

Evidence-based politics of salt and blood pressure

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A friend recently asked me why a small can of tomato juice needs to contain 880 mg of NaCl. He assumed that nephrologists would know the answer and also probably would oppose this as a public-health hazard. He was correct on both counts. Salt is added to all prepared food for an obvious reason: it is the best preservative we know of. It is bacteriostatic and does not radically change the character of the food regardless of its composition; hence it is used in materials as different as fruit juices, ice cream, and meat. But there is a more subtle reason for its use: preserving food often causes an unpleasant, bitter taste, and it has been well documented that increasing salt concentration suppresses bitter taste.¹ There is also some evidence that salt enhances sweet taste; hence, by adding salt, one can make food more palatable. No wonder every processed or canned food in the marketplace is salty. Given that consumption of prepared and canned food is increasing, the intake of salt in industrialized countries is now pretty high.

How good is the evidence that a high-salt diet is detrimental to health? A fair analysis of epidemiological, genetic, and intervention studies shows an overwhelming connection. Hence the presence of a high salt content in processed food requires defense, and the food industry has risen to this challenge. The Salt Institute, a powerful lobbying group composed of salt manufacturers but also supported by a variety of industries including the prepared-food industry, has led the fight to show that salt is actually good for you. Their strategy has been to invent controversy to show that there are two sides to each issue, a well-known political trick! Touting the few studies that raise questions as to whether there is a relationship between salt and high blood pressure, their dissemination of this information has been so effective that, everywhere you look — say, in major newspapers — the idea that a high-salt diet causes high blood pressure is now considered controversial. This is not the place to go over all the epidemiological evidence that links high salt to hypertension and heart disease. But I want to point out that the evidence is not only (I really want to say merely)

epidemiological. Chimpanzees raised on a high-salt diet developed an increase in blood pressure with ageing, whereas their siblings raised on a low-salt diet did not.² All the mendelian diseases associated with hypertension include defects that cause increases in salt absorption by the kidney.³ Large organizations such as the National Institutes of Health (NIH) and the American Heart Association believe there is a relationship and have recommended the reduction of salt intake, but such a decision can never be taken lightly. Of course, propagandists have discovered that, these days, when institutions with authority need to be attacked, they are best cast as purveyors of orthodoxy and political correctness. The view of the NIH and the American Heart Association is simply a reflection of the consensus of most experts in the field. However, there are a few researchers who say it ain't necessarily so.⁴ Michael Alderman, a prominent epidemiologist, says that his problem with the data is that they are “observational” — that is, epidemiological. Alderman is the Salt Institute's hero and was a featured speaker at their 92nd annual meeting in March 2006. Because epidemiology cannot prove causality, scientists intervened by reducing salt intake in patients with various levels of high blood pressure and found in the Dietary Approaches to Stop Hypertension (DASH) study that this dietary modification caused lowering of blood pressure.⁵ It is important to emphasize that the salt reduction was modest by any standard, a reduction to about 100 mmol of salt a day, not enough to raise the renin levels to any significant degree.

The Salt Institute led the effort started by many industries to establish a law called the Data Quality Act (<http://www.whitehouse.gov/omb/fedreg/reproducible.html>). This is a few-sentence piece of legislation stealthily introduced by the lobby as an addendum to the budget and rapidly accepted without discussion. In this law, Congress directs the White House Office of Management and Budget to issue guidelines “ensuring and maximizing the quality, objectivity, utility, and integrity of information ... disseminated by Federal agencies.” That is, all data that form the basis of federal regulation should be of the highest quality; who could

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be against that? Using this law, big business has challenged every piece of federal legislation that protects the environment, regulates drug makers, or issues dietary recommendations, and even those that list certain compounds as carcinogens.⁶ To reduce criticism, the lobbyist who wrote the law (J. Tozzi) has been encouraging public-interest groups to use the act for their own purposes, including a group that aims to legalize marijuana for health uses. A new set of code words has been invented — ‘sound science’ versus ‘junk science’ — to overthrow the regulatory rulings. Their aim is to use this law to make sure that ‘junk science’ (evidence for global warming, harmful effects of salt in the diet, and so on) does not pollute the lives of Americans. In 2003 the Salt Institute and the United States Chamber of Commerce used the law to petition the NIH, challenging the accuracy of the DASH study and its applicability to all individuals. They requested the disclosure of the raw data on all the patients. Their aim is probably to extract data on a few patients and show that these few did not respond to decreased salt intake with lowering blood pressure. They will then publish them and say, See! We told you it is controversial — even in the DASH study.

