

# 2016 CLEAN LABEL CONFERENCE



“SOPHISTICATED SOLUTIONS FOR SIMPLIFIED PRODUCTS”

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friendly

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# 2016 CLEAN LABEL CONFERENCE SUMMARY

## *Sophisticated Solutions for Simplified Labels*

As food manufacturers, retail and foodservice chains, and the nutritional supplement industry show continued commitment to provide consumer-friendly ingredients in their products, interest in how to realistically accomplish this grows. Global Food Forums first recognized the need for this information in 2012, with the first Clean Label Conference held in 2013.

This year's conference, on March 29-30, in Itasca, Ill., continued with the successful format of non-ingredient supplier-aligned, general session speakers offering insights into label ingredient technologies, regulatory updates, and consumer and retailer trends. Eighteen jury-selected Technology Snapshot presentations provided information on new clean label ingredients.

This special report provides presentation highpoints. Complimentary presentations are available for download at [www.GlobalFoodForums.com/2016-Clean-Label/Store](http://www.GlobalFoodForums.com/2016-Clean-Label/Store). We hope to see you at the 2017 Clean Label Conference on March 28-29, at the Westin hotel, Itasca, Ill., USA.



SOURCE: GLOBAL FOOD FORUMS INC., 2016 CLEAN LABEL CONFERENCE

🍇 **Hitting a record of 294 attendees, the 2016 Clean Label Conference registration unfortunately closed early when maximum capacity was reached.**

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# Global Food Forums, Inc.



When we launched Global Food Forums, Inc. in 2012, our vision was to develop a family of in-person, niche product development conferences for the food, beverage and nutritional products market.

Each event would be tied to a significant, long-term consumer and industry trend in which applied food science would need to play a vital role. The events' technical programs would be designed to provide R&D and food scientists with practical and impartial formulation advice, along with key consumer trend insights, emerging ingredient technologies and regulatory updates.

Our "core customer" is the food technologist with applied food science as the keystone of our business. All decisions are driven by how our actions impact the R&D attendee community. We know that in a world dominated by digital communications, the key to true human innovation and collaboration happens when people meet face-to-face.



## Four short years later, our little start-up now includes:

Three annual conferences: the successful Clean Label Conference and Protein Trends & Technologies Seminar and the new Sweetener Systems Trends & Technologies Conference. To date, these events have attracted over 1,600 attendees, from VP/Directors of R&D to bench-level food scientists.

For each event we also publish a Presentation Summary, which is distributed in print and online. GlobalFoodForums.com, with over a quarter of a million views and rapidly increasing traffic, is also home to nearly 150 free PowerPoint presentations given at our events. Additionally, we are launching the 2017 R&D Report: Protein Ingredients with survey results from product formulators on their opinion of current and future use of protein ingredients.

We hope that you'll decide to attend one of our future product development events. When you do, please stop by and say "Hi!"

**Warm regards,**  
**Peter Havens & Claudia O'Donnell**  
**Co-owners, Global Food Forums, Inc.**

## GFF: A Winning Team!

The Global Food Forums Team is composed of people who are dedicated to the food and conference industries. Together, they have nearly 90 years' experience in the worlds of food science, publishing, writing/editing, conference management and graphic design. For an inside look on individual team members, visit: [www.globalfoodforums.com/about-us/gff-team/](http://www.globalfoodforums.com/about-us/gff-team/)

**Claudia O'Donnell**, Co-owner [Claudia@globalfoodforums.com](mailto:Claudia@globalfoodforums.com)  
**Peter Havens**, Co-owner [Peter@globalfoodforums.com](mailto:Peter@globalfoodforums.com)

**Jennifer Bogdajewicz Stricker**, Conference Manager [Jenny@globalfoodforums.com](mailto:Jenny@globalfoodforums.com)  
**Barbara Nessinger**, Content Manager [Barbara@globalfoodforums.com](mailto:Barbara@globalfoodforums.com)  
**Peter O'Donnell**, Cover Design

**Global Food Forums, Inc.**  
P.O. Box 1421 St. Charles Ill. 60174 USA  
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## What Are Consumers Saying, and What is the Industry Doing?

Clean label is like art or—recalling the Supreme Court’s infamous discussion on obscenity—like pornography. “You know it when you see it,” said Tom Vierhile, Innovation Insights Director of Canadean, in his 2016 Clean Label Conference presentation.

Vierhile shared results from Canadean surveys of roughly 50,000 respondents across 47 countries in 2015. When asked, “What does the term ‘clean label’ mean to you?” respondents’ most popular answer wasn’t surprising: 45% of American consumers said they don’t know. However some 30% associated it with “free from artificial ingredients,” while 29% credited natural/organic claims. Roughly a quarter identified no pesticides/chemicals/toxins, minimally processed and free from allergens. One fifth said no GMOs, and 17% answered “simple/short ingredient list.”

“For marketers of ingredients and consumer packaged goods, [this means] if you use verbiage like ‘clean label,’ consumers aren’t going to know what it means,” Vierhile said.

Even more interesting is the breakdown of responses by age. Young respondents think they know clean label best, while older demographics don’t. The top responses by each age group also show that clean label means different things to each segment. For 18-34-year-olds, it’s about natural/organic claims. The 35-44 segment agrees but also scores high for minimal processing. Every segment at 45 and above most often said “free from artificial ingredients.” (See chart “I Don’t Know What Clean Label Means.”)

“A majority of U.S. consumers really don’t want to pay a premium for clean label,” Vierhile added. “That’s something all age groups agree with.” The most generous segment is 18-24-year-olds, with nearly 40% of them willing to pay 1-5% more, but they’re also the most cash-strapped, according to Vierhile.

A survey targeting U.S. consumers shows they consider terms like fresh (72%), natural (65%) and organic (58%) as meaning more nutritious, while GMOs are less nutritious. When broken down by age, 33% of 18-to-24-year-olds consider GMOs significantly less nutritious, and that percentage drops to about 25% for the other age groups; it is lowest among 65+, at 18%. Companies are inventing even more undefined food terms that suggest attention to clean label concerns, Vierhile noted, citing as examples such terms as bare, stripped, simple, ugly, unfiltered and cold-pressed.

Approximately 86% of consumers find products with short ingredient lists appealing (45% say somewhat; 41% said very). “Shorter ingredient lists are part of a back-to-basics movement,” Vierhile said, citing Haagen-Dazs Five

(which is no longer on the market, but helped pioneer the trend) and Back to the Roots’ stoneground flakes.

