

Salt and health: the CASH and BPA perspective

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Summary

This paper reviews the strong evidence that links our current high salt intakes to high blood pressure and current evidence for less established links with other adverse health effects such as stomach cancer and osteoporosis. It looks at our current salt intake in relation to recommendations, together with the sources of salt in our diet. The current situation with the food industry and retailers salt reduction programmes is highlighted and further necessary steps are discussed. This paper also discusses the confusion behind salt labelling and simple ways we can all lower our salt intake.

Keywords: blood pressure, salt intake, salt

Background evidence for the need to reduce salt

Salt is made up of two constituents: 40% sodium and 60% chloride; it has several functions in the body. Firstly, sodium together with potassium is an essential mineral for regulating body fluid balance. Secondly, it is essential for the transmission of nerve and muscle impulses (Piper 1996). However in Western societies most of us consume far too much salt for our body's requirements. The physiological need of salt, which has been interpreted in terms of evolution, is only around 0.5 g per day. However, in the UK, adults consume an average of between 9 and 12 g of salt a day (Henderson *et al.* 2003).

It is now clear that high levels of salt intake are detrimental to health (see Table 1 for the most common diseases associated with a high-salt diet). Evidence from epidemiological (Intersalt Cooperative Research Group

1998), migration (Poulter *et al.* 1990), intervention (Forte *et al.* 1989), genetic (Lifton 1996) and animal (Denton *et al.* 1995) studies shows that salt is an important factor in regulating blood pressure. There is also strong evidence from drug intervention studies to link salt with the development of high blood pressure, the consequence of which is heart attacks and strokes. A summary of this key data is discussed below.

A recent meta-analysis of longer-term trials of 4 weeks or more looked at the dose response between salt reduction and fall in blood pressure and then compared this with two well controlled, double blinded crossover studies which included three different salt intakes in the UK population (He & Macgregor 2003). Results found that a reduction of 3 g/day predicts a fall in blood pressure of 3.6–5.6/1.9–3.2 mmHg (systolic/diastolic) in hypertensives. From these values it was estimated that the effect of reducing salt by 3 g/day would reduce strokes by 13% and ischaemic heart disease by 10%. This effect would be doubled and tripled if reductions of 6 g/day and 9 g/day, respectively, took place across the general population.

Another meta-analysis (He & MacGregor 2002) showed that a large but feasible salt reduction (6 g salt

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Table 1 The harmful effects of a high-salt diet

Blood pressure	Increases blood pressure – even those with normal blood pressure find that it falls when they reduce salt intake (He & MacGregor 2002)
Stroke	Increases risk of stroke by causing a rise in blood pressure, as well as through an independent effect (Perry & Beevers 1992)
Fluid retention	Exacerbates fluid retention (Macgregor 1998)
Calcium loss	Increases risk of osteoporosis (McCarron <i>et al.</i> 1981) Increases urinary calcium excretion (Macgregor 1998)
Other effects include increased risk of	Cancer of the oesophagus and stomach (Antonios & Macgregor GA 1995; Tsugane <i>et al.</i> 2004) Left ventricular hypertrophy, independently of blood pressure (Langfield & Schmieder 1995; Antonios & Macgregor 1996) Asthma (Burney 1987) Impaired renal function (Gansevort <i>et al.</i> 1993)

reduction meaning that the average daily salt intake was approximately 4.5 g) in hypertensives as well as normotensives over more than 4 weeks has a significant effect on improving blood pressure.

The dietary approaches to stop hypertension (DASH) sodium trial is the most recent well conducted trial on the effect of lowering salt in the diet. Over 400 participants (hypertensives and normotensives) were allocated to one of three levels of salt (8 g, 6 g and 4 g/day) and one of two dietary patterns (control diet or DASH diet including ≥ 5 portions of fruit and vegetables a day as well as low-fat dairy foods for 4 weeks). The results showed that reducing salt intake lowered blood pressure, both on the control diet and on the DASH diet, with the greatest reduction in blood pressure occurring in those on the DASH diet at the lowest salt intake (Sacks *et al.* 2001).

