



REDUCING GLOBAL SODIUM INTAKE: INNOVATIVE INGREDIENT SOLUTIONS

Innovating to Meet Nutrition, Health,
and Wellness Needs Every Day



TATE & LYLE



EXCESS SODIUM INTAKE: A GLOBAL HEALTH CONCERN

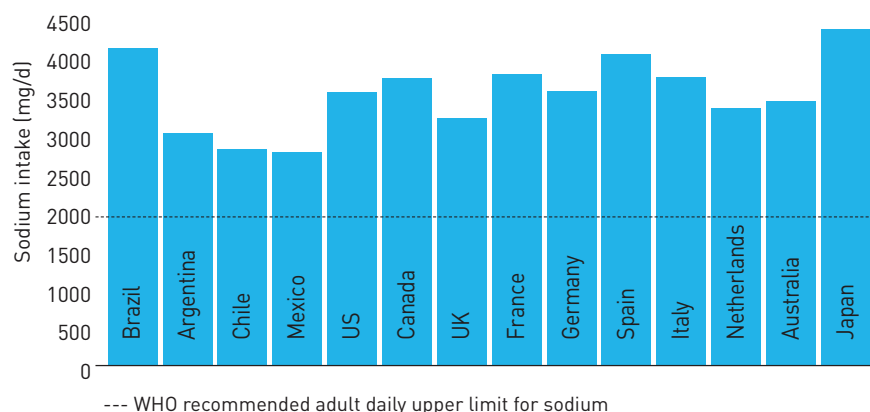
Contributors to dietary sodium consumption depend on cultural factors and dietary habits of a population.¹ Processed foods often contribute significantly to dietary sodium (sources as sodium chloride and sodium bicarbonate), while some sodium is found naturally in a variety of foods, and some enters the diet through cooking and food preparations.¹ While reducing sodium levels in foods is a viable way to help meet public health goals, research suggests that simply cutting out salt is fraught with numerous obstacles such as perceived inferior taste and low consumer compliance. Salt (sodium chloride) is a critical ingredient used not only as a flavor enhancer, but also as a preservative, binding agent, and texture modifier.² Because of its versatility, salt is ubiquitous in the food supply and essential to common staples such as bread, cheese, and meat products. In the body, sodium plays an essential role in the biological function of cells and fluid balance; however, too much can cause increased stress on the body's vital organs, and ultimately long-term over-consumption can lead to the onset of chronic disease.²

Public health authorities agree that chronic excess sodium intake can increase blood pressure levels and the risk for heart attack and stroke.³ High blood pressure contributes to the development of cardiovascular disease, the leading cause of death across the globe according to the World Health Organization (WHO).⁴ It is estimated that 2.5 million deaths could be prevented each year if global salt consumption were reduced to the recommended level.¹

Sodium intakes around the world are well in excess of physiological need (10-20 mmol/day or 230-460 mg/day of sodium).⁵ The WHO recommendations indicate that to prevent chronic diseases, an adult daily upper limit intake of sodium, should be less than 87 mmol/day (2,000 mg/day) or 5 g/day of salt (about one teaspoon) for adults to help reduce blood pressure and risk of cardiovascular disease, stroke, and coronary heart attack.¹

The current average sodium intake in many countries is greater than 3,500 mg/day⁶⁻¹⁰ (Figure 1). Japanese sodium intake exceeds WHO recommendations

Figure 1
Average sodium intake per country⁶⁻¹⁰



--- WHO recommended adult daily upper limit for sodium

- Globally, health authorities continue to prioritize sodium reduction in nutrition and health guidelines.
- Several studies have shown that a reduction in salt intake is one of the most cost-effective interventions to reduce cardiovascular disease risk.
- Meeting consumers' taste preferences by using safe and effective food ingredients to lower sodium content while maintaining the food's perceived salt intensity is one strategy that has been suggested for reducing global sodium intake.
- SODA-LO[®] Salt Microspheres is a salt-reduction ingredient that tastes, labels,* and functions like salt, and it can reduce salt by 25-50% in certain applications.
- SODA-LO[®] SB Microspheres* can provide leavening power while reducing sodium bicarbonate up to 50%.
- Dietary modeling using the United States (US) National Health and Nutrition Examination Survey (NHANES) has demonstrated that the SODA-LO[®] Salt Microspheres application could reduce sodium intake in the US population by 7-9% of current intake.

