

# Aquafacts No.6

## Softened water and health

Although the ion-exchange water softening process has had a successful track record in the home since the First World War it has attracted criticism, over the years, particularly in relation to health issues. Even though the accusations have been proven to be inaccurate (in some cases they were highly exaggerated) there still persists an element of doubt in many consumers minds as to whether softened water can be used for culinary and drinking purposes. We are pleased to say that all of these negatives are now positive.

It is hoped that what is imparted in this fact sheet will dispel many of the myths. The information shown (some historic) is based on the best available evidence to date and this has the support of European, the American and British water treatment trade associations.

## Cardiovascular disease and softened water

Public concern was aroused in this subject by the media at the time of the compilation of data for the British Regional Heart Study (1969-73). Part of this study highlighted the relationship between hard and soft water areas of the country. Preliminary results indicated that cardiovascular (CV) mortality in towns with soft water (Scotland and Wales) tended to be higher than those in hard water areas (Southern England).

In America several medical papers proved similar statistical correlations. However all these studies tended to fail to differentiate between naturally soft water and softened water. The latter contains sodium as part of the ion exchange water softening process. Each water is very different both in mineral content and pH. They should not be associated together. It is interesting to note that the studies failed to find consistent correlations with other specific dissolved minerals and, therefore, no proposed relationship has yet gained acceptance.

When the British Regional Heart Study was published in 1980 it made the following statement in its conclusive remarks: *'There is no indication that artificially softened water in Britain is associated with increased mortality from cardiovascular disease.'* In 1992 this was reaffirmed by the British Heart Foundation. They stated: *'There is no evidence that excessive softness contributes to an increase risk of coronary heart disease. Therefore, there is no evidence that artificially softening of water increases mortality from heart disease.'*

## Sodium and softened water

The water softening process (detailed in Aquafact sheet 5) uses salt to enable chalk and lime hardness to be exchanged for soft sodium. Both substances (although in essence they are the same) have, in recent years, received unfavourable publicity in the face of medical opinion and related dietary trends. The tendency to look at reducing salt / sodium intake in the daily diet has, therefore, seen widespread public acceptance. Consequently, softened water, with its sodium content, has been viewed with much scepticism. The advice not to use it for drinking has gained surprising momentum even though latterly the level of sodium, in softened water, has been proven low and the lobby against salt has been found to be much overstated.

**Sodium restricted diets.** Sodium is one of the most prolific minerals in our daily diet. It is contained in everything from milk to bread to

baked beans. The Department of Health estimates that the normal intake of sodium for an adult is around 5000 milligrams a day. There are those who are recommended to reduce sodium levels and a mild sodium restricted diet is considered around 2000 to 2500 mg. a day. There is a small special risk group who are highly sensitive to sodium and, therefore, need to restrict their intake to less than 500 mg. a day. It is only this group who need to be aware of sodium levels in softened water. However, ingestion of softened water is unlikely, as this type of low sodium diet is virtually impossible without hospitalisation.

**Hypertension.** The effect of sodium alone on hypertension (high blood pressure) has not been established. Studies in recent years suggest that sodium may only be a contributory factor if associated with chloride ion. As the process of water softening forms sodium bicarbonate, drinking softened water should have no effect on hypertension in a normal healthy person.

There is a general view from most studies that a moderate reduction of sodium in a diet may prevent any age related rise in blood pressure. However, the findings concur that, while sodium may influence blood pressure, the extent of that influence is relatively small and is usually outweighed by other dietary influences such as alcohol, fat intake and body weight.

**Preparation of infant feeds.** This is one specific area of caution related to softened water. It is not advisable to use it to reconstitute powdered milk for infant feeds for very young children. For a baby's immature organs, nutritional balance is vitally important and, therefore, powdered milk formulae is processed to match breast milk as closely as possible; the sodium content being in the range of 15 to 30 mg. per 100 ml., with an upper limit guideline of only 35 mg. per 100 ml. This DHSS recommended figure could be exceeded, in some regions, if softened water was used.

A young child's body can find difficulties in coping with mineral excessive which is why infant formulae is so carefully calculated. Too much sodium intake, for instance, could cause a moderate degree of body water loss (partial dehydration) which would result in temporary discomfort for a young child. In theory there could be more serious problems, although unlikely, of renal overload and possibly hypernatraemia.

The manufacturers of infant formulae take great care in advising mothers in the preparation of infant feeds. Our industry likewise warn that softened water, with a sodium content of over 200mg/l, (see third to last paragraph overleaf) should not be used with reconstituted baby feeds or drink for children under six months old.

## Level of sodium in softened water and the EC Drinking Water Directive

It is important to realise that, although sodium is the by-product of the water softening process, it is not, in solution, in the high quantities which many have been led to believe. In fact the opposite is true and the levels are insignificant compared to the amount of sodium ingested as part of the normal daily diet; a factor which has contributed to changes in the revised EC Drinking Water Directive.

When softening 300 mg/l. (milligrams per litre) of hard water (typical of South East England) the amount of sodium intake would be around 150 mg., based on drinking approximately one litre of softened water. This is equivalent to slice of white bread or less than 5% of the average persons daily consumption of sodium.