Not surprisingly, consumers are easily scared off by ingredients with which they are not familiar. A 2013 survey of six countries by Ketchum said 68% of consumers want to recognize every ingredient on the label. Vierhile cited examples like KIND and Nature

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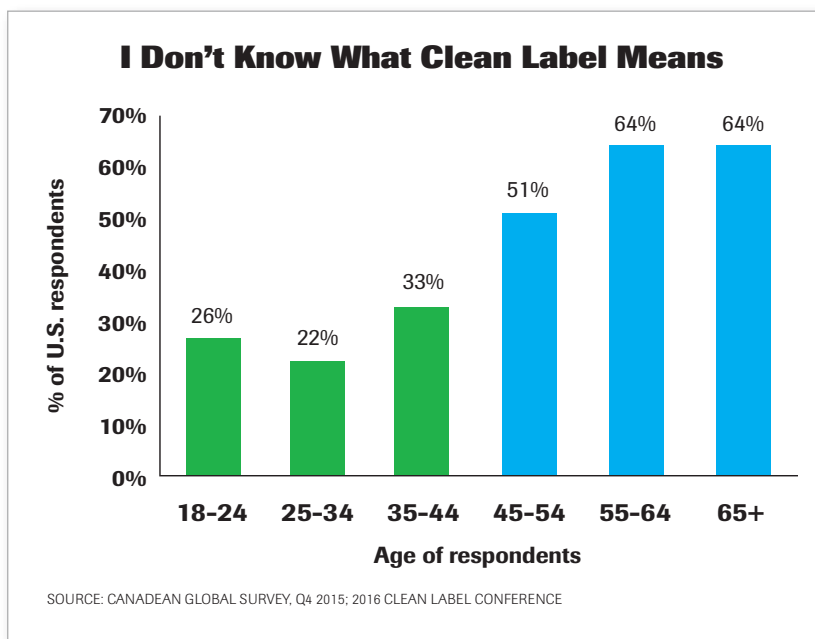
*“For marketers of ingredients and consumer packaged goods, [this means] if you use verbiage like ‘clean label,’ consumers aren’t going to know what it means,” Vierhile said.*

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Valley, with claims like “simple ingredients from nature.”

Raw and unprocessed foods are a growing, albeit controversial, arena. Canadean surveyed U.S. consumers on the perceived benefits: natural (50%), more nutritious (43%), fresher (39%), additive-free (38%) and tastes better (25%). On the negative side, raw foods’ high cost and short expiration dates are viewed as bigger negatives than safety risks (45% vs. 36%).

As a whole, 57% prefer fewer chemicals and processed ingredients over [nutritional] functionality in their foods. Consumers under 35 narrowly prefer functionality, but the reverse is true of those over 35; and, for ages 65+, 69% prefer fewer chemicals/processed ingredients.



■ When asked, “What does the term ‘clean label’ mean to you?” 45% of U.S.-based survey respondents said they don’t know. This shows the “don’t know” response by age, suggesting older consumers are most flummoxed by the clean label concept.

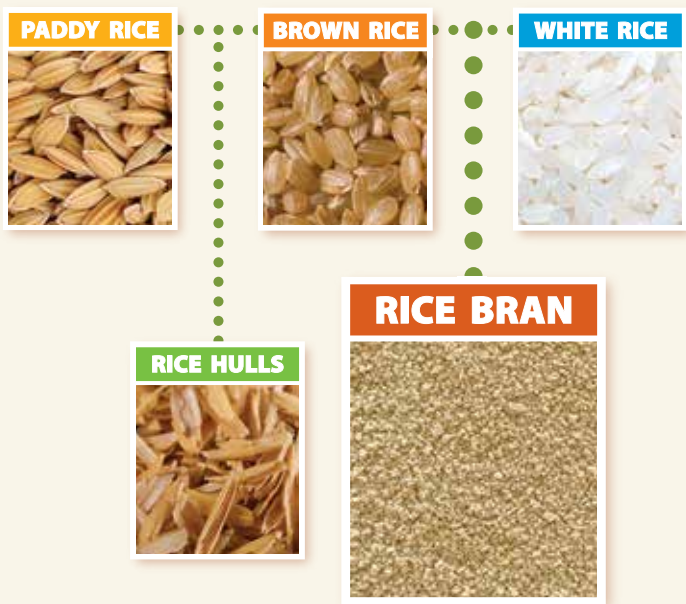


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## Of Birds and Bees, Sweeteners and Gluten

• Sweeteners are getting a lot of scrutiny lately. PepsiCo recently went aspartame-free in favor of acesulfame potassium and sucralose, though the consumer and sales response has not been positive. Coca-Cola Life, with stevia and cane sugar in a green can, hasn't lit up in sales, either. Stevia has a slightly more positive rating with consumers than negative (24% vs. 16%), while sugar and aspartame have terrible reputations, said Canadean's Tom Vierhile. Honey is the most positive sweetener, with 73% saying it's positive

for health. There's no statistical consensus as to which sweetener claims resonate most with consumers, in their research.

- Products kind to bees and birds—pollinators for honey and almonds—are trending.
- On the gluten front, 35% of U.S. consumers are limiting their intake or avoiding it entirely, while the global average is 38%, and it's nearly 50% in countries such as Singapore, Mexico, Brazil and South Africa.

Vierhile credited sectors like sports drinks and high-protein items as boosting the functionality numbers for younger consumers, while suggesting that Perdue Farms' "no antibiotics ever" campaign earlier this year might appeal to the over-35 demographic.

The same may be true for the industry trend of phasing out artificial colors and flavors, as several companies are. Examples include Subway, Mars, Campbell's, and cereals from General Mills and Kellogg's. Trix cereal recently changed to natural colorings, and that came with a few negatives—no more bright colors and 10 additional calories per serving—but one big positive: Sales are up 6% through the first couple of months of 2016.

Although only 24% of Americans link color with nutritional value, purveyors are increasing the number of innovations to tell a "color story," Vierhile said. He pointed to examples like Burger King's black bun burgers from Japan, and the fact that charcoal is trending in beverages to associate with "detoxification."

*"What Are Consumers Saying and What is the Industry Doing?"  
Tom Vierhile, MSc, Innovation Insights Director of Canadean,  
tom.vierhile@canadean.com, 585-223-2705*

### Clean Label: Effective Marketing and Avoiding Regulatory Potholes

Steven Steinborn, J.D., Partner, Hogan Lovells, US LLP, had one main goal in his talk: to help manufacturers reconcile dynamics in the marketplace with a legal framework for clean labels.

"A clean label means a simplified label, with fewer ingredients, nothing artificial and transparency to consumers," he began. "Keep in mind that what is meant on the label is formed by the consumer. Their expectations are very important from a legal perspective, as labels cannot be misleading on the basis of consumer understanding."

When cleaning up labels, it's important to remember some ingredient names are specified by a Standard of Identity in the federal regulations. If an ingredient is covered by a Standard of Identity, it must be named accordingly. If no standard exists, then

an established common or usual name is to be used. "So, if something has been named for decades, it cannot generally be changed now," Steinborn cautioned.

If no common name exists, then a new name can be chosen, but it must be appropriately descriptive. In naming an ingredient, it is advisable to use the basic nature of the food and to work to freely inform consumers. The ingredient statement cannot include adjectives, brand names or marketing terms—only the facts.

Exemptions are also considerations. Incidental additives and processing aids are not required to be declared. But it is a narrow category—so be careful.

Steinborn advised: "Think strategically; while regulations are prescriptive, they do have some flexibility." For example, USDA approves all food labels, and if USDA signs off on a new ingredient name, the company is then in a much stronger position.

"Made with" claims deserve consideration and can be very good strategically. These claims allow a company to zero-in on specific ingredients. It can be much easier to substantiate an ingredient in the formula than [to substantiate] the whole product. But there must be a meaningful amount of the ingredient present. Claiming '2g of whole grain,' for example, is not that much. Be thoughtful, as these 'amount claims' can be useful but can also be a source of trouble," he offered.

