A case for reducing salt in processed foods

Joanna Gibson
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Functions of salt

Salt in the human body
Salt is a dietary essential and its role in the human body is paramount to normal body functioning. Sodium chloride (NaCl) is the chemical term given to common salt and it is the sodium element that is potentially harmful when consumed in excess. The principal role of salt in the body is the maintenance of bodily fluid within close and regulated limits (American Society for Nutritional Sciences, 1999).

Sodium (Na) is the principal cation in extracellular fluids in the body. Together with potassium (K), chloride (Cl) and other ions, sodium ions maintain the volume of the extracellular fluid, osmotic pressure, acid-base balance and electrophysiological activity in muscles and nerves (IFST, 1999). Sodium chloride is necessary for the creation of gradients across cells, to enable the uptake of nutrients, especially from the small intestine (American Society for Nutritional Sciences, 1999).

Sodium content in the body is controlled by excretion through the kidneys into the urine. For this reason, the sodium intake of children must be carefully monitored and regulated, since a child’s kidneys are not fully developed and would not be capable of excreting large quantities of sodium from the body. Sodium is also excreted from the body in the form of perspiration. This occurs more intensely in hot climates and during strenuous exercise, causing muscular cramps. If body fluids are not replenished, by increasing fluid consumption, dehydration may occur. Despite this fact, most healthy people metabolise sodium normally and excrete any excess consumed (IFR, 1999). It is indisputable that salt has an important function in the human body and careful attention must be given to the regulation of salt intake in order to sustain good health.

Salt in food
Salt is a valuable commodity which is used extensively in food processing. It is a cheap and versatile product (MacGregor, 1998; Whitehead, 1998) and its role in the food industry is twofold:

(1) functionality; and
(2) palatability.

The benefits of using salt in food manufacturing are far-reaching, for the food industry and the consumer alike.

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Abstract
Salt is one of the most valuable substances available to man, with a definitive role in the human body and in food production. However, the continued use or indeed misuse of salt has led to adverse effects on health. The increasing consumption of convenience foods has contributed greatly to a high salt intake. Highly processed, convenience foods are known to contain large quantities of salt to optimise storage stability and flavour acceptability. Current high salt intakes have therefore been attributed to processed foods, accounting for 75-85 per cent of total salt intake. Such findings and associated health implications have prompted a call from health professionals and food researchers to reduce salt intake. Effective salt reduction, however, can only be achieved with the co-operation and commitment of the food industry in the development of lower-salt processed foods.

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In food processing, salt is primarily used as a preservative, to reduce water activity and maintain food safety. Salt is essential in bread manufacturing, particularly for fermentation regulation and gluten formation in dough (Whitehead, 1998). It has important binding properties, in that it facilitates water absorption, which in turn leads to increased yield, especially in meat products. This contributes to higher product volume and, ultimately, increased sales and profit.

The palatability of food has long been attributed to the flavouring properties of salt and the additional ability of salt to enhance other flavours within a product. Salt is particularly important in processed foods, which rely heavily on this substance to replace other flavours which may have been lost during manufacturing. MacGregor (1998) has commented that high salt concentrations are necessary in processed foods because many food items would otherwise be inedible. Salt has been reported to have an effect on other product attributes, such as texture, consistency, appearance and mouthfeel (James et al., 1987). The specific effect of reducing salt on product attributes is, however, not fully understood.

In reducing salt content, the functionality and palatability of processed foods will ultimately be affected. The health benefits to be gained, however, are potentially more important for consumers suffering from, and those currently at risk of, hypertension. To appreciate and understand the implications of salt on health, salt consumption must be quantified and considered in view of recommended daily intakes.

**Current salt intake**

It is widely acknowledged that current salt intakes are in excess of recommended daily intake values, with the greatest amount coming from processed foods. National dietary surveys have quantified salt consumption as an average intake of 10.1g per day for men and 7.7g per day for women (Halliday and Ashwell, 1994; Godlee, 1996). A reduction in salt intake to 6g per day has been recommended (COMA, 1994, cited by IFR, 1998). However, the body only requires 1.5g per day to ensure normal body functioning and regulation of extracellular fluid (European Commission’s Scientific Committee for Food, 1993, cited by IFR, 1998).

The most startling fact arising from salt research is that between 75 and 80 per cent of our salt intake comes from processed foods. The remaining 20-25 per cent has been suggested to come from discretionary salt (table salt and salt used in cooking) and salt naturally present in food (IFST, 1999). At present many consumers are unaware of current high salt intakes and, in particular, those foods which are contributing to high salt consumption. Therefore, there is a need for a clearer understanding of the main sources of salt in the diet.

