

## Safe Food-Handling Procedures for Home-Prepared Blenderized Tube-Feeding

### Featuring:

**Teresa Johnson, DCN, RDN, FAND**

### TRANSCRIPT

**Maura Bowen:** Hello listeners, and welcome to Abbott Nutrition Health Institute's, Power of Nutrition Podcast. We're introducing a three-part series for you today, because if you visited ANHI.org in the last year or so, you may have noticed an increase in the education and resources we've shared on the topic of blenderized tube feeding, and this isn't by accident. And that's because we and our experts have noticed a growing interest in offering real foods as part of a healthy tube-feeding diet. And there are many great benefits to this approach, along with some considerations to keep in mind. So, we will spend the next three episodes discussing some of these points.

So, for this episode, Dr. Teresa Johnson, who is professor of kinesiology and health promotion at Troy University in Troy, Alabama is with us to talk about a paper she recently published with her colleagues to address the prevalence, the efficacy, and the safety of blenderized tube feedings. The paper is called Accepted Safe Food-Handling Procedures Minimizes Microbial Contamination of Home-Prepared Blenderized Tube-Feeding, and it was published in Aspen's Nutrition in Clinical Practice in June 2020. So, we'll post a transcript of this recording along with a link to Dr. Johnson's paper on ANHI.org Podcasts and Videos page.

So, let's get started. I'm Maura Bowen with Abbott Nutrition Health Institute, and I am delighted to introduce Dr. Johnson today. Dr. Johnson, thank you for joining us.

**Dr. Teresa Johnson:** Thank you, Maura, for this opportunity to participate.

**Maura Bowen:** Excellent. So, before we begin, I will note for the audience that I'm recording in the studio, Dr. Johnson is dialing in from her office in Troy. So, because of that, you may notice some slight differences in tonality across this recording. And then, Dr. Johnson, I always like to take a few minutes to properly introduce our guests. So, would you mind taking a moment to tell us about yourself and your background?

**Dr. Teresa Johnson:** Certainly. I've been a registered dietitian for over 30 years, so I have a very long background in a variety of settings, including inpatient, outpatient, rehab, and long-term care facilities. Mainly my work has been among children with developmental disabilities. I've also taught at the collegiate

level for about the same amount of time. I'm currently teaching nutrition courses for students who are seeking professional degrees at Troy University, like nursing, pre-med, PT, OT, et cetera. And I have degrees in nutrition from the University of Montevallo, Auburn University, and a Doctor of Clinical Nutrition from Rutgers University. And it's obvious my current research work is in blenderized tube feeding.

**Maura Bowen:** Well, thank you for that, it is such a pleasure to have you here today. And I wanted to make sure that we're starting with a foundational question. Can you tell us what is blenderized or real food tube feeding?

**Dr. Teresa Johnson:** Well, I don't know if there's a universally accepted definition of blenderized tube feeding, and for the purposes of this podcast, I'll just use the acronym BTF. But from a practical standpoint, BTF is just providing real food through a tube feeding. It can be blenderized whole food. It can be blended food added to a standard commercial product, what we call a partial BTF. We can also use BTF recipes from baby food or whole food based. The commercial formula industry also offers products made from whole foods as well. Patients and caregivers interested in this really have a lot from which to choose, and variety is the hallmark of blenderized tube feeding. It's a break from the monotony of just giving a standard product all the time.

**Maura Bowen:** That's very helpful. So, can you tell us a little bit about the history behind the use of this type of feeding?

**Dr. Teresa Johnson:** Well attempts to feed patients through a tube are documented on papyrus. So, it's been going on for a long time, and until the development of commercial formulas in the 1950s, people unable to eat by mouth were given real food, that was our only option. Although historically, this has been with very poor outcomes. As you can imagine in those days, according to our historical documents, attempts were made with eel-skin-covered whale bones and clay pipes, but great improvements were made with the invention of the blender and polyurethane tubing in the early 1900s.

And in those days' hospital kitchens prepared BTF using whole food ingredients that were delivered by bolus through those nasal gastric tubes. But then along came commercial formula. It displaced the use of whole food blends by the 1970s, because compared to BTF at the time, commercial is sterile, convenient, it has a known nutrient composition and was less likely to clog those tubes. And also, medical providers were more eager to cover the expense of that.