An explosion in lawsuits has caused companies to be risk-averse. The cost of defending and damage to brand reputation is high, even if the lawsuit is dismissed. "Litigation should not prevent good companies from making good claims," Steinborn noted.

The key is to know what attracts litigation. "Natural" claims, which are ill-defined, can get a company into trouble. Organic, on the other hand, is subject to a statutory definition and a whole regulatory scheme.

Another area of caution is technical mislabeling, where the wrong name is used on a label. Currently, this is a subject of a number of lawsuits. "Evaporated cane juice," for example, is not an appropriate name for "sugar."



# Pure and unique



## TIC GUMS – unique solutions for ‘clean label’

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## Clean Labeling: The Chemistry and Application of Natural Flavorings

GMO labeling has become quite popular and, for most processors, the Vermont law will become the federal standard, because companies cannot segregate Vermont products. At the time of this conference, Congress tried but could not vote to preempt the Vermont law. “Imagine, the outlook for the food industry must be pretty bleak for it to go to Congress for help, as Congress is typically so helpful,” he jested.

In closing, Steinborn provided some tips for clean labeling. Understand FDA regulations and apply them creatively but sensibly. Recognize the importance of technology; a company with strong R&D has a competitive advantage.

Do not try to fix a clean label problem through labeling; rather, consider changing the formula and ingredients. Leverage suppliers’ expertise but also conduct independent evaluations. Articulate clear benefits (i.e., “healthier eating” is too generic)—being more specific is less risky. Ingredient-focused claims are the wave of the future, as they are easier to communicate and to substantiate.

Lastly, think about leveraging third-party certifiers; they are a big deal now and, from a litigation-risk perspective, may offer protection. Government would be less likely to go after a company, if the certifying body is also included in the lawsuit.

*“Clean Label: Effective Marketing and Avoiding Regulatory Potholes,” Steven Steinborn J.D., Partner, Hogan Lovells US LLP, steven.steinborn@hoganlovells.com*

“As a flavor scientist for decades, clean labeling is not typically my main focus,” opened Keith Cadwallader, Ph.D., Professor in the Department of Food Science and Human Nutrition, University of Illinois at Urbana-Champaign. However, he advised, “Natural flavoring or substances may not always be considered clean, and when cleaning up labels, there may be some challenges with flavoring.”

Flavor is complicated, as it involves not only taste and smell but also cultural aspects. “Likings develop over time, and there is an emotional aspect. As we can all relate, aromas go directly to the brain where memories pop up. Flavor is the main determinant of why we eat certain things and whether we will purchase again,” explained Cadwallader.

The experience of flavor is integrated with overall product expectation, and it includes color and texture. Several studies show clear flavor linkages to a color, like red with cherry or strawberry, or green with lime.

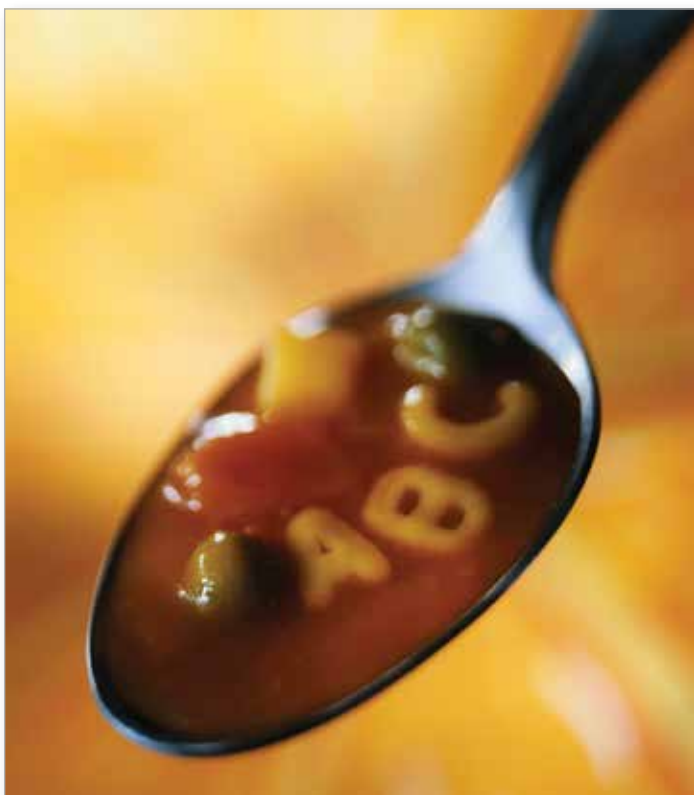
Experts understand that naturals often give lower flavor intensity than artificial flavors, so additional natural substances may be needed to boost flavor intensity. Additionally, with natural source material, variation can be expected. Supplies can also be uncertain (i.e., if produced in a geopolitically unstable part of the world).

### U.S. and EU Flavor Regulations: An Example

Flavor Substance	U.S. Labeling	EU Labeling	Comments
Vanilla extracted from vanilla beans and or purified vanillin from same	“Natural Vanilla Flavor”	“Natural Vanilla Flavor”	
Vanilla made by fermentation from ferulic acid or by extraction from other source material than vanilla beans	“Natural Flavor”	“Natural Flavor”	FDA may require further approval of process; EU might not
Vanillin made by chemical process from lignin	“Artificial Flavor”	“Artificial Flavor”	
Ethyl vanillin (not found in nature)	“Artificial Vanilla Flavor”	“Artificial Vanilla Flavor”	In EU, absence of the word “natural” implies artificial

SOURCE: KEITH CADWALLADER, UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN; 2016 CLEAN LABEL CONFERENCE

**Flavor substances allowed in the U.S. are essentially the same as in the EU, but the EU is a little more controlled, and labeling a little more restrictive. Only certain processing techniques are allowed in the EU to generate flavors. In the U.S., the flavor regulations 21CFR 101.22 have been unchanged for decades.**



❏ **Natural and clean label are not always the same. Consumers know what natural bouillons are, so they may be appropriate for a clean label; certain other options might also be natural but not accepted by all consumers, noted Cadwallader.**

Natural flavors often contain non-flavor constituents that are not stable and can lead to off-flavors, like limonene in citrus, which tends to oxidize very easily.

There are times when a liquid might work better than a dry flavor. A good example is in functional products with many nutritional ingredients that need to be masked.

In nutrition bars, flavors are pretty stable due to low water activity. Encapsulates work well, as flavor can be released during consumption. The shelflife of encapsulates is also good, so use in bars is generally reasonable. Use of certain encapsulated functional ingredients also helps, especially minerals or others that tend to promote oxidation.

Beverages are different due to their high moisture level, which can create a spoilage concern. Viscosity, consistency and mouthfeel need to be consistent with flavors. A thick beverage, for example, needs an indulgent flavor like chocolate or cream; citrus, however, does not work well in most thick, creamy beverages. Legislative restrictions and differing regulations between countries can also be a challenge.

“Natural and clean label do not necessarily mean the same thing, but here are some considerations,” Cadwallader added. Plant-based flavorings are probably safe to consider for clean

label. “Oleoresins, tinctures and alcohol extracts of plant materials (like vanilla extract) have been around for centuries, so they are pretty easy to call ‘clean’” he stated.

