Negative Brief: TSP (Trisodium Phosphate) Ban

By “Coach Vance” Trefethen

This negative brief addresses the case that calls for a ban on trisodium phosphate (TSP), a cleaning agent that has caused many harms that the affirmative will claim. The negative will claim that TSP is a top-quality cleaning agent whose benefits outweigh the harms the affirmative is trying to claim.

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Negative Brief: TSP (Trisodium Phosphate) Ban

NEGATIVE PHILOSOPHY / OPENING QUOTES

“TSP Paint Thinner” meme is an urban legend – debunked by Snopes. No more dangerous than water or baking soda

David Mikkelson with Snopes, a website that debunks urban legends and internet rumors 2016. “Lucky Harms” last updated Sept 2016 <http://www.snopes.com/food/ingredient/tsp.asp>

It is true that trisodium phosphate is effective as a cleaning agent, due in part to its alkalinity. Sodium bicarbonate is a similarly scary-sounding chemical compound used in heavy-duty cleaning, as an agent to detarnish silver, and to extinguish fires — but you cannot make chocolate chip cookies without the leavening power of baking soda, as sodium bicarbonate is more commonly known, and leavening is another common use for sodium phosphates. Similarly, water is a very common substance used for such tasks as cleaning, scrubbing silverware, and extinguishing fires, yet consuming it poses no harm to consumers. Trisodium phosphate is "generally recognized as [safe](http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=182.1778)" by the U.S. Food and Drug Administration (FDA) and is [approved](http://www.food.gov.uk/science/additives/enumberlist#anchor_7) for use by food safety standards agencies in the European Union. TSP in high concentrations can be used for cleaning walls before painting, but it should not be conflated with "paint thinner," a solvent comprised of mineral spirits, turpentine, or acetone that is chemically unrelated to TSP.

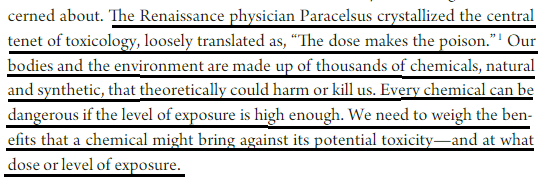
“Why are they used at all?” – Because they enhance the quality of the food

Nguyen Huynh Bach Son Long, Robert Gál and František Buňka 2011. (Department of Food Technology and Microbiology, Faculty of Technology, Tomas Bata University, Czech Republic) Use of phosphates in meat products, African Journal of Biotechnology Vol. 10(86), pp. 19874-19882, 30 December 2011 <http://www.ajol.info/index.php/ajb/article/download/99173/88474//>

Phosphates are widely used in meat processing industry from poultry, chicken, pork, beef, etc. for roast beef, hams, frankfurters, fresh sausages, salami, etc. The usage of the appropriate amount and mixture of phosphates can lead to the improvement of some properties of final products, such as moisture retention, water holding, color protection, slowing down of oxidation, extension of shelf- life, stabilizing and enhancing structure of final products.

Risk alone does not justify ban – everything has risk, after all

Jon Entine 2011 ( senior research fellow at the Institute for Food and Agricultural Literacy at the University of California ) SCARED TO DEATH – How Chemophobia Threatens Public Health <https://www.scribd.com/document/48504531/Scared-to-Death-How-Chemophobia-Threatens-Public-Health>



HARMS / SIGNIFICANCE

Ignore the internet rumors: TSP is completely natural. In fact, it’s naturally found in every cell of your body

Eric Hall 2015 (master’s degree in Physics; teacher at Univ of Minnesota) 9 May 2015 How Michelle Obama Helped Promote Anti-Science Sentiment <https://skeptoid.com/blog/2015/05/09/michelle-obama-anti-science/>

The one ingredient that could cause naturalistic fallacy folks to quickly anger is sodium phosphate. I see a meme about [trisodium phosphate](http://www.snopes.com/food/ingredient/tsp.asp) passed around on a regular basis, saying that in very large amounts it can be used as a cleaner. Sodium and phosphates are found naturally in every cell of our body, and in normal amounts it is harmless. So before anyone tries to point out that it isn’t “natural,” just know it actually is.