As undergraduates in the 1980s, we were told to never put food into a tube feeding, only water formula and maybe milk. And facilities developed tube feeding policies, prohibiting the use of food through the tube. But BTF never really disappeared completely. In areas of the world where a commercial formula is not an option, or a patient's provider doesn't cover the cost, BTF is used. And I've talked to dietitians who also got that

secret BTF recipe tucked away just in case where they have a family that they're not getting enough formula covered. So, they use it sort of as an adjunct to feeding.

**Maura Bowen:** Okay, that makes a lot of sense. And so that kind of leads me into the topic of demand. In your mind, why do patients and families and clinicians want to use blenderized or real food tube feeding? It seems like there's been that reemergence in the use of these feedings over the past few years. So, who is driving the use of these types of feedings?

**Dr. Teresa Johnson:** Wow, that is a great question. You are absolutely correct. Interest in use of BTF has re-emerged in the last 20 years, but it's not the healthcare professionals who are pushing it, it's the tube feeding community. They have responded to the message that clinicians are giving loud and clear on the benefits of diet variety, of eating plant-based diets, and trying to avoid highly processed foods.

**Maura Bowen:** Have you personally seen an increase in the use of this type of feeding by patients and families as well as clinicians in your own day-to-day?

**Dr. Teresa Johnson:** Well, most recently I'm doing more teaching, but from what I hear from colleagues, the fact that more papers are coming out on BTF outcomes, and the fact that commercial formula companies are developing whole food-based products, speaks to the increased demand. I saw an article not too long ago, over a dozen commercially prepared BTF products are available to parents. Now we only have a handful of studies like the survey that we made of pediatric RDs, but those reports corroborate what we're hearing. Half of healthcare practitioners have never heard of BTF, and many are uncertain of its safety and efficacy. Now in our study of pediatric RDs, I think you might find it interesting that the younger dietitians who had never heard of it were more interested in learning about it and supporting it than older ones like me who were trained, "Don't do it."

So, when I speak to groups about BTF, I usually find healthcare providers are either very open and supportive or interested, or they are against it. But as healthcare providers we really can't ignore the fact that patients and caregivers are interested in it and they're using it. I found that the BTF population is very passionate about their decision, and if they're not supported and assisted by us, they will likely go it alone. And they'll use sources that might not be the best, for example, we actually saw one question posted on a BTF website that read, "Should I cook this meat before blending it?" I was like, "Oh, my word." Thankfully, someone jumped on there very quickly and said, "Absolutely." So, we just can't ignore that it's happening. And we need to step in there and be those experts that people need.

**Maura Bowen:** Well, I think that's a fantastic segue into our next question, which is about the paper you published in 2018 with your colleagues related to the prevalence and the efficacy and the safety of these types of feedings. So, what did that paper show in terms of prevalence?

**Dr. Teresa Johnson:** Well, prevalence is a little bit difficult to estimate, because we feel like when people respond to BTF surveys, they probably know about it and that's why they recognize it. But at the time we reviewed the published literature we found five surveys. And about 50 to 60% of those surveys reported using blenderized tube feeding. Parents of tube fed children represent the largest group of people pursuing it. The papers we reviewed were based on populations in the United States and in the UK. However, it could be that those, as I said, who use BTF responded disproportionately than those using standard commercial products.

It's also possible that families add food to their tube feedings in addition to the formula, and they don't really consider that a BTF, or they don't want to admit it. For instance, we had some patients reporting putting food into their jejunostomy tubes, which is not a practice that we would recommend. But the answer to your question may depend on geographic location. Whole food blends are used much more frequently in other countries where commercial formula access might be limited. I think that the increasing number of food-based commercial formula products is a testament to the increasing demand and prevalence of its use.

**Maura Bowen:** So, you have made some references to the literature, kind of the body of research across this topic, but I know that you and your colleagues have conducted your own research on the safety of these types of feedings. So, what does your research say?

**Dr. Teresa Johnson:** Well, since we made that observation about the published work, we decided that two questions needed to be answered. "How does the bacterial load of blenderized tube feeding prepared and conditions expected of developed countries compare to commercial formula? And "Is BTF more likely to clog feeding tubes?" And the second question really came about because, today we have available to us some very high-power, high-velocity blenders that were not available in the '80s. And so, it seemed like that would be a good thing to look at as well.

