

# Clinical Experience of Enteral Nutrition with Real Food in Children

We have seen increasing interest in using blenderized real food for enteral nutrition. How is the trend evolving, what is the impact on paediatric patients and should it be supported by healthcare professionals?

## Enteral Nutrition for children with neurological and gastrointestinal impairment: implementation of real food in clinical practice



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Until the 1970s, there was no commercial formula for enteral feeding; patients were hospitalized and given blenderized traditional food made by dietitians. By the 1990s, commercial formulas were available for use in the home.

Enteral nutrition is an effective tool for supporting children with chronic conditions, particularly neurological and gastrointestinal conditions, who would otherwise be at risk of undernutrition. The standard polymeric formula is suitable for the vast majority of patients and comes in a variety of forms to suit children of different ages and with different needs.

While standard formula is typically well accepted and tolerated, digestive problems are also common. Gastrointestinal symptoms such as vomiting, regurgitation, constipation, bloating, diarrhea and pain cause discomfort for many children using enteral nutrition.

### Real food pros/cons

PROS	CONS
<ul style="list-style-type: none"> <li>■ Tailored to individual nutritional and micronutritional needs</li> <li>■ Improve tolerance</li> <li>■ Improve feeding outcomes</li> <li>■ Promote family inclusion and mealtime engagement,</li> <li>■ Cost (home made)? Reimbursement?</li> <li>■ More natural</li> <li>■ Helpful in the transition to tube weaning?</li> </ul>	<ul style="list-style-type: none"> <li>■ Non sterile (home temperature over a nighttime continuous feeding)</li> <li>■ Viscosity (tube obstruction)</li> <li>■ Nutritional inadequacy (energy, proteins, micronutrients)</li> <li>■ Time consuming/conservation</li> <li>■ Risk of error</li> <li>■ Contamination, toxic</li> <li>■ Need of registered dietician</li> </ul>

### What are the advantages and disadvantages of real food formula?

Blenderized real food is an increasingly popular alternative to commercial formula. There are both advantages and disadvantages to its use. On the plus side, real food can be tailored to the individual, it may improve tolerance, makes children more included in family mealtimes, can be low-cost and could potentially support the transition to tube weaning.

On the negative side, blenderized food carries higher risk of contamination compared to a closed enteral system. It may also be nutritionally inadequate, time consuming, has a higher risk of tube obstruction and requires support from a registered dietician to ensure it meets nutritional needs.

What approach should we take to blenderized food for pediatric patients using enteral nutrition? Recently, new real food-based enteral formula were made available. This helps circumvent the issues encountered by home-made blenderized feeds while efficiently supporting patients' nutritional needs.

# Meeting Nutritional Needs and Improving Enteral Tolerance with Real Food-Based Formula



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Children who require gastrostomy feeding are typically given polymeric formula in the first instance. However, many families advocate for their children to be given blenderized real food, either alone or in combination with formula.

## Using home-blenderized food can be a challenge

Families may need support to provide blenderized food. This might include guidance on nutritional content, nutrient balancing, calorie requirements, fluid intake and micronutrients. They may also need a special blender to ensure particles are small enough for the tube.

Over time, families sometimes find it a challenge to give blenderized feeds because of other demands on their time. This may lead to children being given less food and losing weight. On the other hand, many families place real importance on food culture and want to be able to give their children the same food as the rest of the family.

## Real food-based formula offers the best of both worlds

An approach that can be effective is to use a formula made with real food-derived ingredients that can be added to, or to use this formula for snacks or overnight feeds to ensure optimum nutritional intake. Formula also has the advantage of being much easier to transport outside the home than blenderized real food.

Food-based formulas are easy to use, calorie dense, have good tolerance and offer better micro- and macronutrients.

Formula with real food ingredients is a safe, convenient, and nutritionally-balanced option for children with feeding disorders secondary to developmental delay or neurologic injury.

Also calorie and protein goals were met without notable intolerance in children and with no reports of serious adverse events.

The formula is also a practical, nutritionally-complete, real-food option for parents who are unable to prepare homemade blenderized tube feedings.

Food-based formulas are associated with some positive outcomes for pediatric patients:

■ <b>More likely to reach feeding goals</b>	■ <b>More likely to gain weight</b>
■ <b>Improvement in constipation or stool regularity</b>	■ <b>Promotion of diverse gut microbiota</b>
■ <b>Decreased vomiting or improvement of reflux</b>	■ <b>Normalization of feeding diet for G-tube patients</b>
■ <b>Facilitated transition to oral feeding</b>	■ <b>Decreased health care utilization</b>

# A National Retrospective Study in Children who Have Switched to Real Food-Based Formula



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Blended diets for children using enteral nutrition are on the increase. There is a perception that they help to mitigate food tolerance issues. A national retrospective study of children in the UK looked at the impact of switching to real food-based enteral formula.

## What do you do when all options are exhausted?

Some children using enteral nutrition experience symptoms such as retching or vomiting that are hard to resolve. After surgical or medical interventions have been exhausted, families are advised that they have to learn to live with unpleasant symptoms. This can be very distressing for the children and their families.

Some parents turn to blended feeding as a last resort, but this is not always a viable option; for example, schools often refuse to administer blended feeds due to potential issues. Food-based enteral formula is a welcome opportunity to find a middle ground that may help these children and their parents.

## Food-derived formula can help to ease symptoms

A retrospective multi-centre study looked at food tolerance in children who switch from standard formula to real food-based formula. The study included 43 children aged 1-17 (median age six years), who had been on enteral formula for at least one month, providing 80% of total energy requirements. Around half (47%) of the children had a neurological impairment.

