Thickening in Pediatrics: When, Why & How

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Disclosures

• Katie Walsh, Tyler Johnson and Sarah Volz have had their registration fees waived and are receiving an honorarium to speak today.

• They have no non financial disclosures.
Objectives

- **Objective 1:** Participants will be able to identify and discuss clinical rationale for thickening liquids in the pediatric population.

- **Objective 2:** Participants will be able to identify and discuss two conditions where thickening may be contraindicated.

- **Objective 3:** Participants will be able to explain the use of a testing modality (i.e. IDDSI) and how it may be used in their practice when managing thickening.
Thickening in Pediatrics: Why

- Thickening liquids is a common practice in both the pediatric and adult populations when other strategies such as changing the method of introduction (e.g. straw, cup) are unsuccessful.

- For adults, the literature reports increased oropharyngeal transit times, increased tongue base contract to the posterior pharyngeal wall, and changes in UES opening (Bisch, Logenman, Rademaker, Kahrilas, & Lazarus, 1994; Steele, 2005; Lazarus et al., 1993).
Thickening in Pediatrics: Why

- There is a limited amount of information as to the specific impact of thickened liquids on the pediatric swallow. Due to physiological differences in swallow function, it can not be assumed that thickened liquids function the same way in pediatrics as adults.

- Goldfield et al. (2013) looked at pre-term infants and the impact of Level 2 Nectar Thick Liquids in comparison to Level 0 Thin Liquids.

- This study found that thickened liquids moved significantly more slowly through the pharynx. They postulated that this also allows for increased sensory information.
Thickening in Pediatrics: Why

• The impact of aspiration on developing lungs can result in recurrent pulmonary problems and permanent lung damage.

• Silent aspiration rates are high in pediatrics (81%: Weir, 2011) making it critical to ensure we are properly thickening liquids in infants and children.

• Infants with silent aspiration may present with recurrent bronchitis, recurrent pneumonia, congestion or wheeze. However, only a small percentage of children will present with aspiration pneumonia (Tutor & Gosa, 2012).
Thickening in Pediatrics: Why

• A definitive diagnosis of dysphagia and general assessment of swallow function can only be evaluated with an instrumental assessment (Tutor & Gosa, 2012).

• In one study, 33% of infants with a “normal” clinical evaluation aspirate on a VFSS (Duncan, Mitchell, Larson & Rosen, 2018).
Thickening in Pediatrics: Why

• When looking specifically at hospitalization rates, one study noted no difference children who aspirate versus penetrate (McSweeney et al, 2016).

• In infants with inconsistent laryngeal penetration. Thickening may improve symptoms even more so than change in flow rate.
  
  – 91% of infants who received thickening as an intervention saw improvement in symptoms whereas 36% of those who had a change in flow rate saw an improvement in symptoms (Duncan, Larson, Davidson, May, Rahbar, & Rosen; 2018).
Thickening in Pediatrics: Why

- Thickening is also a common practice for reflux.

- Swallow dysfunction and GERD can have very similar presentations (Duncan, Amirault, Mitchell, Larson & Rosen, 2017).

- In a survey of neonatal feeding therapists and providers, thickening was being used by 59% of neonatal feeding providers were thickening for reflux (Madhoun et al., 2015).

- Thickening liquids increases the number of infants who reported no regurgitation reported in comparison to standard formula (Horvath, Dziechciarz, & Szajewska; 2008).
Thickening in Pediatrics: Why

• In children, with normal upper airway anatomy, who aspirated Level 0 Thin Liquids only, they required therapy for a mean of 0.78 years (range 0.25-2.5 years) with 84% having no aspiration on their last swallow study (Adil et al., 2015).

• Of those that aspirated thickened liquids they required therapy longer (mean 1.03 years, range 0.5-1.6 years) with resolution in 80% of children.

