The Tasteful Way to Reduce Sodium

Learn how to use lower levels of sodium chloride in commercially manufactured foods with Ascentra™ Sodium-Reducing Flavor Enhancer. Made from a proprietary, whole milk-based fermentation process, Ascentra is a convenient, clean-label, powdered ingredient that naturally amplifies the perception of “salty” and other savory nuances as it manages to keep sodium contents at consumer-appealing “low” per-serving levels.

DairiConcepts, L.P.

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The Need to Reduce Sodium in Product Formulations

Food formulators recognize that managing sodium content continues to grow in importance and will likely remain a priority in product development, much like eliminating the presence of trans fatty acids. However, unlike trans fatty acids, which nutrition authorities say should measure as zero on the Nutrition Facts, sodium is not only necessary in many food formulations to ensure product integrity and safety, it is also a nutrient the body requires to function properly.

Compared to other minerals, the human body needs sodium in relatively large amounts, but many believe not as much as currently consumed, reports the International Food Information Council (IFIC) Foundation, Washington, D.C. Federal guidelines say the average American should consume about 2,300 milligrams of sodium daily, while some population segments should consume closer to 1,500 milligrams. Research shows that most Americans consume more than 4,000 milligrams each day. Studies suggest that this excessive consumption is a contributing factor to hypertension, heart disease and other health ailments.

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The Science of Salty

In order to do this, formulators must understand the science of salty, one of the five basic tastes— the others being bitter, sour, sweet and umami. Many food ingredients contribute to a salty taste, with sodium chloride, also referred to as common table salt, the most popular.

The five basic tastes are considered sensations triggered by chemical reactions on human taste buds, which have two major types of taste receptors: the ion channels and the G-protein coupled receptors. Salty and sour tastes are sensed via the ion channels. Bitter, sweet and umami tastes are sensed via G-protein coupled receptors.

To date, no other compound is able to perfectly duplicate the salty taste of sodium chloride, the universally recognized chemical reference for the taste of salty. Formulators trying to reduce the sodium content of foods recognize there is no direct substitute for sodium chloride in a food formulation, as no single ingredient elicits the same salty taste characteristics of sodium chloride. They also know that sodium chloride provides other taste attributes such as mouthfeel, body and flavor enhancement. Thus, partial, not complete replacement of sodium chloride in food formulations

seems to be the best approach to reducing sodium content, with the most successful replacement systems not only providing a salty taste, but also contributing to a rounding of flavor and tactile properties.

Potassium chloride is often part of the mix, but unlike salt, potassium chloride's saltiness is tasted slower, and also often with a slight bitterness. To compensate, the sodium replacement system will usually include one or more taste modifiers. Such ingredients include flavorants and spices, which attempt to cover up or mask the bitterness, while sometimes adding flavors that distract from the reduced saltiness. Ingredients that contribute the basic taste of umami, such as Ascentra™ Sodium-Reducing Flavor Enhancer from DairiConcepts L.P., Springfield, MO, are another option.

Delivering the Basic Taste of Umami

Umami is a Japanese word for the savory taste of proteins that have been broken down into amino acids and nucleotides. Foods that are natural sources of umami include cheese, meat, fish, tomatoes and virtually anything fermented, brewed or aged. Ingredients that provide umami are typically protein based.

For example, Ascentra is made from protein-rich whole milk using a proprietary fermentation process with select dairy cultures. The pale brown powdered ingredient no longer resembles milk. It possesses a brothy, meaty, savory flavor profile, rendering it ideal for a broad range of applications, including crackers, dips, meal kits, salty snacks, soups, dressings, sauces and most products that benefit from the presence of umami.

The lingering taste that is experienced with umami foods or ingredients is often described as "deliciousness" and compensates for a reduction in sodium.

Umami is recognized for its ability to amplify the perception of salt and at the same time to round out other flavors and taste sensations. Its mode of action is different than sodium but it can help trick the taste buds to thinking "salty." The lingering taste that is experienced with umami foods or ingredients is often described as "deliciousness" and compensates for a reduction in sodium.

Traditional ingredient sources of umami include hydrolyzed vegetable proteins (HVP), monosodium glutamate (MSG) and yeast extracts. Ascentra is now another option, one that is also label friendly.