The results were overwhelmingly positive, showing reduction in symptoms experienced by the children.

## Post-switch number of patients who reported improvement of gastrointestinal symptoms

<b>Retching</b>	<b>95% reported improvement</b>
<b>Vomiting</b>	<b>85%</b>
<b>Flatulence</b>	<b>75%</b>
<b>Loose stools</b>	<b>90%</b>
<b>Constipation</b>	<b>90%</b>

Participants also achieved weight gain, although the standard formula and food-derived formula were similar in calorie content and volume.

## Care should be taken when introducing real foods

One adverse event was reported in a child who had not been exposed to real food before, who developed food protein-induced enterocolitis syndrome. This underlines the importance of careful monitoring, particularly where children have not encountered whole foods before.

Enteral formula made from food-derived ingredients can bring significant improvements for children dependent on tube feeding. This can be particularly useful for children with complex medical conditions where no alternative options are left. Parents are often happy to use food-derived formula either exclusively or in settings where blenderized feeding is not feasible.

# Real Food in Enteral Nutrition for Chronically Ill Children: Practical Clinical Experience



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We know from currently available data that tube feeding real food can reduce symptoms such as gagging, retching, reflux and constipation for some pediatric patients. These symptoms have been shown to reduce around 76-100% in 56% of children experiencing them, with more than 50% showing a reduction in symptoms.

There are many different types of food for enteral feeding - standard polymeric formula, high energy density, whey hydrolysate, hypocaloric and real food-based formula. A real food formula is composed of a milk base with food such as peas, chicken, green beans and peaches added. It typically provides 1.2 kcal/mL. Real food ingredients provide 38% of proteins and 54% of fiber.

## How is real food-based formula used in the real world?

What does the use of real food-based formula look like in real-world cases? Here are four different patients where this type of feeding was used:

### Case 1

**22 month old girl with nemaline myopathy, tracheostomy and percutaneous endoscopic gastrostomy (PEG). She had progressive and severe muscular weakness and wasting and 24 hour mechanical ventilation.**

- Given blended natural food and nocturnal semi-elemental formula, but needed to be admitted to hospital with recurrent abdominal pain, bloating and diarrhea.
- Real food formula was introduced via PEG with bolus. This resulted in symptom resolution, improved growth and better quality of life.

### Case 2

**Newborn child with esophageal atresia and complex cardiopathy. Started on semi-elemental formula following surgery to close a fistula and establish a gastrostomy.**

- Child went into respiratory distress and had subtotal necrosis of the small bowel, requiring a total resection and jejunum, resulting in colic anastomosis and short bowel syndrome.
- Child had gastroesophageal symptoms and Nissen fundoplication, growth failure and diarrhea.
- Child was switched to real food-based formula - weight and height increased and formula well accepted.

### Case 3

**2 months old with congenital cytomegalovirus (CMV) infection and epilepsy experienced vomiting and failure to thrive. Underwent fundoplication, pyloroplasty and gastrostomy.**

- Given nocturnal regular semi-elemental diet and real food to provide more fibers during the day, but had poor weight gain and abdominal pain during meals.
- Switched to total enteral nutrition with semi-elemental formula, but symptoms persisted.
- Semi-elemental formula, relatively poor in fibers, replaced with real food formula. This was well accepted and the child gained weight and length well.

## Case 4

**2 year old patient with multicystic encephalopathy. Had a gastrostomy in the first few months of life but no tolerance to enteral nutrition.**

- Experienced ab-ingestis pneumonia and gastro-jejunoscopy was performed.
- Available semi-elemental formula, relatively low in fiber, started with intractable constipation as a result.
- Real food formula replaced the semi-elemental formula. This was well accepted with constipation resolution.

### A valuable option for chronically ill children

In conclusion, real food-based formula is cost effective and nutritionally appropriate for chronically ill children who are able to ingest whole food nutrients. Consideration of fiber content and quantity is vitally important, as well as understanding the potential microbiota modifications.

Real food may stimulate the taste receptor in the gastrointestinal tract, regulating the pulsatile rhythm. Sterile real food products produced in aseptic packaging can be a viable option for feeding on the go.

### How do you monitor nutritional adequacy of home-prepared feeds?

**Commercially prepared formula provides complete nutrition in each feed, but how do you ensure children have adequate nutrition when parents are preparing feed at home?**

- Periodic food diaries every 3-6 months to assess diet
- Blood samples or other methods every 6 months to a year to check child micronutrient levels
- Encourage parents to use milk as a base rather than water
- Work with families to supplement food where necessary

## Which is the most suitable enteral formula?

Standard polymeric (1.0 kcal/mL)	General formula
High energy density (1.5 kcal/mL)	Children with poor volume tolerance
Whey hydrolysate with fiber	Children with GERD and/or constipation
Hypocaloric, high protein	Low mobility patients
Real food	Ongoing research; patients with unresolved symptoms

### Quotes:

“ Using real food-based formula can promote family inclusion and mealtime engagement. ”

**Frédéric Gottrand**

“ Economic factors have an impact - some children might benefit from a blended diet but this would be hard to afford, whereas real food-based formula may bring convenience safety and fulfil patient needs. ”

**Martha van der Linde**

“ Blended food is definitely becoming more popular. It used to be me bringing it up as an option, now parents raise it with me. ”

**Gerard Minor**

“ Motility is better when we use real-food formula - this is probably due to the higher fiber content. ”

**Claudio Romano**

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