CHEESE and SAUCE

a Perfect Match

Photo: Sargento Foods Inc.

By Tony Benedict
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One of my fondest memories of cheese sauce goes back to Vermont where my children Jack and Katie were born. Sunday was pasta day—where freshly cooked homemade noodles were topped with a simple cheese sauce made with fresh, natural, unsalted butter, a small amount of the pasta water and freshly grated Parmesan and Pecorino Romano cheese. We could smell the aroma of the cheese as it melted into the hot pasta, and see and taste the creamy butter and cheese turn into this effortless, yet perfect, sauce.

This imagery contrasts with early versions of sauce that, it is said, were used to disguise the taste of food, particularly spoiled food. I'm happy to report, though, that's no longer the case. Today, chefs use sauces to add flavor, texture and color to foods. Sauces enhance and complement what we eat.

Saga of the sauce

So, if sauce was originally used to hide the taste of foods, when did it morph into its new role as a flavorful cheese sauce? We can trace most sauces we currently use back to five basic, or "mother," sauces that evolved in Europe beginning in the late 1600s: béchamel, velouté, espagnole, tomato and egg-based emulsions such as hollandaise and mayonnaise. These sauces have survived so long because they are very adaptable, and they provide a foundation for

a considerable number of other sauces, including cheese sauces. For instance, béchamel and velouté can easily carry cheese thanks to their existing dairy components and *roux*—cheese fits into the body of these sauces.

Béchamel sauce, also called white sauce, is thought to have been created for Louis XIV by his personal chef, Pierre de la Varenne, and the recipe can be traced back as far as 1680. Béchamel sauce was made with scalded milk thickened with flour and butter. Later, adding hard Gruyère and Parmesan would create the French Mornay sauce, and—voilà—the cheese sauce was born. Some may argue whether this was actually the first cheese sauce, but, if not the first, it definitely ranks among the most famous, along with its counterpart Alfredo. The latter is a modern version of the basic Italian staple of Parmigiano-Reggiano, butter and garlic that was used to flavor freshly cooked pasta.

Indispensable aspects

Fast-forward to today, and cheese sauces are some of the most-valued and versatile food ingredients in a chef's repertoire. They add flavor, texture and color, and are a great medium to expand flavors. Cheese sauces are also the perfect foundation for new and exciting flavors, not only because of the cheese itself, but also because of the ingredients paired with the cheese.

The possibilities when making cheese sauce are endless, as long as you are lucky enough to be able to explore all the fantastic cheeses that are available, and you understand culinary cheese-sauce basics:

- Always use good, high-quality cheeses for sauces—cheap natural-cheese imitations can turn sauces grainy and lumpy and may not melt properly (processed cheese melts smoothly, but often lacks the flavor and character of natural cheese);
- If the cheese is too young, the curd (protein) may not be sufficiently broken down and can make the sauce stringy;
- Always add the cheese toward the end of cooking to capture flavors and to keep the sauce's emulsion from breaking;
- Cream is an indispensable ingredient for most white sauces—it can be reduced to almost any consistency, whereas milk and half-and-half contain more protein, less fat and are susceptible to curdling if not stabilized with starch;
- Cook over a water bath when possible, since high-dairy-solid cheese sauces and *roux*-thickened white sauces can easily scorch from direct bottom heat—most commercial dairies steam-inject sauces to cook them quickly without adding direct heat;
- Shred the cheese to increase surface area to speed the melt;
- Make sure the temperature stays below 180°F when adding the cheese to reduce curdling and separation.

A cheese sauce emulsion can break with too much cheese (solids) and not enough moisture to hold the cheese and/or fat in suspension. Just as important, high heat can coagulate the proteins to a point where the cheese will separate into fats and solids, leaving a greasy, stringy look. For this reason, in a kitchen setting, the sauce is cooked to almost finished, and the cheese is added toward the end. The flavor and the aroma of the cheese will be better captured, plus the cheese will have ample time to melt into the sauce, but not to the point of separating.

Most cheese sauces today are usually based around what I call "the big three": white sauces, such as Alfredo, made with cream and/or milk; Cheddar-based sauces for pasta, like mac-and-cheese; and *queso* sauce, which in American terms can be anything Tex-Mex, but usually refers to Cheddar sauces with chiles, tomatoes or salsa, and is used for dishes like nachos.

While these are the basic sauces, limitless variations can be made from them. Whereas yellow Cheddar may have been the standard for mac-and-cheese in the past, now you're seeing combinations of white Cheddar with Gruyère and other sharp-flavored cheeses. Smoked Cheddar is becoming very trendy, especially in the adult sector, for baked mac-and-cheese, or—with a lighter viscosity—on other pastas like fettuccine. There is also a definite marketing advantage to using excellent local artisan cheeses and specific imported cheeses to call out the regional nature of a dish.

Why cheese?

