

A Molecular Cooking Future?

Research chefs experiment with xanthan gum, methylcellulose, modified food starch, and citric acid to achieve specific textures, flavors and viscosity.

by Rachel Zemser

Food scientists have always stocked their R&D laboratories with libraries of gums, starches, and flavors that represent every product line their suppliers have to offer. Starches can thicken up a BBQ sauce, gums can help suspend particulates in a salad dressing and flavors are used to cut costs and improve taste. These ingredients were once used exclusively by professional food technologists, who sought to make products look and taste homemade, even after being subjected to harsh processing conditions and having one-year shelf lives. In time though, curious chefs discovered our treasure chests of functional industrial ingredients and started using them to create

foods that had never been seen before. But these new creations were the exact opposite of the “homemade” essence that food technologists had strived so hard to achieve. That’s how a unique style of cooking, inaccurately called “molecular gastronomy,” was born.

Molecular Meanings

In a 1965 article in *Food Technology*, Professor J. Ralph Blanchfield, MBE, defined food science as “a coherent and systematic body of knowledge and understanding of the nature and composition of food materials, and their behavior under the various conditions to which they may be subject.” In 1992 Hungarian physicist Nicholas Kurti

coined the term “molecular gastronomy” to describe the discipline of exploring the science behind traditional cooking methods. According to these two definitions, molecular gastronomy is essentially a division of food science in which scientific observations prompt the development of new culinary techniques in the kitchen. Nowadays, the term molecular gastronomy is often incorrectly applied to restaurant chefs who use food scientists’ tools to explore new flavor and textural possibilities. These “research chefs” experiment with xanthan gum, methylcellulose, modified food starch, and citric acid to achieve specific textures, flavors, and viscosity. They also employ pH meters, laboratory

balances, and refractometers to help maintain consistency in their culinary presentations.

It could be said that both the research chef and the food scientist practice in the field of “food technology.” The chefs who are part of this “molecular” movement prefer, however, that their cooking style be called anything but that! Acceptable alternative labels include Culinary Constructivism, Modern, Progressive, Avant-Garde, or Techno-Emotional cuisine, as the phrase “molecular gastronomy” can confuse consumers and be misinterpreted by the media.

Progressive Pioneers

In the early 1980s, it seemed as if everything imaginable in cooking had al-

Source: Gum Technology



Sodium alginate molecular cocktails

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ready been done. Then two chefs, Ferran Adrià and Heston Blumenthal, debunked that misconception. They explored the uncharted territory of industrial ingredients and equipment by using the scientific approach of a food scientist who works in an R&D lab. Tony Blake, a food scientist from Firmenich who collaborated closely with Blumenthal, shared this memory with me: “Blumenthal and Adrià were doing similar things at the same time and only met in Spain just before Heston got his third Michelin Star and his restaurant knocked El Bulli from the top spot. There has always been a bit of copying of ideas from each other and some friendly rivalry, but both set off down their separate roads independently.”

Adrià gained notoriety in Spain in the 1990s by tapping emotionally into a sixth sense, via culinary deconstructionism – namely, breaking down a familiar dish into its individual components and rebuilding it with a new physical identity, while maintaining its sensory identity. He did this by leveraging techniques such as emulsification, spherification (see outbox), low-temperature freezing, creation of foams, and savory frozen preparations. Blumenthal — owner of the Fat Duck in Bray, Berkshire, England, and voted the best restaurant in the world in 2005 by Restaurant magazine — credits Harold McGee and his 1986 book *On Food and Cooking* with encouraging him to question standard kitchen practices. Blumenthal is known for his meticulous scientific approach to cooking and his use of liquid nitrogen, heat-stable gellens, and dry ice in the kitchen. Most of Blumenthal’s early research was by trial-and-error, because no simplified food science guides

that correlated these ingredients with culinary arts were available. However, in the late 1990s he connected with Dr. Peter Barham, of Bristol University, who helped him extract flavor compounds, and with Tony Blake, VP of food and technology at Firmenich, who introduced Blumenthal to the Firmenich R&D laboratories and gave him the scientific guidance he needed to expedite his techno-culinary and flavor concepts.