No harm from inorganic phosphate – that’s what your body has naturally in it. TSP scare is all “pseudo-science”

Kevin Klatt 2014 (Dietetics and Molecular Nutrition focused PhD Student at Cornell University's Division of Nutritional Sciences) 6 Dec 2014 [Why is that in my Food? : Trisodium Phosphate](http://nutrevolve.blogspot.com/2014/12/why-is-that-in-my-food-trisodium.html) <http://nutrevolve.blogspot.fi/2014/12/why-is-that-in-my-food-trisodium.html?view=mosaic>

The article states that TSP is something that developers and construction workers should be familiar with, not people buying food (a pretty pointless comparison). The authors of the natural cures article go so far to even say that inorganic phosphate can be detrimental to our health: there is no citation for this claim, which is a rather ludicrous one seeing as almost all of the phosphorus in the body's extracellular fluids is in an inorganic form. Organic phosphorus simply refers to when phosphate is found in a complex with carbon-containing materials, like phytic acid in plants or nucleic acids in our body, rather than in an ionic state (1,2).  Note that this issue of TSP in our food is a pretty widespread target for pseudoscience-activists.

TSP is safe according to the UN Food & Agriculture Organization, World Health Organization, FDA and European Union.

**FAO/WHO standard of safe consumption is daily consumption of 70 milligrams per kilogram of body weight. A 160-pound person weighs about 72 kilograms, so he could consume 5040 milligrams or 0.178 ounces per day**

Kevin Klatt 2014 (Dietetics and Molecular Nutrition focused PhD Student at Cornell University's Division of Nutritional Sciences) 6 Dec 2014 [Why is that in my Food? : Trisodium Phosphate](http://nutrevolve.blogspot.com/2014/12/why-is-that-in-my-food-trisodium.html) <http://nutrevolve.blogspot.fi/2014/12/why-is-that-in-my-food-trisodium.html?view=mosaic> (brackets added)

**Is it safe**? Yes. The joint FAO/WHO (Food and Agriculture Organization, World Health Organization) statement on trisodium phosphate as a food additive set the maximum tolerable daily intake (MTDI) at 70mg/kg of bw [body weight] (6) - this was a grouped MTDI for all phosphorus containing additives, not just trisodium phosphate. This is because their is no unique health concern related to TSP. The U.S. Food and Drug Administration has given TSP the Generally Recognized as Safe designation (7). The EU has also approved sodium phosphates, including trisodium phosphate, for use as a food additive (8).

Dangers are exaggerated: Evidence from industrial use doesn’t apply to food. They’re citing risks out of context

Kevin Klatt 2014 (Dietetics and Molecular Nutrition focused PhD Student at Cornell University's Division of Nutritional Sciences) 6 Dec 2014 [Why is that in my Food? : Trisodium Phosphate](http://nutrevolve.blogspot.com/2014/12/why-is-that-in-my-food-trisodium.html) <http://nutrevolve.blogspot.fi/2014/12/why-is-that-in-my-food-trisodium.html?view=mosaic>

The concern raised by Organic Health and the other sites I mentioned are due to the conflation of TSP's role as a food additive with its role in industrial uses. Check out the differences between a technical grade TSP safety (MSDS) sheet and a food grade one: [here](http://www.hillbrothers.com/msds/pdf/n/trisodium-phosphate-crystalline.pdf) and [here](http://www.foodchemadditives.com/msds/834). There is a huge difference between concerns over the few milligrams consumed in food and the large doses that may be accidentally consumed/inhaled in industrial uses. The concerns raised by naturalcuresnotmedicine are analogous to someone saying don't add a few milligrams of sodium on your food because consuming several cups of it could kill you. Context matters.

