Background

A number of dietary electrolytes have been associated with a rise in blood pressure (BP). Raised blood pressure is a major, preventable risk factor for cardiovascular disease (CVD) including: stroke, coronary heart disease, heart failure, peripheral vascular disease and kidney failure (Australian Institute of Health and Welfare 2006). The risk of cardiovascular disease increases as the level of blood pressure increases. In addition to the physiological effects resulting from variations in the intakes of electrolytes, there may be significant interactions between them that affect CVD risk. A review of the literature around dietary electrolytes, BP and CVD was therefore conducted to:

- determine whether a causal association exists between a decrease in dietary sodium intake and reduction in CVD risk, with a focus on BP and clinical end points of CVD;
- determine whether a causal association exists between an increase in dietary potassium, calcium and magnesium and a reduction in CVD risk, with a focus on BP and clinical end points of CVD;
- examine the evidence for each electrolyte (sodium, potassium, calcium and magnesium) in isolation and also in combination with each other and their effect on BP; and
- determine population-based recommendations for sodium in order to reduce BP.

The National Heart Foundation of Australia reviewed the relevant scientific research and developed a Summary of evidence statement on the relationships between dietary electrolytes and cardiovascular disease. The associated Position Statement is based on the summary of evidence and both papers are available at the Heart Foundation’s Heartsite at www.heartfoundation.com.au. The Position Statement may also be obtained through Heartline on 1300 36 27 87 (for the cost of local call).

What are the key findings from the Heart Foundation’s position statement on the relationships between electrolytes and cardiovascular disease?

Sodium

Reducing dietary sodium is associated with a fall in blood pressure in hypertensive and normotensive individuals.

This is supported by good evidence in the scientific literature to indicate that¹:

- A reduction in dietary sodium of approximately 1700 mg/day (75 mmol/day) results in a fall in systolic blood pressure of 4-5 mm Hg in hypertensive individuals (those with systolic blood pressure = 140 mm Hg) and a fall in

¹ Conversion: 4 g of salt contains approximately 1550 mg sodium; 6 g of salt contains approximately 2300 mg sodium; 9 g of salt contains approximately 3500 mg sodium.
systolic blood pressure of 2 mm Hg in normotensive individuals (those with systolic blood pressure < 120 mm Hg)

- A reduction in dietary sodium from 3200 to 2300 mg/day (140 to 100 mmol/day) results in a fall in systolic blood pressure of 2 mm Hg in those with a mean systolic blood pressure of 135 mm Hg (normotensive to mildly hypertensive individuals)
- A reduction in dietary sodium from 3200 to 1500 mg/day (140 to 65 mmol/day) results in a fall in systolic blood pressure of 7 mm Hg in those with a mean systolic blood pressure of 135 mm Hg (normotensive to mildly hypertensive individuals).

There is moderate evidence in the scientific literature to indicate that:
- high dietary sodium intake is associated with increased stroke incidence, and mortality from coronary heart disease and cardiovascular disease

**Potassium**

Increasing dietary potassium is associated with a fall in blood pressure in hypertensive and normotensive individuals.

This is supported by good evidence in the scientific literature to indicate that:
- An increase in dietary potassium intake of approximately 2100 mg/day (54 mmol/day) is associated with a fall in systolic blood pressure of 4-8 mm Hg in hypertensive individuals (those with systolic blood pressure ≥ 140 mm Hg) and a fall in systolic blood pressure of 2 mm Hg in normotensive individuals (those with systolic blood pressure <120 mm Hg).

There is moderate evidence in the scientific literature to indicate that:
- high potassium intake is associated with decreased stroke mortality

**Dietary intake**

There is good evidence in the scientific literature to indicate that:
- a general reduction in sodium intake could be better achieved by a reduction in the sodium content of manufactured food products than by dietary advice alone.\(^2\)

There was no evidence found to support an association between calcium and BP. There was no evidence found to support an association between magnesium and BP or magnesium and CVD.

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\(^2\) The sodium added to processed foods contributes about 80% of dietary sodium.
What are the main messages for the general population?

The Heart Foundation recommends that all Australians reduce the amount of sodium they eat\(^3\), whether they have normal or high blood pressure. Reducing dietary sodium has been shown to lower blood pressure, and may have beneficial effects on the risk of stroke and cardiovascular disease.

The Heart Foundation recommends that all Australians increase the amount of potassium they eat\(^4\), whether they have normal or high blood pressure. Increasing dietary potassium has been shown to lower blood pressure and may have beneficial effects on the risk of stroke.

An eating pattern containing plenty of vegetables, fruit, wholegrain foods and low or reduced fat dairy products has been shown to be beneficial in reducing blood pressure.

How much salt should Australians be eating?

