



The Safety, Efficacy and Tolerability of Blenderized Diets for Gastronomy-Fed Individuals

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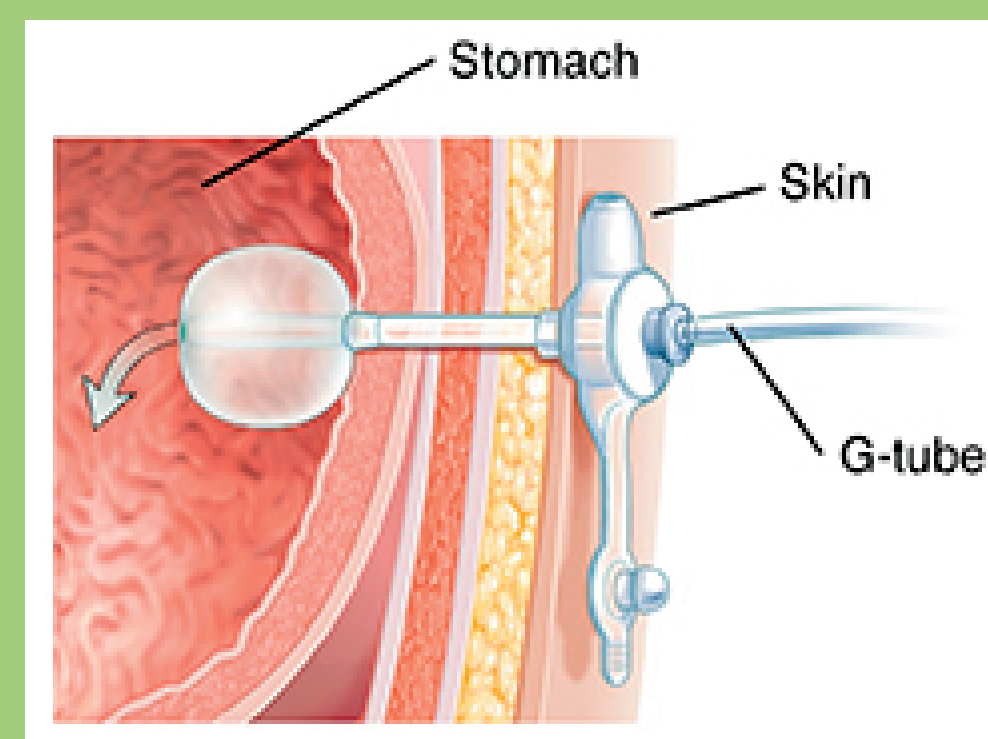
Introduction

Gastronomy tubes, more commonly known as feeding tubes, bypass the mouth and esophagus to deliver nutrients directly to the stomach when individuals cannot meet energy and metabolic needs through oral intake.¹

Tube feeding grew to prominence in the 1900s with the development of commercial formulas (CF). CFs are typically made from protein isolates, maltodextrin and sucrose, vegetable oils, vitamins and minerals. The argument for CF feeding is that it is nutritionally complete, free of bacterial contamination, and easy to administer.²

There is a current movement towards blenderized tube feeding (BTF). Blended diets are pureed mixtures of whole foods and liquids. Patients and parents perceive BTF as a more natural way of feeding with higher quality ingredients and potential benefits to health and quality of life. Surveys have shown that the majority of tube-fed patients use BTF in some capacity.^{3, 4}

Despite patient interest in BTF, many medical providers are not well educated on blenderized diets and are not confident recommending them to their patients. Major concerns related to BTF include the risk of foodborne illness, fear of clogged tubes, questionable nutrient content, and lack of resources.⁵



Research Questions

- How do blenderized diets compare to commercial formula diets in terms of microbial safety and nutrient content?
- Do blenderized diets improve patient health?
- Are concerns from medical providers regarding risks of blenderized diets substantiated?

Methods

A search was conducted in the PubMed database using the term "blenderized tube feeding." Reference lists were used to identify any relevant articles not found in the search. Information from 58 articles was used to answer research questions and write a comprehensive literature review.