Anyone who says TSP is “paint thinner” doesn’t know what they’re talking about

Kevin Klatt 2014 (Dietetics and Molecular Nutrition focused PhD Student at Cornell University's Division of Nutritional Sciences) 6 Dec 2014 [Why is that in my Food? : Trisodium Phosphate](http://nutrevolve.blogspot.com/2014/12/why-is-that-in-my-food-trisodium.html) <http://nutrevolve.blogspot.fi/2014/12/why-is-that-in-my-food-trisodium.html?view=mosaic>

Is it a paint thinner? Paint thinner is just a general term used for a solvent used to thin paints and allow for easy clean up or removal. Paint thinners are commonly thought of as toxic or deadly because they contain large doses of strong solvents like acetone or mineral spirits, that, if ingested, can be deadly. TSP can be used a heavy duty cleaner, with a number of applications including wall cleaning, but it is not a paint thinner in the sense that one thinks about paint thinner as being made of acetone (note: even acetone can be made in the body; the fear over it is dose-dependent, like every other chemical). The TSP used in the picture above, when compared to Lucky Charms, is made by Savogran and can be found [here](http://www.savogran.com/pdfs/TSP_PD.pdf). Note that all of their applications require 1/4 cup to 1 cup of TSP dissolved in water, not the few milligrams found in foods. Anyone who compares TSP to paint thinner has a severe misunderstanding of chemistry and is selling their paradigm with fear, not science or evidence.

Chemical contained also in non-food products proves nothing. Even pears naturally have formaldehyde… so what?

Kevin Klatt 2014 (Dietetics and Molecular Nutrition focused PhD Student at Cornell University's Division of Nutritional Sciences) 6 Dec 2014 [Why is that in my Food? : Trisodium Phosphate](http://nutrevolve.blogspot.com/2014/12/why-is-that-in-my-food-trisodium.html) <http://nutrevolve.blogspot.fi/2014/12/why-is-that-in-my-food-trisodium.html?view=mosaic>

These kind of comparisons ('X' is in my food but is also in 'Y' non-food substance) do nothing to address safety concerns over foods or food additives. I could make you a thousand memes showing that formaldehyde is used in everything from wood finishing to paint, but that wouldn't make you not eat pears because they contain a small amount of formaldehyde, would it?

Phosphates in food have good, legitimate uses and also supply a mineral essential for human health

Nguyen Huynh Bach Son Long, Robert Gál and František Buňka 2011. (Department of Food Technology and Microbiology, Faculty of Technology, Tomas Bata University, Czech Republic) Use of phosphates in meat products, African Journal of Biotechnology Vol. 10(86), pp. 19874-19882, 30 December 2011 <http://www.ajol.info/index.php/ajb/article/download/99173/88474//>

Phosphates offer a range of possibilities when used in meat and poultry productions. Food grade phosphates are used in meat products for several reasons such as changing and/or stabilizing of pHvalue, increasing water holding capacity in order to lead to higher yields, decreasing losses of weight in cooking, improving texture and sensory properties (tenderness, juiciness, color and flavor), extending shelf-life, etc. In addition, phosphates in meat products are also sources of the supply of phosphorus for consumers through diet, which is an essential mineral for the lives of humans.

DISADVANTAGES

1. Lost sports performance benefits

Journal of Science & Medicine in Sport Study: Consumption of sodium phosphate increased oxygen uptake and racing performance in competitive cyclists

Journal of Science and Medicine in Sport 2008. (Dr. J.P. Folland – PhD; Reader in Human Performance and Neuromuscular Physiology, Loughborough University, Britain. Richard Stern - Head Coach of Richard Stern Training, a Level 3 Coach with the Association of British Cycling Coaches; has been professionally coaching cyclists and triathletes since 1998. Dr. Gary Brickley – PhD; Senior Lecturer within the University of Brighton's Sports and Exercise Department.  ) Sept 2008 “Sodium phosphate loading improves laboratory cycling time-trial performance in trained cyclists” <https://www.ncbi.nlm.nih.gov/pubmed/17569583/>