*Labeling and/or claims may vary by country. Prospective purchasers are advised to conduct their own tests, studies, and regulatory review to determine the fitness of Tate & Lyle products for their particular purposes, product claims, or specifications.

SODA-LO® is a technology that addresses the issue of global sodium reduction without sacrificing safety, stability, or taste.



at 4,340 mg/day.¹⁰ Sodium intakes in Brazil (4,100 mg/day), Argentina (3,000 mg/day), Chile (2,800 mg/day), and Mexico (2,760 mg/day) all exceed WHO recommendations.⁶ US and European sodium consumption, ranging from 3,200-4,020 mg/day, are also substantially higher than WHO recommendations.^{6,8,9}

Americans consume significantly more sodium (3,529 mg/day⁷) than the 2015-2020 Dietary Guidelines for Americans recommended maximum for sodium of 2,300 mg/day.¹¹ For some individuals who are at high risk (i.e., anyone over the age of 51, all African Americans, and anyone who has high blood pressure, chronic kidney disease, or diabetes), the current average intake is more than twice the limit of 1,500 mg/day recommended by the 2015-2020 Dietary Guidelines for Americans.¹¹ Health organisations like the Centers for Disease Control and Prevention (CDC) and the American Heart Association (AHA) recommend daily intake be lowered to 1,500 mg/day for all individuals.¹²

Several studies have shown that a reduction in salt intake is one of the most cost-effective interventions to reduce cardiovascular disease risk in both developed and developing countries.^{13,14} A study in the US showed that even a very modest reduction in salt intake of only 10% would prevent hundreds of thousands of strokes and heart attacks over the lifetimes of adults aged 40-85 years and could save more than \$32 billion in medical expenses in the US alone.¹⁴ It is thus recommended that dietary sodium reduction be a first step to reducing hypertension before medications are started.¹⁵

NEW SALT TECHNOLOGY FOR SODIUM REDUCTION IN FOODS

Adapting consumer preferences for saltiness by gradually reducing sodium in food products is one way to achieve sodium reduction across the globe.

Alternately, continuing to find new technologies and innovations that address the issue without sacrificing safety, stability, or taste should, and currently is, being considered by the food industry.

Meeting consumer taste preferences by using safe and effective food ingredients to lower sodium content while maintaining the food's perceived salt intensity is one strategy that has been suggested for reducing global sodium intake. Tate & Lyle is committed to developing ingredients that provide nutrition, health, and wellness solutions, and SODA-LO® Salt Microspheres and SODA-LO® SB Microspheres are two examples of this commitment.

Sodium reduction innovation—SODA-LO® Salt Microspheres and SODA-LO® SB Microspheres

SODA-LO® Salt Microspheres is a salt-reduction ingredient that tastes, labels*, and functions like salt because it is salt. Offered by Tate & Lyle, SODA-LO® Salt Microspheres can reduce salt by 25-50% in certain applications through its patented technology that turns standard salt crystals into free-flowing, hollow salt microspheres that increase the perception of saltiness on the tongue. Tate & Lyle's sensory

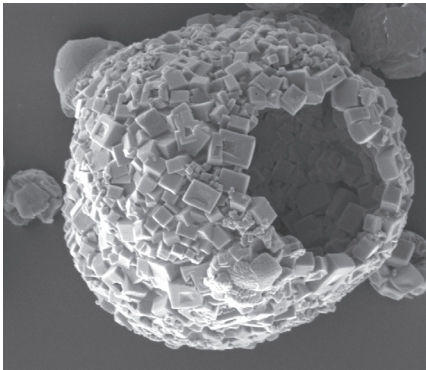
research shows that consumers perceived the flavor of products made with SODA-LO® Salt Microspheres to be on par with products made with regular salt. This product uniquely addresses sodium reduction needs without compromising taste. On a product's ingredient listing, SODA-LO® Salt Microspheres is often listed simply as salt.*

SODA-LO® Salt Microspheres can be used in a variety of products. Significant sodium reductions of 25-50% have been demonstrated in:

- Breads
- Breadings, coatings
- Salty snacks
- Seasonings, crackers, biscuits, pizza dough or other bakery products
- Cookies, doughs

