

Baking & Snack

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to go **LOW** — or **NOT**

Government efforts to get Americans to consume less sodium appear to be stalling. Where does that leave bakery and snack formulators?

by Laurie Gorton

Lowering sodium in American diets may have reached a plateau as a government nutrition initiative. Yes, it's likely to be part of the next edition of Dietary Guidelines for Americans, but the steam has gone out of going lower.

The US government set its voluntary consumption guideline at 2,300 mg sodium, significantly lower than the 3,500 mg most Americans consume daily. The Institute of Medicine (IOM) also stated that people aged 51 and older and those of any age who are African American or have high blood pressure, diabetes or chronic kidney disease — about 60 to 75% of the US population — should further reduce sodium intake to 1,500 mg per day. The American Heart Association, however, continues to tout 1,500 mg for nearly everyone, at risk or not.

The formulator's problem

Baked foods and snacks got unwelcome attention in 2010 when the Centers for Disease Control and Prevention (CDC) cited them as the highest contributors of sodium to the American diet. The problem, however, is not that a slice of bread or handful of chips is excessively high in salt, but that they comprise a big part of daily food choices.

Beyond its role as a flavor enhancer in baked foods, salt is necessary to optimize yeast-raised goods by controlling gassing performance and gluten development. Another consideration is the many sources of sodium. CDC noted that 12% of all dietary sodium occurs naturally in foods. This is true for bakery ingredients, too.

"While most bakers realize salt is an inexpensive yet valuable ingredient, they sometimes forget that sodium can be hidden in other ingredients," said Bill McKeown, vice-president, product innovation, AB Mauri North America,

Chesterfield, MO. "Sodium can be found in an assortment of products from antimicrobial inhibitors to baking powder." He revealed that the company is working on new lower-sodium baking powders. It has already created Arctic, a frozen dough conditioning system without compromising sodium levels, and Supremo Balance LLS, a low-sodium tortilla leavening system.

Salt suppliers are intensely involved in this approach, too. "At Morton, we partner with our customers to help them develop the most effective sodium reduction strategy for their applications," said Andrea Carlson, business segment manager, food processing and foodservice, Morton Salt, Chicago.

The soda, acid combo

Salt is 38.7% sodium by weight, and sodium bicarbonate, a.k.a. baking soda, is 27.3% sodium. "Not only must formulators consider reduction or replacement of salt, but they also must consider the sodium contribution of the baking soda and leavening acid," said Barbara Bufe Heidolph, director, commercial, applications and product development, Innophos, Inc., Cranbury, NJ. That need shines the spotlight on functionality.

Bicarbonates perform more than just a gas-producing role. In cookies and crackers, they help control crumb color and pH, and sodium bicarbonate often contributes up to 50% of the sodium in the baked item, observed Dinnie Jordan, director, Kudos Blends Ltd., Cleobury Mortimer, UK. "A wide variety of uses [for potassium bicarbonate] opens up opportunities for sodium reduction and potassium increase in a different level of products and enables the production of industrywide healthier goods," she said.

“KUDOS potassium bicarbonate can offer reduction of sodium and an increase of potassium through such a functional and simple replacement.” Kudos named Brenntag North America, Reading, PA, as its US distributor.

Then there’s the matter of the leavening acid required to release the carbon dioxide from the bicarbonate. The most popular and commonly used ones contain sodium. “We are seeing customers now tackling the sodium reduction problem through their leavening acids,” said Nita Livvix, R&D manager, Clabber Girl Corp., Terre Haute, IN.

But switching from sodium acid pyrophosphate (SAPP) to monocalcium phosphate (MCP) or dicalcium phosphate changes the rate and time of leavening action. “In the past, many customers had difficulty using MCP because they needed the slow, continuous reaction provided by SAPP,” Ms. Livvix explained. “However, by using InnoVaBake encapsulated sodium bicarbonate, they can control when the reaction takes place with the acid. This allows them to use faster acting non-sodium compound acids with the highest degree of control.”

Development of calcium acid pyrophosphate (CAPP) as a leavening acid helps address the formulator’s sodium problem. “Cal-Rise CAPP/MCP is an excellent choice for sodium reduction,” Ms. Heidolph said. It effectively substitutes for SAPP, providing as much as a 25% reduction in formula sodium without having to alter salt levels. “Cal-Rise along with the other calcium-based leavening acids, MCP, V90, DCPD and the ultra-low sodium SALP products, Levair, BL60 and Actif-8 can be used to reduce the level of sodium contributed by the leavening acid, while still maintaining control of when the leavening gas is released.”