Sodium phosphate loading has been reported to increase maximal oxygen uptake (6-12%), however its influence on endurance performance has been ambiguous. The aim of this study was to examine the influence of sodium phosphate loading on laboratory 16.1 km cycling time-trial performance. Six trained male cyclists (V O(2) peak, 64.1+/-2.8 ml kg(-1)min(-1); mean+/-S.D.) took part in a randomised double-blind crossover study. Upon completion of a control trial (C), participants ingested either 1g of tribasic dodecahydrate sodium phosphate (SP) or lactose placebo (P) four times daily for 6 days prior to performing a 16.1 km (10 mile) cycling time-trial under laboratory conditions. Power output and heart rate were continually recorded throughout each test, and at two points during each time-trial expired air samples and capillary blood samples were taken. There was a 14-day period between each of the supplemented time-trials. After SP loading mean power was greater than for P and C (C, 322+/-15 W; P, 317+/-16 W; SP, 347+/-19 W; ANOVA, P<0.05) and time to complete the 16.1 km was shorter than P, but not C (ANOVA, P<0.05). During the SP trial, relative to the P, mean changes were mean power output +9.8+/-8.0% (+/-95% confidence interval); time -3.0+/-2.9%. There was a tendency towards higher V O(2) after SP loading (ANOVA, P = 0.07). Heart rate, V (E), RER and blood lactate concentration were not significantly affected by SP loading. Sodium phosphate loading significantly improved mean power output and 16.1 km time-trial performance of trained cyclists under laboratory conditions with functional increases in oxygen uptake.

1. Phosphate deficiency

Link: AFF reduces phosphates in US food supply

Link: Phosphates are essential to human health

Nguyen Huynh Bach Son Long, Robert Gál and František Buňka 2011. (Department of Food Technology and Microbiology, Faculty of Technology, Tomas Bata University, Czech Republic) Use of phosphates in meat products, African Journal of Biotechnology Vol. 10(86), pp. 19874-19882, 30 December 2011 file:/ <http://www.ajol.info/index.php/ajb/article/download/99173/88474//>

Phosphates offer a range of possibilities when used in meat and poultry productions. Food grade phosphates are used in meat products for several reasons such as changing and/or stabilizing of pH value, increasing water holding capacity in order to lead to higher yields, decreasing losses of weight in cooking, improving texture and sensory properties (tenderness, juiciness, color and flavor), extending shelf-life, etc. In addition, phosphates in meat products are also sources of the supply of phosphorus for consumers through diet, which is an essential mineral for the lives of humans.

Impact: Needed for growth and maintenance of all living cells

Nguyen Huynh Bach Son Long, Robert Gál and František Buňka 2011. (Department of Food Technology and Microbiology, Faculty of Technology, Tomas Bata University, Czech Republic) Use of phosphates in meat products, African Journal of Biotechnology Vol. 10(86), pp. 19874-19882, 30 December 2011 file:/ <http://www.ajol.info/index.php/ajb/article/download/99173/88474//>

Phosphorus is responsible for many biological properties and functions. It is present in DNA, RNA, enzymes, etc. and especially co-exists with calcium and magnesium forms in bones. Generally, phosphorus is needed for the growth, maintenance and repair of all tissues and cells of living organisms. According to Institute of Medicine recommendation, the recommended dietary intakes (RDIs) of phosphorus depend especially on the age of people and/or some special status: (i) 0 to six months, 100 mg/day; (ii) seven to 12 months, 275 mg/day; (iii) one to three years, 460 mg/day; (iv) four to eight years, 500 mg/day; (v) nine to 18 years, 1,250 mg; (vi) adults (> 19 years), 700 mg/day; (vii) pregnant or lactating women 14 to 18 years, 1,250 mg/day and older than 18 years, 700 mg/day (Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, 1997).

