

Working with Functional Ingredients



- Functional foods' popularity continues to rise as people take an increased interest in the connection between diet and wellness and look to the foods they consume to help maintain their health.
- Functional food trends reflect consumers' desire to take a proactive approach to their health by consuming ingredients with properties that help prevent conditions like heart disease and cancer.
- Flavoring functional food and beverages can be tricky due to certain properties of functional ingredients, such as protein and vitamins. Methods, such as masking and encapsulation, help flavor companies create delicious-tasting functional foods and beverages.

J. GALLAGHER AND
K. BARMANN
FONA International
Geneva, IL, U.S.A.

Hippocrates, the ancient Greek physician, also known as the father of medicine, encouraged people to “let food be thy medicine.” That was 2,500 years ago, but today Americans are really taking these words to heart—to the tune of \$31 billion in functional food and beverage sales in 2008 (4).

With the demand for functional ingredients higher than ever, overcoming the flavoring challenges presented by proteins, botanicals, and minerals is top of mind for many product developers as they strive to meet consumers' high expectations for functional foods: functionality, performance, convenience—and, of course, superior taste.

Before we discuss solutions for some of these common flavor challenges, let's take a step back and look at this exciting and expanding market, including consumer interest and current trends.

What's Moving the Market?

Economic, demographic, social, and environmental factors are driving consumers to functional foods in record numbers. Understanding these influences can help you to better understand your consumers and their expectations of your product. Below are four drivers impacting the market today.

1. Aging Population

Seventy-six million Baby Boomers are growing older and by 2030 people who are 65 and over are expected to make up

20%, or one fifth, of the U.S. population (1). As the population ages, conditions, such as high cholesterol, high blood pressure, osteoporosis, and diabetes, increase. People look to what they consume to improve their health. In fact, today, almost a third of Americans are using functional ingredients to treat or manage an existing condition (5).

2. Healthcare Costs

With healthcare costs on a continuous climb since 1970, people are paying more attention to the connection between their diet and their physical and mental health. Almost 70% of Americans use functional food and beverages to help prevent a health issue (5). Twenty-five percent of Americans rely on functional ingredients to manage or treat an existing condition on their own, foregoing costly doctor visits (5).

3. Consumer Awareness and Habits

With health information readily available and easily accessible, consumers are taking greater control of their health by researching issues and making decisions based on information not available to the general public in the past.

4. Advances in Science and Technology

Increased knowledge of the role of diet in health and disease prevention, and technical advances allowing for the creation of health-promoting foods, have helped open the world of functional foods to consumers around the globe. For example, scientific reports supporting the health benefits of

Five Tasting Tips

1. Keep portion size in mind because healthful ingredients tend to build in your mouth. While you may taste only a few samples of the product, consumers will eat the full portion, so be sure to taste the entire serving in the process. This is the true measure of the flavored product and will help prevent over-flavoring.
2. Taste first thing in the morning when your palate is fresh.
3. Return several times to taste the product, as fatigue can happen quickly while tasting products with functional ingredients.
4. Rinse often with water and crackers. Chocolate can even be used to cleanse fat-based products.
5. Allow flavored functional products to equilibrate at least 24 hours before evaluating. (Ideally, every product should have this amount of time to settle before testing.)

superfoods, such as pomegranate, have helped send these foods soaring into the mainstream from relative obscurity.

What's Tops Today?

As consumers look for food and beverages that deliver specific health benefits they desire, the market drivers discussed above, such as an aging population, influence trends in functional ingredients and products. Here are five functional food trends to keep an eye on:

1. Kids at Risk

As the rate of childhood obesity and the associated health risks begin to climb, healthy food for children is becoming an increasing focus. Twenty-eight percent of parents say they have an overweight child, and one in eight kids has two or more risk factors for developing heart disease as they grow older (5).

What Are Functional Ingredients?

Functional ingredients are items that have demonstrated health and wellness advantages beyond that of basic nutrition. They can either be found in food naturally or added later.