**Sources of salt**

Current high salt intakes have been attributed to the increase in consumption of processed convenience foods. It is now known that the largest proportion of consumers’ salt intake comes from widely used processed foods (Halliday and Ashwell, 1994). These include bread, cereal products, savoury snacks, soups, sauces, cured meats, ready meals, pizza and processed frozen foods (see Table I).

It is apparent that the current salt content of many processed foods is beyond the requirements for food safety and flavour. Food manufacturers must therefore take responsibility for the current state of the nation’s diet, as regards excessive and/or unnecessary salt content in processed foods.

**Health implications**

The association of high salt intake with hypertension and the associated risk of cardiovascular disease is at the forefront of salt research. It is suggested that blood pressure may be raised as a result of high salt consumption. The Intersalt Cooperative Research Group (1988) also outlined the association between high salt intake and elevated blood pressure, with increasing age. Results of the study highlight that habitual high salt intake is a major risk factor for cardiovascular disease and, perhaps more importantly, is one which can be prevented (Stamler, 1997).

High blood pressure is also known to be the main cause of strokes and the major cause of
heart attacks, which are two of the most common causes of death and morbidity in the UK (CASH, 1998). To a lesser extent, high salt consumption has also been correlated with asthma, osteoporosis, stomach cancer and stroke, conditions which are also recognised for the serious implications on health status (Wheelock, 1998). The IFST (1999) have reported an association of high salt intake with heart failure, cirrhosis, nephrotic syndrome and idiopathic and cyclical oedema.

The comprehensive range of illnesses related to high salt intake emphasises the severe implications of high salt consumption and illustrates the need for research into salt reduction strategies.

### A call for salt reduction

The compelling need for a reduction in salt consumption is warranted by the risk of hypertension and cardiovascular disease, which has also been confirmed by extensive medical research. Research has established that reducing salt consumption lowers blood pressure significantly (Law et al., 1991a; Cappuccio et al., 1997; Elliot, 1997). Law et al. (1991b) reported that blood pressure varies according to sodium intake. Consequently, the effect of universal moderate dietary salt reduction on mortality may be more substantial and perhaps even greater than the effects of treating blood pressure with drugs.

Recent recommendations to reduce salt intake have formalised the calls for salt reduction and the need to improve the health of consumers. National and international health organisations have recommended a daily salt intake of 6g per day (Tilston et al., 1993; IFST, 1999), which would entail a reduction of 30 per cent on current salt intakes. However, many salt reduction programmes to date have focused on encouraging a reduction in discretionary salt usage and have been problematic; for example, Law (1995) reports that, whilst one individual could be motivated to reduce salt intake by 3g per day, it is impossible to expect a whole population to achieve such a reduction. Following many failed attempts to reduce discretionary salt usage, a well co-ordinated and workable salt reduction programme still needs to be implemented.

Salt reductions on a population-wide scale can only be achieved successfully by reducing salt in processed foods. Food researchers have been consistent in their call for a concerted response from the food industry. Similarly, the demand for manufacturers to reduce salt has been supported by the Nutritional Aspects of Cardiovascular Disease Review Group. The Review Group (1994) (cited by de la Hunty, 1995) have recognised that the recommended reduction in salt intake can only be achieved through compositional changes in the salt content of processed foods.

### Table I Salt and sodium contents of common processed foods

<table>
<thead>
<tr>
<th>Food product</th>
<th>Salt/serving (g)</th>
<th>Sodium/serving (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weetabix</td>
<td>0.25</td>
<td>0.1/37.5</td>
</tr>
<tr>
<td>Pringles (sour cream and onion)</td>
<td>0.4</td>
<td>0.17/30</td>
</tr>
<tr>
<td>White bread (thick sliced)</td>
<td>0.5</td>
<td>0.2/slice</td>
</tr>
<tr>
<td>Gravy</td>
<td>0.5</td>
<td>0.2/50ml</td>
</tr>
<tr>
<td>Savoury crispy pancakes</td>
<td>0.75</td>
<td>0.3/pancake</td>
</tr>
<tr>
<td>Mature cheddar cheese</td>
<td>0.9</td>
<td>0.35/50</td>
</tr>
<tr>
<td>Cornflakes</td>
<td>1.0</td>
<td>0.4/30 serving with 125ml semi-skimmed milk</td>
</tr>
<tr>
<td>Garlic bread</td>
<td>1.25</td>
<td>0.5/half baguette</td>
</tr>
<tr>
<td>Chicken supreme with rice</td>
<td>1.75</td>
<td>0.7/meal</td>
</tr>
<tr>
<td>Chicken tikka masala with rice</td>
<td>1.75</td>
<td>0.7/meal</td>
</tr>
<tr>
<td>Baked beans</td>
<td>1.9</td>
<td>0.75/150</td>
</tr>
<tr>
<td>Tomato sauce for bolognese</td>
<td>1.9</td>
<td>0.75/150</td>
</tr>
<tr>
<td>Southern fried chicken</td>
<td>2.25</td>
<td>0.9/portion</td>
</tr>
<tr>
<td>Cream of tomato soup (tinned)</td>
<td>3.0</td>
<td>1.2/300</td>
</tr>
<tr>
<td>Lasagne</td>
<td>3.0</td>
<td>1.2/meal</td>
</tr>
<tr>
<td>Pizza</td>
<td>5.75</td>
<td>2.3/180 serving</td>
</tr>
</tbody>
</table>