So, Mayo Clinic donated a high-velocity blender for our first investigation. We selected two blenderized tube feeding recipes developed by UNC, Chapel Hill, and we made them at a local hospital. One of the recipes was made from whole food and the other was a comparable baby food blend. After we prepared those in the hospital kitchen, we took them to an empty patient room in the hospital and we set the pump to deliver those two BTF products over four hours.

Now, I know that's a violation of the recommendations. The current recommendations are that BTF be delivered over two hours, but we just wanted to see what would happen. And we delivered that into the trashcan, not into a real patient. We also hung standard commercial formula, and we ran those three mock feedings three different times, and we collected samples at baseline, at two hours, and four hours. We took those samples to the lab for testing. And even though we doubled the hang time and violated all the rules,

we found that all three feedings were acceptable for safe tube feeding based on the USDA guidelines. They were all clean. So, this was very much a different outcome than what is reported in other literature.

As far as the clogging goes, we had one clog with blended tube feeding and one clog with commercial formula, but both were easily resolved by manipulating the tube. And when it comes to a clogged tube with BTF, it's important to give consideration to ingredients in the recipe. Bread, stringy vegetables, peelings. These types of things are more easy to clog tubes. We cooked all of our ingredients thoroughly, except for the milk and the banana. And then we blended in a high-velocity blender for about four or five minutes, so that's also very helpful.

**Maura Bowen:** Okay. And also, in your 2020 paper by Milton et al in Nutrition and Clinical Practice, that's the paper I referenced in our introduction. It states that "The increasing home enteral nutrition population with their unique and wide-ranging healthcare needs warrants development of standards of care in home enteral nutrition." So, can you tell us a little bit more about what standards you think are needed?

**Dr. Teresa Johnson:** I think we need home enteral nutrition standards in general, and some that are specific to BTF, because the latter is more likely to happen in the home environment, instead of a healthcare facility. There's an excellent 2018 paper published by Gramlich in Nutrients that outlines recommendations for standards needed in home enteral nutrition. The authors describe things like admission criteria for the patients, the need for consistent access to a team. And that team needs of course to include doctors, dietitians and nurses, OTs, SLPs, and imaging specialists to support successful outcomes.

Now the home enteral nutrition population is very heterogeneous in terms of the home environment, the capacity of the caregiver, patient diagnoses, age, and presence of multiple comorbid conditions. But in addition to a complex patient population, tube feeding considerations are numerous. What's the enteral access? What type of feeding? Is there a formulary? And you'll find that they're different ones covered by different agencies. What sort of reimbursement issues must be negotiated? How can we troubleshoot problems? Patient and caregiver education for feeding, site care and how to avoid complications are among the many things that must be addressed.

Patients will need frequent nutrition assessment and oral evaluations, particularly if tube feeding weaning, is a reasonable goal. A communication protocol between multiple caregivers, sustained patient oversight, and consistent messaging from all the team members to that patient and family is paramount. Continued quality improvement should also be a part of standard practice. Gramlich's article highlights research showing that the standardized approach and the enteral, the home enteral nutrition population significantly reduces risk of infectious and metabolic complications. It reduces costs and maximizes the patient's quality of life.

**Maura Bowen:** I know that you have also reviewed the literature to determine the efficacy of these feedings. So, what does that research show?

**Dr. Teresa Johnson:** Great question. In 2018 we found there were six efficacy studies, and four demonstrated positive outcomes with BTF and two were negative. But since that paper was published, additional studies have been published, two in adult patient populations found that BTF reduced diarrhea in critically ill patients. And there was one other paper, it was a retrospective review paper comparing BTF to commercial formula in patients with head and neck cancer. And that paper found negative outcomes.

But I want to point out that we need to read beyond the abstract. In that study they didn't have a true control. And many patients in the commercial formula group actually switched over to BTF during the observational period. So, most papers demonstrate that BTF reduces symptoms of tube feeding tolerance. It supports weight and growth goals and reduces risk of infection and hospitalizations.

**Maura Bowen:** So, in your 2018 paper, by Carter et al in the Journal of the American Association of Nurse Practitioners, it stated that, "Blenderized tube feeding requires oversight by trained healthcare professionals, preferably registered dietitian nutritionist." So, can you talk to us a bit more about that?

