There is a tendency, when trying to make a particular point, to use clichés, jargon and euphemisms. Unfortunately, when this approach is used in public statements that are then broadly quoted by the media, there is a tendency for the public to be misled. A case in point is the use of the term “toxic.” This has long been defined and understood as a material that is capable of causing injury or death, especially by chemical means. In other words, a poison. Occasionally, it may be used to refer to pathogenic microorganisms that are capable of producing poisons. With such a clear and well-understood definition, using this term loosely to make an exaggerated point results in confusion and ultimately causes harm to consumers by diluting its precise understanding.

Referring to bad bank loans as toxic assets benefits no one but a sensationalist media. It may roll off the tongue easily in a sound bite, but does little to inform the average consumer. Indeed, a consumer may be confused by its use applied to bank loans, when it is really meant to describe a physiological effect on life.

It is common knowledge that consumer advocacy groups have a tendency to exaggerate when making a case, even if they knowingly confuse consumers. Indeed, although they make up their major constituencies, confused consumers are the stock and trade of many consumer advocacy groups. There are few consumers formally educated in food technology that belong to these advocacy groups. This happened recently during a press conference held by the Center for Science in the Public Interest (CSPI). During a May 11, 2009 press conference they convened, CSPI representatives Michael Jacobson and Stephen Havas claimed that salt was toxic and that our current levels of consumption are prematurely sending countless Americans to their graves.

Salt, the oldest and most widely used food ingredient - a product that is essential to all life - they chose to describe as “toxic.” Without taking time to question or challenge CSPI, the national media ran with the story, thus leveraging what was in effect, nothing more than a meaningless statement. Will consumers be led to believe that salt is indeed toxic? Or could it be that salt is actually toxic?

Toxicity is the degree to which a substance is capable of causing damage to an exposed organism such as an animal, bacterium, or plant. A central concept of toxicology is that the effects of the toxic material are dose-dependent – in other words, anything can be toxic when taken in large enough doses, whereas for even highly toxic substances such as snake venom, there is a dose below which there is no noticeable toxic effect.

Toxicity is measured by the effects on the target organism. Because individuals commonly have different responses to the same dose of a toxin, a population-wide measure of toxicity is often used which relates the general probability of an effect on a given individual in a population. One such measure is the LD50 or average lethal dose - the dose required to kill half the individuals of a tested population. When such data does not exist, as in the case for humans (because such testing would be impossible), certain “safety factors” or “multipliers” are incorporated to account for uncertainties in data and evaluation processes. For example, if a dose of a toxic material is safe for a laboratory rat, one might assume that one tenth that...
dose would be safe for a human, allowing a safety factor of 5 or 10 to allow for interspecies differences between two mammals. If the data are from fish, one might use a factor of 100 to account for the greater difference between the two species. Similarly, extra protective factor may be applied for individuals believed to be more susceptible to toxic effects, such as children or women who are pregnant. There is no question that this approach is very approximate; but such protective factors are set very conservatively and the methods have been found to be useful in a wide variety of applications.

There is no data for salt toxicity in humans. That is why there are no cases of hypernatremia (elevated plasma sodium levels) associated with excess salt ingestion. The only cases of hypernatremia that exist are the result of an inadequate intake of water, typically in elderly or otherwise disabled patients who are unable to take in water as their thirst dictates. Another cause is the inappropriate excretion of water, often in the urine, which can be due to medications like diuretics or kidney problems, but never due to excess salt intake.

In fact, water is far more toxic than salt. There have been a great many well publicized cases of water toxicity (hyponatremia) due to drinking large volumes of water without consuming enough salt. For instance, on January 12, 2007, Jennifer Strange, a 28-year-old mother of 3, from Rancho Cordova, California, died a few hours after trying to win a Nintendo’s Wii game console. The local radio station’s “Hold Your Wee for a Wii” contest, involved drinking large quantities of water without urinating.

So, if salt is not toxic why would the CSPI representatives refer to it as such? They do so to overstate the connection between salt and blood pressure. Knowing that the published clinical trials on salt and health outcomes will not support their call for a reduction in salt consumption, they have chosen to refer to hypothetical projections made by co-conspirators and to use demonizing language to make their case. Contradicting their own website which states that salt is not toxic, the representatives of CSPI chose to make that characterization in order to attract more press coverage, despite the misinformation it might deliver to consumers.

What they have not done was to take the next step and inform consumers what practical options there are available for reducing salt in processed foods – the real target of their advocacy. As anyone with food industry experience knows, you cannot simply reduce the salt content of foods and expect to have the same degree of acceptability. The salt in processed foods has to be replaced or enhanced with some other ingredient. What about the toxicity of these chemical additives?

### 5-Ribonucleotides

The 5-ribonucleotides are flavor enhancers that are used to enhance the savory sensation, more accurately referred to as the taste of umami, now recognized as one of the five basic tastes. It is a mixture of disodium inosinate (IMP) and disodium guanylate (GMP) and can be sold as the mixture or as individual flavor enhancers.