• Of those that aspirated puree 50% had resolution of symptoms with therapy (mean 1.72, range 1.1-2.75 years).
Thickening in Pediatrics: Why

• Even in cases of severe pharyngeal dysphagia, the goal is to keep children feeding orally in order to:
  – Prevent oral aversion
  – Continue to develop oral skills
  – Maintain oral skills that have already been established
  – Children who orally feed may have less hospitalizations in comparison children with GT placement (McSweeney et al., 2016)
Thickening in Pediatrics: When

<table>
<thead>
<tr>
<th>TABLE 2—Conditions Predisposing to Aspiration in Children</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anatomic</strong></td>
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<tr>
<td>Choanal stenosis</td>
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<tr>
<td>Cleft lip/palate</td>
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<td>Laryngotracheal cleft</td>
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<tr>
<td>Esophageal atresia</td>
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<td>Tracheoesophageal fistula</td>
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<td>Craniofacial abnormalities</td>
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<td>Vascular ring</td>
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<td>Tumors</td>
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<td>Cystic hygroma</td>
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<td><strong>Syndromes</strong></td>
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<tr>
<td>Pierre-Robin</td>
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<tr>
<td>Beckwith-Wiedemann</td>
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<tr>
<td>Down (sometimes)</td>
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<td><strong>Neuromuscular</strong></td>
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<tr>
<td>Perinatal asphyxia</td>
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<td>Cranial nerve or recurrent laryngeal nerve injury</td>
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<tr>
<td>Congenital hydrocephalus</td>
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<td>Neonatal intraventricular hemorrhage</td>
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<tr>
<td>Familial dystonia</td>
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<td>Moebius syndrome</td>
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<tr>
<td>Myotonic dystrophy</td>
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<td>Wernig-Hoffman disease</td>
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<td>Cornelia de Lange syndrome</td>
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<td>Muscular dystrophy</td>
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<td>Myasthenia gravis</td>
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<tr>
<td>Guillain-Barre syndrome</td>
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<tr>
<td>Cerebral palsy</td>
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<tr>
<td>Vocal cord paralysis</td>
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<tr>
<td>Arnold-Chiari malformation (sometimes)</td>
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<tr>
<td><strong>Gastrointestinal</strong></td>
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<td>Gastroesophageal reflux</td>
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<tr>
<td>Esophageal motility dysfunction</td>
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<tr>
<td><strong>Other</strong></td>
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<tr>
<td>Developmental/immaturity of swallowing</td>
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<tr>
<td>Respiratory syncytial virus bronchiolitis</td>
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<td>Endotracheal tubes/tracheostomy tubes</td>
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<tr>
<td>Foreign body aspiration</td>
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<td>Collagen vascular disease</td>
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<tr>
<td>Obstructive sleep apnea</td>
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<tr>
<td>Bottle-propping</td>
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</tbody>
</table>

Thickening in Pediatrics: When

- Patient showing direct clinical signs of aspiration
- Chronic respiratory concerns

- Some high risk populations may include:
  - Neurologic: Cerebral Palsy, Seizures, Non-accidental trauma, Posterior fossa tumors, Chiari malformation
  - ENT/Airway concerns
  - Vocal cord paresis/paralysis (e.g., Cardiac post-op)
  - Certain genetic conditions

- Sometimes an instrumental exam is not warranted.
Thickening in Pediatrics: When

When an instrumental exam may not be warranted:

- No prior history of oral intake
- No practice of the new consistency that you want to assess
- Gagging
- Spits out solids
- Refusing intake
Thickening in Pediatrics: When

Instrumental Evaluations

- Clinical trials are highly important prior to studying.
  - Initiate PO/taste trials during clinical evaluation and/or therapy
    - Advance as tolerated
    - Discontinue with concerns
  - General goal: 15 bites of solids; 15ml of liquids
Thickening in Pediatrics: When

Instrumental Swallowing Evaluations: VFSS vs FEES
- Age
- Airway/structural concerns
- Imaging history
- Timing since last assessment
- Breastfeeding
- Secretion management concerns
- Positioning limitations
- Liquid considerations