Cal-Rise has another advantage over SAPP, Ms. Heidolph explained, because it provides improved texture to baked goods. Also the clean flavor palate of zero and low-sodium leavening acids actually enhances added flavors such as vanilla, butter or almond.

CAPP, like SAPP, comes in different forms with various reactivity properties in the bowl vs. the oven, explained Sharon Book, PhD, senior food technologist, bakery, ICL Food Specialties, St. Louis. “Thus, there is no compromise in leavening activity when replacing SAPP with Levona,” she said of the company’s CAPP leavening acid product. “The unique ions [sodium or calcium] in each acid may have other non-leavening effects in some formulas. It is important to always test in the system of interest and look for such changes as dough consistency, crust color or crumb cohesiveness.”

Another option is glutono-delta-lactone, according to John Reidy, markets development manager, health and nutrition, Jungbunzlauer, Newton Centre, MA. The company’s GdL replaces SAPP to cut sodium by 30%. “Some people state that using GdL makes the product slightly sweeter and has a cleaner taste when compared to other typical

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leavening acids,” he noted. “Also, you are able to overdose the product up to 30% to reduce the pH to extend shelf life but not affect taste or leavening functionality.”

Baking powder combines bicarbonate with leavening acid. The selection and proportion of these components affects the rate of gas release and their sodium — and aluminum — content. Balchem’s BakeShure Complete, a 50%-reduced-sodium baking powder, and BakeShure Sodium-Free baking powder prove this point and allow 1:1 replacement of conventional choices. “The great thing is you don’t have to treat these baking powders any differently than the conventional styles,” said Kate Bohnert, marketing specialist, Balchem, SensoryEffects Division, Brentwood, MO. “You don’t have to make further adjustments in bakery formulations.”

The potassium benefit

Although potassium bicarbonate carries a higher price tag than its sodium cousin, it has a silver lining. It is one of the underconsumed “nutrients of concern” that will likely again be emphasized in the 2015 Dietary Guidelines for Americans as in 2010.

Noting that potassium declarations on package labeling are currently voluntary, Ms. Livvix said hints that the Food and Drug Administration may add this nutrient to the Nutrition Facts panel have prompted much interest. “Many manufacturers are listening to these rumors and

Pancake mixes like other bakery mixes represent a prime target for sodium reduction through a change in the chemical leavening system.
ICL Food Specialties



SODIUM STRATEGIES



The high amount of surface area in this salt's hollow pyramid shape is key to minimizing sodium levels while maximizing salty taste.

Cargill

exploring their options," she observed.

"By helping our customers switch to potassium bicarbonate instead of sodium bicarbonate, we can not only reduce sodium but also increase potassium," Ms. Livvix added. "The customer's label and the end consumer all see two wins with one switch — reduced sodium and increased potassium." To help bakers accomplish this, the company selected a grade of potassium bicarbonate with a solubility rate similar to sodium bicarbonate for its InnovaPhase reduced-sodium baking powder. The result is a 1:1 replacement for conventional baking soda.

The potassium benefit also can be earned by substituting potassium chloride (KCl) for common salt, sodium chloride (NaCl). Morton Lite Salt, a pioneering mixture of KCl and NaCl, provides a "good source" of potassium while imparting saltiness and functionality similar to common salt, according to Ms. Carlson. The company also offers KaliSel potassium chloride that can partially substitute for regular salt and achieve a 50% cut in sodium.

Among the newer potassium-based salt replacers is NuTek Salt, a potassium salt sourced from North American salt mines and treated by a patented technology to create a "single crystal" structure, noted Brian Boor, president and COO, NuTek Food Science, Minnetonka, MN. Working with Cain Food Industries the company found success in cutting sodium by 30 to 50% through 1:1 replacement of salt.

The salt solution

Because salt is both a flavor and a functional ingredient, another tactic for cutting sodium is to switch to a different style of salt. Sea salt, for example, contains a variety of minerals that dilute the sodium. Also, new processing

methods reshape conventional salt to maximize flavor yet minimize sodium.

