

Salt and Battery: Debate on Sodium Targets Gets Feisty

Michael O'Riordan | May 07, 2014

MELBOURNE, AUSTRALIA — An analysis of more than 100 000 participants in the **Perspective Urban Rural Epidemiology** (PURE) study is once again stoking the debate over what level of sodium intake is good for human health. The latest data from PURE suggest that both low and high levels of sodium intake are associated with an increased risk of mortality and cardiovascular events in individuals with and without hypertension.

Presenting the results of the analysis at the **World Congress of Cardiology 2014 Scientific Sessions**, lead investigator **Dr Salim Yusuf** (McMaster University, Hamilton, ON) said that individuals who consumed between 3000 mg and 6000 mg of sodium per day had the lowest risk of death and cardiovascular mortality but that there is a U- or J-shaped association between sodium intake and adverse clinical outcomes at higher and lower levels of sodium intake, where mortality and cardiovascular events are increased.

For Yusuf, the findings make sense, given that sodium is an essential nutrient required by the body. He reminded the audience of the action potential they learned in medical school physiology classes, noting that sodium is required for cell-to-cell transmission. Salt intake, he said, is not a cardiovascular risk factor akin to smoking, where the goal is to reduce the prevalence to zero. Like other essential nutrients, there is likely an optimized zone, and these data suggest that zone lies somewhere between 3000 mg and 6000 mg of sodium per day.

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Dr Bruce Neal (University of Sydney, Australia), a leading proponent of reducing sodium levels to low targets and a critic of the food industry, disagrees with the conclusions. Neal discounted the data, stating that he is "disappointed to see otherwise highly competent epidemiologists get it so wrong in this space." He also said that Yusuf and colleagues were using their position to be overly vocal against the low sodium targets and that it was unhelpful.

"The current guidelines to reduce sodium to less than 2300 mg per day are more than justifiable and feasible and are appropriately being acted upon around the world," said Neal.

PURE-SODIUM: What the analysis showed

The **PURE-SODIUM** analysis included 101 945 individuals who consumed, on average, 4900 mg of sodium/day. Of those included, just 8% had a history of cardiovascular disease. Approximately 10% of the participants consumed <3000 mg of sodium/day and another 10% consumed 7000 mg/day or more. Just under half of the participants consumed between 4000 and 5990 mg of sodium daily. In their analysis, the researchers found that nearly no patients consumed less than 2300 mg of sodium daily.

In a multivariate-adjusted model, those who consumed less than 3000 mg of sodium per day had a 25% increased risk of all-cause mortality and cardiovascular events compared with those who consumed between 4000 mg and 5990 mg/day (reference group). At the high end, those who consumed 7000 mg/day or more had a 15% increased risk of death and cardiovascular events. After further adjustment for dietary factors and blood pressure, those who consumed less than 3000 mg/day still had a 21% increased risk of death and cardiovascular events.

And finally, in a subgroup analysis, the PURE researchers report that those without hypertension had an increased risk of clinical events at the low end of sodium consumption (<3000 mg/day) but not at the high end (≥ 6000 mg/day). For those with hypertension, there was a heightened risk of death and cardiovascular events at the low and high end of sodium intake.

The findings are controversial, given that they challenge the current recommendations from numerous organizations, including the **American Heart Association** (AHA), to reduce sodium intake to very low levels. The AHA recommends that individuals consume no more than 1500 mg of sodium per day. The **2010 Dietary Guidelines for Americans** recommends a daily sodium intake of 2300 mg for the general population and 1500 mg for individuals 51 years of age and older, African Americans, or individuals with hypertension, diabetes, or chronic kidney disease.

Debate on Sodium Reduction Gets Heated

During the presentation, Yusuf said the PURE-SODIUM results are supported by data from the **ONTARGET** and **TRANSCEND** studies in 28 880 patients at high cardiovascular risk. In that analysis, there was an increased risk of cardiovascular events, including cardiovascular mortality, among individuals who consumed less than 3000 mg of sodium per day. He acknowledged there are critics of their conclusions, but he stands by their results.

For Neal, who participated in a debate against **Dr Martin O'Donnell** (McMaster University, Hamilton, ON) on the merits of sodium reduction, the researchers' conclusions rely solely on weak observational data that are further confounded by an "unhealthy focus" on one's own research.

"The problem here is that the data are not fit for the purpose they are being used," said Neal. "Observational epidemiology for nutrition has been shown time and again to be barely worth the paper it's printed on. Unfortunately, large pieces of weak epidemiology, such as ONTARGET and PURE, are no better than small pieces of weak epidemiology. It doesn't advance the field."

During the sodium debate, Neal said the totality of evidence supports lowering sodium intake at the population level to reduce blood pressures and that lower blood pressure translates into reduced cardiovascular and stroke risk. When he focused on the PURE and TRANSCEND/ONTARGET data, Neal drew the ire of Yusuf when he suggested that O'Donnell, a coauthor of both analyses, might have a working interest with the food industry.

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"There has been a smear campaign by a group of people against anybody who questions salt," said Yusuf. "They get attacked. It's the same dozen people who write the same papers and advise the same committees. The moment you stand up and say, 'Well, it might not be as bad as we think,' you get attacked personally."

For his part, O'Donnell took the personal remark in stride, stating that he has no working relationship with industry and receives no funding from food manufacturers. "I occasionally enjoy salt and vinegar crisps [chips], which I purchase with my own money," he said. "A bag has never been given to me for free."

Salt Is the New Tobacco

During the debate, Neal argued passionately that "salt is the new tobacco" and that the burden needs to be on the food industry to show that the levels of added sodium are safe. Currently, nearly every country on earth exceeds the recommended 2300 mg of sodium/day, with the world average somewhere around 10 100 mg/day. In fact, said Neal, "normal" salt consumption has been defined by the food industry, but the physiological requirements for sodium are between 1000 mg and 2000 mg/day.

"If 'normal' is what the food industry decides to feed us, then it would be normal for 1.2 billion people to smoke, because that's the number of cigarettes the tobacco industry decides to sell us," he said.

Neal said current campaigns to lower salt can be achieved cheaply, noting the UK recently had success in reducing sodium intake from 9500 mg/day in 2000 to 8100 mg/day in 2011. Moreover, the public-health campaigns to lower salt can be done at a fraction of the cost of existing hypertension-control programs.

O'Donnell, on the other hand, said the question is not whether sodium intake should be reduced but whether it should be reduced to a low target of less than 2300 mg/day. He is an advocate of reducing high sodium intake among his patients, but there is no evidence supporting a reduction in sodium beyond moderate levels. For example, there is no study that compares a low-sodium diet with a moderate-sodium diet and shows that a low-sodium diet results in a reduction in cardiovascular events.

There is evidence, he said, showing that very low levels of sodium can trigger adverse cardiovascular effects, such as the activation of the renin-angiotensin system and a spike in catecholamine activity.

"Salt isn't the new tobacco," said O'Donnell. "Sitting is the new tobacco. Not salt."

The **Institute of Medicine** (IOM) has recently stated there is evidence supporting a positive relationship between higher levels of sodium intake and the risk of cardiovascular disease, but there is no advantage to lowering intake among individuals who consume a moderate amount of sodium. According to the IOM, the evidence is not strong enough to recommend lowering daily sodium intake to the 1500- to 2300-mg/day range.

