

### Swallow This! How to consistently thicken liquids across contexts using IDDSI guidelines.

Samantha McDonald, MS CCC-SLP Leslie Wilfong, MSP CCC-SLP



**Changing What's Possible** 

### **Disclosures for Samantha McDonald**

### Relevant Financial Relationships:

 Salaried full time employee at Medical University of South Carolina (MUSC) Children's Hospital

I do not have any nonfinancial disclosures



### **Disclosures for Leslie Wilfong**

#### Relevant Financial Relationships:

- Salaried full time employee at Medical University of South Carolina (MUSC) Children's Hospital
- Researcher with Swallowing Cross-Systems Collaborative at Northwestern University
- PRN employee at Bright Start Early Intervention Company
- I do not have any nonfinancial disclosures



### **Objectives**

- Outcome 1: Learners will be able to explain IDDSI and its eight levels of food textures and drink thickness.
- Outcome 2: Learners will be able to demonstrate proficiency testing a variety of liquids using the IDDSI Flow Rate Test.
- Outcome 3: Learners will be able to demonstrate three strategies to thickening using alternatives to over the counter thickeners.



### **Overview**

- Why do we thicken? Indications for MBSS
- Brief Overview of Swallow Function
- IDDSI Defined
- IDDSI Levels
- Thickening with IDDSI



### Let's Eyeball Our Thickeners





Changing What's Possible

# Thickening

- In a research study by Glassburn & Deem, 23 clinicians were asked to thicken liquids & they were not consistent in their thickening practices.
- Lack of evidence to support the use of thickened liquids
- In May, 2011, the FDA issued a consumer warning against the use of Simply Thick (xanthan gum based thickener) in premature infants due to the risk for Necrotizing enterocolitis (NEC) (Beal et al)
- Lack of understanding about why thickened liquids improve airway protection (Goldfield et al)
- Liquid barium may not represent regular or thickened liquids consumed by infants (Cichero et al)
- Thickener influences mineral solubility and dialysability of Ca, Fe and Zn
- Long term effects of aspiration unknown









### **Overview of thickeners**

	Thick-it	Simply Thick Easy Mix	Gel Mix	Infant Cereal
Ingredients	Modified food starch product	Xanthan gum and other gum-based thickeners	Carob bean gum	Rice or oat
Where do I get it?	Many stores and online	Online	Online	Grocery stores
Additional calories?	Minimal	Minimal	Minimal	Considerable. Can lead to excessive weight gain
Use in breastmilk?	No	Yes	Yes	No
Digestive changes?	Tendency toward loose and more frequent stools	Varied	Varied	Can cause constipation (less with oat cereal)
Cost	\$\$	\$\$\$	\$\$\$	\$
Ease of use	<ul> <li>Must wait after mixing. Gets thicker over time</li> <li>Relatively smooth</li> </ul>	<ul> <li>No waiting after mixing</li> <li>Thickness does not change</li> <li>Very smooth</li> </ul>	<ul> <li>Must use warm liquid</li> <li>Must wait after mixing</li> <li>Gets thicker over time</li> <li>Smooth</li> <li>Cannot achieve a "honey" thick consistency</li> </ul>	<ul> <li>May be lumpy or clog nipple</li> <li>Gets thicker over time</li> <li>Different brands need different recipes</li> <li>Brown rice thickens poorly</li> <li>Rice has potential for arsenic exposure in some brands</li> </ul>



### Challenges

- Thickening breastmilk
- Nipple/bottle selection
- Increased sucking pressures
- Effect of time and temperature
- Bioavailability of nutrients
- Caregiver compliance / Multiple caregivers
- Access to thickeners



# **Challenges in Infant Thickening**

### Nutritional, growth, & GI consequences

- Constipation
- Shift of macronutrient composition of diet toward more carbohydrate and less protein and fat
- Can impact daily caloric intake and hydration

(Madhoun et al. 2015)



### **Challenges in Infant Thickening**

### Nutritional, growth, & GI consequences

- Concern regarding safety of artificial thickeners
- Necrotizing enterocolitis (NEC) reported in preterm infants prescribed with xanthan gum or carob-bean gum thickeners
- Most institutions no longer stock these thickeners or allow them to be prescribed
- Clinical significance of other thickeners used (rice cereal, modified corn starch based thickeners) yet to be determined



# Indications for a Modified Barium Swallow Study (MBSS)

- An MBSS is a radiographic examination of swallow function using barium contrast to visualize the timing and extent of oral, pharyngeal, and laryngeal muscular contraction during swallowing and its impact on bolus flow
- At risk populations:
  - Prematurity, cardiac anomalies, neurological impairments, laryngeal and airway anomalies, craniofacial defects, genetic disorders, chromosomal abnormalities, developmental delay



### **Clinical Signs of Aspiration**

- Frequent coughing, sputtering with feeds
- Eye tearing during feeds
- Wet, gurgly vocal quality during feeds
- Any documented Brief Resolved Unexplained Event (BRUE)
- Breath holding or cyanosis during feeds
- Unexplained respiratory illnesses
- Apneic swallow runs