Misunderstood Role

The cooking style that these two chefs started has caused some media controversy. Uninformed journalists often criticize them for cooking with chemicals or creating “Frankenfoods,” which is not only incorrect but also propagates a misunderstanding about food scientists’ role in the industry. Fortunately, both Adrià and Blumenthal have defended the honor of food scientists.

In his *Fat Duck Cookbook*, Blumenthal writes, “Food companies are often viewed with suspicion in part because they are seen as inventors of bad practices that bedeviled the processed food market. But in fact many of the techniques developed by the scientists in such companies are extremely good; it’s just the uses they’re put to that are sometimes dubious.” Adrià was quoted by Andrew Coleman in his 2010 biography *Ferran* as stating,



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with bread and chocolate in hand, “Scientists study both of these, and these are products we eat every day. What is strange about this? Science has been in the kitchen forever. What’s new is the dialogue between scientists and chefs.”

Mass Acceptance

Blumenthal and Adrià, the pioneers of modernist cuisine, have influenced many chefs who are exploring science-inspired techniques. Some who excel at this in their restaurants include Wylie Dufresne (WD50, NYC), Grant Achatz (Alinea, Chicago), Homaro Cantu (Moto, Chicago), and José Andrés (minibar, Washington, DC). While some restaurants focus exclusively on cutting-edge dishes, other more low-key restaurants

might use hydrocolloids in some appetizers and desserts. As this cooking style becomes widely popular, we have now arrived at a point when anyone, professional chef or home cook, can buy a molecular gastronomy starter kit online or make his or her own savory foams using ISI retail-friendly gourmet whips. The secret is out, and it’s only a matter of time before fast food chains start introducing deconstructed versions of the classic burger-and-fries combo.

Help Desk Harassment

As chefs have become more interested in hydrocolloids, they turn to ingredient manufacturers for technical support. Although these companies will often provide such support to food scientists who

purchase by the truckload, they hesitate to spend time assisting chefs who may buy only a few pounds, which is a typical free-sample size to an R&D lab. Wylie Dufresne of WD50 told me in an interview, “I went to the IFT [Institute of Food Technology] show back in 2004 to get answers and was not taken seriously.” Dufresne now has established relationships with many companies, including National Starch, TIC gums, and FMC Biopolymer, but he still tries not to call them too often, because he recognizes that he is not a profitable customer. Allen Freed, President of Gum Technology, also notes that in the past few years his company has received many calls from restaurant chefs who want to experiment with hydrocol-

loids. Freed says he doesn’t mind because he enjoys teaching chefs and wants to further the concept of gum and their usage. Gum Technology has for years offered a basic Gums 101 course, designed to train R&D, Quality Control, Culinary, Purchasing, and Production in the basics of gums, their origins, functionality, characteristics, applications, and how they perform in formulation.

Chef Partnership

CP Kelco, an international producer of specialty hydrocolloids, has partnered with Le Sanctuaire, a specialty retail kitchen boutique that caters to fine-dining establishments and professional chefs. Fany Setiyo, their technical sales manager, provides her chef customers with personalized one-on-one lessons on how to use gums, modified food starches, and acidifying agents in the kitchen. Now, when chefs call CP Kelco looking for technical support, they are sent directly to Le Sanctuaire, where they can buy small quantities of “molecular” items such as sodium alginate and xanthan gum.

The CP Kelco ingredients that are sold exclusively by La Sanctuaire were selected be-

Maximizing Spherification



Spherification is the culinary process of shaping a liquid into round caviar ball shapes. The method involves blending together a flavored liquid like a vegetable or fruit juice with sodium alginate. The solution is then dripped into a calcium-chloride solution.

Ferran Adrià used this technique to create his famous liquid spherified olives and sodium alginate caviar balls add color and flavor to sushi rolls. The first patent for alginate/calcium setting systems was granted in the U.S. in the 60’s to the Donut Company of America. They used it for forming onion rings using a miniature donut maker dropping an

onion/alginate slurry into a calcium solution. The result was a totally standardized onion ring ready for frying.