Australian adults eat about 9 grams of salt a day (Beard et al 1997; Notowidjojo L & Truswell A 1993). The Heart Foundation recommends that Australians reduce their salt intake to less than 6 grams a day\(^5\). Six grams of salt is about one-and-a-half teaspoons.

Six grams of salt contains approximately 100 mmol of sodium or 2300 milligrams of sodium.

The Heart Foundation recommends that Australians with high blood pressure, at risk of CVD, or with existing CVD reduce their salt intake to less than 4 grams a day\(^7\). Four grams of salt is about one teaspoon.

Four grams of salt contains approximately 70 mmol of sodium or 1550 milligrams of sodium.

In order to know how much salt is in a food, advise patients to look at the Nutrition Information panel on the food package. Salt is not shown on the label so the patient must look for the figure for sodium in milligrams (mg) per 100 grams (g). For more information on how to read the Nutrition Information panel please see the Q&A for consumers which is also available on Heartsite.

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\(^3\) People with kidney disease or those taking certain medications (containing lithium or diuretics) should check with their doctor before changing the amount of sodium/salt they eat. Women who are pregnant should also consult their doctor before making dietary changes.

\(^4\) People with renal impairment should check with their doctor before changing the amount of potassium they eat. Increasing dietary potassium intake to reduce blood pressure is only applicable for those people with normal renal function.

\(^5\) These recommendations are consistent with the 2006 National Health and Medical Research Council Nutrient Reference Values for Australia and New Zealand (NHMRC 2006).
How can Australians reduce their sodium/salt intake?

Australians can decrease their sodium/salt intake by choosing:
- plenty of fresh vegetables and fruit
- foods normally processed without salt and foods labelled ‘no added salt’ or ‘low salt’ (‘low salt’ means no more than 120 milligrams of sodium per 100 grams)
- choosing ‘reduced salt’ products if these are the lowest salt options available
- low salt breads and cereals
- water or plain mineral water
- low or reduced fat milk or ‘added calcium’ soy beverages
- 100% fruit juice.

Avoid high salt everyday foods such as:
- ham, bacon, luncheon meats, sausages and hot dogs
- tomato sauce, mayonnaise, commercial sauces and salad dressings
- canned soups, packet seasoning and stock cubes (other than those that are labelled ‘no added salt’, ‘low salt’ or ‘salt reduced’)
- fish canned in brine
- high salt take away foods
- potato chips/crisps and salted nuts
- Asian foods, soy sauce, condiments.

Avoid using salt in cooking:
This includes sea salt, rock salt, cooking salt, salt flakes, pink salt, chicken salt, onion salt, celery salt, garlic salt, MSG, beef and chicken stock cubes, stock powder, soup cubes, gravy powder and soy sauce. Instead use:
- vinegars and fruit juices such as lemon, lime and pineapple juice
- curry spices such as cumin, cardamom, cinnamon, ginger, turmeric, chilli, clove, coriander, pepper and mustard
- other flavourings such as fresh herbs, garlic, onion, chives, spring onion, horseradish, table wine and sherry
- ‘no added salt’, ‘low salt’ or ‘reduced salt’ varieties of stock powders and stock cubes.

Avoid adding salt at the table:
- to flavour food use freshly ground pepper, fresh or dried herbs, vinegar or balsamic vinegar, lemon juice, fresh mustard (made from powdered mustard), and fresh garlic or garlic powder.
- buy commercial ‘no added salt’ sauces.
- try making your own salad dressing, sauces, pickles and chutneys without adding salt.
How much potassium should Australians be eating?

Australian men eat about 2800 to 3200 milligrams of potassium per day and women about 2600 to 2900 milligrams of potassium per day (Beard et al, 1997; Notowidjojo L & Truswell A, 1993).

The National Health and Medical Research Council recommend that men eat an average of 3800 milligrams potassium per day and women eat 2800 milligrams potassium per day in order to prevent a deficiency (NHMRC 2006).

For those who wish to prevent chronic disease (including cardiovascular disease) the National Health and Medical Research Council suggest increasing dietary potassium intake to 4700 milligrams per day.

These figures are summarised in the table below:

<table>
<thead>
<tr>
<th></th>
<th>Current intake (mg/day)</th>
<th>Recommended intake (mg/day on average)</th>
<th>Recommended intake for chronic disease prevention (mg/day on average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>2800-3200</td>
<td>3800</td>
<td>4700</td>
</tr>
<tr>
<td>Women</td>
<td>2600-2900</td>
<td>2800</td>
<td>4700</td>
</tr>
</tbody>
</table>

Which foods are high in potassium⁶?

Potassium should ideally come from food sources rather than supplements.