**Dr. Teresa Johnson:** Certainly. Our surveys of healthcare providers reveal that only half are familiar with or use and recommend BTF in their practice. And that's not just dietitians. There've been a couple of other papers that have been published among nurses and physician's assistants, and it's still running about 50%. That means that half are not prepared to discuss or assist patients. And remember, in our survey of parents using BTF for their tube fed children, less than half were followed by a qualified provider. We know there is a substantial number in the tube fed population interested in or using full or partial BTF. And these revelations warrant a review of learning competencies of healthcare providers, particularly dietitians. Not every tube fed patient is a candidate for BTF. Patients need to be screened for its use. Dietitians need to be trained in it, perhaps even a certificate of training program so that healthcare providers can confidently refer appropriate patients to registered dietitians.

**Maura Bowen:** These are definitely excellent insights. So, what additional research do you think is needed in this area of blenderized and real food tube feeding, considering everything you just said?

**Dr. Teresa Johnson:** This is really low hanging fruit, Maura. There's so much that needs to be done. Most of the studies that we have are observational or retrospective, we need prospective randomized studies. One investigation that I think is really needed is to compare BTF head-to-head with hydrolyzed products when addressing tube feeding intolerance. Most studies so far had been done in children, and we need more in adults. I know of three studies that are published in the adult population, and we just finished one that we hope to publish soon. We need to look at the impact of the BTF on specific conditions like does a whole food

blend ameliorate inflammation, or does it help with wound healing? What is the impact on the GI microbiome? We already have some papers out there that hint at this, but we need some really direct observations. I'd like to see BTF used in our sickest of patients like the ICU setting.

**Dr. Teresa Johnson:** Anecdotally I've heard RDN's say that commercially prepared blenderized tube feeding is a little bit less effective in resolving tube feeding problems than home food blend feedings. So, if we can somehow quantify degree of BTF product efficacy, then I'd like to see those studies. Cost-effectiveness analysis studies are also needed. For example, whole food blend products offered by formula companies are more expensive than standard formula, but if BTF reduces the need for GI medications and antibiotics, if it reduces hospitalizations and the need for hydrolyzed formulas as some of our studies have observed, then perhaps it's actually more cost-effective.

**Maura Bowen:** So, with all that in mind, what do you wish more clinicians knew about this topic? And you know, kind of same question for patients and caregivers, what do you wish they knew?

**Dr. Teresa Johnson:** Oh wow. I'm being given granted wishes. This is great. So, this is what I wish. I wish more healthcare providers were less resistant to its use. It seems there's very little middle ground. I find either enthusiastic support or interest, or I find people have been unduly influenced by conventional wisdom. And it goes unchallenged in spite of what tube-fed patients are actually experiencing.

My second wish is that clinicians would revisit their facility policies if BTF is prohibited. We've had patients who are doing wonderfully in the home environment. They go into the hospital for another reason, and they have to come off their tube feeding. In an era of patient-centered care and evidence-based practice those policies against feeding whole food are rather outdated. One mother told me, "Do I really need permission to feed my child real food?"

My third wish is that clinicians would encourage insurance companies and other providers to cover the cost of BTF without requiring so many additional burdens on the patients to get that cost covered. Many patients today are proactive in their healthcare decisions, and I wish clinicians would give appropriate patients requiring to feeding a choice of real food product. Let me elaborate just a little bit here. The American Institute for Cancer Research, AICR, third expert report encourages cancer patients to eat a diet rich in whole grains, vegetables and fruits and beans and limit processed food. Multiple studies of cancer survivors demonstrate that if they follow a healthy plant-based diet, they can reduce their mortality by 22%. And conversely, if they follow a typical Western diet with highly processed foods, it increases their risk of death by 51%.

Unfortunately, studies of cancer survivors show that their diet quality is very low with a healthy eating index of only about 55 out of a potential score of a 100. What if cancer patients who require tube feeding during



their treatment were given a whole food blend? It could serve a two-fold purpose. It could reduce the side effects and poor outcomes associated with cancer treatments, and provide a teachable moment, convincing patients that following the AICR diet recommendations after treatment would confer some benefit for them.