Similarly, natural bouillons, concentrated dried stock or aqueous extracts are also likely to be understood by consumers. Process flavors, created by enzymatic modification or thermal processing, are more borderline and may be less likely to fit under the “clean label” umbrella. Considered not so clean by some, although completely natural, are HVPs or yeast extracts.

A natural HVP (i.e., soy sauce) has a good flavor. However, certain consumers may understand it contains MSG and be less accepting of it, even though it is natural. Liquid smoke is also considered natural and has been popular since the 1970s. But, looking at how it is made, one may not consider it so natural or appropriate for clean labels.

Often, GMO technology is used to increase yield and production of essential oils in source materials. With all these considerations, it can be best to involve a flavor house, as they will consider all aspects of the products and have R&D to understand processing and environment. The flavor needs to be considered from processing all the way through storage. Again, natural flavors are not necessarily clean, Cadwallader advised.

*“Clean Labeling: The Chemistry and Application of Natural Flavorings,” Keith Cadwallader, Ph.D., Professor in the Department of Food Science and Human Nutrition, University of Illinois at Urbana-Champaign, [cadwlldr@illinois.edu](mailto:cadwlldr@illinois.edu), 217-333-5803*

## **Natural Antimicrobials: Strategies & Considerations for Their Use in Food**

Jairus David, Ph.D., Natural Antimicrobial Program, Research & Innovation, ConAgra Foods, Inc., began his presentation on a positive note. He affirmed that a dialogue about clean labeling is exactly what is needed; the focus of his speech was on preservatives, antimicrobials and options for clean labels.

“None of us may have all the answers,” suggested David, “but by connecting, we can try to understand what ‘clean label’ and this movement mean and how we can achieve the desired results.”

The application of preservatives and antimicrobials is complex and requires due diligence. “Preservatives are good, and they have played a big role in protecting food for centuries,” David stated. “Without preservatives, there would be more food spoilage and public health issues due to food-borne pathogens.”

For example, sorbates, benzoates and propionates are antimicrobials that specifically control the growth of spoilage and pathogens, and they need to be used in a prudent and judicious

## Antimicrobial Toolbox

### Classical Preservatives

#### Organic acids & salts

- Sorbate
- Benzoate
- Propionate
- Lactate
- Diacetate
- Citrate
- Nitrate

### Natural

#### Clean Label

#### Bacteriocins

- Nisin
- Pediocin
- Natamycin
- Bisin (possibly)

#### Live cultures

- Lactic starter culture
- Pediococcus
- Probiotics
- Yeast spray (for mold control)
- Bacteriophages (processing aid)

#### Fermentates

- Cultured cane sugar
- Cultured sugar with vinegar
- Cultured dairy
- Cultured wheat starch
- Others

#### Natural ingredients

- Plant and animal extracts
- Celery extract
- Cherry powder
- Rosemary
- Vinegar
- Essential oils
- Phytophenols
- Bioflavonoids
- Lysozyme
- Others

SOURCE: JAIRUS DAVID, PH.D., CONAGRA FOODS; 2016 CLEAN LABEL CONFERENCE

🧩 **Vendors are challenged to assist in the development of clean label foods by expanding the toolbox offered to processors, so they might find efficient options for reducing spoilage and pathogens.**

manner—not to mask poor practices. Lactates and diacetates are examples of antimicrobials used in meat to limit growth of *Listeria monocytogenes* and are especially important in refrigerated RTEs and perishable meats. Producers and consumers want to be assured of a certain retail shelflife and do not want spoilage or returned products.

“Food manufacturers should monitor the microbial load at all stages in the conversion of raw materials to end food products,” he stated. The finished product will not be better than the starting material. The key is a kill or control step, which could be sterilization or pasteurization, for example. Consumers also play a role in food safety: in how they handle, store, cook and reheat food. There is definitely a case for use of preservatives.

When using an antimicrobial, the first question is, does it work? “Usually,” advised David, “the answer is ‘yes, but...’”

Each product needs customization and, in clean labeling, cost is a big deal. Margins are very low. Developers need to understand the efficacy, sensory impact and regulatory limits of the antimicrobial. Especially with naturals, taste can be impacted in a good or bad way. Usually, the sensory threshold is lower than the efficacy level. Also note that the regulatory limit for antimicrobials is usually well-defined and cannot be exceeded.

“There is nothing wrong with chemical preservatives,” David emphasized, “but today, consumers want a clean label.” When looking at a new natural antimicrobial ingredient, due diligence pays off. Antimicrobials are a big challenge; for example, there are

not a lot of natural options for Gram-negative pathogens like *Salmonella*.

David offered tips for application of natural antimicrobials: Look early at the sensory impact and efficacy. At least a two log reduction in microbiological media and model foods (either orange juice or sterilized milk) is needed, or it will not work in food. The next question is whether it will function after scale-up and how the cost impacts the product. And, natural, clean label antimicrobials are not inexpensive. Who is going to pay for it? Lastly, unantic-

ipated issues often occur during development, scale-up and plant trials. Therefore, the key is to persevere.

To cover all bases, David suggests use of an antimicrobial toolbox to maintain sanity (see chart “Antimicrobial Toolbox”), and he challenges vendors to come up with more options for Gram-negative bacterial pathogens and spore formers, in particular.

“*Natural Antimicrobials: Strategies & Considerations for Their Use in Food*,” *Jairus David, Ph.D., Natural Antimicrobial Program, Research & Innovation, ConAgra Foods, Inc., jairus.david@conagrafoods.com*

## An Industry Insight into Replacing Nitrites and Phosphates in Processed Meats

Processed meats are a food category where easily recognizable, clean label ingredients can be used to achieve the same technical functionality of manufactured ingredients. However, these ingredients come with their own flavor and technical challenges.

“The primary ingredients currently used to develop clean label processed meats include vegetable juice powders, to replace nitrates/nitrites as curing agents; and acerola cherry powder to replace sodium erythorbate as a cure accelerator. Plum-based products (fresh and dried concentrates, powders and fibers) are effective at replacing phosphates for moisture retention,” said Webb Girard, MSc, a Culinologist with CuliNex, Seattle.



## Clean Label Alternatives for Processed Meats

### Curing

- Vegetable juice powder
  - ◆ Source of nitrate
  - ◆ Source of nitrite
- Acerola cherry powder
  - ◆ Cure accelerator
  - ◆ Replacement for sodium erythorbate

### Moisture Retention

- Plum juice concentrate
  - ◆ Phosphate replacer

SOURCE: WEBB GIRARD, MSC, CULINOLOGIST, CULINEX, LLC;  
2016 CLEAN LABEL CONFERENCE

### Most clean label alternatives for processed meats come from fruit and vegetable sources.

The nitrates in vegetable juice powder are converted to nitrites via lactic acid bacteria to create curing agents. Because they use vegetable ingredients, they have a unique flavor profile, all while promoting pink color and firming the texture. They also act as a preservative and antioxidant.

For clean label products, manufacturers can use vegetable sources of nitrites, primarily celery juice. Nitrites, both naturally and synthetically derived, are very effective at recommended usage levels but can be toxic at high levels, so control of usage levels is very important, advised Girard.

