ABC of Nutrition

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NUTRITIONAL ADVICE FOR OTHER CHRONIC DISEASES

Dental caries affects people predominantly in the first 25 years of life. Dental enamel is the hardest material in the body. Its weakness is that, because it is basically calcium phosphate, it is dissolved by acid. Three factors together contribute to caries.

Infection—A specific species of viridans streptococci, *Streptococcus mutans*, metabolises sugars to lactic acid and polymerises sugars to a layer of covering polysaccharide in which the bacteria are shielded from saliva and the tongue. Some people harbour more of these bacteria than others.

Substrate—Most sugars serve as substrate—sucrose, glucose, fructose, and lactose (apparently not sorbitol or xylitol). Starches too, if they stay in the mouth are split to sugars by salivary amylase. Consumption of sugary foods between meals, especially if they are sticky and consumption is repeated, favours the development of caries. Brushing the teeth and rinsing the mouth after meals reduces the likelihood of caries.

Resistance of the teeth—Caries is more likely in fissures. In older people the “mature” enamel is more resistant. An intake of 1-3 mg/day of fluoride—as occurs, for example, if drinking water is fluoridated at a concentration of 1 mg/l—increases the enamel’s resistance, especially if taken while enamel is being laid down before the tooth erupts.

Gall stones

Most gall stones are composed mainly (about 85%) of crystallised cholesterol with small proportions of calcium carbonate, palmitate, and phosphate. Cholesterol would be completely insoluble in an aqueous fluid like bile if it were not kept in micelle microemulsion by the combined detergent action of the bile acids and phospholipids (chiefly lecithin) in bile.

Non-dietary risk factors include female sex, pregnancy, oral contraceptives, age, ileal disease, surgery for peptic ulcer, clofibrate therapy, and certain ethnic group—for example, Pima Indians have a high incidence of gall stones.

Dietary factors associated with this multifactorial condition have been worked out—for example, by the study of duodenal bile samples after cholecystokinin in people on different diets or by dietary histories, in patients with gall stones compared with controls. They include: obesity; periods of fasting or missing meals; possibly high dietary cholesterol and high dietary sugar; low dietary fibre intake, especially wheat fibre; and total parenteral nutrition. A reported association with high intakes of polyunsaturated fat has not been confirmed, and no association has been found between gall stones and deviations of plasma cholesterol concentrations. Moderate alcohol intake appears to be protective.

These associations do not apply to the less common pigment stones.

Urinary tract stones

Food rich in oxalate

Beetroots, cocoa, chocolate, currants, dried figs, rhubarb, parsley, spinach, tea, swiss chard, blackberries, gooseberries, oranges, strawberries, raspberries, turnip greens, carrots, green beans, onion, cucumbers, lemon peel.

One dietary cause of acid urine is a high protein intake. The amino acids methionine and cystine are metabolised to urinary sulphuric acid.

Foods traditionally rich in purines include liver, kidneys, sweetbreads, sardines, anchovies, fish roes, and yeast extracts, but there are no modern tables and RNA may raise plasma urate more than DNA

Calcium stones—Dietary factors which tend to increase urinary calcium or have been associated with stones are high intakes of protein, sodium, refined carbohydrate, vitamin D, calcium (spread over the day), alcohol, curry, spicy foods, and Worcester sauce and low intakes of cereal fibre and water.

Oxalate stones—Associated dietary factors are high intakes of oxalate and vitamin C and low water intake.

Uric acid stones are associated with an acid urine, a high purine diet, and low water consumption.

The one common dietary association with all the common types of stone—and with the rare ones also—is a low water intake. Drinking plenty of water is an important habit for anyone liable to stones, especially if the weather is hot. Last thing at night is the important time to take it.

Diabetes

Development of insulin dependent (type I) diabetes is not related to antecedent diet. This type of diabetes occurs all over the world, and in undernourished communities it is the predominant type.

Non-insulin dependent (type II) diabetes, which is the more common type in affluent communities, is closely linked to obesity. It was observed as long ago as 400 BC in India that diabetes is a disease of the well fed in countries with food shortages. Death rates have fallen in each of the European wars in the last 110 years. The prevalence of diabetes is strongly correlated with indices of overweight both between countries and within countries.

Looked at another way, diabetes is the complication of obesity whose incidence goes up at the steepest gradient with degree of overweight.

Diabetes is, again, a multifactorial disease. There is a strong family influence, though this may be partly because eating habits and body weight are influenced by family behaviour.

But a genetic factor is clear in some groups: the Pima Indians in North America and Micronesians on Nauru. When these people are obese (which most of them are these days) the incidence of diabetes (in older life) is over 50%.