- Miller, C.K. (2011)

- Testing for laryngeal sensitivity (Link et al, 2000)
Thickening in Pediatrics: When VFSS vs. FEES
Thickening in Pediatrics: When
VFSS vs. FEES
Thickening in Pediatrics: When

Potential Causes of Aspiration

- Reduced bolus control (anterior, posterior)
- Reduced oral-pharyngeal sensation
- Pharyngeal-nasal splashback
- Reduced pharyngeal compression
- Reduced hyolaryngeal elevation/epiglottic inversion

Thickening in Pediatrics: When

Potential Causes of Aspiration (cont’d)

• Delayed initiation of the swallow
• Reduced airway closure
• Altered oral/pharyngeal/esophageal pressures
• UES dysfunction
• Esophageal or Motility issues

Research supports increased aspiration risk across a variety of neurologic conditions.

- Increased risk of aspiration pneumonia after seizure (Detoledo et al, 2004)
- Increased prevalence of dysphagia in children with Cerebral Palsy (Calis et al, 2008; Fung et al, 2002)
- Increased prevalence of dysphagia in patients with brain tumors (Nickell et al, 2003)
- Other diagnosis groups are also at increased risk.
Neurologic Impairment

- Medical Status
  - Related to diagnosis
  - Respiratory function/stability
  - GI Function
  - e.g., studies reveal increased reflux in seizure populations (Tirosh and Jaffe, 1996)

- Motor function
  - Positioning/posture and other motor abilities
  - In therapy, positioning considerations can help improve swallow function in children with Cerebral Palsy (Larnert, G., & Ekberg, O., 1995)
  - Oral/Motor and Sensory function
    - Reflexes
    - Nutritive and Non-Nutritive Suck
    - "neuro tongue"
Thickening in Pediatrics: When

Neurologic Impairment

• Medications

• Diet considerations
  – Ketogenic diet
    • Can use breast milk, though most patients end up on a formula (Fenton et al, 2015)
  – Oral motor limitations may make some textures and/or modes of intake more challenging.

• In neurologic populations, a swallow study is often warranted (Morton et al, 2008).
Upper Airway

- **Tonsils and Adenoids**
  - Enlarged tonsils and adenoids can result in muscular, functional and orthodontic changes in children (Valera et al, 2003).
  - Feeding difficulties can be a factor helping ENT decide if surgery is appropriate for a patient (Darrow and Siemens, 2002).

- **Posterior Laryngeal Cleft (PLC)**
  - Degree of cleft and/or aspiration is part of the surgical decision making process (Mitchell, 2010; Rahbar et al, 2006).
  - Patient may also be a candidate for injection repair (Cohen et al, 2011).
Thickening in Pediatrics: When

- Cleft Lip and Palate
  - Cleft lip and palate often change feeding and swallowing patterns and function (Masarei et al, 2007).
  - Orthodontics do not always “fix” feeding problems (Masarei et al, 2007).

- Other conditions to consider: TEF, craniofacial disorders

- Consider the impact on flow and pressures.
Cardiac

- Medical course
  - Prolonged intubation is shown to be a significant factor in feeding difficulties in patients with congenital heart surgery (Kogon et al, 2007)
  - Transesophageal echocardiography when used during open heart surgeries can increase aspiration risk (Kohr et al, 2003)
  - It’s important to remember that surgeries, intubations, supplemental tube use and prolonged hospital stays have the potential to interrupt typical feeding development.
  - Feeding difficulties can result in prolonged hospitalizations.

- Diet considerations
  - High calorie
  - Fat free diet (chylos)
  - Supplemental tube feeds and impact on schedule/hunger
Thickening in Pediatrics: When

- Vocal cord function (post-op)
  - Could be intubation related
  - Patients are also at increased risk for cranial nerve damage during single ventricle procedures such as aortic arch reconstruction or Norwood procedure (Pham et al, 2014).
  - However, research also shows increased aspiration risk regardless of vocal cord function after single ventricle repairs (Skinner et al, 2005; McGrattan et al, 2017).
Thickening in Pediatrics: When

Gastrointestinal Considerations

• UES dysfunction, GER, Motility Issues, Short gut

• Diet
  – Often dictated by MD/GI/Ped Surg and/or RD
  – Schedule & hunger may not always be in our control
  – Tube feeding rates may not be helpful to our therapy goal of increasing oral intake.

