase fibre; casein powder (such as Casilan) sprinkled on to food three times a day to increase protein; spoonful(s) of fish oil (such as Maxepa) to increase long chain highly polyunsaturated fatty acids.

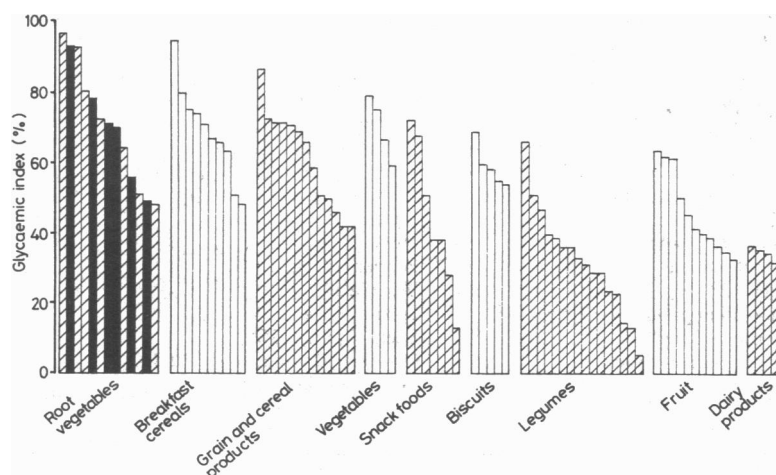
Diets are more likely to be followed and persisted with by patients who are well motivated, have stable mood, at least normal intelligence, good home support, and lead a well organised life. Indeed, in some obsessional patients there can be the opposite problem of overdoing a diet suggested long ago on thin scientific evidence or for a condition that has since disappeared.

Diets for treating diabetes

History of diets for diabetics in the twentieth century

1900-25	Fasting (Naunyn, Allen); 5% carbohydrate, 85% fat (Newburgh 1923)
1922	Insulin discovered (but not generally available for a few years).
1930	15% carbohydrate and 70% fat
1940 and 1950	All carbohydrate low, eg, 40% and fat 50%. Lawrence's lines in UK.
1970	Carbohydrate round 40%; sugar prohibited. Emphasis on oral drugs or insulin rather than diet.

Since about 1970 the diets used for treating diabetes have undergone further change, as several facts have emerged: (a) oral hypoglycaemic drugs predispose to heart disease; (b) there is no evidence that eating sugar causes diabetes; (c) Asian diabetics on high starch diets have fewer complications (especially atherosclerotic) than their counterparts in Western Europe and North America; (d) Western diabetics are dying of excess atherosclerotic disease, have higher plasma cholesterol values, and have been eating higher fat diets than non-diabetics; (e) viscous dietary fibre such as guar and pectin (though carbohydrates) improve diabetic control; (f) increased dietary carbohydrate improves the response to a glucose tolerance test. Increasing the (complex) carbohydrate of diabetic diets is not usually followed by deteriorating control; (g) individual foods containing carbohydrate do not give the same glucose and other metabolic responses at a standard intake. When put to the test amounts containing 50 g carbohydrate of some foods give much higher blood glucose concentrations than others. This means that carbohydrate exchange lists can no longer be relied on. It was always hard to believe that 2 oz of grapes had the same effect in the body as 7 oz of whole milk. The *glycaemic index* is the ratio of the area under the blood glucose curve after food (containing 50 g carbohydrate) to the corresponding area after 50 g glucose; (h) diabetics also have an increased chance of developing hypertension.



Reported glycaemic indices for single foods arranged in groups, based on reports from six research groups. The solid bars represent one food—potatoes.

Aim for non-insulin dependent diabetics

Reduce weight by combining a low energy intake from a balanced diet low in fat, alcohol, and sugar with increased exercise

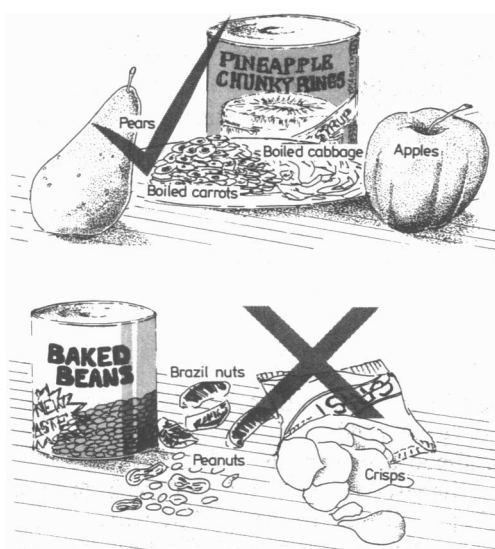
The sodium content of their diets has been largely ignored. We have recently reported that salt with food increases its glycaemic index.