The popular belief that eating a lot of *sugar* predisposes to diabetes is not confirmed by several epidemiological and prospective studies. High *fat* intake is more likely to lead to diabetes, a hypothesis first put forward in Britain in 1935 by Sir Harold Himsworth. High *total carbohydrate* (mostly starch) and high *fibre* intakes are characteristic of peasant communities, in which maturity onset diabetes is uncommon.

Diets and prevalence of diabetes* in eleven populations

	Diabetes prevalence	Carbohydrate	Percent of calories Sugar	Protein	Fat
East Pakistan	2.0	83	2	10	7
Malaya	3.3	68	8	11	21
Costa Rica	5.4	69	17	11	21
El Salvador	3.2	70	7	12	17
Guatemala	4.2	73	10	12	15
Honduras	4.1	66	8	13	22
Nicaragua	5.0	66	12	13	21
Panama	2.5	67	9	11	22
Uruguay	6.9	53	12	14	33
Venezuela	7.0	62	7	14	24
Bangor, Pa.	17.2	47		13	40

*Venous blood glucose >149 mg/100ml in subjects over thirty years of age.
Some totals do not add to 100 per cent because of rounding.

Chromium (in the organic compound, "glucose tolerance factor") appears to be necessary for the stimulation by insulin of glucose transport into cells, but chromium deficiency is a rare cause of carbohydrate intolerance. This trace element must, however, be remembered in prolonged parenteral feeding.

Diets for managing established diabetes will be discussed in a later article.

Cirrhosis of the liver

Countries with high alcohol consumption per head have high mortalities from cirrhosis. These have fallen when there has been a reduction in the supply of alcohol—for example, during prohibition in the USA and during the two world wars in Europe.

Correlation of alcohol consumption and deaths from cirrhosis between countries is close, but there are deviations. Britain has a lower incidence of cirrhosis than might be expected from the rate of consumption but mortality from cirrhosis has nearly doubled here in the last 25 years. Where alcohol consumption is high most cases of cirrhosis are due to alcohol. Other causes—for example, hepatitis B—account for about a third of cases in Britain.

Within countries the risk of developing cirrhosis is related to the dose and duration of alcohol intake. Daily heavy drinking for years is the typical pattern—80 g (eight drinks) a day in men, and usually well over this.

No safe level of intake can be given—only a clinical impression—because people who drink heavily underestimate their consumption when asked about it, and no prospective epidemiological study has been done. Women are more susceptible to hepatic damage from alcohol. Not all heavy drinkers get cirrhosis; those with certain HLA antigens, such as B8 and B40, are more susceptible.

Although alcoholics may become deficient in nutrients, those who develop cirrhosis are often socially organised and well nourished. There is no evidence that a high protein diet or choline can prevent alcoholic cirrhosis in man. Even when cirrhosis is established, improved clinical state and prognosis may be expected in those who thereafter manage to abstain completely.

Some types of cancer

Oesophageal cancer

300 x range in incidence

Highest rates

Linxian, People's Republic of China,
E Mazandaran, Iran,
and Transkei, South Africa

In Europe there are moderately high rates
in NW France and in Switzerland

Differences in diets are thought to account for more variation in the incidence of all cancers than any other factor (with smoking in second order). The big questions are which dietary components are active, and how do they work? Our bodies have three routes of entry for foreign compounds: the skin, lungs, and intestines. As a function of surface area the chances of absorption are skin 1, lungs 1000, and intestines 1 000 000. There are countless natural non-nutrient substances in foods and several are mutagens. The fact that they can induce mutations in a standard bacterial culture does not, however, establish that they are dangerous to man: there are many available protective mechanisms. Diet may have a more decisive effect by weakening defence mechanisms than by supplying potent carcinogens. Epidemiologists estimate that synthetic chemical additives in food account for under 1% of all cancers. The cancers most clearly related to habitual diet are oesophageal, gastric, and large intestinal cancers.

Gastric cancer

The incidence in Britain has spontaneously fallen to half in the past 25 years. There have been similar reductions in many countries.

Highest rates in Japan are 5 times those in England and Wales, 10 times those in the USA, 25 times those in parts of east Africa.

Atrophic gastritis is a precancerous state.

Cancer of the large bowel

The second largest cause of death from cancer (after lung cancer in men and breast cancer in women)

It is 10 times more common in developed Western countries like Britain and USA than in the Third World.

Rates in Scotland have been the highest in the world.

The epidemiology of rectal cancer shows some minor differences from the larger group of colon cancer.

Oesophagus—In the Chinese focus of oesophageal cancer nitrosamines have been found in mouldy food and there is a deficiency of molybdenum. Domestic fowl are affected too. In the Iranian focus there are some vitamin deficiencies and people may take opium by mouth. In the Transkei researchers think that fusarium mycotoxins, together with deficiencies of niacin, zinc, and other micronutrients, are responsible for the new epidemic of oesophageal cancer. In Europe alcohol, especially that derived from apples, and tobacco are associated factors.