2. One Hundred-Calorie Helpings

Twenty-five percent of consumers are seeking out 100-calorie snack packs, while 63% of U.S. shoppers are looking for lower-calorie versions of their favorites. With two-thirds of shoppers trying to eat snacks with more nutrition, healthy snack sales outpaced traditional snacks nearly three to one over the last few years (5).

3. Phytochemicals

A phytochemical is a compound found in all plant-based foods, such as eggplant and grapefruit, that reduces the risk of many diseases, including cancer, heart disease, stroke, high blood pressure, cataracts, and osteoporosis.

4. Healthy Fats

Omega-3 fatty acids support cardiovascular health, and their growing popularity is leading consumers to seek other healthier oils as well (5). More than half of shoppers are trying to avoid trans fat, total fat, and saturated fat (2).

5. Gluten and Grains

One in 100 people are wheat gluten intolerant, a four-fold increase from just 50 years ago (3). Because of whole grains' association with a reduced risk of some types of cancer, gastrointestinal health, and possible maintenance of blood glucose levels, seven in 10 consumers tried to increase their consumption of whole grains last year (2).

How Do We Overcome Flavor Challenges?

The ingredients consumers are demanding aren't easy to work with when it comes to creating a product that scores high on function *and* flavor. Ingredients such as vitamins and proteins present product developers with flavor challenges that can be tricky to overcome. Common flavoring challenges include:

- Bitterness from vitamins, caffeine, and polyphenols
- Astringency from herbals
- Beany notes from proteins

- Fishy notes from omega-3s
- Metallic taste from vitamins

There is no one way to meet these flavor challenges and no one solution that will work the same way each time. Developing an excellent flavor in functional foods takes time, an open mind, and plenty of communication with your flavor house. While there are a variety of approaches, let's take a look at the general steps involved with finding your perfect flavor.

Step One: Neutralize the Base

The first step in overcoming the flavor challenges posed by functional ingredients is to identify and neutralize the offensive note in the base. Common ways to alter taste are modification, masking, blocking, and encapsulation. Your solution might be one or a combination of these methods.

Modification

Modification involves ingredients in the finished formula that can complement, enhance, or modify the way you taste the food. Modifiers adjust the oral perception of a flavor by providing a bit of competition to manipulate taste buds. For example, low levels of gums and starches can be added to coat the mouth, preventing the taste buds from touching the offending ingredient. Or, a food scientist might modify the formula with low levels of basic ingredients, such as salt, acids, or sugars, which can have significant effect on the taste. Still other modifications can offer creaminess and fullness to affect the taste perception.

Masking and Blocking

Masking and blocking are ways to use flavor to neutralize the base. Masking involves using flavors to confuse the brain and provide competing responses from the nose and tongue. Blockers are components

that cause a physical interaction on the palate, blocking receptors on the tongue. Both masking and blocking can be used across a wide spectrum of applications, but also have the potential to alter flavor profiles you don't intend them to or upset the overall balance of the formula. Using these methods is a delicate process.

Encapsulating

Encapsulating difficult ingredients isolates them, providing a protective barrier between them and the other ingredients.

Considerations when Flavoring Functional Foods

When everyone understands the goals of the project and the limitations of the product, it is easier to meet the flavoring challenges of functional foods. So, when formulating and flavoring, discuss with your flavor house project details, such as:

- What is the end product you want to deliver?
- How much of a functional ingredient is going into the product?
- Are there multiple functional ingredients in one product?
- What is the serving size and frequency?
- What forms of the ingredients are available?
- What do you want the label to look like on your finished product?
- How long of a shelf life does it need?