Lynn Myers, vice-president, sales, Nexcel Natural Ingredients, Springfield, IL, described SOLO, an all-natural, magnesium-enriched sea salt that also carries potassium. "It contains 60% less sodium than ordinary salt yet can be used to replace it on a 1:1 basis without sacrificing taste or functionality," she said.

Adam Fisher, vice-president, Oceans Flavor Foods, Acworth, GA, whose company has long supplied food processors with sea salt, noted that many have adopted a stealth mode. "Sodium reduction is often associated with bland taste," he said. "The sole purpose and drive for our salts is to provide a less-sodium sea salt product that is still full of flavor." The company's proprietary source yields salts with nonmetallic taste and essential trace minerals, with OF-57LSB as the main sea salt used in food applications.

Describing Salona, a sea salt sourced from the Dead Sea, Dr. Book reported replacement of a quarter of regular salt in formulas with no detrimental effect to color, taste or appearance. "Consumers would only know the difference if they read the label," she said.

Smart Salt, composed of magnesal (magnesium ammonium potassium chloride hydrate), yields "an improved flavor profile versus other salt replacers such as KCl alone," Ms. Heidolph noted. "It provides a salty taste with no bitter or metallic aftertaste and up to 40 to 50% less sodium than salt." Innophos is the exclusive licensee for Smart Salt in the Americas.

The range of reduction, observed Deb Rolf, executive vice-president and president, Americas, Smart Salt, Inc., Arnold, CA, depends on what other sodium-containing ingredients are present in the bakery formula and whether some have already been substituted out.

A bit of a boost

Sometimes, you've just got to have that salty flavor to satisfy your consumer. But how can you provide it without salt itself? Consider the fifth taste, umami, and the role it can play in flavor perception. Present on the human tongue, umami taste receptors signal increased saltiness along with pleasant savory effect.

"Umami flavor enhancers, more than ever before, have a place in reduced sodium applications in the baking and snack market," said Joseph Leslie, national industrial sales manager, Kikkoman Sales USA, Inc., San Francisco. The company's Tamari gluten-free soy sauces in liquid and granulated form bring the umami effect to baked snacks. "These ingredients boost the underlying flavor and deliciousness of snacks without adding flavor of their own." They not only boost salty perception but also mask off flavors of sodium replacers.

A different choice is choline chloride. Balchem's C-Salt choline chloride salt enhancer replaces up to 50% of salt, with some formulations reaching 75% replacement. "It has added benefits for brain development in infants and children and improves mental acuity," said Kate Bohnert, marketing specialist, Balchem, SensoryEffects Division.



Natural flavor enhancers based on soy sauce use umami to accent salty perception.

Kikkoman Sales USA

Mr. Reidy noted that its sub4salt and sub4salt plus products affect yeast activity and gluten structure similar to salt because they contain salt as well. "It is also important to state that our sub4salt plus product is 'Whole Foods compliant,' which is a big trend right now," he added.

By manipulating the shape of salt crystals, manufacturers can alter perceived taste, giving the same flavor with less salt. "Cargill has been investing in research to understand the effect of physical characteristics of salt particles on salty taste perception in an attempt to lower sodium in topical food applications," reported Janice Johnson, PhD, food applications leader, salt, Cargill, Minneapolis. Working with the company's Alberger Fine flake salt, which has a unique hollow pyramid shape, sensory results suggested that these salts tasted saltier than table salt.

The company also developed a patent-pending compacting technology to flake both NaCl and KCl. The resulting particles are low in bulk, highly soluble and adhere well to food surfaces. In one bakery application, Dr. Johnson reported a 30% sodium reduction compared to a full salt control using FlakeSelect 50/50 NaCl/KCl Fine.

SODA-LO, licensed for worldwide distribution by Tate & Lyle, Hoffman Estates, IL, also demonstrates how shape affects taste. A patented process turns standard salt crystals into hollow microspheres that enable a 50% cut in sodium in baked foods while maintaining a clean salt taste. This ingredient works best in low-water-activity products and those with some fat content to protect the microspheres. •

Editor's note: A table listing the many ingredients noted here is available at www.bakingbusiness.com. Check the digital edition for the link.

Find resources for cutting sodium by visiting www.esourcebaking.com. Browse by category under Ingredients, and click on Minor for listings.

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