Results

Study	Description	Findings
Bahramian et al., 2022 ⁶	-Five BTF diets formulated -Tested for nutrient content, microbial contamination and dietary inflammatory index (DII)	-All BTFs reached recommended macronutrient levels -No foodborne pathogens, yeast, or mold detected -DIIs negative, all BTF diets were anti-inflammatory
Batsis et al., 2020 ⁷	-23 pediatric patients -Transitioned from CF to BTF diets, followed for 1 year	-95% of patients had improved GI symptoms -22% decrease in use of acid suppressive meds
Chandrasekar et al., 2022 ⁸	-41 pediatric patients -Half of patients followed BTF diet, half CF -GI symptoms, growth and nutritional status of the two patient groups were compared	-Use of PPIs and pro-motility drugs 22% and 31% lower in BTF group -BTF group had significantly fewer complaints of stomach upset, heartburn/reflux, nausea, diarrhea and constipation -BTF group had healthier, more diverse gut microbiota -Caloric intake met EERs in both groups -All blood marker components in normal range
Fabiani et al., 2020 ⁹	-215 adult patients admitted to cardiac surgery ICU -Half followed BTF diet, half CF, observed for 8 days	-BTF halved the risk of developing diarrhea
Gallagher et al., 2018 ¹⁰	-20 pediatric patients -Transitioned from CF to BTF, followed for 6 months	-BTF group had greater micronutrient intake -Gagging and retching decreased from 82% to 47% -Increased bacterial diversity and richness in stool samples -100% would recommend BTF
Hron et al., 2019 ¹¹	-70 pediatric patients -Compared hospital admissions of BTF patients to CF patients over 1 year	-Total ER visits reduced by 43% -Total admissions reduced by 53% -Respiratory admissions reduced by 67%
Johnson et al., 2019 ¹²	-3 tube feeding formulas (CF, baby food BTF, and whole food BTF) prepared and held at room temp -Compared for growth of <i>S.aureus</i> , <i>E. coli</i> and coliforms at 0, 2, and 4 hours	-CF had no bacterial contamination at any time point -BTF did not exceed acceptable limits
Kernizan et al., 2020 ¹³	-35 pediatric patients -Transitioned from CF diet to BTF	-40% had improvement of gastroesophageal reflux disease (GERD)
Milton et al., 2020 ¹⁴	-50 participants prepared BTF in their home kitchens -Assessed for growth of <i>S.aureus</i> , <i>E. coli</i> and coliforms at 24 and 48 hours	-88% met the FDA Food Code guidelines for safety -11% met guidelines for marginal safety by other standards
O'Connor et al., 2022 ¹⁵	-43 medically unwell pediatric patients -Switched from a standard CF to one with food-derived ingredients, followed for 4 months	-95% had reduction in retching -85% had reduction in vomiting -90% had improvement in stools
Pentiuk et al., 2011 ¹⁶	-33 pediatric patients post Nissen fundoplication surgery with symptoms of gagging and retching -Started on a BTF diet, followed for up to 24 months	-52% had a significant reduction in gagging and retching -57% had increased oral intake
Samela et al., 2017 ¹⁷	-10 pediatric patients with intestinal failure -Slowly transitioned from CF diet to 100% BTF diet -Followed for 1 year	-90% had improvement in diarrhea and inconsistent stooling -Use of stool softeners eliminated -All maintained age appropriate weight gain
Schmidt et al., 2019 ¹⁸	-62 critically ill, adult neurological patients -Half followed BTF diet, half CF -Followed for 30 days	-61% reduction in number of liquid stools in BTF group -No decreases or differences in BMI

Discussion

Blenderized, whole food diets improve health outcomes and patient satisfaction. Varied, well designed diets are capable of meeting the nutrient requirements of medically complex children and adults.