Culinary Experimentation with Ingredients

Ingredient	Industrial Uses	Culinary Creations	Chef-Restaurant
Agar	Reduces sugar crystallization in icing gummy bear formation	Liquid Nitrogenized Faux Coconut Foam	Michael Gillet, The Bazaar
Sodium Alginate	Cold Gel formation in pies and custards	Spherified Mango Caviar	Ferran Adria, El Bulli
Guar Gum	Thickens sauces, provides mouthfeel to dairy products	Dehydrated Crumbled Buttermilk Foam	Jiho Kim, L’Espalier
Xanthan Gum	Stabilizer, texturizer and suspender for salad dressing	Salted Aromatic Cod Foam	Paul Librandt, Corton
Isomalt	Low calorie bulking agent, sugar substitute	Sugar Sphere Encapsulated Olive Oil	Ferran Adria, El Bulli
Lecithin	Emulsifier in chocolate and dressings	Beet Root Air Foam	Ferran Adria, El Bulli
Gellan Gum	Gelling agent in jams, particulate suspension (beverages)	Gelled and Grilled Milk Cubes	Jourdan Kahn, Red Medicine Restaurant

cause they function well in a restaurant test kitchen. Kelcrol Xantana T630, sold on the La Sanctuaire website, hydrates well in acid conditions without heat, so it can be used to create texture in lemon juice and vinegar. Gellan gum is another popular ingredient with chefs because of its heat-resistant properties. Dufresne uses it to make deep-fried Hollandaise sauce, and Blumenthal applies it to his flaming sorbets.

Industry pricing for these ingredients runs from \$4 to \$10 a pound, but Le Sanctuaire's prices range from \$34 to \$77 for 18 to 20 ounces. The higher price allows Setiyo to provide technical support because, unfortunately, chefs sometimes do not do their homework! When I interviewed Setiyo recently, she revealed, "Chefs will call me in the middle of service asking me why their emulsion didn't work. I ask them, did you experiment first?" Le Sanctuaire also offers hydrocolloid classes, either onsite in a chef's restaurant or at its San Francisco headquarters. Chefs don't have many options when it comes to purchasing these

specialty ingredients. Some are sold in health food stores, but there they are limited in supply and inconsistent in quality.

Natural Evolution

Chefs from the San Francisco Bay area should thank Adrià and Blumenthal for driving home the message to consumers and the media that ingredients like xanthan, guar, and konjac are natural and have been used for centuries to achieve viscosity and texture in the kitchen. These chefs can now meld the high-tech with the homemade – and "local and sustainable" with culinary science – and still maintain that northern California caché that celebrates farmers and sustainable ingredients.

A review of several Bay area websites reveals each restaurant's approach. Coi Restaurant (San Francisco) uses "flavors of place" but still "embraces modern cooking techniques." The restaurant called eVe (Berkeley) is self-described as "neo-artisanal" [it serves sous vide, jellied basil, and avocado mousse]. Commonwealth (San Francisco) "showcases first rate ingredi-

ents, incorporating modern techniques and diverse culinary approaches." The chefs at these establishments enjoy working with hydrocolloids but have relegated it to a supporting role in an environment that strives to be as local and sustainable possible.

Science Serving Art

The molecular renaissance that started in the early 1990s has spread far and wide. Not only are there "neo-artisanal" restaurants, but molecular gastronomy kits are now available online. Books like Blumenthal's *Fat Duck Cookbook* and Nathan Myhrvold's soon-to-be-published *Modernist Cuisine* explain in detail everything a home cook needs to know about the science behind what you do in the kitchen. Now that sodium alginate gum balls can be made at home, the mystique

and novelty of modern cuisine have diminished. Ferran Adrià will shut down El Bulli in July 2011, and it's fairly easy to get a table at Moto or WD50 these days. Consumers are hungry for something new, and everyone is waiting to see what Adrià comes up with in 2014.

In the meantime, molecular gastronomy, as it is incorrectly called, will persist in a more practical arena. Chefs will focus on the day-to-day applications that allow them to use ingredients once found only in laboratories to support and create dishes that are not the opposite of what we find in nature, but perhaps more natural than nature itself. In effect, the chefs are becoming more like food scientists. Their new-found scientific techniques will largely recede to the background, even though much of their artistry will depend on practical science. ♦

Source: Innova Market Insights



Heston from Waitrose Hidden Orange Christmas Pudding (UK) features this claim: "The candied orange in the middle of this incredibly moist Christmas pudding makes it very special. As it cooks, the essential oils from the orange peel infuse the pudding from the inside out."