A recent population-based cohort study carried out in Japan (Nagata *et al.* 2004) examined the association between sodium intake and stroke deaths. The authors found a positive association between sodium and two types of stroke – intracerebral haemorrhage and ischaemic stroke in men (*i.e.* a higher sodium, and thus salt intake was associated with a greater risk of a stroke). However, in women the association was not replicated. In addition, this finding was independent of the presence or absence of high blood pressure.

Other effects of high-salt diets on diseases are emerging, although they have not been so well researched, to date. For example, there is a link between salt intake and cancer of the stomach: a population-based prospective study based in Japan in over 38 000 men and

women showed that highly salted foods (*e.g.* salted fish roe) were strongly associated with the risk of gastric cancer (Tsugane *et al.* 2004). Another recently published paper showed a link between salt intake and *Helicobacter pylori* (*H. pylori*) infection (Beevers *et al.* 2004). An ecological survey in Europe, USA and Japan also found a positive link between salt and *H. pylori*, suggesting that salt may somehow encourage *H. pylori* infection, although the mechanism for this was not investigated in the study. It is known that *H. pylori* is linked with stomach cancer, so it is possible that a high-salt diet could exacerbate this risk. Conversely, a low-salt diet might reduce infection rates thereby reducing stomach cancer rates.

There is also some evidence that high salt intake can increase the risk of osteoporosis through increased urinary calcium excretion (Antonios & MacGregor 1996). Patients with hypertension tend to excrete more calcium in the urine and are therefore at higher risk of osteoporosis.

It is therefore clear from this evidence that a high-salt diet is linked to ill health; with very strong evidence linking it with high blood pressure, stroke and heart attacks.

Current recommendations

The UK Scientific Advisory Committee on Nutrition (SACN) released a report in May 2003, providing recommendations on the population target salt intake for adults (6 g/day) and for the first time proportionately less amounts of salt for children (Table 2) (SACN 2003).

A 6 g target has been set in adults because this is a realistic target to achieve, particularly if manufacturers make reductions in the salt content of many foods over the next few years. However, once the 6 g per day target is achieved, a lower target should be set, as continuing to lower salt intake to 3 g/day has been shown to have a beneficial effect on blood pressure (He & MacGregor

Table 2 Scientific Advisory Committee on Nutrition guidelines for salt

Age	Target average salt intake (g/day)
0–6 months	<1 g/day
7–12 months	1 g/day
1–3 years	2 g/day
4–6 years	3 g/day
7–10 years	5 g/day
11–14 years	6 g/day
Adults	6 g/day

Available at: <http://www.sacn.gov.uk>

2003), and in terms of evolution our physiological requirement for salt is far less at around 0.5 g per day. However, this could only be achieved without compromise to dietary variety if substantial changes are made to the salt content of many foods.

The Department of Health supports SACN's recommendations for a population target of no more than 6 g of salt a day. 'A major initiative by the food industry to reduce the salt content of processed and catered foods could help save lives in the long term. Immediate moves to provide clear information to consumers on salt and the sodium content of food products would bring major benefits' (the Chief Medical Officer, 2001).

The World Health Organization has stated that daily salt intake should be limited to less than 5 g per day. 'Current evidence suggests that an intake of no more than 70 mmol or 1.7 g of sodium (equivalent to 4.2 g salt) per day is beneficial in reducing blood pressure and is not associated with adverse effects' (WHO/FAO 2002).

Why are we eating too much salt?

Professor Graham Macgregor, Chairman of Consensus Action on Salt and Health (CASH), has stated that 'the rise in salt intake was due originally to a multiplicity of changes but it was mainly related to salt's magical property of preserving food. It was then reinforced by an acquired addiction for salt which is now maintained, in large part, by the consumption of processed foods' (Macgregor & Wardener 1998).

The main reason why our current salt intake is considerably higher than the current recommendations is because most of the salt in the average UK diet comes from salt added by food manufacturers to processed foods, canteen food, restaurant and fast foods – this makes up approximately 76% of our salt intake. Five percent is naturally present in food and 19% is salt that we add either in cooking or at the table (Henderson *et al.* 2003) (Fig. 1).

