

Why do we love snack food?

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Snack foods are a must for a game day party. Many of the finger foods that football fans will enjoy while watching the big game are manufactured in Pennsylvania. Credit: Patrick Mansell

Although the Steelers and Eagles didn't make it to the Super Bowl this year, Pennsylvania and Penn State will still be represented on game day—on your plate. And more likely than not, Penn State experts have had a hand in developing, or evolving, many of the Keystone State's famous finger foods.

While Nittany Lion alumni will represent Penn State Feb. 2 at MetLife

Stadium, Pennsylvania food industries' wares will be served at Super Bowl parties nationwide. Companies from around the commonwealth—referred to as the snack food belt—supply many of the Sunday afternoon munchies enjoyed while calling plays from the couch.

If your potato chips are from Utz, Middleswarth, Martin's, Snyder's of Hanover or Snyder of Berlin—just to name a few—the snack came from some region of Pennsylvania.

The state isn't just about spuds. Pretzels, Peeps and peanuts also reign supreme. And of course, chocolate—Hershey and Mars among the largest. All kinds of sweet and savory foods are made in Pennsylvania, and Penn State researchers representing one of the top food science programs in the nation have helped improve companies' products, including some famous brands not readily associated with the Keystone State.

"In addition to chocolate and confectionery, you have the chippers—potato chips—nuts and other kinds of things you might even not necessarily consider snack foods. In Muncy, you have Kellogg's making Pop-Tarts. You have Frito-Lay with the chip factories in Williamsport," said Greg Ziegler, Penn State professor of food science. "Then, obviously, pretzels. And then in the best of all worlds: Chocolate-covered pretzels."

Why is Pennsylvania home to many of these products? "Both chocolate and pretzels have a heritage extending back to the Pennsylvania German ethnicity that we have around here," Ziegler said.

Factors like location and infrastructure also play a role. "Since Pennsylvania is within 500 miles of 40 percent of the U.S. population, certainly the East Coast population, we're very centrally located" for widespread production and distribution of these kinds of shelf-stable

foods, he said.

In general, Ziegler explained, there are three kinds of operations in the overall food industry: supply-oriented industries, where the raw material, such as meat, is the important factor; demand-oriented industries—like the bread industry—in which it's cheaper to produce products very close to the market; and footloose industries.

"These are not industries that are bound by supply and demand, but they tend to locate where there is the infrastructure, things like shipping and a good labor pool," he said. "Probably most of the snack food industry in Pennsylvania would be considered the footloose."

For chocolate, Ziegler points to the need for sugar and cocoa, which doesn't grow locally. "For a long time, a lot of cocoa came in through the port of Philadelphia," he said.

The science of salty and sweet

Penn State shares a slice of the proverbial pie, too. Beyond its famed creamery, the University has a wealth of knowledge and research dedicated to many kinds of sweet treats.

In fact, the food science department has had an endowed graduate fellowship from the Pennsylvania Manufacturing Confectioners Association for more than 25 years. The current PMCA scholar is working on astringency, "the puckering, drying feeling that you get when you eat chocolate and some other foods," Ziegler explained.

[Read more](#) about Greg Ziegler's research studying individuals' tolerance levels of bitterness in chocolate.

The work combines Ziegler's confectionery expertise with assistant

professor John Hayes' sensory research.

"This is very relevant to the chocolate industry because if you think about all these high-cocoa polyphenol chocolates that are supposed to be healthy for us, these dark chocolates are bitter and astringent," Hayes said.

Hayes oversees a wide range of sensory research at the University. "We work on burn, bitterness and astringency, which all seem sort of unpleasant, but when you think about it, beer that isn't bitter isn't any good," he said. "Burn sounds unpleasant, but then when you put it in context—'During the Super Bowl, I'm going to serve mild, medium and hot salsa'—you're catering to people who prefer different levels of heat. We try to understand why in our lab."

Penn State researchers have found that spice preferences and other types of taste preferences—such as with bitter non-nutritive, or artificial, sweeteners—vary depending on factors including personality and biological makeup.

