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By Heidi Happonen

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How to eat when you can't swallow

Jan Blake's eyes fill with tears.

Blinking, she looks up, and in a voice barely audible as her throat clenches to fight back an outpouring of emotion, she utters with conviction:

"I hated that feeding tube."

Blake, like many of the 15 million people in the U.S. suffering from dysphagia—a condition that inhibits the ability to swallow effectively—was remembering a time when her suffering was so severe that her life depended on a feeding tube inserted directly into her stomach through her abdomen.

After her battle with tonsillar cancer, Blake lost her ability to swallow traditional foods. Turning to meal supplement shakes after finally graduating from the feeding tube, she started to lose a dangerous amount of weight.

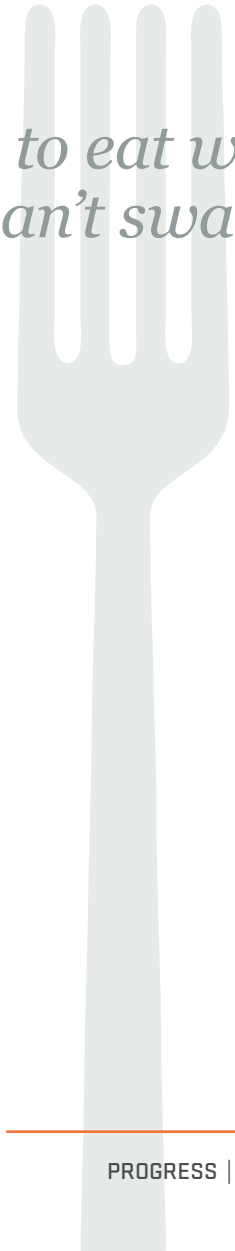
"Those shakes just started to taste like paste. All I wanted was to eat something that I could put my teeth to,"Blake added.

A patient of Dr. Reva Barewal, who had reconstructed her mouth and teeth following the cancer, Blake eventually regained the ability to eat some solid foods but continues to suffer from dysphagia.

A prosthodontist by trade, Barewal herself was born with a congenital issue where part of her lower jaw did not fully develop, making chewing difficult.

"It's what made me want to be a dentist," she explained. "It's what made me want to become a prosthodontist where I could focus on reconstructing the mouth, helping people to smile and chew again. I wanted to help others as I recognized the importance of oral health in making us feel whole."

In time, Barewal became more aware of dysphagia—and was surprised to learn just how pervasive it was—not only with cancer patients like Blake, but with patients managing changes in eating and swallowing that can come with a stroke, ALS, Parkinson's Disease and Alzheimer's Disease.



Jan Blake, who suffers from dysphagia, was one of several volunteers who helped OSU researchers test meltable solid foods.

Several of Barewal's patients suffering from dysphagia began to share similar stories. Barewal, who, in addition to her distinguished dental credentials, is also a trained chef, having studied at Le Cordon Bleu Culinary Arts Institute in Canada, took it upon herself to find a solution and began experimenting with foods in her home kitchen.

However, it soon became clear that the challenge of creating a crunchy, savory, nutrient-dense food that could melt in the mouth would require a level of food science expertise that wasn't taught in culinary school. That's when she learned about Oregon State University's Food Innovation Center (FIC) and reached out to both Sarah Masoni, the Director of FIC's Product & Process Development Program and Jason Ball, FIC's Research Chef and Faculty Research Assistant.

After explaining the challenge to them, Ball was initially nervous. Masoni, however, leapt at the opportunity to take on the project.

Recognizing the obstacles ahead, Masoni simply said: "We got this."

With Barewal's passion and Masoni's confidence, the team launched the collaborative project from FIC's lab.

"It was honestly one of the harder challenges we've faced," Ball admitted when recalling how it developed. "It's rare that we have such a specific textural requirement when we tackle a food project. And it would have been impossible without the support and participation of the very patients we were aiming to help."

Collaborative, Patient-inspired Research

The process for developing what would later be named "Savorease" started in FIC's food lab with different kinds of ingredients aimed at trying to achieve multiple goals.

The food had to be fortified with plant-based protein, crunchy, melt in the mouth, and actually taste good.

"While we were able to achieve some of our goals for taste and nutritional profile relatively easily, we struggled with other aspects of the development," Ball added. "We relied heavily on patient participants to help us understand the specific textural challenges associated with this type of product. Their perspective was invaluable."

Using a base of aquafaba—the viscous water in which legume seeds such as chickpeas are often cooked—the team at FIC collaborated on the development of a savory, crunchy, meltable cracker and puree dip that together would provide a nutrient-dense and calorie-rich snack for people who had difficulty swallowing.