Sodium-Reducing Flavor Enhancer

In anticipation of sodium becoming a hot button in the world where food formulating meets health and wellness, DairiConcepts commercialized Ascentra's production in 2007. This simple, pure and natural ingredient made from real dairy products and containing no preservatives is now available to assist product developers with tastefully managing sodium levels in food formulations.

Ascentra is able to lower sodium content by 25% to 50% in a broad range of food systems. It does this by amplifying the perception of salty and boosting savory nuances and umami effects. It also makes flavors taste brighter and enables flavors to linger, allowing the consumer to enjoy the product a little longer.

Instead of providing an upfront salty “hit,” Ascentra yields a richer, more rounded flavor, often an improvement to even some traditional, all-salt formulations. In fact, a sensory evaluation panel described Ascentra applications as tasting more wholesome and balanced than those made with yeast extracts and yielding a more rounded flavor than traditional all-salt formulations. Levels as low as 0.5% have been used to reduce salt and remove MSG from soups and snack foods, create mouth-watering crackers, and boost the meat, cheese and vegetable flavors of meal kits, sauces and dips.

Ascentra is made from a proprietary, milk-based fermentation process that produces potassium glutamate. For cost options and flexibility with ingredient lines, Ascentra is offered on either maltodextrin or nonfat dry milk as a carrier. The maltodextrin versions include minute amounts of milk protein concentrate to assist with the drying process. Ingredient statements read either “cultured whole milk, maltodextrin, milk protein concentrate” or “cultured whole milk, nonfat dry milk.”

There are five basic items in the Ascentra family of ingredients, with their variations being carrier and certifications. All of them exert the same sodium-reducing, flavor-enhancing effect. Additional certifications are available upon special request. (See Table 1.)

Table 1. Ascentra Family of Ingredients

		Ingredient Declaration	Fat	Protein	Carbs	Shelf Life
Item Numbers	**36490** **36494 Kosher**	Cultured whole milk, maltodextrin, milk protein concentrate	11% – 15%	12% – 16%	53% – 57%	18 months **Storage** 50 – 80˚F <70% relative humidity
Item Numbers	**36491** **36495 Kosher** **36496 rBST-Free**	Cultured whole milk, nonfat dry milk	11% – 15%	26% – 30%	40% – 44%	**Appearance** Pale brown powder **Packaging** 50 lb. Kraft bag

Ascentra does not contain HVP, MSG or yeast extract, so consumer foods made with the ingredient can be produced with a clean label and are also gluten-free. Although rich in potassium (milk naturally contains potassium), Ascentra does not contain potassium chloride, eliminating metallic flavor notes.

Labeling Advantages

Formulators find Ascentra appealing because of its natural, clean-label qualities. Its use compliments today's consumers' label-reading habits.

According to the *2012 Food & Health Survey* from IFIC, a web-based survey of 1,057 adults conducted in April 2012, six in 10 (60%) consumers consider sodium content when buying packaged foods and beverages. Further, 57% of respondents said that during the past year, they actively compared the sodium content of packaged products and chose the foods with lower numbers.

In a separate survey question, 53% of respondents indicated that they try to avoid or limit their intake of sodium, which was the highest response rate for all nutrients in the survey. Next were sugars, with 51% of respondents indicating that they are actively avoiding or limiting intake, followed by calories (49%).

Interestingly, 87% of the respondents indicated that taste had the greatest impact on final purchase decision. This was followed by price (73%), and then healthfulness (61%). And, when asked about what information they look at on food or beverage packaging when deciding to purchase or eat the product, expiration date (76%) was the leading response, followed by Nutrition Facts (66%) and ingredient list (51%).

Less than half of the respondents indicated being influenced by calorie and other nutrition information on the front of the package via an icon or graphic (48%), statements about nutrition benefits (42%) and statements about the absence of certain food ingredients on the front of the package (24%).

According to a study by market research firm Mintel, Chicago, women (25%) are more likely than men (18%) to state that they "always" consult sodium levels when shopping for foods. Similarly, while 22% of all respondents "always" assess sodium levels when shopping for foods, 32% of 55- to 64-year-olds report doing so along with 33% of those aged 65 or older. Thus, foods designed in large part for women and/or mature consumers are among those that should be considered for reformulation.

