recent years there has been a revolution in both the research approach to food, as well as the health promotion messages. Rather than concentrating on the dangers of our diet, the emphasis has shifted to researching what is healthy and good for us. This follows a ground-breaking meta-analysis showing unequivocally that people with a high fruit and vegetable diet were significantly healthier on a wide range of parameters, such as longevity (Block, 1992).

The Government currently recommends that adults should eat at least five portions of fruit and/or vegetables a day. A portion is equivalent to one small fruit, e.g. an apple or banana or a cup of frozen vegetables (Ministry of Agriculture, Food and Fisheries, 1995). Also, a small glass of fruit juice counts as one portion, as does an individual pack of dried fruit, which even people who do not like fruit find acceptable. Any fruit or vegetable is acceptable, except potatoes. These are not included because the Government does not wish to appear to be encouraging consumption of chips (potatoes are an excellent source of vitamin C and starch).

Fruit and vegetables can be prepared and cooked in any way (although some of the benefits are lost if they are fried), or eaten raw. The common assumption that fruit and vegetables are best eaten raw may not be true, and several studies have found that many of the important nutrients are more easily absorbed from some cooked vegetables, such as tomatoes (Coghlan, 1999).

People may need advice to maintain a sustained increase in fruit and vegetable consumption. Air transport and intensive farming have made it possible to buy anything almost all year round. However, products bought out of season are expensive, and advising people on buying locally available foods in season may help to keep the costs down.

Nurses may be asked to give advice to people who wish to improve their diets. However, it is often difficult to give such advice, as research in this field is often complex and the conclusions vague and even contradictory. Adult nutrition is a fast developing field and is very prone to fashions and commercial pressures.

This article aims to review scientific advice, and outlines current research findings and theoretical thinking.

Healthy eating contributes to an individual’s welfare. If everyone ate well, the health of the population as a whole could be improved. It is estimated that an unwise diet contributes in at least 35% of all deaths from cancer (Doll, 1986).

HEALTHY EATING

In an attempt to simplify the choice of healthy foods, the food pyramid was devised by the National Institute of Health in the USA (Figure 1; Table 1). This places all foods into one of six categories, and ranks them into four levels. The bulk of food should come from the lowest two layers, with the third eaten in moderation and food from the tip only occasionally. This provides a simple and accurate way of choosing a good diet, and may also assist individuals in identifying where their diet is inadequate.

From the pyramid, it will be noticed that fruit and vegetables feature prominently. In

Abstract

The previous three articles in this series reviewed current nutritional advice to help maintain health during pregnancy (Vol 9(17): 1133–8), weaning (Vol 9(21): 2205–16) and in childhood (Vol 10(1): 26–31). This article reviews current thinking on what constitutes a healthy diet for the individual who has left childhood behind, but has not yet encountered many of the changes associated with old age. Most people enjoy food, and also believe that a good diet will improve their health. This article aims to review current thinking on what constitutes a healthy diet for the adult.

Alison Coutts

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A meta-analysis is a statistical summary of several existing studies. This particular study involved reviewing over 200 published articles.
Most fruit and vegetables should be stored in the refrigerator to maximize shelf-life, but many people find that fruit and vegetables taste better at room temperature and will remove them from the refrigerator some time before eating. People may need guidance on cooking, but it is important to note that frozen vegetables are as good as fresh ones (Ministry of Agriculture, Food and Fisheries, 1995).

There are a number of factors that make fruit and vegetables such useful foods. Some of the reasons are well established, e.g. most fruit and vegetables tend to be low in fat and high in fibre, while others are still obscure. Almost all vegetables are low in fat, and often they are high in starch and fibre (Ministry of Agriculture, Food and Fisheries, 1995).

Fibre, once called roughage, is a polysaccharide that cannot be absorbed from the gastrointestinal tract. Within the gastrointestinal tract, however, it is metabolically active. First, it absorbs water, so that the stool is soft and bulky. This will help people troubled by both constipation and diarrhoea as a high-fibre diet helps to normalize transit time. In most people, fibre has the effect of decreasing transit time, i.e. increasing the speed of material through the gut. Second, this may help protect the individual from cancer by ensuring that carcinogens from the diet, or metabolites that are carcinogenic, are moved along more quickly.

Starch, however, has a more direct protective role with regard to colonic cancer (Vines, 1994). The small intestine does not absorb β-starch, so it enters the colon largely unchanged. There, it is fermented by microorganisms, and the products of this are short-chain fatty acids.