1. Salmonella

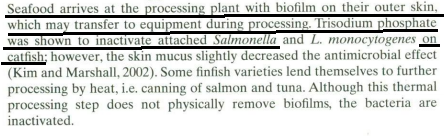
Link: Trisodium phosphate is effective as an anti-microbial agent in pork

J.S. Dickson, H.S. Hurd and M. H. Rostagno 2015 (Dickson - Dept. of Microbiology, College of Agriculture, Iowa State University. Hurd & Rostagno - Pre-Harvest Food Safety and Enteric Disease Unit; National Animal Disease Center, Agricultural Research Service, USDA, Ames Iowa) “Salmonella in the Pork Production Chain” 11 Dec 2015 <http://articles.extension.org/pages/27413/salmonella-in-the-pork-production-chain>

The final wash, when combined with the application of an anti-microbial treatment, can potentially reduce the populations of bacteria on animal carcasses (Dickson and Anderson, 1992). The use of hot water (Gill et al., 1995) or hot water in combination with organic acids (Barkate et al., 1993; Dickson, 1998) has been shown to be an effective method of decontaminating hog carcasses. In addition, trisodium phosphate, an alkaline food additive, has also been demonstrated to have anti-microbial effects on the surface micrflora of hog carcasses (Morris et al., 1997).The final carcass wash is a “whole carcass” treatment, as compared to the “spot” treatment of manual trimming, and therefore is effective in reducing microbial contamination that may be missed by visual inspection of the carcass.

Link: TSP kills Salmonella on seafood

K. T. Rajkowski 2009 (US Dept of Agriculture, Agricultural Research Service) “Biofilms in fish processing” <http://naldc.nal.usda.gov/naldc/download.xhtml?id=37635&content=PDF>



Link: Trisodium phosphate kills salmonella in poultry

Amreeta Sarjit and Gary Dykes 2016 (Sarjit - School of Science, Monash University, Jalan Lagoon Selatan, Bandar Sunway 46150, Selangor, Malaysia. Dykes – School of Public Health, Curtin University, Australia) Journal of Food Control “Antimicrobial activity of trisodium phosphate and sodium hypochlorite against *Salmonella* biofilms on abioticsurfaces with and without soiling with chicken juice” October 2016 <http://www.sciencedirect.com/science/article/pii/S0956713516305461>

Salmonella is a major foodborne pathogen of public health concern and is often associated with contaminated poultry. This pathogen can adhere to surfaces in food processing facilities leading to the formation of biofilms. Antimicrobial treatments during poultry processing represents a mechanism to control biofilms. This study investigated the effect of trisodium phosphate (TSP) and sodium hypochlorite (SH) on biofilms of two strains each of S. Enteritidis, two strains each of S. Typhimurium, and one strain of S. Senftenberg on stainless steel, glass and polyurethane. Biofilms were grown on surfaces without soiling or with soiling (chicken juice) applied before or after biofilm formation. Biofilms on all surfaces were treated (TSP: 8, 10 and 12% (w/v), pH 11.5 and SH: 40, 50 and 60 ppm, pH 5.5) for 10 min. Untreated controls and controls using water were included for all the experiments. Bacterial numbers in biofilms were determined by plating on thin layer xylose lysine deoxycholate medium. If numbers were below the limit of detection (1.81 log cfu/cm2) biofilms were enriched in buffered peptone water before plating to establish the presence of live cells. All TSP treatments rendered cells uncountable except for four specific combinations of bacteria, soiling and surfaces at the 8% treatment level. In cases where numbers were below detection, live cells were present for some combinations of bacteria, soiling and surfaces at all TSP levels. All SH treatments rendered cells uncountable on unsoiled stainless steel and glass for all strains. In these cases strains were alive at 40 ppm on stainless steel. On polyurethane cells were only uncountable for one strain at 60 ppm and live cells were detected in this case. All SH treatments resulted in countable numbers of cells for all strains on soiled surfaces. Trisodium phosphate has strong potential as a sanitizer to reduce biofilm formation by Salmonella spp. on abiotic surfaces during poultry processing.