The key claim in their petition was that the DASH study does not meet the standards of objectivity or its underlying requirements of transparency and reproducibility — that without the original data the public cannot assess whether there is some reason to question the objectivity of the sources. The real issue seems to be that, according to the Salt Institute, the concept of reproducibility is not statistical; rather, any finding must apply to all of the subgroups. But because the petition was to release data rather than to question their accuracy, the NIH construed it as falling under the Freedom of Information Act and denied it. The Salt Institute and the Chamber of Commerce then sued the National Heart, Lung, and Blood Institute on the grounds that it had violated the Data Quality Act, but the courts dismissed the case on the grounds that the plaintiffs did not question the correctness of the data and hence had no standing in the case. In addition, their suggestion that they had suffered ‘injury’ by the lack of the original raw data apparently did not convince the court. The NIH also argued that, because these data had been subjected to continual peer review at every level of the organization, conduct, and publication of the trial, no issue of quality was involved. Needless to say, the Salt Institute and the Chamber of Commerce appealed the decision, and arguments were presented in early February 2006 before the United States Court of Appeals (Fourth Circuit) in Virginia. Here they argued that they had received “informational injury.” In a lucid opinion, Judge Luttig dismissed the case (<http://pacer.ca4.uscourts.gov/opinion.pdf/051097.P.pdf>), concluding that the plaintiffs

again had no standing. It has been rumored that now the Salt Institute will do what it knows best how to do: slip some benign-sounding legislation into a budget bill that will overturn these legal opinions.

Where do we go from here? For one thing, we must continue to do research on the subject, but not epidemiological research. This kind of work simply will not solve any of the problems. It is not that I am against epidemiology; how can one be? The problem is that epidemiological studies of issues like diet and blood pressure require massive numbers of subjects, which means that the information gathered can never be anything but superficial — with too many centers collecting data; too much variability; critical findings such as salt intake that cannot be adequately quantified in such a large population; and so on. There has been an increase in reports of something called reverse epidemiology; that is, results that are counterintuitive. We are told that patients are at a higher risk of dying if they have lower cholesterol or lower blood pressure when they are on dialysis. I remember a study many years ago that showed that people who do not eat breakfast have a higher mortality rate. It later turned out that the study had included many people with malignancies and, hence, anorexia; of course they had had a higher incidence of death. Reverse epidemiology probably has the same kind of problem; sicker people have lower blood pressure and eat less, so their cholesterol is lower. Is this the explanation for the new finding by Adelman that there is an inverse correlation between salt intake and cardiovascular mortality?⁷ Very likely, I would say: patients who went on a low-salt diet probably did so because they had seen a doctor and the doctor had prescribed it; those who were sicker were probably more likely to stick to the diet, so they were likely to have a higher mortality. And at any rate, measurements of sodium intake or excretion were not taken here; it was just the subjects’ reports of their sodium intake! When are we going to start thinking like scientists about this? Let us eject the real junk science from this debate.

1. Breslin PA, Beauchamp GK. Suppression of bitterness by sodium: variation among bitter taste stimuli. *Chem Senses* 1995; **20**: 609–623.
2. Denton D, Weisinger R, Mundy NI *et al*. The effect of increased salt intake on blood pressure of chimpanzees. *Nat Med* 1995; **1**: 1009–1016.
3. Lifton RP, Gharavi AG, Geller DS. Molecular mechanisms of human hypertension. *Cell* 2001; **104**: 545–556.
4. Alderman MH. Dietary sodium and cardiovascular health in hypertensive patients: the case against universal sodium restriction. *J Am Soc Nephrol* 2004; **15**(Suppl 1): S47–S50.
5. Sacks D *et al*. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. *N Engl J Med* 2001; **344**: 3–10.
6. Weiss R. ‘Data quality’ law is nemesis of regulation. *Washington Post* 16 August 2004.
7. Cohen HW, Haipen SM, Fang J *et al*. Sodium intake and mortality in the NHANESII follow-up study. *Am J Med* 2006; **119**: 275.e7–275.14.