![Disodium inosinate](image)

![Disodium guanylate](image)

The Joint FAO/WHO Expert Committee on Food Additives, which met in Rome on 4-13 June 1974, determined that ingestion of large amounts of these compounds by man can increase the serum uric acid level and urinary uric acid excretion – risk factors for gout and kidney disease. More troubling is a recent report published in New Scientist indicating that the 5-ribonucleotides in foods have triggered an outbreak of itchy ribo-rashes, dramatic skin eruptions and even anaphylactoid episodes. Reactions to ribonucleotides can range from a single itchy rash to life-threatening swelling of the lips and tongue. The internet abounds with personal anecdotal incidents of people who have suffered as a result of consuming products containing 5-ribonucleotides.
**L- Lysine**

L-lysine, an essential amino acid, which means that it is necessary for human health but cannot be made by the body. Although it has low toxicity, there is a potential for side effects and interactions when consumed with other medications. Studies on animals have shown adverse effect and toxicity on the fetus, but no adequate and well controlled studies have been done on pregnant women.

**Monosodium glutamate**

Monosodium glutamate (MSG) is one of the most widely used flavor enhancers in the food sector and is found in a variety of foods prepared at home, in restaurants and by commercial food processors. MSG was originally made by the acid hydrolysis of wheat gluten, which is roughly 25% glutamic acid, but is now produced by the fermentation of carbohydrates, using bacteria or yeast. MSG as a food ingredient has been the subject of many health studies. A report from the Federation of American Societies for Experimental Biology compiled in 1995 on behalf of the FDA concluded that MSG was safe for most people when “eaten at customary levels.” However, it also said that, based on anecdotal reports, some people may have an MSG intolerance which causes “MSG symptom complex”—commonly referred to as Chinese restaurant syndrome—and/or a worsening of asthmatic symptoms. In addition, according to a University of North Carolina at Chapel Hill School of Public Health study, people who consume MSG as a flavor enhancer in their food are more likely than people who don’t use it to be overweight or obese even though they have the same amount of physical activity and total caloric intake.

**L-arginine**

Arginine is a semi-essential amino acid, meaning most of the time it can be manufactured by the human body, and does not need to be obtained directly through the diet. The biosynthetic pathway however does not produce sufficient arginine, and some must still be consumed through diet. Symptoms of too high an intake may include thickening and coarsening of the skin, muscle weakness, diarrhea, nausea, as well as increasing the activity of some viruses. Arginine has also been implicated in retina cell death in mice.

**Lactates**

Potassium lactate is a product that is mainly used in the meat industry. It is used for shelf life extension and salt flavor enhancement. A disadvantage of aqueous potassium lactate solutions is their bitter aftertaste.

**Mycosent**

Mycosent is a flavor enhancer derived from fungus protein. No information on toxicity is readily available.

**Trehalose**

Trehalose, also known as mycose, is a natural disaccharide originally discovered in 1859 in fungal infections of rye grain (ergot). It can be synthesized by fungi, plants, and insects. It is now made in commercial quantities from starch and has a broad spectrum of applications including the enhancement of salt flavor.

Because of the myriad role that salt plays in food formulation, even the experts at the famous Monell Chemical Senses Center, in Philadelphia, believe it’s nearly impossible to completely replace salt. Nevertheless, efforts to do this are ongoing and the list of chemicals used to replace these functions of salt is extensive. In salt replacement, once the process of modifying flavor or texture profiles is launched, it can result in an endless merry-go-

**continued on page 4**
round of adjusting nuances and adding counter-nuances to correct for off-flavors or dis-functionalities introduced by the previous additive. By the time the formulation is completed, the product can contain a veritable cocktail of complex industrial chemicals just to replace the salt it previously contained.

Would it not be prudent to question carefully the health implications of a broad-based replacement of salt with an arsenal of synthetic chemical products that have never been tested for their interactions and toxicities at the anticipated salt replacement levels? It is little different than replacing animal fats with trans fats or cane sugar with the several unpronounceable industrial chemicals we call sugar replacers today. All these replacers distort the consumer's perspective of food and have promoted greater overall caloric consumption – just one of the unintended consequences of their application.

And if a more rigorous toxicological consideration of the chemical additives used to replace salt were not enough, consider the further impact of reduced salt on physiological function. Insufficient salt intake stimulates the Renin-Angiotensin Aldosterone System, whose role, among others, is to conserve the body's salt as was highlighted in a previous Salt and Health Newsletter. Evidence indicated the Dietary Guideline recommended levels of salt in the diet (3.8 – 5.8 g/day) is insufficient to prevent the development of elevated aldosterone levels. It has now been generally recognized that the negative clinical implications of aldosterone in metabolic syndrome and resistant hypertension is extensive. In fact, there are now new prescription pharmaceuticals whose specific role is to act as an aldosterone antagonist. So, on top of being subjected to a host of additional chemical additives, a possible additional impact of salt reduction for some individuals will be the need to take a new class of prescription drugs.

Salt replacement is not a simple task, nor is it without consequences for consumers. We have allowed our bodies senses to guide us in our consumption of this ingredient for millennia. There is no convincing evidence that a population-wide reduction in salt intakes will have any positive impact on health outcomes, on the contrary, the possibility of unintended consequences are significant. It is time for policy-makers to consider this matter rationally with a comprehensive view of all the available evidence.

References

(Endnotes)


3 Dangers of Ribonucleotides #635 - The ‘Ribo Rash’ can be accessed at: http://www.onegirlworld.com/additives/