These data, and other similar studies, indicate that consumers are reading the Nutrition Facts and making purchase decisions based on sodium-per-serving contents. As a result, many product developers are reformulating foods to lower the level of sodium, but they are trying to do so very discretely. In fact, many marketers choose to not flag the sodium reduction on front labels, as consumers who are influenced by front-of-label packaging often immediately assume the product has an inferior taste if the sodium is reduced.

Reducing sodium without drawing attention to the reduction is a growing trend in the food formulating world. Ascentra enables this reduction to take place, tastefully.

Potential Cost Savings

Sodium chloride is a very inexpensive ingredient. Whenever it is replaced with any other ingredient, formulation costs tend to increase. Ironically, when Ascentra is part of the sodium replacement ingredient matrix, it is possible to maintain costs, and sometimes even lower total ingredient costs. This is because Ascentra not only allows for the reduction of added sodium chloride; it also can assist with replacing high-cost ingredients such as cheese and natural flavors with more economical ones.

For example, beginning with a standard cheddar cheese seasoning, a formulator can remove a significant portion of the salt, all of the MSG, and portions of the cheese base and flavors, replacing this with additional whey powder, maltodextrin and Ascentra. All other ingredients remain unchanged. This reformulated cheddar cheese seasoning, which can be used topically on snacks or as part of a sauce mix base, contains 51% less sodium with an overall cost reduction of 6.6%. Further, in sensory evaluation, the two products were indistinguishable.

Applications

As mentioned, generally, a good starting usage rate is 0.5% of the finished product. At this level, up to half of the sodium chloride can be removed from a product formulation, and Ascentra added. The result is a lower-sodium product that tastes just like or sometimes even better than the all-salt formulation.

In some applications, Ascentra works best in combination with potassium chloride. A good rule of thumb is to replace up to half of the sodium chloride in a product formulation with a blend of two-thirds Ascentra and one-third potassium chloride. The Ascentra masks the bitter off-notes of potassium chloride, while the potassium chloride keeps the umami taste balanced.

Using processed cheese as a timely application, potassium chloride and Ascentra together can enable a significant reduction in sodium, yielding a product that meets USDA recommendations for lower-sodium cheese in the National School Lunch Program. Table 2 shows two different Ascentra-enhanced formulas, which reduced sodium by 38%. Both can be further adjusted to meet finished product specifications. (See Table 2.)

Table 2. Sodium-Reduced Processed Cheese

Ingredients	All-Salt Formula 450 mg Sodium per oz (%)	Ascentra-Enhanced Formula A 280 mg Sodium per oz (%)	Ascentra-Enhanced Formula B 280 mg Sodium per oz (%)
Cheddar cheese	52.00	51.90	48.70
Cheddar, enzyme-modified	0.80	0.80	0.80
Salt	1.52	0.70	0.70
Anhydrous milkfat	12.30	12.30	11.92
Whey powder	3.28	3.65	5.65
Milk protein concentrate	4.00	4.00	4.00
Sodium citrate	2.00	0.00	0.00
Disodium phosphate	0.30	0.00	0.00
Ascentra #36491, #36495 or #36496 depending on label certifications	0.00	0.60	0.60
Phosphate blend	0.00	2.00	2.00
Potassium chloride	0.00	0.25	0.25
Color	0.08	0.08	0.08
Water	23.72	23.72	25.30
	100.00	**100.00**	**100.00**

Though Ascentra's origins are milk, applications are not limited to dairy products. In fact, Ascentra can be used in various salty, savory applications, as it can withstand most typical food manufacturing processes.

A very successful application is dry mixes, such as those used topically on salty snacks or as part of a sauce in pasta-based meal kits. The following application for a dry mix Alfredo sauce demonstrates how Ascentra can reduce sodium content without the help of potassium chloride. This sauce, containing 6% sodium chloride, can experience a 30% reduction in sodium when the salt is cut in half (6% to 3%) and 5% Ascentra is added. (See Table 3.)