The British Diabetic Association recommends that diabetic diets should contain 55% of calories as carbohydrate, as much as possible unrefined and starchy. Fat should be about 35% of calories (a little less than the average consumption in Britain, which is 41% of food energy, excluding alcohol) with saturated fat restricted. The association sees little place for sorbitol and fructose, which contain as much chemical energy as other carbohydrates. Non-caloric sweeteners like saccharin are useful. Diabetics should not be prescribed a diet that contains more sodium than that consumed by non-diabetics. Current recommendations in the USA are similar.

In practice about 90% of diabetics have type II, non-insulin dependent diabetes, usually maturity onset, and they are usually overweight. The overwhelming objective in their dietary management is to reduce weight by combining a low energy diet with increased exercise.

In type I insulin dependent diabetics food should be distributed in the day to match the times of greatest insulin activity. Distribution and amounts should be kept as constant as possible from day to day. The emphasis should be on foods low in fat with a low glycaemic index. Legumes like lentils and peas are especially suitable.

Diets for renal failure

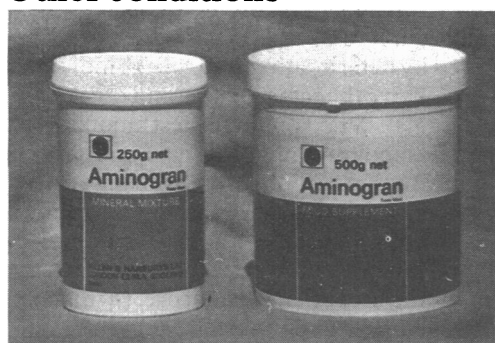


A therapeutic diet is needed for patients with renal failure during the few days between diagnosis and dialysis and for the minority for whom dialysis will not be used. The diet should be low in protein (40 g/day) or very low in high biological value protein (25 g/day) with low potassium and a controlled sodium and water intake.

Most patients with chronic renal failure in Western countries are, however, nowadays treated with regular dialysis while awaiting a transplant. For them the outpatient diet is not very different from a normal one. Protein should be about 1.2 g/kg body weight, a little more than the recommended daily intake for healthy people. Rather more protein is lost, and so needed, on continuous ambulatory peritoneal dialysis than on haemodialysis. Potassium is carefully monitored but usually needs to be only a little restricted, sometimes not at all. It is controlled by adjusting the concentration in the dialysing fluid; 50 mmol/day is an average amount for the diet. This is achieved by eating fruit with a low potassium content (apples, pears, and canned fruits) and boiled leafy vegetables and avoiding higher potassium vegetables (legumes), nuts, dried fruits, chocolate, and potato chips and crisps.

Patients can usually take an ordinary amount of sodium (about 110 mmol/day) or need only mild restriction. Fluid intake is restricted to about 1000 ml/day. Supplements of water soluble vitamins are given in nutrient dosage. Fat soluble vitamin supplements are not required; they tend to accumulate.

Other conditions

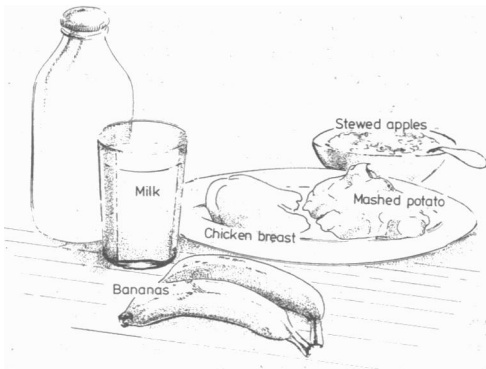


Phenylketonuria is one of the better known examples of an inborn error of amino acid metabolism. It leads to mental retardation and other abnormalities if patients are not started on a low phenylalanine diet in the first few weeks of life. Diagnosis is by routine screening of blood phenylalanine after adequate intakes of milk—that is, on about the seventh day of life. Bottle feeding is essential in infancy and a special low phenylalanine formula has been used, such as Lofenalac or Minafen. When the child is weaned the diet has to be very different from that of other children: a combination of low protein foods and a phenylalanine free mixture of other essential amino acids—for example, Aminogran—with sugars and fats. The relative amounts of the first two are adjusted to

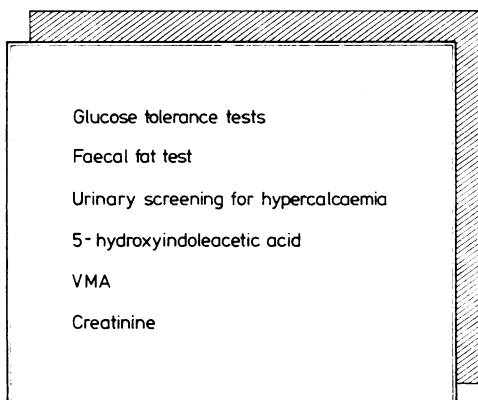


maintain plasma phenylalanine neither too high (toxicity) nor too low (inadequate growth). The diet has to be strictly maintained and monitored until the child is about 8 years old, after which it can usually be relaxed. But it is required again in women during pregnancy.