Stomach—Dietary factors associated with gastric cancer are the consumption of dried salted fish, pickled foods, cured meats, and salt and lack of refrigeration. Foods that appear from surveys to be protective include salads and citrus fruit. The hypothesis is that nitrates produce nitrites, which, in the stomach, with secondary amines, produce nitrosamines and nitrosamides, which are carcinogenic. When gastric acid output is low there is bacterial colonisation of the stomach and more nitrites produced. Refrigeration reduces secondary amine formation; vitamin C inhibits nitrosation.

Large intestine—Between-country data and several case-control studies give a fairly consistent picture of the background diet. Total fat intake appears to be causally related to cancer of the colon. Both wheat fibre and brassica vegetables appear to be protective. Meat consumption is usually correlated with fat but is less consistently related to colon cancer. Some types of beer have been associated with rectal cancer. There have, however, been variations and inconsistencies in all the case-control studies. Apart from diet, there is a familial influence: rectal cancer is commoner in men, polyps are precancerous lesions, and cholecystectomy increases the risk of cancer of the colon.

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MATERIA NON MEDICA

Chilean earthquake

We touched down at Santiago on 2 March, the day before the earthquake. It struck as we were passing through the house of one of my wife's many Chilean cousins on our way to the garden; the floor suddenly moved sharply right and left. Outside I turned and watched with amazement the ground between myself and the house heave up and swing repeatedly to and fro with increasing intensity for some two to three minutes. The house and trees shook and swayed. Loose objects in the house were flung about and smashed. Two further quakes of considerable but less intensity occurred that evening and were followed by similar ones day and night throughout the next two weeks: in the silence of the night I sometimes heard them coming, like the rumble of distant thunder. The last was a strong one at midnight. Its intensity increased until one wondered apprehensively just how far it was going.

In Santiago the main quake registered seven on the Richter scale and damage was severe. On the coast 70 miles to the west it measured eight, the epicentre being 25 miles out at sea from the port of San Antonio where a huge crane crashed down and a river bridge was destroyed. Damage was also severe in Valparaíso and Viña, where a high rise block of flats, to the terror of its occupants, was left leaning at a fearsome angle and was too dangerous for them to re-enter to rescue their possessions before being dynamited. The "dissident" (Protestant) cemetery on a hill in Valparaíso, where relatives of my wife lay buried, was partly destroyed, with coffins exposed and broken open. Water mains were ruptured. We found an old man sitting beside his ruined house disconsolate because his cat was missing. Fortunately the main quake struck in daylight on a Sunday evening, when most people were at home, and casualties were light—some 200 killed and 2000 injured. Eighty thousand buildings were destroyed.

Before leaving we were flown in a cousin's twin engined Piper down the fringe of the snowcapped Andes to his farm and splendid ranch house 400 miles to the south. Chile is a lovely country, Edwardian in style like the England I knew as a boy pre-1914. The many relatives we visited kept servants devoted to them and their families and treated with mutual respect

as family. The people thronging the streets of Santiago and its famously beautiful underground were clean and polite. There were no yobos and not a scrap of litter. If ever the Reds got control here our first choice would be Chile.—J G BOURNE, retired anaesthetist, Salisbury, Wilts.

The treasure

I suppose every family has one. Our own "treasure" has been with us since my sons were babes. She is as much a part of the family as the formal and legal representatives we acquired through marriage. Her cleaning days are almost over but she bustles about with a duster, makes cups of tea, and entertains my wife to the gossip of her neighbourhood now, alas, much less salty since she transferred from her old tenement to a high rise flat. She also keeps us abreast of the state of play in the war she wages with the girl she instantly disliked when they first met at school 60 years ago.

Although my sons are now grown up she still regards them as the boys she took to play in the park and let sit on the vacuum when she cleaned the carpets. She makes remarks about their hair, clothes, and manners which, if coming from me, would make them leave home immediately. Their girlfriends are subject to careful and sometimes hostile scrutiny and she is not afraid to voice her thoughts. All this is taken meekly. They realise that in some ways we are the family she never had.

In spite of the years she has never quite understood my type of doctoring. Community medicine is a closed book to her and she has never come to terms with the fact that I do not carry a stethoscope, a small black bag, and a ready supply of pills. She discusses her aches and pains only with my wife. Things came to a head recently when she regaled my wife with the medical misfortunes of a close friend. A crisis developed during the night and the "emergency" doctor had to be called. Apparently he did not live up to their expectations. "For all the good he did," said our treasure, "we might as well have called out the plumber—or even," she continued, looking at me severely, "our own wee man."—WILLIAM THOMSON, chief administrative medical officer, Lanarkshire.