One of these fatty acids, butyric acid, is of particular interest because it is absorbed by the bowel mucosa but, unlike the other short-chain fatty acids, it does not move from there into the bloodstream. Butyric acid is known to have a stabilizing effect on DNA and to prevent uncontrolled cell division. In this way, it seems to be protective against colonic cancer (Vines, 1994). This form of starch is available in cold, cooked potatoes, and in slightly under-ripe bananas.

Brussels sprouts are another food that seem to be protective against cancer (Vines, 1996). These contain several members of a group of substances called glucosinates. These are not

![Figure 1. The food guide pyramid. Adapted from US Department of Agriculture/US Department of Health and Human Services (1995).](image-url)
nutrients, but act as herbicides that prevent the plant being eaten by a predator. Glucosinates seem to be able to interfere with the development of cancer cells. One example is sinigrin, which seems to destroy precancerous cells. When rats with precancerous changes in their colons were given just one dose of sinigrin they had no cancerous or precancerous changes detectable 6 weeks later. It is possible that, in humans, an occasional portion of Brussels sprouts or broccoli (which has similar effects) may keep cancer in check in some people (Vines, 1996).

These are just two examples of ways in which fruit and vegetables are particularly healthy, but there are other, as yet undiscovered, ways.

There is some concern at present that individuals who intake large amounts of fruit and vegetables may inadvertently be consuming pesticide residues. These are chemicals that are almost always used to reduce the number of pests killing the crops, some of which may remain in the food and some of which may be harmful (New Scientist, 1989). However, it is possible that much of this is exaggerated (Bradley, 1991). Nevertheless, the American government has introduced lower permissible limits for pesticides in food (Kleiner, 1998).

**DIET AND ENERGY BALANCE**

One aspect of diet that interests a lot of adults is that of weight control. Adults are right to be concerned about being overweight. Obesity seems to be positively linked with several health problems, even when other factors, such as smoking and socioeconomic status, are taken into account (Department of Health (DoH), 1993). The disorders linked to obesity include insulin resistance (leading to non-insulin-dependent diabetes), hypertension, sleep apnoea, gall bladder disease and some cancers such as breast cancer (Pi-Sunyer, 1999).

However, not all people aiming to lose weight are motivated by concern for their health. In many Western cultures, individuals wish to obtain a particular body weight for reasons of fashion, and many people who are not at risk of health problems caused by excess weight are, nevertheless, trying to lose weight.

The most commonly used means of calculating whether someone should lose weight is the body mass index (BMI). This is a means of calculating weight as a function of height:

\[
\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2}
\]

An individual's BMI indicates the proportion of his/her body weight that is made of fat. The ideal BMI is 20–25. A person with a BMI 26–30 is said to be overweight and may be in danger of developing health problems related to his/her weight. A person with a BMI of 30 or over is obese (DoH, 1993) (Table 2).

Body mass index over-simplifies the situation, since body shape is almost as significant as body size. It is advantageous to have a lower waist-to-hip ratio, since this is associated with higher blood levels of high-density lipoprotein. Thus, central obesity ('apples') is more damaging to health than peripheral obesity ('pears') (Mansfield et al, 1999). Furthermore, women tend to have a higher BMI than men, and older people are heavier than younger people.

Once an individual has decided to attempt to lose weight he/she may ask the nurse for advice, in which case the nurse needs an understanding of energy balance. This can be summarized as:

Weight change = Energy intake minus energy expenditure.

<table>
<thead>
<tr>
<th>Table 1. What counts as a serving?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bread, cereal, rice and pasta group</strong></td>
</tr>
<tr>
<td>1 slice of bread</td>
</tr>
<tr>
<td>1 ounce of ready-to-eat cereal</td>
</tr>
<tr>
<td>1/2 cup of cooked cereal, rice or pasta</td>
</tr>
<tr>
<td><strong>Vegetable group</strong></td>
</tr>
<tr>
<td>1 cup of raw leafy vegetables</td>
</tr>
<tr>
<td>1/2 cup of other vegetables — cooked or chopped or raw</td>
</tr>
<tr>
<td>3/4 cup of vegetable juice</td>
</tr>
<tr>
<td><strong>Fruit group</strong></td>
</tr>
<tr>
<td>1 medium apple, banana, or orange</td>
</tr>
<tr>
<td>1/2 cup of chopped, cooked or canned fruit</td>
</tr>
<tr>
<td>3/4 cup of fruit juice</td>
</tr>
<tr>
<td><strong>Milk, yogurt and cheese group</strong></td>
</tr>
<tr>
<td>1 cup of milk or yoghurt</td>
</tr>
<tr>
<td>1 1/2 ounces of natural cheese</td>
</tr>
<tr>
<td>2 ounces of processed cheese</td>
</tr>
<tr>
<td><strong>Meat, poultry, fish, dry beans, eggs and nuts group</strong></td>
</tr>
<tr>
<td>2–3 ounces of cooked lean meat, poultry, or fish</td>
</tr>
<tr>
<td>1/2 cup of cooked dry beans or 1 egg counts as 1 ounce of lean meat. Two tablespoons of peanut butter or 1/3 cup of nuts counts as 1 ounce of meat</td>
</tr>
</tbody>
</table>