Table 3 shows the salt content of some typical foods. Consumers are often unaware that many of our staple foods, such as bread and breakfast cereals, can be high in salt and this often makes the consumption of a low-salt diet difficult to achieve.

There are a number of reasons why the food industry uses salt in products. The first is for preservation and for certain products this helps to extend their shelf life and prevent the growth of micro-organisms (*e.g.* meat products) (Matthews & Strong 2005). Second, salt is used for taste and/or to bring out the flavours of other ingredients. However, we know that the large amounts that

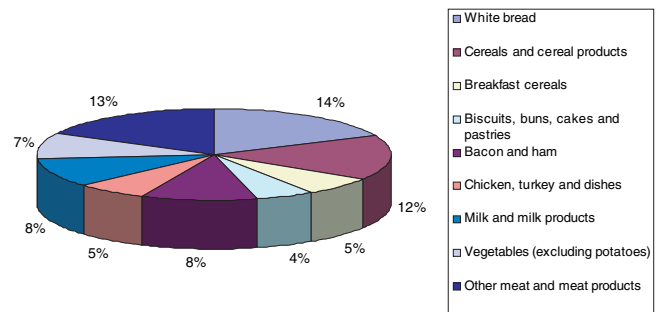


Figure 1 A pie chart to show sources of salt intake from various foods (a total of 76% of daily salt intake) (Henderson *et al.* 2003 and FSA 2003).

Table 3 The salt contents of some common foods (FSA 2002)

Food type	Portion size	Salt per portion
White bread (medium sliced, fresh)	36 g (1 slice)	0.4 g
Bran type cereal	30 g (small bowl)	0.63 g
Cook in pasta sauce (bought)	150 g	1.53 g
Pork or beef sausage (grilled)	40 g (1 large sausage)	1.2 g
Cream of vegetable soup (canned)	220 g (medium bowl)	2.3 g
Hamburger in bun (bought)	204 g	3.1 g

are currently used are not necessary and can be cut considerably, as some food manufacturers and all of the major supermarkets (see below) have already started to make these reductions, and there are reports that the sales of such foods have not diminished (*e.g.* by Asda).

The food industry and retailers' perspective

The food industry and retailers are aware of the dangers to health of a high salt intake and a number have responded by drawing up salt reduction programmes over the past 9 years. The following is not a comprehensive list but contains some examples of food manufacturers that are making salt reductions:

- Birds Eye has recently announced that they are making a 16% reduction in salt across a range of their products.
- Campbell Grocery products are working on salt reductions in their sauces.
- Heinz is making a further 15% reduction in their baked beans.
- Kraft foods have publicly pledged a further 40% reduction in their Lunchable range from October 2004, and they recently announced a 33% salt reduction across the board of their products.

- Unilever Bestfoods have reduced the sodium in margarines by 18%.
- Weetabix is making 10% salt reductions.
- Burger King pledged that they no longer add salt to their fries and they are working on salt reductions in children's cheeseburgers.
- McDonalds have reduced the amount of salt added to fries, as well as cutting salt in their chicken nuggets.

All the major supermarkets have drawn up salt reduction plans over the past 9 years. Co-op was the first retailer to offer lower salt alternatives as part of their healthy living range. Other retailers have since made some reductions in certain food categories, as well as bringing out new healthier ranges that have been controlled for salt. In addition, most companies have now also put voluntary salt labelling on their own brands, where space permits.

With regards to the catering sector, only a few concrete plans for salt reduction have been announced to date. For example, Burger King and McDonalds have made some salt reductions to their foods (see above).

Whilst the food industry are responding, it will be necessary for companies to make further reductions across the board for a number of years in order for the adult population to reach the target of an average of 6 g of salt per day. In addition, it is vital to verify and audit the salt reductions that the food industry are making; as yet, as far as the authors know, there is no organisation that is responsible for making these checks. CASH will initiate such activity and support other organisations to carry out this type of work.