• Long-term tube use
  – Inexperience may result in poor bolus control, reduced strength and/or poor coordination.
Gastrointestinal Considerations

- Reflux has been associated with apnea and aspiration in infants (Orenstein, 2001).
- Not all children with reflux will necessarily aspirate, and not all children who aspirate necessarily have reflux (Sheikh et al, 2001).

- Retroflow (consider etiology)
  - Motility
  - Stricture
  - Malrotation
  - Atresia
  - Allergy/intolerance
Prematurity

• In premature infants, there is an increased likelihood of comorbidities. The patient may have issues in neurological function, respiratory function, GI function, among other things (Jadcherla et al, 2009).

• Neonates with prolonged respiratory support and delayed enteral and oral feeding were more likely to have feeding difficulties. Neonates are also more likely to have issues with vomiting, as well as difficulties with texture progression of solids (Hawdon et al, 2007).

• Research supports improved feeding outcomes for patients who receive early intervention (Takahata et al, 2011).
10 month male - Seizure disorder
12 month old male – Anoxic brain injury
3 month old female – Poor weight gain; Reflux
2 week old male – Maple Syrup Urine Disease
18 month old male – 32 weeker, VACTERL, TEF s/p repair
4 month old male - Cricopharyngeal Achalasia

[Images of esophageal x-rays]
Thickening in Pediatrics: How

- Old terminology included: thin, thin nectar, nectar, syrup and honey thick for liquids and puree, soft solid, and a regular diet for solids.
- Recipes for thickening infant formula were developed with standard infant formula (i.e., Ready to Feed Enfamil Infant)
- Problems we encountered
  - Inconsistent thickening
  - Unclear and ambiguous terminology
- These shortfalls created a patient safety issue
The International Dysphagia Diet Standardization Initiative (IDDSI) committee was formed by volunteer professionals from around the world.

Objective was to develop standardized terminology and definitions for both thickened liquids and modified solids that can be used across ages, cultures, and settings.

(Cichero et al., 2013; Cichero et al., 2016; Lam, Stanschus, Zaman, & Cichero, 2017)
Thickening in Pediatrics: How

- The IDDSI Framework classifies and labels food and drinks within a continuum of 8 levels ranging from 0-7.
- Liquids or drinks are represented by levels 0-3 while solids fall into levels 4-7.

The International Dysphagia Diet Standardisation Initiative 2016 @https://iddsi.org/framework/.
Thickening in Pediatrics: How

- **IDDSI Flow Test**
- **Flow Test for Liquids**
  - Gravity flow test that classifies liquids (levels 0-3) based on rate of flow through a 10 mL syringe
  - Liquid level is determined based on amount of liquid remaining in syringe after 10 seconds
  - Standardized and objective measure (Steele et al., 2018)

The International Dysphagia Diet Standardisation Initiative 2016
@https://iddsi.org/framework/.
Thickening in Pediatrics: How

- IDDSI Flow Test
- Required Materials: Stopwatch or clock with second hand and a 10 mL syringe
- Not all 10mL syringes are alike
  - Either BD Luer-Lok, Luer Slip Tip, Eccentric Luer Slip Tip are required
Thickening in Pediatrics: How

- IDDSI Flow Test
- Step 1: Remove the plunger from one syringe.
- Step 2: Place your finger under the tip to prevent liquid from flowing through.
- Step 3: Using the second syringe, fill it to the 10mL line.
- Step 4: Remove your finger from the tip and allow the liquid to flow for exactly 10 seconds.
- Step 5: Place your finger back under the tip to stop the liquid from flowing