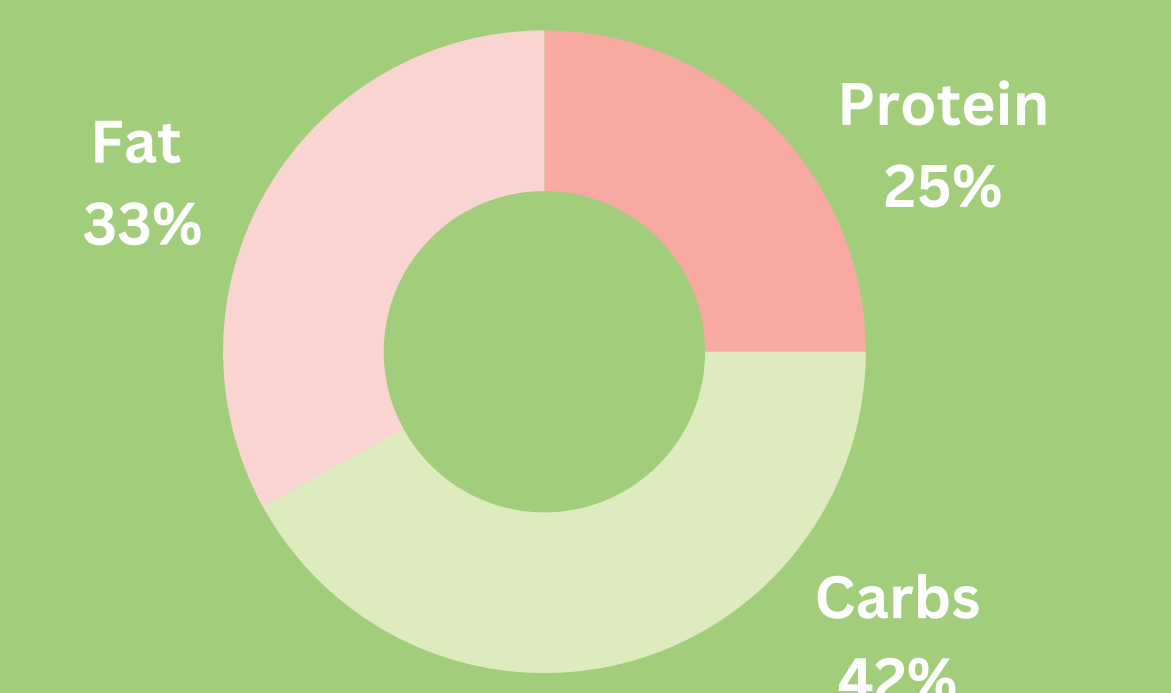
In terms of microbial safety, homemade blenderized feeds are comparable to commercial formula. Concerns for foodborne illness by medical providers may be overstated.

To start a blenderized diet, patients should be at least 6 months old, have mature gastronomy sites with 14-Fr+ tube sizes, and have the physical and financial means to prepare blenderized meals.

Next steps include creating evidence-based guidelines and recipe resources to increase patient and provider education.

1 Day Meal Plan

	Protein (g)	Carbs	Fat
Breakfast			
1 c whole milk	8	12	8
1 c oats	10	55	5
1 tbsp olive oil	-	-	14
2 eggs	12	1	10
1 c spinach	1	1	-
1/2 c diced tomato	1	3	-
Lunch			
1 c water	-	-	-
4 oz canned oysters	18	4	6
1/2 c rice	2	23	-
1 orange	1	16	-
1/2 avocado	2	7	11
handful fresh herbs	-	-	-
Dinner			
1 c whole milk	8	12	8
4 oz chicken	35	-	4
3/4 c quinoa	6	30	3
1/2 c carrots	-	6	-
1 tsp cinnamon	-	2	-
Snack			
1 c bone broth	9	-	-
3/4 c plain greek yogurt	16	8	4
1/2 c frozen berries	-	11	-
1 banana	1	27	-
1 tbsp peanut butter	4	4	8
Totals			
Calories: 2095			
Protein: 134g			
Carbohydrates: 222g			
Fat: 81g			
Fiber: 33g			
Calcium: 1240mg			



References

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