Over the last 8 years, CASH has been working hard to encourage manufacturers to make salt reductions. As well as providing factsheets on ways to reduce salt, we have drawn up a salt reduction plan which aims to support food manufacturers in their efforts to reduce the amount of salt in foods in order to meet our strategy for reducing salt intake in the UK (Table 4), which recommends a 50% reduction in salt added in cooking or at the table by the consumer and a 53% reduction in the

salt added by the food industry. This target could easily be reached over 4 years by gradual stepped reductions of 10–15% per year. Such reductions have been shown not to be detected by the consumer (Girgis *et al.* 2003). The type of food will determine the extent of reduction that can be made without the consumer being aware of a difference in taste. In foods where only 10% cuts can be made, these will have to be done on an annual basis, where 25% cuts can be made it will only be necessary to do this twice during the 4-year period. It is not sufficient to target only higher salt foods, as in the Food Standards Agency (FSA) strategic salt reduction plan – all foods where sodium has been added must be reduced by at least half.

Food labelling

When looking to lower the salt intake of the UK population, it is not only the high salt content of processed foods that is a major issue. Food labelling is also of concern, with current labelling practices often leaving the consumer unable to interpret the amount of salt in foods.

Food labelling in general is a subject of much debate amongst the food industry, government and various stakeholder organisations. Responsibility for food labelling rests with the European Union (EU) which, in the UK, then falls to the FSA. There are various issues around food labelling which need to be tackled; one of the major concerns being the inconsistent use of nutrition panels on food products. Nutrition panels can provide a useful tool for the consumer to select foods low in sodium, fat, sugar and energy, and foods high in fibre and certain vitamins or minerals. At present there are no legal requirements for food manufacturers or caterers to provide nutrition panels on prepackaged foods. Rather the FSA *recommends* that nutrition panels are provided on all foods, but on a voluntary basis only. The exception to this is where a claim is made for a product (*e.g.* 'low in fat'), in which case nutrition labelling is compulsory (MAFF 1999).

Where nutrition panels are included, two standard formats must be used, as set out in EU law. 'Group 1 (or "Big 4")' is the basic 'energy, protein, carbohydrates and fat' label; 'Group 2 (or "4 + 4")' also includes sugars, saturated fat, fibre and sodium. Where 'Group 2' is used, legally sodium must be listed, as opposed to salt, reflecting the fact that sodium is found in forms other than salt (*e.g.* monosodium glutamate). Where claims are made that relate to other nutrients (*e.g.* vitamins), the relevant amounts must also be given. Various criteria specify which panel should be used (a guide is found

Table 4 Consensus Action Salt and Health (CASH) recommended strategy for reducing salt in the UK

Male-average salt intake/day		Reduction needed	
Table/cooking (15%)	1.8 g	50% reduction	0.9 g
Natural (5%)	0.6 g	No reduction	0.6 g
Food industry (80%)*	9.6 g	53% reduction	4.5 g
Current	12 g	Target	6 g

*The 80% also includes salt added by restaurants and the catering industry.

at <http://www.foodlaw.rdg.ac.uk>), but essentially what this means is that many food labels give no indication of salt or sodium content at all.

Where nutrition panels are used there is a lack of consistency between the use of 'salt' and 'sodium'. Since sodium only makes up around 40% of salt, potentially food manufacturers can give the impression that a product is lower in salt by listing the sodium content but not the salt content. For instance, if a manufacturer wanted to give the impression of a food being lower in salt than it really is, they might state 1 g sodium per 100 g on the label but not its counterpart, 2.5 g salt per 100 g. A further problem is the use of salt or sodium 'per 100g' (or 100 ml), with no indication of the amount per portion. Or, where 'per portion' is provided, the portion size is often an underestimation of the usual amount consumed.

A further obstacle for the consumer is the use of 'healthy eating' logos, with no enforced legislation about which foods can be labelled as 'healthy'. For instance, the major supermarkets each have their own 'healthy eating' ranges, which are designed to give the impression that the foods are healthy choices. Terms like 'salt balanced' and 'lower fat' are also used, to identify products with reduced salt and fat. But these claims are not consistent – each supermarket sets its own criteria for what actually constitutes 'healthy eating', 'salt balanced', etc. Furthermore, some of these foods have actually been found to have more salt and fat than the standard versions, and a lot more sugar. Or, they have been found to have less fat but more salt, to make up for loss of flavour.