Research published in *Food Science & Nutrition*, provides the most recent estimates of sodium intake among the US population and assesses the potential impact of a sodium reduction technology on sodium intake via a modeling analysis.¹⁶ Using NHANES 2007-2010 data that included over 17,000 participants, the study found that sodium reduction using Tate & Lyle's SODA-LO® Salt Microspheres could potentially decrease sodium intake by 230-300 milligrams per day or about 7-9% of total sodium intake among the US population depending on age and gender

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SODA-LO® Salt Microspheres is a salt-reduction ingredient that tastes, labels*, and functions like salt because it is salt.

group.¹⁶ SODA-LO® Salt Microspheres is a salt-reduction ingredient that can reduce sodium in certain foods through the technology, which turns standard salt crystals into hollow salt microspheres that efficiently deliver salt taste and functionality by maximizing surface area.

Changing consumer behavior is difficult, and some attempts to encourage individuals to lower dietary salt intake have largely proven to be ineffective.¹⁷ Thus, using technology like SODA-LO® Salt Microspheres could be instrumental in improving dietary intake and health among the US population. The potential decrease of sodium intake by 300 milligrams per day in adults age 19-50 years is predicted to reduce systolic blood pressure by 0.45 to 0.88 mm Hg and potentially yield US \$3.0 to \$5.3 billion in healthcare cost savings annually.¹⁶

A second study published in *Nutrition Journal* also used NHANES 2007-2010 data to model the potential impact of SODA-LO® Salt Microspheres on sodium intake in ethnic population subgroups who have higher risk for hypertension and associated diseases.¹⁸ Based upon potential usage of SODA-LO® Salt Microspheres, there was a

reduction of 185-323 milligrams of sodium per day, which translates to a 6.3-8.4% reduction of current sodium intake in ethnic population subgroups, representing a meaningful reduction in these subgroups whose current intake exceeds recommendations.¹⁸

A second ingredient, SODA-LO® SB Microspheres, provides the leavening power needed in dough applications while reducing sodium bicarbonate up to 50%. Leavening ingredients in baked goods can contribute well over 50% of the total sodium in these foods, thus simply reducing the salt is not adequate to achieve significant sodium reductions. Since, SODA-LO® SB Microspheres is made from sodium bicarbonate, there are no off-flavors or required label changes.* The smaller particle size of the hollow microspheres is less dense than regular sodium bicarbonate, allowing superior dispersion within the dough matrix for desired leavening with less sodium.

The many benefits of this ingredient include:

- Reduce sodium bicarbonate level up to 50%
- Clean taste—no off-flavors that are commonly associated with potassium or ammonium bicarbonates
- Delivers the same functional attributes of standard sodium bicarbonate (baking soda)
- Allows for reduction of entire baking powder system including leavening acid
- Labels as sodium bicarbonate*
- Works in a wide-range of baked goods

SODA-LO® SB Microspheres is ideally suited for food application systems with low moisture and/or high viscosity. SODA-LO® SB Microspheres has proven

successful in a wide-range of foods including crackers, cookies, soda bread, tortillas, and savory biscuits.

INNOVATING TO MEET NUTRITION, HEALTH, AND WELLNESS NEEDS EVERY DAY

A commitment to innovation

Tate & Lyle, a global leader in wellness innovation, is committed to delivering innovative ingredients that can be incorporated into great-tasting foods to help consumers meet their nutrition, health, and wellness needs every day. That is because Tate & Lyle invests heavily in innovation and research and in developing ingredients that can be incorporated into a wide-variety of food and beverage solutions. Teams of food and nutrition scientists are continuously innovating, researching, and testing ingredients that will meet current and future health and nutrition needs.

At the same time, Tate & Lyle has a robust market research program designed to provide the necessary insights on consumer preferences around the world. The research program allows Tate & Lyle to customize its offerings and provide tailor-made solutions in local and regional markets.

Better-for-you ingredients for health and wellness

In response to global public health efforts calling for people to reduce calories and sodium and increase fibre intakes, Tate & Lyle offers a number of innovative ingredient solutions that meet these needs.

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To learn more about Tate & Lyle ingredients and innovations as well as health benefits and relevant research, please visit www.foodnutritionknowledge.info and www.tateandlyle.com.



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