The obvious reason to add cheese to sauces is because it tastes good. But there's so much more beyond that. Cheese is rich in fat and a great carrier of flavor, so adding cheese to sauces enhances the overall richness, mouthfeel and flavor. Cheese is also often added to sauces as a finishing component to add body, flavor dimension, color and aroma, all in one or two simple ingredients.

Cheese is also used where fresh, sharp flavors are desired and as a flavor foundation where the cheese flavor is enhanced by the long, slow, cooking process, resulting in caramelized and cooked dairy notes. This would happen in an Alfredo made with Parmigiano-Reggiano and Romano that's cooked on the stovetop, and then finished in the oven.

As noted, cheese in a sauce adds a multitextural dimension to the overall mouthfeel and organoleptic properties, which is unobtainable in *roux*-thickened sauces without the addition of cheese. Certain hard and aged cheeses, like Parmesan, can add umami, when a savory, meat-like quality is desired. Cheese and cheese sauces can be integral to completing a dish's flavor. More importantly, they can impact body, as with baked *queso* sauces, baked pasta dishes (such as baked mac-and-cheese with sharp Cheddar and Gruyère, or lasagna made with traditional béchamel, Parmigiano-Reggiano and pecorino Romano) and can complete side dishes, such as gratins and a variety of fondues and dips (such as Spinach-artichoke dip with fontina, Gruyère and Parmesan, or Asiago and fontina).

Making the sauce

It's important to remember that cheese sauces are more than melted cheese. They blend natural and processed cheeses and other ingredients that, when combined and used correctly, can offer a wide variety of flavors and textures: thick, thin, smooth or chunky, and mild or spicy and sharp. Cheese sauces are flavorful and functional ingredients that complement and add value to other foods.

True, clean and fresh ingredients will always make the best sauces—fresh full-fat cream, butter, aromatics and, of course, the best cheeses. Some great cheese obviously should be eaten alone, yet when combined with other proper and beneficial ingredients, will make a superb sauce. A perfect cheese sauce should not hide, but rather carry and promote the flavors of the cheese being represented and the main component. For example, a great Alfredo sauce should be very simple with just a few fresh, high-quality ingredients—fresh cream, Parmesan, butter, garlic. Simple variations on Alfredo might involve accents via finishing cheeses, like Romano or Asiago, or adding roasted garlic.

When creating cheese and dairy sauces, factors to keep in mind are: type of cheese, application, flavor building blocks of the dish, functional components of the dish, mouthfeel, dairy notes, cooked dairy, creaminess, fat, richness and subtle flavors of the cheese itself. A perfect cheese sauce should, ideally, have a consistency slightly thicker than reduced cream. Again, this depends on the end application. The sauce should also have good color and sheen. Obviously, the cheeses used will impact some of the color, such as when working with colored-Cheddar sauces.

A thinner sauce might be called for in cases where it needs to go through an additional cooking step. A common example would be a sauce that goes into a baked pasta. Here, the starches from the pasta and the additional cooking will reduce the sauce to the correct consistency and body. Similarly, some cheese-sauce applications contain starch systems that hydrate when heated and are intentionally left thinner when cold—for example, pasta dishes designed for end-user baking or microwaving. The thinner body allows the sauce to fully coat and mix with pasta without additional mixing or stirring. Also, if added to a sauté application, the sauce needs to be slightly thinner beforehand to cook down to the correct consistency.

Choosing the right cheese

The different ingredients and processes used when making, maturing and processing a cheese result in a variety of cheeses that function differently in prepared foods

and sauces. Each cheese has a distinct texture and flavor profile that directly translates into the cheese sauce.

All cheeses do not act the same when cooked. Natural cheese can vary in moisture content, flavor, age, color, texture, acidity and many other factors, and different types of cheese perform different functions in sauce applications. To understand this, one needs to understand the makeup of the cheese and the other sauce components.

Managing the quantity and quality of protein in a cheese sauce is very influential in achieving the desired viscosity. As cheese ages, fats and proteins break down into shorter units that increase the flavor profile. However, the same series of events also means aged cheese has less of an ability to blend into a smooth, stable emulsion, and could result in a thinner sauce with a grainy, or "curdy," texture and less cling. Most often, a blend of cheeses and/or cheese ages will help control viscosity and achieve flavor balance. Combining younger cheeses with aged cheeses achieves the desired creamy consistency along with the stronger impact of the sharper, aged cheeses. When cost is a factor, hard or aged cheeses, with their sharper flavors, can add a lot of flavor without using a large quantity of cheese. The body and volume of a sauce can be increased with water along with other dairy solids, whey proteins and/or dry milk powders. They can also be tightened with starch systems.

Scaling up

The techniques for making good cheese sauces at the bench start out exactly the same way they do in the kitchen: great cheese, dairy and other quality ingredients. As in the kitchen, I try to source the best ingredients first and go from there. I know that the gold standard sauce I develop has to be able to be duplicated authentically for the customer. The challenge is to achieve the same result in the much-larger scaled-up version.