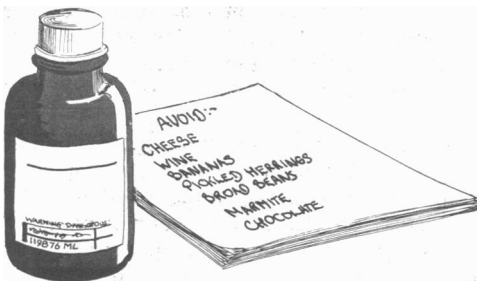
Patients with *gluten sensitive enteropathy*, coeliac disease, and dermatitis herpetiformis have to modify their diet to eliminate all wheat gluten, rye and barley gluten, and possibly oats. Fresh milk, fresh meat, fish and eggs, fresh vegetables and fruit, rice and maize, tea, coffee, sugar, wine and spirits are all safe but many processed foods have gluten added. With many of these foods some brands contain gluten, others do not. The only thing to do is to check ingredients on the label or check brands against an up to date copy of the Coeliac Society's list of gluten free manufactured products (PO Box 181, London NW2 2QY). Gluten free breads and pasta and other products, even communion wafers, are available, some on prescription. Unlike many other diets, even a small lapse and inclusion of the harmful component can lead to prompt return of symptoms.



Diets for dyspepsia present a contrast to the two preceding essential diets. Classic diets for peptic ulcer have not been found to accelerate healing in controlled barium meal studies; modern drug treatment, especially with cimetidine and insoluble alkalis is usually effective. Diet is therefore less emphasised than before for gastroduodenal diseases. Nevertheless, some foods are known to cause gastric irritation or stimulate acid secretion, including chili powder, coffee, tea, peppers, alcohol, and cola beverages. Other foods commonly cause heartburn by lowering the tone of the lower oesophageal sphincter: peppermint, garlic, onion, fatty meals. Orange, tomato juice, and radishes can cause heartburn through irritation of injured oesophageal mucosa. Frequent, small volume feeds are beneficial in both peptic ulcer and oesophageal reflux. Traditional bland foods such as milk, chicken, mashed potatoes, bananas, apples, and ice cream usually relieve symptoms in patients with dyspepsia, though individuals vary.



Diets for diagnostic tests—For several days before a *glucose tolerance test* patients should be standardised on enough carbohydrate—that is, about 300 g or at least 50% of calories, the amount of carbohydrate in ordinary Western diets. Before a *faecal fat* test for malabsorption patients should be on a known, controlled, and adequate fat intake, 70 to 100 g/day. Before *urinary screening for hypercalciuria* patients should be on a high normal calcium intake of about 1000 mg/day. Before urine is collected for 5-hydroxyindoleacetic acid (5-HIAA) measurement dietary sources of it or of serotonin should be excluded: bananas, plantains, tomatoes, plums, avocados, pineapples, passion fruit, and walnuts. For urinary 4-hydroxy-3-methoxy-mandelic acid (VMA) specific laboratory methods are now used, and dietary preparation should be unnecessary. Even urinary *creatinine* is affected (increased) by meat consumption.



Diet for patients taking monoamine oxidase inhibitors—The diet for depressed patients taking these antidepressants is the most striking example of dietary adjustment to prevent side effects from drugs. Monoamine oxidase inhibitors interfere with the normal breakdown of tyramine, dopamine, and other amines that occur naturally in foods in which flavour is enhanced by protein breakdown. Dangerous increases of blood pressure may follow ingestion of cheddar cheese, but other foods contain these amines and should be excluded too: wines, bananas, aged game, pickled herrings, broad beans, yeast extracts, and chocolate. The drugs which require this dietary modification include tranylcypromine, phenelzine, and isocarboxazid.

In practice the most commonly needed diet is one with reduced energy and the second most needed is a regimen with reduced alcohol intake. Both are prescribed much more often than they are successfully followed. This discrepancy remains a challenge for medical practice and research.

Diets low in energy, with altered potassium, low in oxalate, low in sodium, low in saturated fat (with increased polyunsaturated fat), and elimination diets are described elsewhere in this ABC series.

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