**IDDSI Flow Test Video**
Thickening in Pediatrics: How

- The liquid level is determined by the amount of liquid remaining in the syringe.
Thickening in Pediatrics: How

• Prior to IDDSI implementation
  • Thin, Thin-Nectar, Nectar, Syrup, and Honey

• Using the IDDSI flow test, we established new baselines
  – Level 0 (Thin Liquid): 60 mL Varibar Thin Liquid
  – Level 1 (Thin-Nectar Thick Liquid): 15 mL Varibar Thin Liquid + 45 mL Varibar Nectar
  – Level 2 (Nectar Thick Liquid): 60 mL Varibar Nectar
  – Level 2.5 (Syrup Thick Liquid): 30 mL Varibar Nectar + 30 mL Varibar Thin Honey
  – Level 3 (Honey thick liquid): 60 mL Varibar Thin Honey
  – Level 4 (Pureed Solid): Varibar Pudding
Thickening in Pediatrics: How

Our modified terminology

LIQUIDS
- Level 0 (Thin Liquid): All 10 mL flows through within 10 seconds
- Level 1 (Thin-Nectar Thick Liquid): 1-4 mL remains after 10 seconds
- Level 2 (Nectar thick liquid): 4-7 mL remains after 10 seconds
- Level 2.5 (Syrup thick liquid): 7-8 mL remains after 10 seconds
- Level 3 (Honey thick liquid): >8 mL remains after 10 seconds

SOLIDS
- Level 4 (Pureed solid): Holds it shape on a spoon, can be tilted off of a spoon and still hold its shape
- Level 5 (Minced and Moist): Can be eaten with a spoon, No chewing required, No separate liquid, Small lumps may be visible within the food, Lump size is 2 mm (Distance between fork prongs is 4 mm)
- Level 6 (Soft and Bite Sized): A knife is not required to cut, Chewing is required, Can be easily mashed with a fork, Bite sizes are 8 mm
- Level 7 (Regular Solids): No restrictions at this level
Thickening in Pediatrics: How

- Ready to Feed formulas are a Level 0
  - Similac 19 kcal
  - Similac Neosure 22 kcal
  - Enfamil Infant 20 kcal
  - Enfamil Neuropro 20 kcal
  - Enfamil EnfaCare 22 kcal
  - Enfamil 24 kcal
  - Enfamil AR 20 kcal
Thickening in Pediatrics: How

• Most infant formula made from powder is a level 0
  – Used IDDSI flow test on over 15 different formulas
  – Increased caloric density and temperature did not increase liquid level
Thickening in Pediatrics: How

- Ready to feed Enfamil AR 20 kcal is a Level 0
- Enfamil AR 20 kcal prepared from powder and served immediately is Level 0
- Enfamil AR 20 kcal can be a Level 1: Must be prepared from powder needs to rest for at least 30 minutes prior to serving
  - Because this is not always convenient for families, we often recommend that families prepare batches of formula for the day and store in fridge
  - Both cold and cold to warm formula was Level 1
Thickening in Pediatrics: How

Naturally Thick Liquids

• Level 1 (Thin Nectar Thick Liquid)
  – Pediasure 1.5 (cold)
  – Pediasure Peptide 1.5 (cold or room temperature)
  – Ripple (cold)
  – Bolthouse Farms Smoothies – Mango, Green Goodness, and C-boost (cold)
  – COMPLEAT (room temperature or cold)

• Level 2 (Nectar Thick Liquid)
  – Pediasure Harvest (room temperature or cold)
  – Boost Very High Calorie Vanilla (room temperature)

• Level 2.5 (Syrup Thick Liquid)
  – Boost Very High Calorie Vanilla (cold)

• Level 3 (Honey Thick Liquid)
  – Real Food Blends: Salmon, oats, squash (room temperature)
Thickening in Pediatrics: How

Naturally Thick Liquids

• Drinkable yogurts ranged from Level 1 to Level 2.5 depending on flavor and brand