Most commercial sauces are engineered for quick cooking and maximum throughput efficiency, so reliance on flavor systems, fat stabilizers and starch-based thickeners is necessary to copy, as closely as possible, the gold standard sauce. Water is also a primary ingredient in many manufactured cheese sauces. It's supplemented with whey protein, dry dairy powders and fat replacers to mimic cream and other dairy. These formulations are desired for their shelf life qualities—resistance to fats breaking down or turning rancid, ability to stay emulsified at refrigerated and at ambient temperatures—as well as their ability to replace

Photo: Sargento Foods Inc.

expensive cream and lower overall cost. Optimizing pH, salt and water activity (a_w) can allow these sauces to be shelf stable at room temperature for an extended time.

When making cheese sauces for industrial customers, I am asked to capture fresh flavors, sauté and roasted notes, fresh colors, aromas and, of course, fresh cheese flavors and profiles. To satisfy these requests, I can use flavor systems to copy and enhance almost any sauce process step, from sweating to reductions. There are numerous excellent wine and alcohol reductions, flavor enhancers (natural and artificial), cream replacers and a seemingly endless list of flavors, ranging from herbs, sautéed and roasted vegetable flavors, and a limitless supply of cheese and dairy concentrates. Wine reductions would go well with aromatic vegetable flavors that might replace any vegetables or herbs, such as shallots, onions, bay leaf and garlic, present in the gold standard. Along with these flavors, the dairy and cheese notes can be further accented with cheese and dairy flavors, and enzyme-modified cheeses.

The richness or creaminess of a sauce can be enhanced by cream replacers that employ high-shear cutting of the fat into a stabilized solution of liquid and dairy solids. This type of process not only enhances the mouthfeel of the sauce, it can reduce overall ingredient costs and can improve the functional cling properties that certain sauces need.

Even more challenging are sauces that call for longer refrigerated shelf life and shelf-stability requirements. Depending on the customers' cooking and holding parameters, cheese sauces can be formulated to be either frozen, refrigerated or shelf stable. To ensure total food safety for sauces, the proper use of preservatives is sometimes critical, but, unfortunately, this often results in notable differences in flavor and finished-sauce quality

from the original. Frozen sauces—the closest to kitchen-made—will be good for only a few days after thawed. Sauces that have lower a_w, higher salt and lower pH can stay safe at refrigerated temperatures for weeks and even months. Shelf-stable sauces have salt, pH and a_w at levels where they will stay safe for extended periods of time at ambient temperatures.

To overcome these differences, selecting the correct organic acid to complement a flavor of the type of cheese in the sauce can often limit the flavor impact of preservatives. In the same regard, one preservative does not fit all applications and will have different effects on flavor.

Many sauces manufactured for the foodservice market have a pH less than 5.8 and an overall a_w low enough to prevent microorganisms from growing. These might be in the form of concentrates where additional water is added by the user. Cleaner-flavor and preservative-free sauces usually have to be frozen.

Looking ahead

I see the future of cheese sauces encompassing more ethnic cheeses and cheese blends. We'll also see more use of artisan-style cheese and cheese with specific marketing points, such as Point Reyes blue from California, or cheeses with identifiable brand names such as Grafton Village Cheddar from Vermont or Roth Käse Gruyère from Wisconsin.

These types of cheeses will most likely be used in small, high-end restaurants, while eventually working their way up to casual chains. There is still a large focus on high-end food quality, and more food adventurers are looking for different flavors and will opt to buy locally whenever possible.

Cheese sauces and cheese solutions will continue to reign as the all-encompassing, versatile, comfort, fun food that can act as dressings, dips, spreads and toppings. As restaurants continue to look at the cross-functionality of food items that can expand across the menu, deliver exciting new flavors, be cost-effective and continue to rise in popularity, cheese sauces will emerge as primary options, especially because they can be produced for almost any type of application.

Factors most addressed in casual and quick-serve chains relate to operational efficiencies: Can it hold for extended periods of time? Can it be easily microwaved without breaking? But on the flavor side, cheese sauces that can be cross-functional on the menu will also have great impact. A microwavable, spreadable sauce with lots of particulates (chicken, beans, herbs, etc.) and lots of flavors can work as a dip or stirred into soups, or function as a spread on a wrap.

Also, major advances in low-fat and reduced-fat cheeses have led the way for lower-fat cheese sauces. Heat is also a big trend showing no signs of abating. With popular chiles, such as jalapeño, chipotle, habanero and ancho, we now can look to natural cheeses and sauces that are produced with these hotter chiles to help carry and balance robust, fun flavors while delivering the spiciness that customers are expecting.

Tony Benedict came to Sargento Foods Inc., Plymouth, WI, as development chef in 2006. He has served as chef at The Rattlesnake Club, Detroit; corporate executive chef/director of R&D at Carla's Pasta; executive *sous* chef and chef Instructor at New England Culinary Institute; and chef at a variety of restaurants, hotels and resorts. Benedict is an active member of the Institute of Food Technologists and the Research Chefs Association and has received numerous awards recognizing his culinary expertise. He is married, has two children and resides in Plymouth, WI.

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