**Maura Bowen:** So, I think we already know the answer to this next question, but I'll ask it anyway. Do you see this as a feeding practice that will continue in the future?

**Dr. Teresa Johnson:** I hope so. I've actually read or heard another professional in this area say that this particular observation and occurrence may be as dramatic as the introduction of commercial formula in the '50s. So, I'm sure it will continue, and I hope that BTF induces a significant change in how we think about enteral nutrition. I'd like to see the day when a whole food blend-based product is the standard house formula on formularies.

**Maura Bowen:** So, there was something that you mentioned before we started to record today, and you seemed very excited about it. It had to do with some research that you've done recently on blenderized tube feeding in head and neck oncology patients. So, I wanted to ask if you'd mind telling us a bit about that research?

**Dr. Teresa Johnson:** Well, because of the study I mentioned earlier, the retrospective chart study, where they found that blenderized tube feeding was associated with negative outcomes in head and neck cancer patients, we did our own study, and what we found overwhelmingly was a positive outcome. And I would love to share a little more, but I'll have to make this a teaser and say, "Wait for the published paper." The oncologists at the facility read the drafts and they are just overwhelmed by our results and very excited. And we're seeing a dramatic increase of use and even ordering it where it's not appropriate. The dietitians there having to say, "Wait just a minute. Yes, we know this is exciting, but it's not appropriate for everybody." Now I do feel like this is going to be another paper that will help people, feel a little more confident that it is an appropriate feeding, even in our sickest of patients.

**Maura Bowen:** Wow, that's Great. We like teasers here. So, don't be surprised if we ask you to come back to talk about the next study, but first as we're kind of rounding up this conversation, do you have any advice for clinicians who are working with these feedings to help them better help their patients?

**Dr. Teresa Johnson:** Absolutely. First, if you've never heard of BTF or you've been taught, it should not be used, please read the literature, and share with colleagues, seek to incorporate it into your clinical practice and note your own observations.

Second, educate yourself in detail on BTF, and it's not difficult to do. There's a lot of great articles. There are how-to guides, online presentations, and tools. There's even some resources to help build a good knowledge



base to help guide patients, recipe builders, all sorts of people out there that you can reach out to for assistance.

**Dr. Teresa Johnson:** Third, if you work in a facility where it's prohibited or not supported, challenge that status quo for the benefit of the clients that you serve. Isn't it ironic that we should have to get permission to feed people real food?

And I'll leave you with something that one mother wrote in response to our survey, "One day I read the ingredients on my son's can of formula and thought, he hasn't had a fruit or vegetable in seven years. I wouldn't feed him this way if he could eat by mouth. That day I switched to blended food and it was the best decision I ever made."

**Maura Bowen:** Wow. That's such a powerful way to end this discussion, and what an interesting body of work that you've been working through with your colleagues and all the research you've done. So, I really want to thank you so much for your time today. Excellent information, and what a perfect way to begin our series on blenderized tube feeding. So, you're a dream to interview. I hope you'll join us again sometime soon if you're up for it?

**Dr. Teresa Johnson:** Absolutely. I really appreciate the opportunity to be asked to share the work of our research team from Troy University and Mayo Clinic on this topic. I'm a convert. As we started out, I was a non-believer for many years, and I regret that I probably didn't help a lot of my patients because I was not convinced or unaware of the potential benefits. So, this has been a great opportunity to make amends for that. And you've been a great host. I hope our listeners found the information we've discussed today helpful and provocative.

**Maura Bowen:** I think they definitely will and thank you again. And for our listeners, if you're looking for more podcasts, including the continuation of this particular series, we'll have dozens and dozens across a variety of different nutrition science topics, and you can find them on ANHI.org by clicking Resources at the top of the page, and then Podcasts and Videos.

And I want to mention too that we have quite a few other blenderized tube feeding related resources, including a handful of self-study courses and a tube feeding guide for parents, and a helpful series of infographics we've created with families and caregivers in mind. So, when you visit ANHI.org, simply type "blenderized tube feeding" into our search bar, filter by content type if you'd like, and you'll find what you're looking for. I also want to note we're on Spotify now. So, if you are so inclined, look for ANHI's, The Power of Nutrition Podcast, and you can subscribe and tell your colleagues all about us. Meanwhile, thanks, everyone. Stay healthy and safe.