Reducing the energy value of the diet is an almost universal means of weight control. Lipid (i.e. fats and oils, although both are popularly referred to as “fat”) should account for no more than 30% of energy intake, ideally even less, but for most people in the UK the usual figure is about 40%. One reason for restricting lipid is that lipid, particularly animal fat which is high in saturated fats, tends to increase cholesterol.

This means that, to reduce weight, individuals need to increase the amount of energy they use or decrease the energy value of their diet. As discussed in the third article of this series (Vol 10(1): 26–31), individuals wishing to lose weight should be encouraged to adopt a generally more active lifestyle.

Although a burst of great activity, such as a game of squash, may be of value as part of a weight loss regime, it may not be suitable for individuals who are very unused to activity, are very overweight, or have certain health problems. For such individuals strenuous activity can cause an undue strain on the circulatory and respiratory systems and joints.

However, almost everyone could increase the amount of energy they use in everyday activities: they could walk occasionally rather than use the car (a brisk walk uses up even more energy than a stroll); or they could use the stairs rather than a lift.

Reducing the energy value of the diet is an almost universal means of weight control. Lipid (i.e. fats and oils, although both are popularly referred to as “fat”) should account for no more than 30% of energy intake, ideally even less, but for most people in the UK the usual figure is about 40%.

One reason for restricting lipid is that lipid, particularly animal fat which is high in saturated fats, tends to increase blood cholesterol. This is discussed in more detail below.

A given amount of energy taken as lipid would lead to less satisfaction than the same amount of energy taken as carbohydrate, and the former may leave the individual still feeling hungry. Furthermore, lipid material is very dense in energy: protein yields 17 KJ of energy and carbohydrate yields 16 KJ of energy, while fat provides 37 KJ of energy. Thus, a high-fat meal is likely to provide more energy than a high-carbohydrate meal.

A diet free of lipid, however, is not recommended for a number of reasons. The first is purely practical: the lipid component of our diet tends to provide much of the taste and the enjoyable texture, and to eliminate this would lead to an unenjoyable diet that the individual is unlikely to take for a long period of time.

The second is that to remove all the lipid from the diet would almost inevitably lead to an inadequate intake of the lipid-soluble vitamins, which are A, D, E and K, and a loss of essential fatty acids that are important in brain development.

**PROPRIETARY HEALTH FOODS**

There are currently a huge range of manufactured foods specifically marketed as ‘healthy’ or as assisting in some way in weight control. While some of these products can be useful, the nurse should view them with some scepticism.

Several of the meals that are ‘low in calories’ are actually quite small, leaving the individual hungry and very likely to snack. Many ‘spreads’ that are marketed as healthy options to butter are actually no lower in energy content, and some people may use more of it to achieve a good taste. Furthermore, as discussed in the first article of this series (Vol 9(17): 1133–8), these may contain a lot of artificially hydrogenated vegetable oils, and concerns have been expressed that these may also cause problems with immune function (Galland, 1994).

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**Table 2. Height, weight and body mass index (BMI)**

<table>
<thead>
<tr>
<th>Weight</th>
<th>Height</th>
<th>Body mass index</th>
<th>Health implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>57 kg (9 st)</td>
<td>1.74 m (5ft 9in)</td>
<td>19</td>
<td>Slightly underweight</td>
</tr>
<tr>
<td>56 kg (8 st 12 lb)</td>
<td>1.64 m (5 ft 3 in)</td>
<td>23</td>
<td>Ideal weight</td>
</tr>
<tr>
<td>90 kg (14 st 2 lb)</td>
<td>1.82 m (6 ft)</td>
<td>27</td>
<td>May be advised to lose weight depending on other factors such as age and lifestyle</td>
</tr>
<tr>
<td>104 kg (16 st 5 lb)</td>
<td>1.78 m (5 ft 10 in)</td>
<td>33</td>
<td>Should lose weight, as are likely to incur health problem, if they have not done so already</td>
</tr>
</tbody>
</table>
Infarction (MI), accounted for 26% of all UK deaths in 1991, and cerebrovascular accident (CVA) accounted for 12% (DoH, 1993). In 1992, it was a Government target to reduce deaths in people under 65 years of age by 40% by the year 2000; however, early indications are that these targets have not been met.