Technology has advanced from the use of liquid vegetable juice to vegetable juice powder as a nitrite source. The powdered version is much easier to use and has minimal vegetal flavor. The meat processor must still carefully control pH and might need to balance the celery flavor with other seasonings. Vegetable juice powder costs some \$26/lb vs. 6 cents/lb for conventional nitrates.

Labeling implications are outlined in 9CFR 317.17 and 9CFR 391.2. Label the product as uncured (i.e., “uncured boneless ham”). The label must also declare, “No nitrates or nitrites added except for the naturally occurring nitrates in sea salt and celery powder. Not preserved. Keep refrigerated below 40°F at all times.”

There are no regulations on the amount of vegetable juice powder to be added, and usage levels are dictated by the amount needed to achieve desired effects and flavor balance. There is a wide variety of effectiveness and a lack of product

control on some clean label products in the marketplace, according to Gerard.

Use USDA guidelines for nitrite levels to determine optimal levels of natural nitrites. A level of 40ppm is the minimum needed for color fixing, and color will fade after 45 days. A level of 100ppm is the minimum needed for stable color.

Cherry powder from the acerola cherry can be used to replace sodium erythorbate as a cure accelerator through pH reduction and is needed in rapid-process products, such as hot dogs and bacon. It also helps improve flavor stability, color and shelflife. The type of meat application will determine if there is a need for a curing accelerator.

Phosphates alter the pH and increase the water-holding capacity of meats. Phosphate replacers can be expensive and can impact the flavor and texture of the finished product.

One option is to use plum-based products for phosphate replacement. Plum products attract and hold moisture in open-muscle fibers and commuted products. Plum products have minimal flavor impact; may enhance flavor; and can be cost-neutral when used to replace phosphates. They are high in antioxidants and suppress warmed-over flavors. Though they have a regulatory limit when used as a binder, there is no limit on usage as a flavor enhancer. They are allergen-free and can allow for salt and spice reduction. Depending on what form of plum is used, they are typically labeled as “fresh plum concentrate” or “dried plum purée.”

Whole foods ingredients are effective in replacing synthetic ingredients in processed meats. However, meat manufacturers will need to optimize formulas for flavor, cost and functionality.

*“An Industry Insight into Replacing Nitrites and Phosphates in Processed Meats,” Webb Girard, MSC, Culinologist, Culinex, LLC, webb@culinex.biz, 206-719-0485*

## Conventional to Emerging Natural Sweeteners: Key Properties for Product Applications

“Some say clean label is food industry’s response to the lack of a clear definition for ‘natural,’” began Catalin Moraru, International Food Network/Covance Food Solutions, at the 2016 Clean Label Conference.

Sweeteners are among the top strategies for cleaning up labels; this strategy is being employed by the industry, as over the past four years the use of the “natural” sweetener stevia has increased more than 30%. The FDA’s new labeling rule to include the amount of added sugars on a product’s Nutrition Facts panel will focus even more attention on sweeteners.

## Sweetener Calories and Intensities

Sweetener	kCal/g	Intensity
Raw sugar/Turbinado/Demerara	3.8	1
Evaporated cane juice	3.8	1
Coconut (palm) sugar	3.75	1
Sweet potato juice concentrate	~2.2	0.6
Honey	3.5	1
Agave nectar	3.1	1.3
Maple syrup	2.7	1
Barley malt syrup	3	0.5
Brown rice syrup	3.2	0.5
Blackstrap molasses	2.9	0.8
Sorghum syrup	2.9	0.5
Yacon syrup	1.5	0.5
Xylitol	2.4	1
Erythritol	0.2	0.6–0.7
Stevia extract	0	200–300
Monk fruit extract	0	150–250
Thaumatococcus	4	2000–3000
Monatin	0	3000

SOURCE: VARIOUS SOURCES AND SUPPLIERS, IFN/COVANCE FOOD SOLUTIONS; 2016 CLEAN LABEL CONFERENCE

**Synergy was documented among several sweeteners, which can be cost-beneficial and lessen impact of any detrimental attributes. For example, Reb A exhibits synergy with sugar and with the FEMA GRAS ingredient monatin.**

Most nutritive sweeteners have similar or lower sweetness compared to sugar. In contrast, high-potency sweeteners are significantly sweeter than sugar; therefore, they are used in much smaller quantities. The natural high-potency sweeteners approved in the U.S. are stevia and monk fruit extracts. Some others are FEMA GRAS, so they can be used and labeled as flavors, but may enhance sweetness. Flavor houses use some of them as sweetness modulators.

Among the criteria to keep in mind when selecting a sweetener, the primary is obviously the sweetness potency and quality. Sucrose has a clean flavor, while other natural sweeteners may have a specific taste, aroma and/or color. For example, barley malt syrup has a slightly malty, barley aroma and darker color; sweet potato concentrate has a sweet potato flavor, etc. These attributes may be beneficial or detrimental, depending on the application. Blends of sweeteners may address quality issues and help reach the potency desired, while reducing detrimental levels of off-notes or colors. Synergies among blend constituents can also make blends more cost-effective.

Another consideration related to sweetness quality is the temporal profile: how quickly is sweetness perceived from the moment the sweetener is on the tongue, and then how long until

the sweetness sensation dissipates. Sugar has a relatively fast onset, but it dissipates quickly, too. In contrast, stevia extract's onset is slower, and it lingers longer.

“Most consumers do not like remnant sweetness lingering in the mouth,” Moraru stated. “This is yet another reason to consider using sweetener blends, as their components can address the onset and later perception or lingering, respectively.”

Other physical attributes of interest depend on the application. For instance, heat stability is key in baked applications; pH stability is important in carbonated beverages; and color may be detrimental in clear beverages.

When replacing sugar, its other functionalities in the application will need to be addressed. Some sweeteners contribute color through Maillard browning or caramelization, which can be desirable in baked goods but detrimental in other applications. Sugar and certain other sweeteners are also humectants; they help retain desirable moisture in a product. Sugar contributes body, texture and volume, and may act as a preservative, because it lowers water activity. The choice of sweeteners

for a specific application will thus be driven by the functional aspects which are to be provided.

Sugar is a cost-efficient sweetener compared to most others; however, the cost-in-use should be considered when comparing options. When replacing sugar, cost may be controlled using a blend of high-potency and bulk sweeteners.

Fine-tuning sweetness can be done with modifiers that address specific issues, such as off-flavors or slow onset and lingering flavors. Flavor houses now offer a large number of modifiers, sweetness potentiators and enhancers, as well as various blockers and maskers.

In summary, a fair number of natural sweeteners are currently available, and their selection will be based on their functionality, attributes and cost, while understanding specific consumers wants. Much research is underway to better understand sweetness receptors and how this knowledge can be utilized.

“Conventional to Emerging Natural Sweeteners: Key Properties for Product Applications,” *Catalin Moraru, Ph.D., Technical Manager, Covance Food Solutions, Catalin.Moraru@covance.com, 607-257-5129*

## What Consumers Pay Attention to on Labels



**67% Easy-to-understand ingredient information**

**62% No artificial additives**

**61% Free from preservatives**

**60% No artificial colorants**

SOURCE: *NUTRITION BUSINESS JOURNAL* 2014, AND GNT GROUP, 2015, DAYMON WORLDWIDE

While short, understandable ingredient lists continue to be a key strategy, free-from claims are also a fast growing way to communicate product attributes to consumers.

