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Does more dietary salt intake cause dehydration in children?

Even in childhood, children with a higher dietary salt intake (as measured by the excretion of sodium in the urine) are more likely to have higher systolic blood pressure. High blood pressure over time is a strong risk factor for heart disease, and therefore reduction of excess salt intake during childhood seems to be reasonable.

Another potential adverse impact of excess salt intake is its effect on hydration status. The excretion of excess salt requires the excretion of water – therefore excess salt intake might result in mild dehydration, or compensating intake of beverages. A group of German researchers investigated salt intake in children and adolescents with a particular focus on hydration status. The information for the study was collected in Dortmund between 2003 and 2009, with the final number of participants being 499 providing 1575 dietary records and urine samples collected over a full day.

The investigators found that dietary salt intake increased with age – this is not surprising because food intake increases with age. As might be anticipated, salt intake was strongly associated with intake of salty foods – including convenience foods, cold meats, and bread but not cheese or ready to eat cereals.

Interestingly, the average daily salt intake was estimated to range from 3.6 grams in 4-8 year old girls to 8.2 grams in 14-18

year old boys. These intakes are high - the Australian 'adequate intake' is up to 1.5g/day for age 4-8 years and up to 2.3g/day for age 14-18 years.

Dietary salt intake was not associated with hydration status – children who had a higher salt intake increased their beverage intake to compensate for their higher water requirement. This analysis did not distinguish between different types of beverages, but it has been proposed that increased fluid intake is associated with excess energy intake because of the large proportion of beverages being high in energy (for example, soft drinks and fruit juices). In this cohort of German children, higher body weight status was found to be related to higher urinary sodium excretion but not because of higher consumption of sugar containing beverages – the reason is not known.

Another finding of the study was that dietary salt intake had not changed appreciably in the German children over the 7 years of the study – an effective strategy for lowering dietary sodium should be explored.

Reference:

Alexy U, Cheng G, Libuda L, Hilbig A, Kersting M. 24h-Sodium excretion and hydration status in children and adolescents – results of the DONALD Study. *Clinical Nutrition* 2012;31:78-84

The salt intake of infants

Infants have a low sodium intake – in the United Kingdom the maximum recommended intake is less than one gram of salt a day. Too much salt can be harmful to developing kidneys, and may contribute to developing a taste for salty foods. But it is easy to consume too much salt when children begin eating solid food.

A study of 8 month old infants in the United Kingdom aimed to investigate what foods were contributing to salt intake. Solid food was first introduced to 925 of the 1178 infants studied when they were between 3 and 4 months of age, and typically the first foods were plain baby rice, flavoured baby rice and other cereals.

For the 8 month old infants, about 70% had more than the recommended 400 mg of sodium a day. Food contributors to salt intake for those children in the highest 25% of sodium intake were primarily 'family foods' – bread, meat, salty flavourings (including marmite) and pasta/rice (including tinned varieties). For children in the lowest 25% of sodium intake, the majority of sodium was sourced from milk or ready prepared infant foods with other important foods being bread and breakfast cereal. Gravy intake was three times higher for children in the highest 25% of sodium intake compared to those in the lowest 25%.

The dietary information for this study was collected in 1993 – in the period since then the United Kingdom has undertaken an intensive program of sodium lowering across the population. This has included baby foods, with substantial reduction in sodium content being achieved.

The researchers who conducted this study noted that poor complementary feeding practices were responsible for high sodium intake in children. In particular, cows' milk as a main drink, salty flavourings, canned foods

and normal adult foods contributed to high dietary sodium levels. During infancy, adding salt to food is inappropriate – food should not be flavoured to suit adult tastes.

The recommended maximum intake of sodium (400 mg/day) for this age group may be too low to be achieved by the majority of children. If the adult recommendation of 6 g /day were applied on a relative energy intake basis, the recommendation for sodium would be about 850 mg/day. Even at this higher level, many of the children were consuming a higher intake of sodium.

Conclusions:

The advice of the researchers is that infants should be introduced to a 'baby-specific' diet using home prepared foods or ready prepared infant foods. Clear advice should be given to all mothers about foods suitable for infants including advice not to introduce cows' milk as a main drink before 12 months of age; and food manufacturers should continue to reduce sodium levels in food products, including those for infants.

Reference:

Cribb VL, Warren JM, Emmett PM. Contribution of inappropriate complementary foods to the salt intake of 8-month-old infants. European Journal of Clinical Nutrition 2012;66:104-110.

A conflict between nutritionally adequate diets and meeting the 2010 dietary guidelines for sodium.