Impact: Sickness and loss of billions of dollars from salmonella

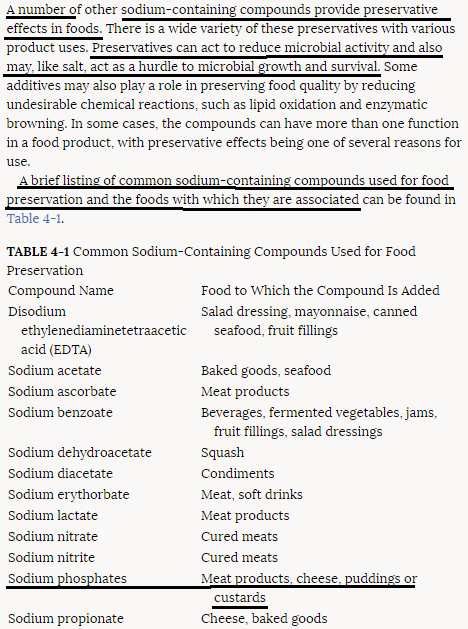
J.S. Dickson, H.S. Hurd and M. H. Rostagno 2015 (Dickson - Dept. of Microbiology, College of Agriculture, Iowa State University. Hurd & Rostagno - Pre-Harvest Food Safety and Enteric Disease Unit; National Animal Disease Center, Agricultural Research Service, USDA, Ames Iowa) “Salmonella in the Pork Production Chain” 11 Dec 2015 <http://articles.extension.org/pages/27413/salmonella-in-the-pork-production-chain>

There is currently an explosion of research activity on food safety, including Salmonella contamination of pork and pork products. Salmonellosis is considered to be one of the most common foodborne illnesses in humans, with worldwide distribution and increased incidence in the United States during the last years (CDC,2000). Reasons for this include; increased public awareness of microbiological hazards of food, widespread distribution of virulent serotypes such as Salmonella typhimurium DT104, improved monitoring, increasing consumption of foods of animal origin, changes in consumer eating habits, and increased number of highly susceptible people (with impaired immune system). The Economic Research Service (ERS) of the U.S. Department of Agriculture updated earlier estimates of the medical costs and productivity losses due to foodborne Salmonella infections in the United States. The update was based on an estimate of annual salmonellosis cases by the Foodborne Diseases Active Surveillance Network (FoodNet) and data on medical care for salmonellosis. Using this information, ERS estimated the annual economic cost of human illness due to foodborne Salmonella infections to be $2.3 billion (in 1998 dollars)

1. Increased food spoilage

Link: Salt compounds (including trisodium phosphate) are added to prevent food spoilage

Institute of Medicine of the National Academy of Sciences 2010 (Jane E. Henney, Christine L. Taylor and Caitlin S. Boon, editors. National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters) STRATEGIES TO REDUCE SODIUM INTAKE IN THE UNITED STATES, “Preservation and Physical Property Roles of Sodium in Foods” <https://www.nap.edu/read/12818/chapter/6#95>



Impact: Listeriosis from spoiled meat

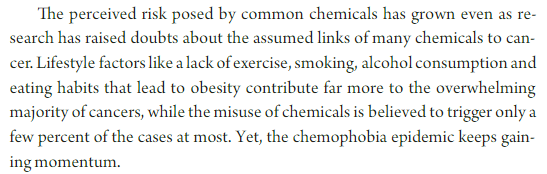
Institute of Medicine of the National Academy of Sciences 2010 (Jane E. Henney, Christine L. Taylor and Caitlin S. Boon, editors. National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters) STRATEGIES TO REDUCE SODIUM INTAKE IN THE UNITED STATES, “Preservation and Physical Property Roles of Sodium in Foods” <https://www.nap.edu/read/12818/chapter/6#95>

For example, in cured meats, reducing the sodium content (by removing both salt and sodium nitrite) could allow for rapid growth of lactic acid bacteria and action by proteolytic microorganisms, resulting in a product that spoils more rapidly (Roberts and McClure, 1990; Stringer and Pin, 2005). In some foods, pathogen growth, rather than spoilage, may become a concern. There is speculation that some past salt reduction efforts may not have adequately accounted for the need to adjust additional hurdles to microbial growth. In the United Kingdom, salt reduction efforts in chilled, ready-to-eat foods were cited as one factor that may have contributed to an increase in the incidence of listeriosis from 2001 to 2005 (Advisory Committee on the Microbiological Safety of Food, 2008). Listeriosis is caused by Listeriamonocytogenes, which has a high thermal stability and is able to grow and survive at refrigeration temperatures and elevated salt levels (Zaika and Fanelli, 2003).