As outlined, for the general public it is often difficult to make sense of food labelling, especially where salt and sodium content are concerned. In addition, the consumer may not even be aware that they should be looking to choose low-salt foods as part of a healthy diet. So there is a need for the public to be educated about the consequences of consuming a high-salt diet, as well as consistent, clear labelling of all prepackaged food products (whether sold in a supermarket, restaurant, sandwich shop, canteen, etc.) to aid the consumer in selecting low-salt foods.

The FSA has acknowledged the need for better salt labelling but at present has only increased its advice to the food industry to include sodium and salt content on all foods, on a voluntary basis. Most major supermarkets have now followed this for the majority of their own brands, but there remain many other food manufacturers who have not taken this advice on board. The FSA has also agreed, as part of a nutrition statement published by various European representatives (FSA

2004), to 'work together to promote harmonization of European rules for salt labelling especially for a simple way to identify high-salt products'. Initiatives being considered include the consideration of 'traffic light' labelling, to indicate whether products are high in salt, fat and sugar (see Foster & Buttriss 2005), and the introduction of specific criteria for the use of claims like 'salt balanced'.

Ideally every food product, whether purchased in a food store, restaurant or other food outlet, should be labelled with the amount of sodium and salt per (realistic) serving size, as well as per 100 g. This would help consumers tally up their total daily salt consumption, and thus help them to limit their salt intake to less than 6 g/day. This should be a mandatory requirement, and the format used should be comparable on all prepackaged foods.

Practical ways to lower salt intake

Whilst salt levels remain unacceptably high in many food products in the UK, and labelling of salt is inconsistent or non-existent, one of the immediate ways we can all take action to lower salt intake is to be selective in the food choices we make. To do this, consumers need practical tips to help them select a diet that is low in salt. For those involved in health promotion, the list below identifies CASH's and Blood Pressure Association (BPA)'s suggestions for ways that people can be guided into choosing foods low in salt.

(1) Increase intake of home-prepared meals and reduce intake of high-salt processed foods.

- Seventy-six percent of salt intake is from processed foods and so lowering consumption of these foods can significantly lower a person's salt intake. This includes some ready meals, fast foods, bread and breakfast cereals (see below), processed meat products, soups, pizzas, instant packet foods and yeast extracts.

- Breakfast cereals with no added salt should be chosen: *e.g.* some brands of muesli, puffed wheat and shredded wheat; home-made bread with no added salt or breads with less than 0.4 g sodium per 100 g will also reduce salt intake.

- For those who may rely on processed foods (*e.g.* the elderly and people on a low budget), food labels should be read in order to select products with the lowest salt contents (see below).

(2) Salt should not be added to food.

- The salt cellar should be removed from the table (including sea salt, rock salt and garlic salt); alternative flavours including pepper, vinegar or lemon/lime juice,

etc. could be used. Sauces, *e.g.* soy sauce and ketchup, which are usually high in salt, should be avoided.

- During cooking, salt should not be added to the cooking water or to ingredients and stock cubes (except for low-salt versions) should also not be used. Natural flavours should be used, *e.g.* herbs, spices (be aware that spice mixes often include salt), onions, garlic, chillies, etc.

- For people who cannot bear to go without salt, a mineral salt with potassium could be used (however, people with kidney problems should avoid potassium salts); these salts have less sodium and the potassium has a potentially blood pressure lowering effect.

(3) Read food labels to check salt content.

- The difference between salt and sodium on food labels should be clearly understood: where only sodium content is listed, estimate the salt content by multiplying sodium content by 2.5.

- Where salt is not listed on a nutrition panel the ingredients list could be used. If salt or sodium-containing ingredients (including monosodium glutamate, sodium bicarbonate [as found in baking powder], preservatives such as sodium nitrate) are listed near the beginning, or middle, the product may be high in salt.

- Take a practical guide like that presented in Table 5 to the supermarket, as a general tool for selecting foods low in salt.

- Convert salt content per 100 g to portion size where large quantities (> 100 g) are to be consumed.

(4) African-Caribbean people should watch out for high-salt foods.