Lowest salt content

Highest salt content

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In doing so, it is expected that the long-term health benefits of a co-ordinated salt reduction programme would be much greater than those of individual efforts (James et al., 1987).

Pressure on food manufacturers to reduce salt in processed foods is undoubtedly increasing. Some workers (Nan et al., 1995) have suggested a combined approach to salt reduction. This approach would involve alterations in food preparation and product formulation, in conjunction with changes in the diet (Adams et al., 1995; North and Neale, 1995). Clearly, a reduction in salt intake is dependent on both changes in individual behaviour and, more importantly, changes in product formulation. However, individual behavioural changes are difficult to achieve and, therefore, in the initial stages at least salt reduction may depend primarily on the food manufacturer (Anonymous, 1996).

However, reducing salt in processed foods presents limitations for the food manufacturer. The main disadvantage is loss of flavour, which continues to pose a problem for food manufacturers. It has been proposed that a gradual reduction in the salt content of processed foods offers an achievable means of successfully reducing salt intake, without adversely affecting taste and ultimately consumer acceptability (Antonios and MacGregor, 1997). Many believe that a gradual reduction of sodium in existing products could be achieved without greatly changing food habits (Engstrom et al., 1997). Nestlé food expert, Professor David Richardson (cited by Whitehead, 1998), has commented that stepped reductions in salt content allow consumers to acclimatise to any taste variation. As salt intake is reduced, the salt taste receptors become much more sensitive, and highly salted food becomes unpleasant (Antonios and MacGregor, 1997). For this reason, gradual salt reductions enable consumers to acquire a taste for less salt and develop a preference for low-salt foods. Universal studies have shown little or no decrease in consumer acceptability for low-salt produce (Wyatt, 1983; Norton and Noble, 1991; Rodgers and Neale, 1999).

In addition, the food industry has been reluctant to reduce salt content because of its preservative effects, even though many technological developments have helped to reduce or eliminate such dependence (Smith et al., 1990a; 1990b; Williams, 1994). Fundamental developments such as refrigeration, packaging developments and improved standards of food hygiene have contributed to the somewhat reduced need for salt as a food preservative.

Reducing salt in processed foods, therefore, appears to be a critical part of the ongoing need to improve the health of the population. Reducing the amount of salt added to processed foods would lower blood pressure considerably and prevent some 70,000 deaths a year in the UK, as well as reducing many other disabilities (Law et al., 1991a). However, despite the evidence to support a reduction in dietary salt intake, there has been little concerted effort to reduce sodium intake in western countries (MacGregor and Sever, 1996). The UK has been slow in its development of salt reduction in processed foods, unlike Australia, where research has been ongoing for many years and is well established; for example, breakfast cereal manufacturer, Kelloggs, has significantly reduced the salt content of their products in the Australian market. Following such successful product developments, the UK breakfast cereal market could surely be encouraged to adopt a similar approach.

**Food industry perspective**

With growing concern surrounding high salt consumption, a response from the entire food industry is imperative (Hegsted, 1991; Cappuccio et al., 1997; Elliot, 1997). A report in the *British Medical Journal* (Anonymous, 1996) reported that, given the large quantities of salt in processed foods, there was clearly a role for food manufacturers to reduce salt content in food. However, to date, the food industry has been reluctant to reduce salt in processed foods (Anonymous, 1996).

Food producers and the salt industry have opposed the reduction of salt in processed foods because of potential loss of flavour and eventual loss of revenue (MacGregor and de Wardener, 1998). Furthermore, salt contributes significantly to product yield, which in turn generates high product volume and profit. Any arbitrary reductions in salt content would undoubtedly entail a risk of losing market share for many food manufacturers (Matz, 1996).