(continued over)

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water

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## Sodium in the diet

### Example:

	Sodium Content.
A glass of softened water	50 mg.
A slice of brown bread	200 mg.
A tablespoon of tomato sauce	200 mg.
A glass of semi skimmed milk	250 mg.
100g (3.5oz) bacon	250 mg.
1 beef burger or sausage	700 mg.
100g (3.5oz) of pork pie	700 mg.
100g (3.5oz) of yogurt	800 mg.
1 bowl of tomato soup	1000 mg.
100g (3.5oz) of cheddar cheese	1500 mg.

On average 90% of sodium in our daily diet originates from sources other than drinking water. Almost 50% comes from salt used in the commercial processing of food. A quarter relates to additives and flavouring agents added to food at the cooking stage or at the table. The remainder occurs naturally in the foods we eat.

The current EC Drinking Water Directive, adopted on 3rd November 1998, excludes the 60 mg/l of calcium carbonate minimum hardness level originally embodied in the 1980 Directive. This highlights a more relaxed attitude to sodium, by legislative and medical authorities, and certainly reflects the World Health Organisation's 1993 decision not to apply health based guidelines to sodium levels, in drinking water, on the basis that: *'No firm conclusions can be drawn concerning the possible association between sodium in drinking water and the occurrence of hypertension.'*

### Micro-organism contamination and water softeners

There will always be some growth of micro-organisms in a water supply and associated equipment. The lack of concern about the possible effects in water softeners is reflected by the fact that there is little published information apart from a study in Paris in 1989. This showed little increase in heterotrophic plate count (HPC) bacteria. In June 1998, The British Water trade association conducted its own tests, which showed no significant HPC levels over a five day stagnation period. A second trial, in the September, overseen by the Cranfield School of Water Sciences, gave similar results. This supports the considerable health and medical safety record that residential water softeners have established over more than three quarters of a century in every day use in thousands of homes around the country.

### Lead and softened water

It has always been general policy not to install water softeners in homes which have internal lead pipework. Historically softened water has been viewed as aggressive and, naturally, there have been concerns about the health implications if drunk, even though evidence of lead leaching has been inconclusive.

In 1988 research in America proved that softened water had little effect on lead and corrosion. The results did not increase lead beyond the detectable level of 10 ppb. (parts per billion) Further studies have painted a similar picture.

In late 1993 the following statement was made by the Water Quality Association (WQA) of the USA: *'The WQA has long disputed that softened water is excessively corrosive and believes that while naturally soft water, with its typically low volume of total dissolved solids (TDS), is more aggressive, softened water should have little change in either TDS or pH.'*

### Eczema and softened water

It has been known for some years that both soft and softened water can bring relief to many eczema sufferers unfortunate in having hard water supplied to their homes. Hard water is an irritant

to the condition and causes dryness and itching. Some years ago the National Eczema Society (NES), confirmed that water type can affect eczema and stated that some people who live in a hard water area find their skin condition improves when they go on holiday to soft water areas.

The success of softened water with society members has led to the NES officially supporting the use of water softeners which can reduce inflammation substantially. However, they make it clear that, what softened water may do for one person, it may not necessarily do for another.

Nottingham University are a centre for epidemiological excellence and have recently looked very closely at the link between hard water and eczema in children. Softened water showed an equivalent improvement to those on medication - about 20%. Hywel Williams, Foundation Professor of Dermato-Epidemiology and Chief Investigator said, "Although surprised and disappointed parental belief that water softeners help eczema is still strong". The industry's trade association, the UKWTA stated, "We are surprised by the results considering the large number of reports we get every year from purchasers of water softeners that a family member's eczema has improved.

### Can you drink softened water? YES - but the choice is yours!

The United Kingdom Water Treatment Association (UKWTA) has codes of practice which regulate the installation of domestic water softeners. The adopted policy gives the consumer the democratic right of choice as to whether, or not, they wish to use softened water for drinking. We follow this policy and, wherever possible, either leave the cold tap at the kitchen sink on the hard water supply or alternatively (and more preferable) fit a specially designed third tap, or one of the popular three way monobloc taps, now available (see product leaflet on 'Deluxe Drinking Water Taps').

Softened water will do no harm to those who drink it. Although a hard water drinking facility can be provided there is no legal requirement to do so.

There are a small number of places where water is extremely hard (over 425 mg.l). In these areas the content of sodium, in softened water, can exceed 200 mg.l (milligrams of sodium in a litre of water). The Department of Health recommend that, at this level, softened water should not be used to reconstitute baby feeds, or by those restricted to a low daily intake of sodium for medical reasons.

**This situation does not arise in the Thames Valley and North Hampshire** as water is only between 300 and 350 mg.l of calcium carbonate hardness and consequently sodium levels, in softened water, are below this level.

**IMPORTANT NOTE:** Softened water containing 0 and 200 mg.l of sodium is now referred to as being 'wholesome'. In Part G of the revised Building Regulations (concerned with water efficiency in new dwellings), April 2010, this water is classified as 'wholesome softened water'. The standards of 'wholesomeness' and a water undertakers duty of supply of 'wholesomeness' is outlined in the Water Supply (Water Quality) Regulations, 2000. [This clarifies that water quality for domestic and food production must be 'wholesome', giving credence to the potability of softened water at this level.](#)

If you still have concerns about drinking a sodium biased water and it is not possible to fit a separate hard water drinking tap, we suggest the option of installing a reverse osmosis purifier. We advise linking this to the softened water supply. This system (described in Aquafact sheets Nos. 3 and 4) gives an exceptional quality of potability while removing most organic and inorganic matter including sodium.

**If you don't read anything else you should definitely read this...**