Diet is an important contributory factor to the pathogenesis of these diseases, and a number of alterations have been recommended. These recommendations stemmed from pioneering observations on the geographical variations in the disease, which led to the classic diet-heart theory. Menotti (1999) states that circulatory disorders were linked with a diet high in fat, energy, saturated fatty acids and cholesterol.

Cholesterol is fat which travels around the body attached to small lipid-protein complexes called lipoproteins, which make the cholesterol water-soluble (Marieb, 1995). Cholesterol is an essential chemical in the body.

Low sugar or no added sugar foods are also very popular. They are perceived as low in calories and promoting dental health. However, most of these products have some artificial sweeteners, and may, if taken in high quantities, lead to health problems.

Aspartame (NutraSweet) is probably the additive to attract the most criticism (Brown, 2000). It is a molecule composed of two amino acids that the manufacturers claim is broken down by the gut to its component parts, and treated by the body just like other amino acids. However, its detractors claim that high doses of aspartame cause a wide variety of problems, including headaches, sleep disorders, irritable bowel syndrome and mood changes (Brown, 2000).

It is difficult to support these claims by scientific research; however, more work needs to be carried out as all the indications are that these products will become an increasing part of our diet as the manufacturers introduce more products.

One example of the possible increase in intake of these substances is that the next generation of artificial sweeteners will be heat-stable, thus allowing them to be used in cooking. At present, it is estimated that 61% of the British population use sweeteners. This has not, however, led to a decrease in sugar consumption (Brown, 2000).

Another product that will probably be launched in the next couple of years, and which is currently seeking approval, is Olestra, which is manufactured by Proctor and Gamble (Kleiner, 1996). This is a fat substitute that is not absorbed from the gut. Thus, it may be possible to enjoy what would normally be a high-lipid manufactured food, but not incur the disadvantages associated with lipid intake in terms of weight gain or rise in blood cholesterol.

It does appear that Olestra is an inert compound, and for some people it may cause bowel irritation. It is necessary to be aware that intake — possibly in very large quantities — of a novel, artificial compound is a new venture and should be viewed with caution (Kleiner, 1996).

**HEALTHY HEARTS**

Coronary artery disease (CAD) and other circulatory disorders have been identified as a target for health intervention, as it is the single biggest cause of death in men and women (DoH, 1993). CAD leading to myocardial infarction (MI), accounted for 26% of all UK deaths in 1991, and cerebrovascular accident (CVA) accounted for 12% (DoH, 1993).

In 1992, it was a Government target to reduce deaths in people under 65 years of age by 40% by the year 2000; however, early indications are that these targets have not been met. Diet is an important contributory factor to the pathogenesis of these diseases, and a number of alterations have been recommended. These recommendations stemmed from pioneering observations on the geographical variations in the disease, which led to the classic diet-heart theory. Menotti (1999) states that circulatory disorders were linked with a diet high in fat, energy, saturated fatty acids and cholesterol.

Cholesterol is fat which travels around the body attached to small lipid-protein complexes called lipoproteins, which make the cholesterol water-soluble (Marieb, 1995). Cholesterol is an essential chemical in the body.
Foods that are high in sugar are the main source, but even more important is the “stickiness” of the food. Very sticky food enables the bacteria that colonize mouths to adhere to the teeth and gums, and promotes the formation of plaque... For this reason, dried fruit can be more damaging than may be apparent, while liquorice and chocolate are among the least damaging of sweets.

body. Most of the body’s cholesterol is synthesized by the liver; only approximately 15% comes from the diet, and it is used in the synthesis of cell membranes and some hormones (Marieb, 1995).

Lipoproteins can be classified according to their density: low-density lipoproteins (LDL) and very low-density lipoproteins (VLDL) have more lipid attached to them and seem to be the most destructive, while high-density lipoproteins (HDL), or ‘good cholesterol’, may actually be protective by helping to remove lipid material from cells and transfer it to the liver.

LDL and VLDL promote the formation of atheroma, which are fatty deposits on the inside wall of the arteries. These deposits lead to a narrow lumen and also limit the ability of the artery to dilate to allow increased blood flow (Menotti, 1999). Both of these effects impede the flow of blood to the organs distal to atheroma, i.e. those organs whose blood supply is potentially restricted by atheroma. The resultant diseases are varied (such as renal disease), and can result in MI and CVA, depending on the organs affected.