Table 3. Sodium-Reduced Alfredo Sauce

Ingredients	All-Salt Formula (%)	Ascentra Enhanced Formula (%)
Parmesan cheese powder	42.00	42.00
Butter powder	15.00	15.00
Nonfat dry milk	9.00	9.00
Romano cheese powder	6.00	6.00
Food starch	7.00	7.00
Shortening powder	6.00	6.00
Onion powder	3.00	3.00
Garlic powder	1.00	1.00
Parsley flakes	1.00	1.00
Ascentra #36490 or #36494, depending on label certifications	0.00	5.00
Salt	6.00	3.00
Maltodextrin	4.00	2.00
	100.00	**100**

Success has also been found in sauces used in multi-component prepared meals such as southwestern enchiladas, lasagna and chicken stir fry. In these applications, Ascentra can manage sodium levels at the same time it enhances savory flavors and rounds out the overall flavorful profile by adding an element of deliciousness.

Ascentra may also be used in salad dressings to smooth and balance the overall flavor of the product. (See Table 5.) It also works in fat-free dressings, helping to tone down the acid harshness sometimes associated with these versions.

Table 4. Sodium-Reduced Buttermilk Herb Dressing

Ingredients	All-Salt Formula (%)	Ascentra-Enhanced Formula (%)
Mayonnaise	66.50	66.50
Buttermilk	32.60	32.30
Dried chives	0.06	0.06
Dried parsley	0.06	0.06
Dried dill weed	0.10	0.10
Garlic powder	0.20	0.20
Onion powder	0.10	0.10
Salt	0.30	0.10
Pepper	0.08	0.08
Ascentra	0.00	0.50
	100.00	**100.00**

For snack seasonings, Ascentra may be used to reduce sodium as well as ingredient costs without with no distinguishable affect on flavor. In the Cheddar cheese seasoning shown in Table 5, 25% of the salt was removed along with removal of 100% MSG, 19% of the cheese base and 12% of the flavoring ingredients for overall cost savings.

Table 5. Sodium-Reduced Cheddar Cheese Seasoning with Cost Savings

Ingredients	All-Salt Formula (%)	Ascentra Enhanced Formula (%)
Cheddar cheese powder	59.65	48.00
Whey powder	24.00	26.90
Salt	4.00	3.00
Onion powder	4.50	4.00
Garlic powder	0.50	0.40
Monosodium glutamate	6.65	0.00
Citric acid powder	0.50	0.50
Sour cream flavor	0.20	0.20
Ascentra #36490	0.00	4.00
Maltodextrin	0.00	13.00
	100.00	**100.00**

Additional opportunities exist in the baked goods category. For example, Ascentra could lower the sodium content and the usage level of cheese ingredients in garlic-cheese dinner rolls. This also presents a cost-savings opportunity.

The applications for Ascentra are numerous. (See Table 6.) Assistance with specific formulations can be provided by DairiConcepts.

Table 6. Suggested Usage Levels in Target Applications

Food Category	Usage Level
Breads/yeast dough	2% of the dough weight
Crackers	4% of the dough weight
Dips	1% – 3% on a wet basis
Dressings	0.5% – 1.5% on a wet basis
Meal kits and sides	4% – 6% of the sauce mix
Processed cheese	0.6% of the formula
Sauces	0.5% – 1.5% on a wet basis
Soups	0.5% – 2% on a wet basis
Topical seasonings	2% – 4% of the topical seasoning blend

Summary

With a growing number of consumers reading food labels, and making purchase decisions based on sodium content, among other qualities including taste, price and overall healthfulness, formulators are turning to ingredients such as Ascentra™ to discretely manage sodium levels. Its natural, clean-label qualities, and its ability to amplify the perception of “salty” and other savory nuances, makes it a timely option for today’s food formulators.

About DairiConcepts

DairiConcepts, L.P., is a leading U.S. provider of innovative, dairy-based ingredients for the global food industry, producing cheese and dairy powders and concentrates, seasonings, flavor enhancers and hard Italian cheeses. DairiConcepts serves icon-brand food companies, foodservice providers, restaurant chains, and industrial ingredient and private-label food manufacturers.

A wholly-owned subsidiary of Dairy Farmers of America, Inc., DairiConcepts today has eight manufacturing plants in the United States, two development laboratories and a pilot testing plant. All manufacturing plants are SQF Level 3-certified, with major facilities certified for organic, kosher and halal production. Internationally, DairiConcepts does business in North America, South America, Europe and Asia.

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