These solid foods are generally referred to as "transitional foods." While there are a number of transitional foods developed for children—Cheerios™, Baby Mum-Mums teethers—these are made for an undeveloped palate. They are bland. They also do not meet the nutritional requirements for an adult.

Simply put, no adult wants to eat a Baby Mum-Mum.

The only way to truly know if the adult transitional snack food the team at FIC was trying to develop struck the right balance of nutrition, crunch, meltability and flavor was to work not only with people suffering with dysphagia but with the professionals that regularly make food choices for this group.

"We learned a tremendous amount from the patients that participated in our tastings," Ball said. "At first, I didn't realize what we were asking of them. The amount of courage required for participants to taste our prototypes was something that we had not initially considered. It was inspiring to witness such emotional tasting sessions."

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Jason Ball and Sarah Masoni at OSU's Food Innovation Center collaborated to help develop Savorease.

Blake was joined by another dysphagia sufferer, Ernie Brache, in tasting sessions.

Like Blake, Brache found it difficult to swallow following his cancer diagnosis and was forced to use a feeding tube non-stop for six months after treatment.

"The caregivers at OHSU saved my life, more than once. For which I am eternally grateful," Brache said. "But I was not prepared for the fact that I was no longer able to eat the foods I loved."

When his radiation and chemotherapy treatments were over, and he was cleared by his physicians, Brache celebrated by cooking himself a T-bone steak.

"I found it was impossible to eat. That shocked me."

Like many head and neck cancer patiences, Brache discovered that he was unable to swallow solid foods or anything with substance. He found himself relying on softer foods like creamy soups.

"I did not know or expect that when I was diagnosed with cancer. I had to adjust to a new normal," he said.

A year and a half after treatment, Brache went on an international business trip to his home country of Costa Rica. There he found a chef that prepared him a dish with plantains.

"I love plantains," Brache said. "It was the first time I started to have hope for the possibility to enjoy food again."

So, when Barewal asked if he would be interested in joining the study with FIC, Brache enthusiastically agreed.

"One of the things I missed most was the ability to eat the foods of my youth," Brache said. "When Dr. Barewal asked if I'd be willing to help in this study to create a cracker and dip and I found out I might be able to help influence the flavor of a black bean dip—one of my favorite foods—I was in."

Over the course of several months, the FIC conducted numerous tasting sessions. The unique approach taken was to include not only the voices of the people suffering with dysphagia, but those of the doctors and professionals who treat it as well. Refining the ingredients, texture and flavor profiles with everyone at the table allowed for many opinions to merge into a unifying solution. As an added bonus, the team found solutions to fit Savorease products into other restricted diets—such as renal, sodium-restricted, low glycemic, and chewing difficulties—expanding the audience of potential consumers.

Another FIC scientist, Qingyue Ling, later joined the effort to develop shelf stability. Additional occupational therapists and packaging manufacturers were brought in to assist in creating packaging that considered target consumers who may also have tremors, arthritis, or other afflictions limiting the dexterity of their hands and fingers.

Following the prototype product development, Ball and Barewal were able to secure the necessary Institutional Review Board (IRB) approval to test the dissolution speed of the crackers—the rate by which a solid becomes liquid—in comparison to other transitional foods on the market. Not only was this type of testing novel in the field of dysphagia research, it was also the first clinical trial conducted at FIC.

In addition, the team provided the full Savorease product line, which included the crackers, dips and instant soup blends, to Samantha Shune, assistant professor in the Communication Disorders and Sciences Program at the University of Oregon, for a trial she was conducting on improving snack choices for older adults living in facility care.

Over the course of that study, they learned that residents given a greater variety of snacks, particularly snacks that met diet restriction needs while maintaining preferred tastes, could experience improvements in nutritional health and food enjoyment. Notably, transitional foods could offer that possibility.

"The concept of transitional foods is not new. What's novel is we are moving transitional-state foods into the adult market. Snacks for adults simply don't exist for this population," Shune noted.

The primary challenge for individuals who have dysphagia is a lack of choice.

According to Shune, providing a variety of transitional foods made for adults helps patients not only satisfy their cravings, but experience the same social connection they did before dysphagia.

Social Isolation: An Equal Enemy

In addition to the physical health impacts that result from a lack of nutrient-rich and palatable foods, there are significant psychological impacts that come from the isolation inherent in an inability to eat traditional foods.

Dr. Shune's research focuses on the psychosocial side of dysphagia, and it is something she sees as an area that doesn't receive as much attention.