[Maillot M, Drewnowski A. *American Journal of Preventive Medicine* 2012;42:174-79]

Many dietary recommendations are difficult to comply with – this is particularly true for the reduced salt recommendation because of the widespread addition of salt to many foods.

US investigators from the University of Washington accepted the task of assessing how feasible it is to meet the sodium recommendation while having a diet that is adequate in all other nutrients. They did this by examining the patterns of intake from 128 food categories for 6 demographic groups defined by age and sex, and undertaking a mathematical modelling process. A dietary intake model was constructed for each demographic group that met the required energy intake, the recommended intake of a large range of nutrients (vitamins and minerals), and where food category intake was not too far from the American eating pattern. The model was then programmed to meet progressively lower sodium targets until the target was met (1300mg/day for men and women over 50 years of age, and 1500mg/day for other adults); or no mathematical solution was possible.

For men, it was not possible to model nutrient adequate diets below 2000 mg of sodium per day for 20-30 year olds, or below 1600 mg per day for 30-50 year olds. For women aged 20-30 years, a nutrient adequate diet could only be achieved when sodium intake was above 1700 mg per day.

In general, reducing sodium below 2000 mg per day was associated with substantial deviation from existing food patterns – the amount of meats, poultry and fish, eggs and grains needed to be sharply reduced while the amount of fruit, beans, nuts and seeds were greatly increased.

What this study suggests is that Americans cannot achieve sodium reduction targets without either addressing the amount of added sodium in their foods, or drastically changing the pattern of foods that they eat (or both).

It is said that a 10% to 20% reduction in sodium content of food is generally not noticed by most people – this could be an early target for total food supply sodium reduction. However, people who are serious about having a nutritionally adequate but low salt dietary intake will eat only low sodium food (less than 120mg/100g).

Programming of Health before Birth.

In the past decade and more, evidence has continued to accumulate that early childhood growth and nutrition within the womb programs susceptibility to important characteristics such as body fatness and blood pressure which are related to risk of major chronic disease and death in later life.

Evidence has now been found that the metabolism of minerals may also be determined by developmental programming in the womb. Austrian researchers studied pre-birth hormonal influences on mineral metabolism in 139 healthy university students.

The ratio of the length of the second finger to the length of the fourth finger is a well-established marker of prenatal sex steroid action. This is because during early embryonic development sex hormones govern the rate at which skeletal precursor cells divide. Different finger bones have different levels of sensitivity to androgen and estrogen.

The investigators measured the ratio of second finger to fourth finger lengths and concentrations of sodium, potassium, magnesium and calcium in hair samples. They found that mineral ratios could be predicted by finger ratios, although the relationship in men was opposite to that in women.

The authors consider that the type and extent of prenatal programming of essential metabolic features of an individual may turn out to be an important mediating factor determining the impact of dietary salt reduction. Consequently, measuring the ratio of finger lengths (or essential minerals in hair samples) might enable a personalised dietary strategy to be developed.

Schulter G, Goessler W, Papousek I. Prenatal programming of adult mineral metabolism: relevance to blood pressure, dietary prevention strategies and cardiovascular disease. Am J Hum Biol 2012;24:74-80.

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We are on the Web at
www.saltmatters.org

Salt Skip News will
continue to be distributed
in hard copy in The BP
Monitor (QHA newsletter)

Urinary sodium excretion and cardiovascular mortality in Finland.

1173 Finnish men and 1263 women aged 25-64 years had cardiovascular disease risk factors and 24 hour urinary sodium excretion measured in either 1982 or 1987. Each of the participants were followed up until the end of 1995 - about 10 years. High sodium intake (as measured by high urinary sodium excretion) predicted mortality (risk of death), and risk of cardiovascular disease independently of other cardiovascular disease risk factors, including high blood pressure. These results provide direct evidence of the harmful effects of high salt intake in the adult population.

The classic cardiovascular risk factors (smoking, serum cholesterol, blood pressure and body mass index) were also found to be associated with risk of cardiovascular disease.

Tuomilehto J, Jousilahti P, Rastenyte D, Moltchanov V, Tanskanen A, Pietinen P, Nissinen A. Urinary sodium excretion and cardiovascular disease mortality in Finland: a prospective study. Lancet 2001;357:848-51.

WORLD SALT AWARENESS WEEK 26th March – 1st April

A focus on salt reduction and the prevention of stroke.

Look at www.AWASH.org.au for activities.

BP Monitor with Salt Skip News is published every 2 months, from February to December (6 issues a year).
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