In opposing salt reductions in processed food, manufacturers have highlighted their
concerns regarding research findings to date. The food industry demands firm evidence relating salt and hypertension rather than suggested relationships. However, as The Intersalt Cooperative Research Group (1988) shows, evidence of the relationship between salt and blood pressure is becoming stronger (MacGregor and Sever, 1996). A reduction in salt consumption strongly indicates a significant reduction in blood pressure (Forte et al., 1989). Despite re-analysis of results, food manufacturers have continued to discredit evidence linking salt to high blood pressure (Liebman, 1996). Some food manufacturers have adopted desperate measures to try and stop government recommendations on salt reduction. Manufacturers have lobbied governments, refused to co-operate with expert working parties and have encouraged misinformation campaigns, rather than concentrating on product reformulation (Godlee, 1996).

Despite the lack of co-operation from many areas of the food industry in reducing salt, there have been plausible efforts with regard to salt labelling. In response to public demands and government pressure, many food retailers have included the salt/sodium content of products in their nutritional information. This has been an important step forward for the industry and must be duly acknowledged. However, the emphatic need for salt reduction in processed foods still remains the fundamental issue.

The way forward

The way forward for successful salt reduction is clearly through co-operation between government, health professionals, food researchers and food manufacturers (CASH, 1998). It is surely timely to reach a consensus to support a reduction in dietary salt intake and seek to improve the diet and health of the population nation wide. Government intervention in the salt debate is particularly welcomed, and it is anticipated that government recommendations on salt reductions are imminent (Whitehead, 1998). Such a response would certainly be a positive move forward and prove valuable in reducing dietary salt intake.

Consumer demand for reduced-salt produce is essential in persuading manufacturers to develop products that consumers actually want (Hegsted, 1991; CASH, 1998). Consequently, consumers must lobby the government and food manufacturers to reduce the current high salt content in processed foods and provide more low salt alternatives. However, it is anticipated that only consumers who are well informed and concerned about diet and health will go to such lengths to secure a better quality of life for themselves.

In the UK, the major food retailers have responded positively to concerns surrounding the high salt content of processed foods. It could be said that the leading food retailers have been proactive in seeking to reduce the salt content of their own brand products. Heading the developments for “lower” salt, has been ASDA. ASDA initiated salt reductions by announcing a reduction of 25 per cent on the current salt content in many of their own brand products. This reduction has been increased to 40 per cent in a wide selection of ready meals and processed poultry products. Following closely in salt reductions has been the Co-op. The Co-op has focused on the use of the low sodium product, “Lo-Salt”. Recent product developments and re-formulations have involved salt reductions by as much as 10 per cent in standard white bread. Other retailers, however, have been slower in their response to the salt issue. Tesco have introduced the “salt calculator” information leaflet, to enable consumers to convert sodium content to salt content. With this information, it is hoped that consumers will be able to quantify their salt intake and adjust it accordingly. However, it could be argued that the conversion chart would only benefit the well-informed, health conscious consumer, trying to reduce salt intake, as opposed to benefiting those consumers most at risk of high blood pressure and cardiovascular disease. In view of this, it would appear that the way forward is clearly through a gradual reduction in the salt content of processed foods. A collaborative approach, involving food retailers and manufacturers, may be the only way to successfully reduce dietary salt intake and improve the health of the entire population.

Successful salt reductions in processed foods have been confirmed by numerous studies (Wyatt, 1983; Ruusunen et al., 1999; Rodgers and Neale, 1999). These workers have reported little or no differences in taste, preference or consumer acceptability of
reduced salt products, as revealed from sensory analysis testing. Such findings support the feasibility of reducing salt in processed foods; however, it is important that initial reductions are small and gradual to allow consumers to become accustomed to any changes in taste. With continued consumption of low salt foods, taste receptors adapt to less salt and eventually consumers should acquire a preference for foods lower in salt. The health benefits to be achieved from reducing salt in processed foods are immeasurable. Consumers suffering from hypertension and those at risk of hypertension will benefit significantly.

Given the success of existing salt reductions in processed food and efforts by food retailers to reduce salt, it is imperative that the food industry in general responds immediately to the quest for lowering salt intake. Calls for salt reduction reinforce the seriousness of the situation and the severity of the risks to health. However, effective salt reductions can only be achieved if food manufacturers adopt a proactive approach to salt reduction and if realistic salt reduction programmes are implemented. Salt reduction strategies must also have the support of government, health professionals and dietary advisers, to ensure complete and effective implementation and, more importantly, improved health among the population.

References and further reading


IFST (Institute of Food Science and Technology) (1999), "Salt", IFST Current Hot Topics, position statement.