• ALWAYS USE IDDSI FLOW TESTING TO CONFIRM

Thickening in Pediatrics: How

Thickening Agents: Infant Cereal

- Can be used to thicken infant formula or cow’s milk
  - Does not work for water or juice
  - Breastmilk thickened with infant cereal thins out over time (Gibbons & Davidson, 2018)

- Types of cereal: rice, oatmeal, multigrain, barley, quinoa
  - Oatmeal cereal alone is not effective at maintaining thickness
  - 50:50 blend of rice cereal and oatmeal

- Brands of cereal: Earth’s Best, Gerber, Beechnut, Happy Baby, Plum Organics
Thickening in Pediatrics: How

Thickening Agents: Infant Cereal

- **Our recommendations**
  - Buy 1 box of rice cereal and 1 box of oatmeal cereal
  - Mix 2 cups of infant rice cereal and 2 cups of infant oatmeal cereal in a large plastic bag. Shake well to ensure this has been well mixed.
  - For Gerber Infant Cereal run a can or a rolling pin over the plastic bag to crush the cereal for 1-2 minutes
  - Earth’s Best cereal can be used as is – do not crush

- **Thickening recipes are provided in teaspoons and milliliters**
Thickening in Pediatrics: How

Thickening Agents: Infant Cereal
• Mix cereal immediately before serving
  – Cereal settles to the bottom over time
## Thickening in Pediatrics: How

### Thickening Agents: Commercial Thickeners

<table>
<thead>
<tr>
<th>Product</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simply Thick</td>
<td>Xanthan Gum</td>
</tr>
<tr>
<td>Gelmix</td>
<td>Organic Tapioca Maltodextrin, Organic Carob Bean Gum, Calcium Carbonate</td>
</tr>
<tr>
<td>Purathick</td>
<td>Organic Tapioca Maltodextrin, Organic Tara Gum, Calcium Carbonate</td>
</tr>
<tr>
<td>Thick It</td>
<td>Modified Food Starch and Malodextrin</td>
</tr>
<tr>
<td>Thicken Up</td>
<td>Modified corn starch</td>
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</tbody>
</table>

(www.simplythick.com/nectar-packets, 2019)
(www.healthierthickening.com/gelmix-infant-thickener, 2019)
(www.healthierthickening.com/Purathick, 2019)
(http://thickit.com/products/thickeners, 2019)
(www.nestlehealthscience.us/brands/resource/resource-thickenup-hcp, 2019)
Thickening in Pediatrics: How

Thickening Agents: Commercial Thickeners
- Defer to each product’s recommendations for when to use
- Can be case by case, parent preference or recommended by the medical team for various reasons
Thickening in Pediatrics: How

Contraindications to using commercial thickeners

• Each thickener is made of different ingredients that will interact with beverages in different ways.

• Gum based thickeners tend to more stable over time.

• Starch based thickeners tend to thicken over time and tend to be thicker at colder temperatures.

(McCallum, 2011)
### Supplements That Use SimplyThick EasyMix WITHOUT MODIFICATION

| Boost High Protein Complete Nutritional Drink | Carnation Breakfast Essentials – High Protein |
| Boost Kid Essentials | Carnation Breakfast Essentials – Powder |
| Boost Kid Essentials 1.5 Fiber | Enfagrow Toddler Next Steps |
| Boost Simply Complete | Ensure Light |
| | Ensure Max Protein |
| Ensure Original Evolve Classic Glucerna | Glucerna Hunger Smart Muscle Milk |
| Nestle Isosource 1.5 PediaSmart | PediaSure PediaSure SideKicks Premier Protein |
| | ProNurish Low Fodmap Nutritional Drink |
| | SlimFast Original Suplена |

### SUPPLEMENTS ABOVE USE SIMPLYTHICK EASYMIX WITHOUT MODIFICATION

<table>
<thead>
<tr>
<th>Per 8 oz.*</th>
<th>Nectar (Level 2 Mildly Thick)</th>
<th>Honey (Level 3 Moderately Thick)</th>
<th>Pudding (Level 4 Extremely Thick)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Strokes (6g/stroke)</td>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Nectar Packet (Level 2 Mildly Thick) (6g)</td>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Honey Packet (Level 3 Moderately Thick) (12g)</td>
<td>N/A</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

*Note: Most supplements come in 8 oz. containers. This table shows the use rate for thickening the full container.