Table I. Using characterizing flavors to address a flavor challenge

Challenge	Characterizing Flavor	Reasons
Bitterness	Dark chocolate, grapefruit, coffee, peanut Mixed citrus, citrus punch	Paired bitterness, complementary Complementary
Astringency	Cranberry, blueberry, pomegranate, tea (white, black, green), rhubarb, blueberry	Complementary
Beany	Toffee, honey, jammy fruits (raspberry, strawberry), caramel, maple	Masks beany notes
Fishy Notes	Lemon, lime, citrus, mango, mango-citrus, tropicals Watermelon, bubblegum Honey-lavender	Flavor pairing, complementary Kid profiles Complex/complementary
Metallic	Honey, honey-lemon, honey-melon, creamy fruits (orange cream, strawberry cream)	Blends of tart and creamy

Encapsulation can also delay or prevent rancidity of oils, such as with omega-3s, extend shelf life, and control interactions with other ingredients. Keep in mind, not all healthful ingredients you may need are available in this form and encapsulated ingredients are more costly.

Step Two: Build a Profile

After neutralizing the base, it's time for the fun part—building your flavor profile to suit your target audience and develop a taste that's all your own. Flavors used in this process are defined as characterizing and noncharacterizing.

Characterizing Flavors

When you smell or taste these flavors, they provide familiarity and are reminiscent of the named flavor—a strawberry is a strawberry. Choosing the right characterizing flavor can complement inherent notes of the base (Table I).

Noncharacterizing Flavors

Noncharacterizing flavors help to enhance the flavor and bring it depth. They add nuance to make the flavor your own, like adding a hint of cookie dough to your vanilla flavor to create an enticing finished product with a signature taste.

Step Three: Enjoy the Journey!

Developing your signature flavor to meet these challenges is a journey, so keep an open mind and remember there is no one formulation that works in all situations. Also, consider flavors that might not be consistent with your first thoughts. You never know what new ideas, blends, and possibilities will be your perfect solution!

References

1. Department of Health & Human Services, Administration on Aging. Aging statistics. Published online at www.aoa.gov/AoARoot/Aging_Statistics/index.aspx.
2. International Dairy-Deli-Bakery Association. *Health & Wellness: The Purpose-Driven Consumer*. Summary published online at <http://www.iddba.org/store/Health-Wellness-The-Purpose-Driven-Consumer-P75C13.aspx>.
3. Marcotty, Josephine. Gluten allergy a growing problem in U.S., study shows. Published online at <http://www.deseretnews.com/article/705315339/Gluten-allergy-a-growingproblem.html>.
4. Packaged Facts. Functional Foods Market Thrives as Consumers Take Proactive Approach to Health. Published online at <http://finance.yahoo.com/news/Functional-Foods-Market-iw-15231898.html>.
5. Sloan, A. Elizabeth. The top 10 functional food trends. Published online at http://members.ift.org/NR/rdonlyres/D94DACC3-0EA8-46F8-BBF9-AFA2103FB714/0/0408feat_trends.pdf.%20April%202008.



Jean Gallagher, solutions manager for grains and beverages at FONA International, has more than 25 years of experience in the food and flavor industries. She has spent a large part of her career formulating and developing low- and no-fat products, including bake-stable, low-water activity products for the bakery industry. At FONA, she is responsible for drawing on the extensive bank of resources and support services (market research, regulatory, flavor development, applications, analytical, and sensory) to deliver FONA customers solutions that address the complete needs of their products. She can be reached at jgallagher@fona.com.



Kit Barmann, communications editor, corporate communications, has 10 years of experience in communications. She leads FONA's editorial communications efforts to promote a greater understanding of FONA, flavors, and the flavor industry throughout the food and beverage industry. Barmann can be reached at kbarmann@fona.com.

Is your lab up-to-date with the **NEW** 11th Edition of the *Approved Methods of Analysis*?



Ensure your lab is up-to-date; get company-wide access to over 325 approved methods along with built-in calculators, videos, collab study reports, and more.

Order early and your company can take advantage of special introductory savings on a subscription to the new *Approved Methods of Analysis, 11th Edition*.

Find out more at

www.aaccnet.org

(click on Approved Methods Online)



Advancing grain science worldwide

#MB431-8/09