- Some traditional African-Caribbean foods are very high in salt, *e.g.* saltfish, saltbeef, salted mackerel, salted pig tails. To compound this, African-Caribbean people may also be more sensitive to the effects of salt. It is

therefore important for people of African-Caribbean descent to be aware of the harmful effects of consuming too much salt. Soaking saltfish, salted mackerel, etc. overnight in water and boiling before cooking can help remove some of the salt content, and avoiding salt-containing seasonings in cooking is advisable.

(5) Select lower salt options in food outlets.

- At a restaurant, ask the chef not to add salt to your meal, or to recommend a meal that is low in salt.

- 'Fast food' products like burgers and pizzas tend to be very high in salt and should be avoided.

- Avoid sandwich shops that do not list salt content on their products; some sandwiches are very high in salt.

Finally, people should be aware that it may take 2–4 weeks for their taste buds to adapt to a lower salt diet. After this time, foods with a strong salty flavour taste unpleasant because salt receptors become more sensitive to the taste of salt, and the taste of natural flavours are enjoyed more.

Conclusions

Research clearly demonstrates a link between salt and blood pressure, heart attacks and strokes, and suggests an association with other conditions such as increased risk of osteoporosis. In the UK population, the average intake of salt needs to be reduced from 9–12 g/day (Henderson *et al.* 2003) to less than 6 g/day to help reduce the health risks associated with raised blood pressure, *i.e.* strokes and heart attacks. Since 76% of salt in the UK diet is from processed, restaurant, take-away foods, etc., the onus is on the food industry to make large salt cuts to their products to help achieve this target. In addition consumers need to be educated and motivated to select lower salt options.

The Department of Health has acknowledged the need to reduce the salt content of processed and catered foods, and the FSA is working with the EU to look at ways to help the population to lower its salt intake, including better salt labelling. The FSA has set a target of reducing salt consumption in the population to 6 g per day by 2010.

The FSA has designed a salt model which suggests cuts for specific food categories like pizzas and sandwiches. Melanie Johnson, the Public Health Minister, called upon the food industry to reduce the salt content of foods. She asked for revised plans to be submitted by mid-September 2004, which are currently being considered. If the food industry does not respond sufficiently, there is the threat of legislation for a reduction of salt in foods.

Table 5 CASH's advice on how to read a food label to choose foods low in salt

Good choices	Generally avoid
Products with <0.25 g salt per 100 g	Products with >0.5 g salt per 100 g*
Products with <0.1 g sodium per 100 g	Products with >0.2 g sodium per 100 g*
Products labelled 'low-salt', 'salt-controlled' (but check the nutrition panel to confirm this claim)	Products with salt, sodium or any ingredient containing sodium, near the beginning of the ingredients list

*It is not advisable to eat foods in this category, but if such foods are normally eaten in small quantities, *e.g.* some condiments, they can be eaten occasionally/in moderation.

In Autumn 2004, the FSA launched a high profile public awareness campaign. This was a staged campaign, with various messages like 'too much salt is bad for your heart – it causes high blood pressure leading to the risk of heart disease and stroke'. The messages were conveyed by various means including television, press, posters and a website.

The government (including the FSA) is concentrating its salt reduction plans on certain processed products only and retailers generally only focus their salt reductions on specific 'healthy eating' ranges or certain products, rather than making cuts across the board on all their own brand products. But stakeholders like CASH are calling upon the food industry to reduce salt in *all* processed and high-salt foods, which would have a greater impact on average UK salt intake, as well as helping people to become accustomed to the taste of less salt in all foods.

In addition to government activities, professionals and organisations involved in public health education can play a large role in reducing the salt intake of the population, by advising people about the health risks of consuming too much salt and offering practical tools to enable them to select a diet low in salt. In addition, those involved in consulting caterers can emphasise the importance of lowering the salt content of foods.

We all need to recognise the importance of the relationship between salt and health, and the public must be encouraged to consume a lower-salt diet. We should be calling upon the government and food industry to implement further strategies to lower the salt intake of the UK population and reduce the incidence of strokes and heart attacks.

Further information about the BPA can be found at <http://www.bpassoc.org.uk>. Information about CASH is available at <http://www.actiononsalt.org.uk>.

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