Used with permission from Simply Thick
B Supplements That Use SimplyThick EasyMix WITH MODIFICATION

Atkins Protein Rich Shake
Boost Glucose Control
Boost Optimum
Boost Very High Calorie
Carnation Breakfast Essentials
Ensure Compact
Ensure Enlive
Ensure High Protein
Ensure Plus
Enterex Diabetic
Nepro
Nestle Fiber Source 1.2
Peptamen Junior

Supplements listed to the left use SimplyThick EasyMix at HALF of our standard use rates. 1 packet or 1 pump stroke will effectively thicken 8 oz. of these supplements. The table below is for 8 oz. of the supplement.

SUPPLEMENTS ABOVE USE SIMPLYTHICK EASYMIX WITH MODIFICATION

<table>
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*Note: Most supplements come in 8 oz. containers. This table shows the use rate for thickening the full container.

C SUPPLEMENTS THAT ARE NOT COMPATIBLE with SimplyThick EasyMix.

The following supplements are not recommended for use with SimplyThick EasyMix:

Boost Brooz — All Flavors
Ensure Clear — All Flavors
Hormel Solutions 206 — All Flavors
Isopure — All Flavors
KetoCal 3:1 — 3:1 ratio ketogenic formula (20kcal/fl oz 0.66 Kcal/mL)
Nutron — All Flavors
Optisource — All Flavors

Questions? Email us at: info@simplythick.com · Visit us at: www.simplythick.com

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Thickening in Pediatrics: How

Thickening Agents: Food Based Recipes

• Pudding and milk
  – Level 1: 2 oz pudding to 4 oz milk
  – Level 3: 4 oz pudding to 4 oz milk

• Yogurt and milk
  – Variations depending on the type of yogurt used

• Gerber banana puree
  – Level 1: 2 oz Gerber banana to 4 oz liquid
  – Level 3: 4 oz Gerber banana to 4 oz liquid

• Gerber apple puree
  – Level 1: 1 oz Gerber apple to 1 oz liquid
  – Level 3: 3 oz Gerber apple to 1 oz liquid
Thickening in Pediatrics: How

Thickening Breastmilk

• Breast milk is essentially made up of carbohydrates, fats and proteins and the specific composition varies in each mother. (Fernandez et al 2013, Heslett et al 2007)

• During breast feeding, breast milk interacts with infant saliva to produce metabolites that regulate oral and gut microbiota (Al-Shehri et al, 2015)
Thickening in Pediatrics: How

Thickening Breastmilk

- Amylase is a digestive enzyme that is found in breast milk and may impact how thickeners interact in breast milk (Cichero et al 2013)

- So, when we add cereal or thickener, what will breast milk do?
  - According to Theophilou et al, carob-based thickening agents maintain their thickening properties within the stomach and are not broken down by salivary amylase. (2017)
Thickening in Pediatrics: How

Specialty Diets: Ketogenic Diet

• High fat, low carbohydrate diet often used for seizure management when medication has proven ineffective (Kossoff et al., 2018)

• Simply Thick
  – Remember Ketocal 3:1 is incompatible

• Xanthan gum powder
  – Recommend using blender bottle or blender to ensure product is fully dissolved
  – Can make your own “gel” with water and powder

• Guar gum
Thickening in Pediatrics: How

• Specialty Diets: Food allergies or intolerances
  – Soy Formulas (Similac Isomil, Enfamil Prosobee, Gerber Good Start Soy)
  – Partially Hydrolyzed Formulas (Enfamil Gentlease, Enfamil Reguline, Similac Total Comfort, Gerber Good Start Gentle, Gerber Good Start Soothe)
  – Extensively-Hydrolyzed Formulas (Alimentum, Nutramigen)
  – Amino Acid-Based Formulas (Neocate, EleCare)

