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Food 2.0: Chefs as Chemists

By KENNETH CHANG

In September, talking to an audience of chefs from around the world, Wylie Dufresne of WD-50 on the Lower East Side of Manhattan waxed enthusiastic about a type of ingredient he has been adding to his restaurant's dishes.

Not organic Wagyu beef or newfound exotic spices or eye of newt and toe of frog, but hydrocolloid gums — obscure starches and proteins usually relegated to the lower reaches of ingredient labels on products like Twinkies. These substances are helping Mr. Dufresne make eye-opening (and critically acclaimed) creations like fried mayonnaise and a foie gras that can be tied into a knot.

Chefs are using science not only to better understand their cooking, but also to create new ways of cooking. Elsewhere, chefs have played with lasers and liquid nitrogen. Restaurant kitchens are sometimes outfitted with equipment adapted from scientific laboratories. And then there are hydrocolloids that come in white bottles like chemicals.

Xanthan gum, for instance, a slime fermented by the bacteria Xanthomonas campestris and then dried, is used in bottled salad dressing to slow the settling of the spice particles and keep water and oil from separating. Xanthan and other hydrocolloids are now part of the tool kit of high-end chefs.

"These ingredients are finding more and more of a footing in the traditional, free-standing restaurant," said Mr. Dufresne (pronounced doo-FRAYN) at the Starchefs International Chefs Congress in New York.

He noted that the hydrocolloids he uses came from natural sources and often had a long history in the cooking of other cultures.

"In our ongoing search of working with hydrocolloids, we're always trying to find interesting and new things and new applications," said Mr. Dufresne, who at times sounded as if he were talking to chemists rather than chefs.

And rightly so. Cooking is chemistry, after all, and in recent decades scientists have given much closer scrutiny to the transformations that occur when foodstuffs are heated. That has debunked some longstanding myths. Searing meat does not seal in juices, for example, but high heat does induce chemical reactions among the proteins that make it tastier. The experimentation with hydrocolloids represents a rare crossover between the culinary arts and food science, two fields that at first glance would seem to be closely related but which have been almost separate. Food science arose in the 20th century as food companies looked for ways to make their products survive the trek to the supermarket and remain palatable. The long list of ingredients on a frozen dinner represents the work of food scientists in ensuring shelf life and approximating the taste of fresh-cooked food.

"Ten years ago, or maybe a little more than that, no chef in a serious restaurant would be caught dead using

these ingredients," said Harold McGee, author of "On Food and Cooking" (Scribner, 2004) and the "Curious Cook" column, which appears in the Dining section of The New York Times. "Because they were industrial stabilizers for the most part."

Then a few chefs like Ferran Adrià in Spain and Heston Blumenthal in England started experimenting. "They asked what can you do with these ingredients that you can't do with other ingredients," Mr. McGee said.

Despite its imposing name, a hydrocolloid is a simple thing. A colloid is a suspension of particles within some substance. A hydrocolloid is a suspension of particles in water where the particles are molecules that bind to water and to one another. The particles slow the flow of the liquid or stop it entirely, solidifying into a gel.

Cornstarch used as a thickener is a hydrocolloid. So is plain flour. But the properties of hydrocolloids differ widely, depending on their molecular structure and affinity for water.

Today, Grant Achatz, chef of Alinea in Chicago, uses agar-agar, which is a hydrocolloid made from seaweed that is best known for growing bacteria in petri dishes, and gelatin, a more familiar hydrocolloid made from collagen in meat, to make transparent sheets that he drapes over hot foods. For a dish made of a confit of beef short ribs, he wanted to add a taste of beer so he draped a veil flavored with Guinness on top — "a thin, flavorful glaze that ensured the diner would get some beer flavor in every bit of the dish," Mr. Achatz said. Plain gelatin would simply melt, and ruin the effect.

Even chefs far from the avant-garde use hydrocolloids. David Kinch, the chef of Manresa Restaurant in Los Gatos, Calif., known for ultra-fresh and ultra-local ingredients, makes purees of vegetables. To keep water from leaking out, he adds a touch of xanthan gum.

One of the dishes Mr. Dufresne presented in his Starchefs talk was what he called "knot foie," a result of experimentation combining xanthan gum with konjac flour, made from a tuber long used in Japanese cooking.

"We've had konjac flour in the kitchen for a long time, and we just hadn't used it," Mr. Dufresne said. "We realized, after reading, that it has a really interesting synergy with xanthan gum. It makes a kind of funky, strange gel on its own, but in conjunction with xanthan gum, which on its own won't make a gel but is just a thickener, it makes a really interesting, very elastic product."

He continued: "So we thought, well what could we take that normally wouldn't behave like that but would be really interesting. And almost instantly, we came up with the idea of foie gras."

One wall of the WD-50 kitchen, with metal shelves filled with white bottles of hydrocolloids, looks almost like a pharmacy. Mr. Dufresne's reading material includes "Water-Soluble Polymer Applications in Foods" and "Hydrocolloid Applications: Gum Technology in the Food and Other Industries."

Like scientists, Mr. Dufresne and his staff experiment, recording their observations and findings in notebooks. Using butter — much cheaper than foie gras — they began a series of trials in May to determine the ideal proportion of konjac to xanthan, which turned out to be 70 percent konjac, 30 percent xanthan in a 0.65 percent concentration.

"It's a recipe," Mr. Dufresne said.

In addition to flexible butter, Mr. Dufresne also has a recipe for a butter that does not melt in an oven. (That innovation has yet to find a place on his menu.) The latest experiments are how to make deep-fried hollandaise sauce, which he hopes to wrap into a variation of eggs benedict.

To make a flexible foie, a foie gras terrine is melted into liquefied fat, the xanthan and konjac are mixed in, and then a small amount of water and an egg yolk, which helps keep everything evenly suspended in the liquid, are blended in. The mixture is spread on a sheet, chilled, cut into strands and tied into knots. Hence, knot foie.

In the question-and-answer session, one person asked why Mr. Dufresne went to the trouble of making a foie gras terrine, a process that takes half a day of chilling, when the next step was melting it into a liquid.

"We were trying to be true and honest to that aspect of French cooking," Mr. Dufresne replied. He paused before adding, "And do something kind of crazy with it."

ATTACHMENT 21

Fact-Based Article Analysis

Note: The Fact-Based and Issue-Based Article Analysis sheets must be copied back to back.

When you read the article, did it present a certain point of view about an issue under dispute? If so, use the other side of this sheet. If the article informed you but did not raise any concerns, use this side.

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Write an article summary or definition in your own words. Do not list facts. Give an overview.

Draw a figurative representation.

List your questions (at least two).

What are the facts? List at least five.

List at least five key words.

Relevance to today: This is important or not important because . . .

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