## Trends in “Free-from” Labeling in Retail

“In a retail environment, whether it’s in-store or online, ‘free-from’ is a promise increasingly seen on labels—whether it’s gluten-free, allergen-free, dairy-free, hormone-free, or free from artificial flavors or GMOs,” said Carl Jorgensen, MSc, Director of Global Consumer Strategy-Wellness at Daymon Worldwide, in his 2016 Clean Label Conference presentation. “It’s a specific promise to the customer that targets customer attitudes toward certain food properties and ingredients.”

Based on survey results from *Nutrition Business Journal* and GNT Group, Jorgensen said consumers pay nearly as much attention to free-from claims as they do easy-to-understand ingredient information (67%). The top concerns are: no artificial additives (62%), free from preservatives (61%) and no artificial colorants (60%).

“Avoidance of GMOs is a trend that has been stable for some time, and consumers are changing their attitudes towards fats—looking to avoid trans fats and partially hydrogenated oils, but also looking for good fats from plant, dairy or animal sources,” he added.

“An important trend for brand managers to consider is that consumers increasingly view the absence of ‘bad’ ingredients as a baseline, or price of entry, and are making more decisions based

on positive attributes—like nutrients and fair trade.”

Retailers are responding to consumer demand to eliminate so-called bad ingredients in two very different ways: Jorgensen described them as the long-list approach and the short-list approach.

The primary example of the long-list approach is Whole Foods. Their 365 brands, Everyday Value and Organic, have a free-from list currently composed of 78 items—some of them ingredients, like MSG, and others ingredient groups, like benzoates. Kroger’s Simple Truth brand has taken a similar path, with Free From 101, a detailed list of 105 ingredients (so far).

An example of the short-list approach is Trader Joe’s. Their stores “bucket” ingredients, rather than

naming specifics, for the sake of simplicity and to avoid constant revisions to their list. Trader Joe’s free-from promise includes artificial flavors and preservatives, MSG, GMOs and partially hydrogenated oils/artificial trans fats.

Having GMOs on the free-from list is a rarity for brands, Jorgensen said, but one that is increasing. Hershey’s recently announced its intentions to do so, for instance. “A recent Mintel study found that GMO-free claims are important to 58% of free-from customers, with 35% ranking it as one of their top three claims,” he added.

Aldi is another short-list example. It recently removed synthetic colors, partially hydrogenated oils and MSG from its private brand products. Jorgensen described it as a “pick your battles” approach, identifying the ingredients consumers object to the most and are likewise easy to reformulate. General Mills is taking a similar approach with artificial colors and flavors in its cereals, he added. “Even removing a couple of ingredients helps build brand trust and loyalty.”

The advantage of the long-list approach is that it’s very specific and easily verified, but the flip-side is that it’s difficult to maintain and impossible to satisfy every customer. Meanwhile, the short list is easier to maintain and communicate, but it risks not satisfying the more engaged members of the customer base, Jorgensen concluded.



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## Conventional vs. Organic Cropland

Crop	U.S. Cropland Acres (thousands)	Share of Total Percent	Certified Organic Acres (thousands)	Share of Total Percent
Corn	91,900	30%	235	12%
Soybeans	78,000	26%	132	7%
Hay	61,600	20%	786	39%
Wheat	54,400	18%	345	17%
Fruit and nuts	4,000	1%	155	8%
Vegetables	2,800	1%	161	8%
Rice	2,700	1%	49	2%
Oats	2,600	1%	64	3%
Dry beans, peas, lentils	2,500	1%	62	3%
Total, selected crops	302,500	100%	2,034	100%

SOURCE: MERCARIS; 2016 CLEAN LABEL CONFERENCE

Today, 0.6% of total U.S. acres are organic, with a strong organic share in fruits, nuts and vegetables. Currently, organic corn is grown on 235,000 American acres, but 75% of this is used for cows producing organic milk. Convincing U.S. farmers to switch to organic farming is tough, so manufacturers will need to find incentives, such as contracting for and finding uses for all of the rotation crops.

“Based on our monitoring of industry trends, more and more retailers and brands will be making free-from promises going forward; there’s no doubt about that,” Jorgensen said of the future. He likewise expects shorter free-from lists; more claims of GMO-free; and increasing instances of free-from claims reflecting ethical and environmental concerns.

The cage-free egg trend will evolve to include claims like Whole Foods’ ban on *foie gras*, for example. But the most obvious thing to expect in the future: Food scientists will continue to use their ingenuity to support customer demands.

*“Trends in ‘Free-from’ Labeling in Retail,” Carl Jorgensen, MSc, Director of Global Consumer Strategy-Wellness at Daymon Worldwide, cjorgensen@daymon.com*

## Breaking New Ground in Organic & Non-GMO Markets

Grounding manufacturers’ expectations from the strained organic supply chain was the aim of Scott Shander, MSc, Economist, Mercaris, during this presentation. When considering organic product launches, securing supplies can be challenging, and the nuances need to be understood and appreciated.

In the “2014-2015 State of the Industry Report,” The Organic Trade Association showed \$39 billion in organic sales, up from \$10 billion in 2003. Data concerning organic acreage in the U.S. shows a massive expansion in organic food, compared with limited available acreage to grow organic.

Currently, 36% of organic sales are in fruit and vegetables; interestingly, the emerging organic market includes compound growth

rates in snack foods, bread, meats and other packaged foods. “Looking at these categories, meeting this demand will require disproportionate growth in organic grains and oilseeds relative to other crops,” said Shander.

Organic crop rotation is important to manage soil health, pests and weeds. Organic farming requires a multi-year rotation period for growing corn, then alfalfa, soybeans, etc. A significant ramp-up in organic corn production, for example, will also require a ramp-up of other organic crops—including barley, oats, peas, lentils and hay (of which there is currently not much demand)—presenting a significant problem, if demand for these less common crops does not also increase.

“The industries’ short-term solution to supply shortages in the U.S. has been finding international suppliers. Over the last four years, organic corn and soy imports skyrocketed, but the U.S. needs a solution to develop these grains domestically,” noted Shander.

Conventional farmers can currently earn \$129 per acre for corn, with organic corn bringing \$552 per acre. “At these numbers, why is not every farmer taking action?” Shander asked rhetorically.

“Many reasons make this tough,” Shander went on to explain. “The average farmer in the U.S. is 58 years old; trying to convince them to completely change their business and hire third-party certifiers to tell them how to run the farm can be very difficult.”

Furthermore, organic farming requires a 36-month transition period; a large investment to the land; and benefit will not be seen for several years. Many farmers may not have grown anything other than corn or soy. They have no knowledge of other



crops—i.e., their uses and their buyers—and they would need to develop completely new relationships in order to farm successfully. Also, a very limited number of organic processing and storage facilities exist.