"Food is a central activity of daily life. So much of what we do is around food. If someone can't eat or can't eat the same types of foods that others are eating, they are often excluded," Shune explained.

Emily Triggs photo

Savorease products are highly nutritious snacks developed specifically for adults who have difficulty swallowing.

This exclusion can take the form of missing out on mealtime with family, "fake eating" to still participate in social activities, or simply not attending social events involving food.

"People don't often consider the power food has in social settings," said Barewal. "When you can't eat the same foods as the people you love, and they don't like the foods you eat, you become perpetually isolated."

This aspect of social isolation was perhaps the most difficult for Barewel to convey in trying to demonstrate the importance of adult transitional foods.

"A lot of people don't know about dysphagia to begin with," Shune added. "We all take for granted the ability to swallow until you can't do it. But once someone does develop dysphagia, both their physical and psychological health is at a higher risk. From the health side, we often see malnutrition and dehydration with dysphagia patients. It also definitely results in higher levels of anxiety, social isolation, and increased rates of depression."

Barewal sees, too, that the COVID-19 shelter-in-place orders and other measures across the world have raised the curtain on the issue of social isolation —particularly with older adults. According to the NIH, 94% of older adults live at home and their lack of social interaction has almost been an accepted characteristic of this growing population. Unfortunately, social isolation can accelerate conditions such as depression and cognitive decline. While the devastation of COVID-19 is real, it may have also inadvertently brought more awareness to the pain of social isolation for the elderly.

"Maybe now people will be more sensitive to the fact that being isolated is just as significant a health risk as the physical ones associated with people dealing with dysphagia," Barewal added.

Recognizing the opportunity to drive more attention to those negative health implications associated with isolation

Emily Triggs photo

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Savorease founder and prosthodontist, Dr. Reva Barewal, was born with a congenital issue where part of her lower jaw did not fully develop, making chewing difficult. She attributes that experience to her inspiration to become a dentist. More information about Savorease can be found at **savorease.com**.

has evolved Barewal's thinking about ways to launch the national rollout of Savorease snacks.

Prior to the pandemic, she had collaborated with the FIC to develop production, distribution and marketing strategies to make the product available to more people.

"I think we were really focused on initially introducing the products in nursing homes and hospitals, to the medical community, and speech and language therapists," Barewal said. "Post-pandemic, I think we can see a real opportunity to shed light on the fact that Savorease snacks can be delivered to your door, eaten at home, or brought to social settings with others who don't share similar eating challenges. Everyone can enjoy the same foods because these foods taste good. Savorease isn't another sweet, syrupy meal supplement shake. It's shareable. That's key."

The opportunity Barewal sees is to create a direct-to-consumer marketing strategy for Savorease, delivering the product to people suffering from dysphagia with a spotlight on the fact that it is tasty enough to share.

Barewal noted, "Now that more people recognize the power of sharing experiences together, including sharing food, I think more people can help raise awareness of this oft-overlooked condition where a key effect is an inability to eat many foods and the isolation that creates."

According to Shune, the most recent statistics demonstrate that 8% of people worldwide experience some form of dysphagia. But in specific patient populations, such as those who have had a stroke or are suffering from dementia, that number can dramatically increase, up to 80%.

"The potential for this is huge," Shune added. "It's an entirely new market for transitional state foods. And it's a market that's in dire need."

The New Normal and the Power of Interdisciplinary Collaboration

Ultimately, the interdisciplinary, cross-institutional collaboration of multiple organizations and individuals made this project a success. It required the dedication of time and resources of many people to create a product they so desperately wanted to see made available.

Masoni, reflecting on her experience, noted that she was personally affected by this project. It gave her the tools to help her neighbor who has a feeding tube and dysphagia as well.

"Reva's compassion and knowledge are what have really driven this project forward," Masoni added. "I'm grateful that I had the opportunity to contribute and gain a deeper appreciation for the complexity of the types of foods dysphagia patients can swallow, and the importance of flavor, along with the social aspects of eating. Allowing people to be present at the dinner table, or the luncheon with friends, by having convenience items that taste good and meet nutrition goals for their eating needs is a win-win."

The new attention being placed on our need for social engagement helps underscore the importance of meeting the nutritional—and emotional—needs of dysphagia patients.

The recent COVID-19 pandemic has demonstrated the power of virtual connection through teleconferencing services and those new insights will likely be a part of our new normal for some time. However, it has also shown us just how much we need to interact with each other. Social engagement, sharing lives together—these things are critical to both our psychological and physical health. And one of the primary ways we come together socially is over food.

As the general public gains awareness, they may see the importance of increasing food choices for a population that, by and large, has been suffering alone in silence.