Dietary potassium is found in many foods, particularly in vegetables, fruit, nuts, legumes and wholegrain cereals. For adults, the food group contributing the largest proportion of potassium is vegetables.

⁶ People with renal impairment should check with their doctor before changing the amount of potassium they eat. Increasing dietary potassium intake to reduce blood pressure is only applicable if you have normal renal function.
Choose:

- Avocado, mushrooms, broccoli, pumpkin and root vegetables. Beans and peas contain moderate amounts of potassium
- Bananas, kiwifruit, grapes, many dried fruits, oranges and orange juice, rock melon and honeydew melons
- Plain, unsalted nuts
- Low or reduced fat milks and yoghurts
- Lean meats and fish.

As an example, the following food and drinks could provide a daily intake of 4700 mg of potassium each day:

<table>
<thead>
<tr>
<th></th>
<th>Potassium contributed (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breakfast</strong></td>
<td></td>
</tr>
<tr>
<td>Wheat biscuit (3) with sliced banana and skimmed milk</td>
<td>750</td>
</tr>
<tr>
<td>A glass of orange-apple-mango juice</td>
<td>350</td>
</tr>
<tr>
<td><strong>Lunch</strong></td>
<td></td>
</tr>
<tr>
<td>Two slices of wholegrain toast topped with canned tuna (oil, drained) and slices of cucumber and tomato</td>
<td>550</td>
</tr>
<tr>
<td>A tub of fruit yoghurt</td>
<td>430</td>
</tr>
<tr>
<td><strong>Snacks</strong></td>
<td></td>
</tr>
<tr>
<td>A Kiwi fruit</td>
<td>220</td>
</tr>
<tr>
<td>A bunch of grapes</td>
<td>220</td>
</tr>
<tr>
<td>A handful of plain unsalted almonds</td>
<td>215</td>
</tr>
<tr>
<td><strong>Dinner</strong></td>
<td></td>
</tr>
<tr>
<td>A serve of homemade lasagne</td>
<td>500</td>
</tr>
<tr>
<td>A small serve of oven baked potato wedges with skin</td>
<td>1100</td>
</tr>
<tr>
<td>A side serve of steamed broccoli and zucchini</td>
<td>470</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4805</td>
</tr>
</tbody>
</table>
What is the Heart Foundation position on potassium for mildly hypertensive individuals?

The Heart Foundation found good evidence in the scientific literature to make recommendations to increase potassium for normotensive (systolic BP < 120 mm Hg) and hypertensive individuals (systolic BP = 140 mm Hg). The Heart Foundation found that there was less evidence that focussed on mildly hypertensive individuals (systolic BP 120-139 mm Hg) and therefore has not made recommendations for this group of individuals.

What are the messages for those with high blood pressure, high risk or existing cardiovascular disease?

To assist in lowering blood pressure health professionals should advise patients to:

- reduce their salt intake to less than 4 grams of salt a day (approximately 1550 milligrams of sodium)
- choose an eating pattern that has minimal added salt, as well as choose ‘low salt’ foods (no more than 120 milligrams of sodium per 100 grams) or ‘no added salt processed foods
- avoid adding salt during cooking or at the table
- increase their potassium intake to at least 4700 milligram a day by eating vegetables, fruits, nuts, legumes and wholegrain cereals regularly.\(^7\)

What steps can patients take to lower their blood pressure?

Lifestyle is very important in helping to control high blood pressure and its associated risks. Health professionals should advise patients to:

- be a non-smoker (for information on quitting smoking call Quitline 131 848)
- reduce salt intake and/or increase potassium intake
- achieve and maintain a healthy body weight
- limit alcohol intake to no more than 2 standard drinks per day (men) or no more than 1 standard drink per day (women)
- undertake daily physical activity\(^8\)
- take blood pressure medication as advised if prescribed.

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\(^7\) People with renal impairment should check with their doctor before changing the amount of potassium they eat. Increasing dietary potassium intake to reduce blood pressure is only applicable if you have normal renal function.

\(^8\) Some specific types of physical activity should be avoided by people with high blood pressure. These include body presses and lifting heavy weights.
References


National Health and Medical Research Council. Nutrient Reference Values for Australia and New Zealand including Recommended Dietary Intakes. 2006. Canberra, NHMRC.


Further information

For a detailed discussion of the evidence please refer to the full Summary of evidence statement on the relationships between dietary electrolytes and cardiovascular disease and the accompanying Position Statement on Heartsite at www.heartfoundation.com.au. The Position Statement may also be obtained through Heartline at 1300 36 27 87. A separate Q&A for consumers is also available on Heartsite.

For more information contact Heartline, the Heart Foundation’s national telephone information service on 1300 36 27 87 (local call cost) or email Heartline@heartfoundation.com.au or visit Heartsite at www.heartfoundation.com.au.

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