• Some infant cereals have soy or gluten – read labels!
Thickening in Pediatrics: How

Common questions/concerns from parents

- Will thickening cause constipation/gas?
- Will thickening cause my child to have loose stools?
- Will thickening dehydrate my child? I have to use so much thickener that they aren’t getting any liquid?
- My child doesn’t like the taste of thickened liquid.
Thickening in Pediatrics: How

Wrapping Up

• Cold liquids tend to be thicker (Cichero & Lam, 2014)

• Some thickening agents are more difficult to mix and may require a blender bottle, whisk, or even a blender to properly mix all ingredients
  – If the thickening agent is not entirely dissolved, the liquid will not be the correct consistency

• Increasing the caloric density of infant formula did not make the liquid thicker
  – The only exception was Enfamil AR prepared from powder

• Many nutrition drinks/shakes with higher calorie contents were thicker
  – Examples: Pediasure 1.5, Pediasure Peptide 1.5, Boost Very High Calorie
Thickening in Pediatrics: How

Wrapping Up

• Overall we found that thickening infant formula is highly variable
  – The same formula does not always thicken the same from day to day which could be due to many uncontrollable factors: water temperature, amount of formula used, how much air/bubbles in the formula, etc.

• Recommend frequent use of IDDSI flow test to ensure liquids are thick enough
Thickening in Pediatrics: Case Study 1

- 12 month old male seen for clinical evaluation due to report of ongoing coughing and congestion with bottle feeding
- Premature birth at 28 weeks twin gestation, bilateral grade III intraventricular hemorrhage, medical necrotizing enterocolitis, ROP, ASD, pulmonary valve stenosis; 2 month NICU stay – discharged home full PO
- Clinically thickened to a level 2.5 syrup thick consistency at evaluation
- During a follow-up visit, IDDSI flow test was used on thickened liquid prepared at home – came out as a Level 0 thin liquid!
- Admitted with aspiration pneumonia several days later
  - VFSS revealed silent aspiration of Level 2 nectar thick liquids and improved swallow safety with Level 2.5 syrup thick liquids
- Frequent use of IDDSI flow test is important!
Thickening in Pediatrics: Case Study 2

- 2 month old male seen while admitted into the hospital for increased work of breathing.
- Premature birth at 35 weeks, solitary kidney, OSA, GERD, laryngomalacia s/p supraglottoplasty, tethered cord, congenital hemi-vertebra.
Thickening in Pediatrics: Case Study 2

- We left him doing small volumes of thin liquids.
- He had a repeat supraglottoplasty with GT placement.
- Repeat FEES shortly thereafter at 3 months old with largely the same results.
- At 6 months old we increased thin liquid volume after a FEES exam determined improvement with liquids and said no puree due to continued poor compression.
- At 8 months old, FEES was performed with vast improvement in pharyngeal compression and patient was allowed to go POAL.
- GT was removed at 16 months old.
Thickening in Pediatrics: Case Study 3

- 5 month old female seen for videoswallow study during her hospital admission.
- Premature birth at 25 weeks, IUGR, BPD, subglottic stenosis, s/p tracheostomy and GT placement.
- Speech began working with her at 4 months old post tracheostomy placement when she began consuming small volumes of thin liquids to prepare for her VFSS; however, despite good oral skills volumes were rather limited.
Thickening in Pediatrics: Case Study 3
Thickening in Pediatrics: Case Study 3

- We decided to thicken her liquids to a Level 2 Nectar Thick Liquid.
- We tried to thicken breast milk with cereal; however, we were never able to get a Level 2 consistency.
- She easily began consuming 30 mL of thickened formula after attempts at thickening breast milk.
Questions?

Try IDDSI for Yourself!
References


References


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References


References


References continued