Currently, in Illinois alone, 74,300 farmers cover 27 million acres, compared with the entire U.S. organic market with 14,870 farmers covering only two million acres nationally. A current corn producer has many options to deliver grain from his farm to storage or processing facilities. However, when trying to market organic corn, a farmer is lucky to find even one processing facility, even far away. And, that processor might not be buying corn that day or prices are not competitive; so the farmer needs to try the next buyer, etc. Processors can take advantage of this situation by providing less market transparency and forcing organic farmers to sell crops as needed.

Many organic food manufacturers have moved to 100% imports, developing international relationships with more supply security.

Some manufacturers are securing supplies for an entire year by contracting with growers. However, farmers willing to help big food companies with sustainability initiatives need to produce additional materials, like lentils and smaller grains. And there needs to be a home for these, so companies need to find creative uses for rotation crops.

Shander's final takeaways were that the organic market will continue to grow; innovative manufacturers will take action; and competition will intensify. A competitive edge will exist for companies who can find uses for rotation crops, like the smaller grains and legumes. Organics can be daunting for procurement teams who will need thoughtful leadership in order to deliver long-term security for these plans.

*"Breaking New Ground in Organic & Non-GMO Markets," Scott Shander, Ph.D., Economist, Mercaris. To access Mercaris reports and analysis on organic and non-GMO markets, please contact Scott Shander, scott.shander@mercaris.com, 312-423-1877*

## Clean Label Trends and Food Colorant Realities

Winston Boyd, Ph.D., Food Industry Consultant, Focus International, began his presentation with a discussion of the various social, cultural and scientific factors that appear to be shaping the current clean label trend. He took particular note of the roles that consumers, activists and scientists take in shaping the discussion.

Turning to the role of food colorants in the clean label conversation, he looked at the regulatory framework that determines which food colorants are permitted for use in the U.S. and how



**❏ To be considered “natural” by FDA, a color additive must be natural or normal to that food. That is, strawberry juice used to color strawberry jam would meet the current definition of naturally colored, but cherry juice to color strawberry jam or parfait would not.**

regulations affect the way food colorants are labeled. In the U.S., color additives are categorized as certified and exempt from certification. Most exempt-from-certification colorants are derived from natural sources and may be labeled as “color added,” “artificial color” or by naming the ingredient and function (i.e., “colored with red beet juice”). Boyd briefly mentioned similarities and differences between colorant regulations and trends in the EU and the U.S.

Negative perceptions of synthetic food colorants are the driving force behind interest and growth in the use of natural food colorants. This creates opportunities for companies attempting to clean up their labels, but there are also many challenges. Boyd highlighted a few of the top issues encountered in the rush to replace synthetic colorants with colorants from natural sources. Decades of synthetic colorant use has created some fairly demanding performance expectations that must be met.

Generally, synthetic colors tend to be broadly useful; efficacious across many applications; and offer vivid colors, predictable behavior and significantly lower cost than natural food colorants. In contrast, while exempt-from-certification colors continue to grow



## Hydrocolloids: Properties

- Solution behaviors are related to the associative properties of hydrocolloids
- Hydrocolloids with regular repeating-unit sequences have a natural tendency to adopt a helical conformation
- Interactions between helices are affected by surrounding water molecules and cations (in the case of anionic hydrocolloids)
- Interactions between helices are responsible for the associative properties of hydrocolloids

SOURCE: SRIVIVAS JANASWAMY, PH.D., WHISTLER CENTER FOR CARBOHYDRATE RESEARCH AT PURDUE UNIVERSITY; 2016 CLEAN LABEL CONFERENCE

### The conformation of hydrocolloids controls the functional properties.

in popularity, they are inclined to be more narrowly useful and efficacious, less vivid, less predictable and, generally, more expensive. They might have limited availability, due to crop variation or harvest conditions.

Boyd's presentation also covered general information on solubility, stability and ease-of-use of colorings. More detailed information regarding the complexities of two classes of natural colorant, carotenoids and anthocyanins, illustrated some of the application and performance challenges.

For example, the red color of anthocyanins that is prevalent at low pH gives way to a blue color, as the pH increases. The blue color form is less stable and degrades irreversibly to a colorless state. Also, a dramatic reduction in color intensity is seen as pH increases from 1 to 5.

Strategies such as the addition of antioxidants and/or co-pigmentation increase a coloring's stability. In the case of red radish anthocyanin, the co-pigmentation effect is based on an intramolecular folding which boosts stability at high pH, due to interactions between positions within the molecule.

Boyd also provided insights into several reasons for the higher cost-in-use of natural vs. synthetic colorants.

Boyd discussed the role consumer misunderstandings play in driving the clean label trend. Noting specific rules of thumb—such as “If you can't pronounce it, it doesn't belong in food”—he cited specific and safe food ingredients that have been given a less-than-favorable reputation by such simplistic thinking.

*“Clean Label Trends and Food Colorant Realities,” Winston Boyd, Ph.D., Food Industry Consultant, [colordoc@execpc.com](mailto:colordoc@execpc.com), 224-255-5376*



TO DOWNLOAD AN AUDIO VERSION OF BOYD'S PRESENTATION, GO TO <http://globalfoodforums.com/clean-label-trends-and-food-colorant-realities>

## “Natural” Hydrocolloids: Physiochemical Properties to Research Initiatives

To date, most hydrocolloids have escaped clean label controversy. Generally derived from natural sources, the majority have managed to stay off most “no-no” lists. However, it would benefit food manufacturers to understand the physiochemical properties of hydrocolloids and to stay on top of consumer sentiment. This would help them make formula adjustments, if they

wished to react to changing consumer attitudes.

Hydrocolloids, also called food gums, are derived from natural materials, including plants, seaweed, seeds and bacteria. “Hydrocolloids are part of the family of polysaccharides, and to understand their structure-function relationships and enhance the cognizant utility, it is necessary to realize their interactions at the atomic level,” said Srinivas Janaswamy, Ph.D., of the Whistler Center for Carbohydrate Research at Purdue University.

Hydrocolloids can be used to thicken, form gels, stabilize suspensions, bind and hold water, improve texture, stabilize emulsions, form films and coatings, and even to encapsulate bioactive compounds. For example, gum Arabic and xanthan gum are used as emulsifiers in salad dressing. Carrageenans are used to suspend cocoa in chocolate milk, as well as to encapsulate nutraceuticals and flavors. Locust bean gum helps to stabilize foams in whipped toppings. Often, a blend of two hydrocolloids is needed to obtain the desired functionality.

The solution behaviors of hydrocolloids are related to their associative properties. Hydrocolloids containing regular repeating-unit sequences have a natural tendency to adopt a helical conformation. In the presence of water, hydrocolloids and water interact via hydrogen bonds and/or ion-dipole interactions, leading to swelling and viscosity. They also form junction zones, connected by various types of bonds, including hydrogen bonds, ionic bonds and covalent bonds, and are responsible for the onset of gelation.

Janaswamy also explored some of the label-friendly hydrocolloids, which have sources that consumers might readily understand.

Guar gum is a seed endosperm used in ice cream, baked goods, meats, beverages, dressings and sauces. It hydrates rapidly in water and yields highly viscous dispersions. It is a neutral gum, and pH has little effect on the viscosity.

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Locust bean gum has a low molecular weight compared to guar gum. Some parts are highly substituted (hairy regions), and others are not substituted (bare regions.) This intrinsic property makes it interact well with other hydrocolloids in creating novel functional blends.