[Read more](#) about John Hayes' genetics-based sensory research of bitter foods.

The goal is to help the food industry to understand market segments that are untapped and how to split people into better-defined groups, rather than by traditional demographics.

"We do a lot of work on what we call biological market segmentation and trying to understand the factors that drive people to like certain products," Hayes said.

Researchers have found that taste for a sweetener isn't universal, so it might not be the case when a person claims to dislike all diet soda

products, which use a variety of these artificial sweeteners.

"Just because you like or dislike one non-nutritive sweetener doesn't mean you're going to like or dislike another," he said.

Hayes also directs the Sensory Evaluation Center, which works directly with food companies, including many from Pennsylvania.

"We do a lot of basic research on taste perception, but we also do a lot of applied work for the [food industry](#), everything from straightforward product reformulation—when a local mom-and-pop company in Pennsylvania wants to launch a new product but they don't have their own sensory group, they'll come to us—to transnational corporations that want to reformulate a product to make it healthier by reducing the amount of salt," he said.

[Read more](#) about John Hayes' study of "supertasters" and others' salt consumption preferences.

The center tests between 300 to 500 people a week, and employs about 15 part-time students each semester to run the tests, which may include trying out a new product or testing the shelf life of a food that is microbiologically safe but might not taste as good.

The center has a database of about 900 people who have volunteered to be on an email list of participants. For each new project, a questionnaire is sent to screen participants to find users of a product. Participants earn \$5 per visit.

Student workers, who will often see more than 100 taste-testers in a one-to-two-hour window, learn a lot of useful skills, and full-time summer interns have the opportunity to write reports of their findings for company clients.

"It's a really great practical training opportunity for students," Hayes said. "Our undergraduate students can go out and get a job with a food company with more experience in routine taste testing than I had at the end of my master's degree because we have high volume testing going all the time."

Many of those jobs are right here in the Pennsylvania. Ziegler said employers who often hire Penn State food science graduates include companies like Heinz, Hershey, Mars and Giant Eagle, among many others.

Whether they apply their knowledge at Pennsylvania companies or multinational companies around the world, graduates are taking with them experience working with a diverse faculty with an eye for improving not only product quality but also health.

"Here, we have engineers, we have chemists, we have microbiologists, we have nutritionists, and these are people who have come from all different kinds of backgrounds. One of the things that makes it fun is the ability to bring all of those together in a cohesive approach to food," Ziegler said. "Food science, as an applied science, has some direct connections with not only industry, but consumers in the state, too. We would like a healthy economy and healthy consumers, so oftentimes we do our best in research to bring those two things together."

Dipping into healthier chips

Almost 60 percent of U.S. potato sales are to chip, French fries and dehydrated potato processors, according to the Agricultural Marketing Research Center. If you're feeling a little guilty diving into a bag of deep-fried spuds just weeks after making a New Year's resolution to watch your diet, reach for a bag of the multicolored chip variety instead.

As some small- and medium-sized companies market these rainbow-colored snacks as a healthier option, Penn State researchers are working to determine if there really are increased health benefits even after processing, said Jairam Vanamala, associate professor of [food science](#).

His research has shown that colored potatoes, such as purple potatoes, contain more anthocyanins, or anti-inflammatory, health-benefiting compounds.

While frying might not be the healthiest potato preparation option, Vanamala said early results show that some of the increased anti-inflammatory compounds found in colored potatoes are retained after frying. So colored potato chips, which originally contained more health-benefiting compounds, still hold more than their traditional fried white potato counterparts.

"Typically, it is assumed that the brighter the color the better," he said. "So, at the end of the day, it's about eating a rainbow."

As the marketing trend grows, Vanamala and his team are working to find better ways to fry a potato to keep more of the anti-inflammatory compounds.

"Right now we are trying to optimize the processes to make these [potato chips](#) maintain most of their health-benefiting properties," Vanamala said.

"As far as the research is concerned, my goal is to improve the health benefits of [food](#) products, particularly the snacks."

Provided by Pennsylvania State University

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