This theory has been refined recently, with more discussion as to the role of other nutrients. One area of interest is the beneficial effects of the so-called Mediterranean diet. This diet is high in lipid, but it is in the form of olive oil, which appears to attenuate the thrombogenic (clot-forming) effects of a meal high in lipid material, even compared to other oils of vegetable origin (Larson et al, 1999).

Another feature of the Mediterranean diet is that it tends to be rich in antioxidant compounds. These tend to be fruit and other foods rich in vitamin C. Antioxidants are compounds that are able to combine with free radicals and render them harmless. Free radicals are a by-product of normal metabolism and contain an unpaired electron, making them highly reactive, tending to be very disruptive of other structures, particularly cell membranes.

For example, the oxidation of LDL cholesterol yields a product that damages the vascular system by encouraging the formation of atheroma (the fatty material laid down inside arteries that leads to circulatory disorders).

Antioxidants are made in the body, but can also be taken with the diet, which may attenuate damage by free radicals. Antioxidants include β-carotene and vitamins C and E. Many plants contain antioxidants, particularly tomatoes that contain flavonoids. Even tea has antioxidant properties, green tea being the most potent, but the more popular black tea has some antioxidant properties, as does red wine (Weisberger, 1999).

A low-cholesterol, high-antioxidant diet may not only reduces the incidence of circulatory disorders, but also the incidence of many cancers, such as stomach, colon, breast and prostate. Such a diet may even mitigate the effects of ageing and lead to a long and healthy life (Weisberger, 1999).

DENTAL HEALTH

The final aspect of nutrition and health to consider is the matter of dental health. Poor oral health can lead to gum (periodontal) disease or tooth decay (caries). Both can lead to discomfort and eventually the loss of teeth. For periodontal disease to become established three criteria must be met:

1. Bacterial colonization
2. Substrate for the bacteria to interact with
3. Time for bacteria to work on substrate.

Bacteria work on the substrate over a period of time and this leads to the formation of plaque. Plaque is a colourless film produced by the bacteria that is constantly forming over teeth and gums and, if not removed, can harden and cause periodontal disease or caries. The bacteria also work by interacting with the sugar in food to produce acid that damages tooth enamel (Rugg-Gunn and Nunn, 1999). Thorough dental brushing and flossing can mitigate the effects of bacterial colonization and the substrate, but the real cause of poor oral health is diet.

Foods that are high in sugar are the main source, but even more important is the ‘stickiness’ of the food. Very sticky food enables the bacteria that colonize mouths to adhere to the teeth and gums, and promotes the formation of plaque (Rugg-Gunn and Nunn, 1999). For this reason, dried fruit can be more damaging than may be apparent, while liquorice and chocolate are among the least damaging of sweets.

It is not possible or even desirable to eliminate these from the diet. Indeed, most foods can have some deleterious effect on oral health. However, oral health can be maximized by eating infrequently, i.e. eating only...
three to five times a day, and this includes drinking. Snacking should be eliminated between these times, and only water should be drunk between meals.

Although the benefits of certain types of diet are almost beyond dispute, the exact mechanisms are still unclear. An important European study, coordinated by the International Agency for Research on Cancer, is commencing a significant prospective study to investigate the effects of diet on health, particularly in cancer (Coghlan, 1991). Although the final results cannot be expected for many years, the study should give more precise details of the link between health and diet.

CONCLUSION

This article has reviewed some of the issues a nurse may wish to explore if giving advice to adults about healthy eating. The selection, preparation and consumption of food are enjoyable subjects for most people. Not only do people like the taste of food, but also, for many, eating is often a social occasion, when family, cultural and religious ties are celebrated. This, too, is an important aspect of good health, and the nurse giving health advice must not lose sight of this fact.

The final article in this series will discuss nutrition and the older adult.

New Scientist (1989) Pesticides bound to grain may be drunk between meals. New Scientist 123(1676): 3

KEY POINTS

- The food pyramid gives an easy-to-understand summary of the healthy diet.
- Five fruit and/or vegetable portions a day maximize health in ways that are not yet fully understood.
- Body mass index gives a rough estimate of the amount of body fat present.
- Increase in activity throughout the day will increase energy expenditure and aid weight loss.
- The Mediterranean diet may be particularly helpful in maintaining a healthy heart. Reducing the frequency of feeding will improve dental health.