Gum Arabic is an exudate gum sourced from teardrop-shaped globules from the bark of Acacia trees. It aids to control the moisture migration and crystallization in many foods.

Alginate is produced from brown algae and is water-soluble. It finds useful applications in ice cream, meringue and salad dressings, to name a few. One of the interesting properties of alginate is the production of beads in the presence of calcium ions.

Carrageenans are water-soluble and come in 15 varieties. Among them, kappa, iota and lambda types are utilized extensively. In food applications, they are used as thickening, viscosifying and gelling agents due to their greater versatility. [Note: One audience member noted that while perhaps unfounded, some consumers have found issue with carrageenans.]

Consumers can be wary of ingredients they don't understand. One strategy to enhance consumer acceptance of hydrocolloids

is to explain their critical functionality in a given food product, such as "xanthan gum (for consistency)," said Janaswamy. Hydrocolloids are sourced from natural ingredients and continue to remain essential tools for controlling moisture, achieving optimal texture and developing consumer-friendly food products.

*"Natural' Hydrocolloids: Physicochemical Properties to Research Initiatives,"* Srivivas Janaswamy, Ph.D., *The Whistler Center for Carbohydrate Research at Purdue University, janaswam@purdue.edu, 765-409-2590*

**Global Food Forums, Inc. again wishes to thank the speakers, attendees, sponsors and tabletop exhibitors for making the 2016 Clean Label Conference a very successful event.**

**We invite you to attend the 2017 Clean Label Conference, which is in its planning stages. It will be held at the Westin Hotel, Itasca, Illinois, USA, a venue close to the Chicago O'Hare International and Midway airports. Please see [www.GlobalFoodForums.com/2017-clean-label](http://www.GlobalFoodForums.com/2017-clean-label) for updates. Hope to see you there!**

## Resources on Protein Ingredient Technologies

Traffic to Global Food Forums' website ([www.GlobalFoodForums.com](http://www.GlobalFoodForums.com)) continues its exponential growth with well over a quarter of a million views by July, 2016, and over 25,000 per month. The site has a wealth of information from past presentations by high-profile industry experts, as well as trends and statistics related to Global Food Forums' core conference topics.



### With Our Compliments

**Global Food Forums, Inc.** wishes to thank the speakers, attendees, sponsors and tabletop exhibitors for making the 2016 Clean Label Conference a very successful event. To download complimentary copies of presentations from the Conference, including both General Sessions and Technology Snapshots, go to <http://globalfoodforums.com/2016-clean-label/program> or scan the QR code, left.



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### Looking Ahead: 2017 Technology Snapshots

Many of the 18 Technology Snapshot Presentations were standing room only at the 2016 Clean Label Conference. A jury process is used to select presentations using the Technology Snapshot Advisory Panel (<http://goo.gl/JTBC24>), members of which serve an annual term. Submissions for the 2017 Clean Label Conference will be open late summer of 2016 and will be announced to the ingredient vendor community by email. Please contact Barbara Nessinger ([Barbara@globalfoodforums.com](mailto:Barbara@globalfoodforums.com)) for more information.





**Global Food Forums, Inc.** has launched a new event theme. The **Sweetener Systems Trends & Technologies Conference** is designed for technologists involved in product formulations. The program will provide insights and actionable information on hot topics related to sweeteners, such as consumer attitudes, formulating for sugar reduction, emerging technologies, nutritional aspects, and sensory, regulatory and analytical issues. Core to the event will be the properties and interactions of a range of ingredients that impact the sweetness perception and performance of finished products. Please go to [www.globalfoodforums.com/sweetenersystems](http://www.globalfoodforums.com/sweetenersystems) to access the 2016 Sweetener Systems Trends & Technologies Conference.

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As the clean label trend continues to penetrate all categories within the food and beverage industry, TIC Gums supports these initiatives

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\*Email \_\_\_\_\_

\*Phone \_\_\_\_\_

\*Title \_\_\_\_\_

\*Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

Postal Code \_\_\_\_\_ Country \_\_\_\_\_

\*List name as it should appear on badge  
\_\_\_\_\_

Special needs: \_\_\_\_\_

Note: Your credit card statement will reflect a charge by **Global Food Forums, Inc.**

**METHOD OF PAYMENT**

Enclosed is my check for \$ \_\_\_\_\_ made payable  
to Global Food Forums, Inc. drawn on US funds.

\*\*Charge my:  VISA  MasterCard  American Express

Card Number \_\_\_\_\_

Expiration Date \_\_\_\_\_ Security Code \_\_\_\_\_

Amount \$ \_\_\_\_\_

Name on card \_\_\_\_\_

Signature \_\_\_\_\_

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**REGISTRATION & FEES (effective until expiration of Early Bird Discount on January 27, 2017)**

**Food & Beverage Manufacturer-\$895.00**

**Ingredient/Services Supplier-\$995.00**

Attendees will receive a registration receipt confirmation email. Visit <http://GlobalFoodForums.com/2017-Clean-Label> to update your registration information. \*\*A \$25.00 credit card processing fee is assigned to all on-line transactions. Registration includes Monday, March 27<sup>th</sup> (6:00-7:30 p.m.) and Tuesday, March 28<sup>th</sup> (6:00-7:30 p.m.) evening receptions, general sessions, Technology Snapshot sessions, meals, networking events and attendee bag and binder.

**I plan on attending:**  **Monday Night Reception**  **Tuesday Night Reception**

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**Official Hotel**-Westin NW, 400 Park Blvd., Itasca, Illinois, 60143 USA. <http://www.westinchicagonorthwest.com> .

A limited number of discounted rooms have been reserved at **\$139.00**, plus tax, per night for Monday and Tuesday, March 27 & 28, 2017. Make your hotel reservations on <http://www.GlobalFoodForums.com/2017-Clean-Label> (Registration tab) or call 1-630-773-4000 and mention the **2017 Clean Label Conference**. The cut-off date for discounted room reservations is March 7, 2017.

**Cancellation & Substitution Policy**-Cancellations must be received in writing. Visit [www.GlobalFoodForums.com/2017-Clean-Label](http://www.GlobalFoodForums.com/2017-Clean-Label) for refund details. Alternative parties may be substituted at any time without penalty.

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## **New 2017 R&D Report: Protein Ingredients**

New market research conducted by NSM Research, Inc. surveys R&D and food application formulators on their attitudes, formulation issues and future trends, as related to their use of protein ingredients. This 45+ page Global Food Forums' R&D Report: Protein Ingredients will become available fall of 2016. Updates and more information on the report are available at: <http://goo.gl/WEJ4KQ> or contact Jenny Stricker at [Jenny@GlobalFoodForums.com](mailto:Jenny@GlobalFoodForums.com) or +1.800.799.9671 ext. 1.

# PROTEIN TRENDS & TECHNOLOGIES SEMINAR

<http://www.globalfoodforums.com/ProteinSeminar>



## CLEAN LABEL CONFERENCE

<http://www.globalfoodforums.com/CleanLabel>

## SWEETENER SYSTEMS TRENDS & TECHNOLOGIES CONFERENCE

<http://globalfoodforums.com/sweetenersystems>