1. Masking Disadvantage. Affirmative distracts us from real threats to public health

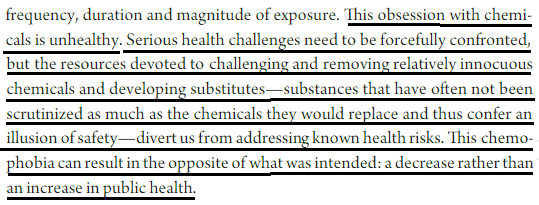
Link: We’re focused on small traces of chemicals and ignoring things that are really killing lots of people every year

Jon Entine 2011 ( senior research fellow at the Institute for Food and Agricultural Literacy at the University of California ) SCARED TO DEATH – How Chemophobia Threatens Public Health <https://www.scribd.com/document/48504531/Scared-to-Death-How-Chemophobia-Threatens-Public-Health>



Impact: Net reduction in public health

Jon Entine 2011 ( senior research fellow at the Institute for Food and Agricultural Literacy at the University of California ) SCARED TO DEATH – How Chemophobia Threatens Public Health <https://www.scribd.com/document/48504531/Scared-to-Death-How-Chemophobia-Threatens-Public-Health>



1. Harms the shrimp industry

TSP is indispensable to preserving live shrimp from deterioration, contamination and economic loss during the freezing process

Journal of Applied Sciences Research 2013 (authors are all with Food Science & Technology Dept, National Research Center, Cairo Egypt: R. K. Moawad, M.M.S. Ashour, G.F. Mohamed, Enssaf M.A. El-Hamzy) Effect of Food Grade Trisodium Phosphate or Water Dip Treatments on Some Quality Attributes of Decapitated White Marine Shrimp (Penaeus spp.) During Frozen Storage <http://www.aensiweb.com/old/jasr/jasr/2013/3723-3734.pdf>

From the results it is apparent that, the assumption that frozen shrimp are immune to quality deteriorations is false, since chemical reactions, enzymatic as well as non-enzymatic reactions could proceed at temperatures below freezing. All of reactions have the potential for reducing the quality attributes of frozen shrimp, the rates of these deteriorations are increased as the time of frozen storage progressed. We could conclude that, TSP is an indispensable additive for the maintenance of the functional properties of the seafood proteins which helps the preservation of the muscle integrity, inhibits the drip loss and helps to prevent the economic loss during the thawing and the cooking. Phosphates dip treatments were effective in inhibition of flavor, color and lipid oxidation by the quelation of metallic ions; enhancing tenderness of seafood by restricting protein denaturation; and reduces microbial growth and other deterioration of shrimp quality during frozen storage.

Works Cited: TSP Ban (NEG)

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2. David Mikkelson with Snopes, a website that debunks urban legends and internet rumors 2016. “Lucky Harms” last updated Sept 2016 <http://www.snopes.com/food/ingredient/tsp.asp>
3. Eric Hall 2015 (master’s degree in Physics; teacher at Univ of Minnesota) 9 May 2015 How Michelle Obama Helped Promote Anti-Science Sentiment <https://skeptoid.com/blog/2015/05/09/michelle-obama-anti-science/>
4. Institute of Medicine of the National Academy of Sciences 2010 (Jane E. Henney, Christine L. Taylor and Caitlin S. Boon, editors. National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters) STRATEGIES TO REDUCE SODIUM INTAKE IN THE UNITED STATES, “Preservation and Physical Property Roles of Sodium in Foods” <https://www.nap.edu/read/12818/chapter/6#95>
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