### Signs and symptoms are not always overt...

- In a retrospective research study done by Boston Children's Hospital, 412 children under the age of 2;0 underwent MBSS for object assessment of the swallowing mechanism. They found:
- 80% of aspiration events were silent on MBSS
- More than 25% of patients did not demonstrate overt signs or symptoms of aspiration with meals.
- Observation of feedings by skilled clinicians are not sensitive enough to diagnose aspiration in children because of the high rate of silent aspiration



(Duncan, Mitchell, Larson, Rosen, 2018)



# Association between presenting symptoms and VFSS after adjustments for comorbidities

Symptom	VFSS	5 Result		
Symptom	Normal (n=107)	Abnormal (n=293)	Punadjusted	Padjusted
Choking/Gagging	38 (35.5%)	112 (38.2%)	0.64	0.44
Reflux	35 (32.7%)	81 (27.7%)	0.32	0.43
Vomiting	35 (32.7%)	72 (24.6%)	0.13	0.27
Poor feeding	28 (26.2%)	63 (21.5%)	0.35	0.44
Slow feeding	8 (7.5%)	16 (5.5%)	0.49	0.34
Coughing	56 (52.3%)	173 (59.0%)	0.25	0.16
Noisy Breathing	21 (19.6%)	81 (27.7%)	0.12	0.15
Congestion	26 (24.3%)	58 (19.8%)	0.33	0.45
Spells	15 (14.0%)	53 (18.1%)	0.37	0.36
<b>Respiratory Distress</b>	12 (11.2%)	38 (13.0%)	0.73	0.90
Recurrent Pneumonia	7 (6.5%)	34 (11.6%)	0.19	0.24
Oxygen Requirement	3 (2.8%)	16 (5.5%)	0.43	0.54
During Meals	75 (70.1%)	220 (75.1%)	0.24	0.28
After Meals	36 (33.6%)	83 (28.3%)	0.39	0.38
During and After Meals	26 (24.5%)	58 (20.2%)	0.41	0.43

Duncan, D. R., Mitchell, P. D., Larson, K., & Rosen, R. L. (2018). Presenting Signs and Symptoms do not Predict Aspiration Risk in Children. *The Journal of pediatrics*, *201*, 141–146. doi:10.1016/j.jpeds.2018.05.030



### Penetration

VS.

### Aspiration



Bolus entry into the laryngeal vestibule without progression below the vocal folds Bolus entry below the level of the vocal folds



### Liquid Presentations: Bottles, cups, and straws

**Commercial Nipple Flow Rates** 



Damian, L. A., & Johnson, K. (n.d.)



## If you have to thicken liquids...

- Consistent thickening
- Caregiver education
- Follow-up with SLP
- Repeat MBSS
- Referral to other providers
  - ENT, Pulmonology, Neuro, Genetics, etc.



## **IDDSI Defined**

- The International Dysphagia Diet Standardization Initiative
  - Founded in 2013
  - Goal: "to develop new global standardized terminology and definitions to describe texture modified foods and thickened liquids used for individuals with dysphagia of all ages, in all care settings, and all cultures."
  - Provides a common terminology to food textures and drink thickness
  - Provides instructions for tests intended to confirm the flow or textural characteristics of a product
  - Comprised of 8 levels (0-7)



### **IDDSI** Defined



DRINKS



### **IDDSI Flow Test**







### Flow test instructions





Changing What's Possible

## IDDSI – Level 0 - Thin



- Flows like water, breastmilk, some formulas
- Can drink through any time of teat/nipple, cup or straw (as appropriate)
- Can functionally manage liquids of all types
- Flow Test: Test liquid flows through a 10 mL slip tip syringe completely within 10s, leaving no residue







## IDDSI – Level 1 – Slightly Thick

- Thicker than water
- A little more effort to drink than thin liquids
- Still flows through straw, syringe, teat/nipple



- Similar to the thickness of commercially available added rice/anti reflux (AR) formula and adult supplements
- Primarily used in pediatrics as a way to reduce speed of flow, yet is still able to flow through infant nipple
- Flow test: all 10mL flow through syringe in 10 seconds leaving 1-4mL



### IDDSI – Level 1 – Slightly Thick

# **IDDSI Flow Test**

Level 1







**Changing What's Possible** 



## IDDSI – Level 2 – Mildly Thick

- The old "Nectar"
- Flows off spoon



- "Sippable" pours quickly from a spoon, but slower than thin liquids
- Effort is required to drink through standard bore straw
- Flow test: liquids flows through a 10mL slip tip syringe leaving 4-8mL in the syringe after 10 seconds



### IDDSI – Level 2 – Mildly Thick



### Level 2







Changing What's Possible

# RECIPES FOR NECTAR-THICK/LEVEL 2 MILDLY THICK CONSISTENCY

### THICKENING FOR INFANTS

### CEREAL

- Add 1 Tablespoon (TBSP) cereal to 2 ounces formula
- For small volume feeds, recipe is 1 teaspoon (tsp) cereal per 20mL formula
  - Rice cereal
  - Oatmeal cereal
  - Gerber
  - Beechnut
  - Earth's Best

### OVER THE COUNTER

- Gel Mix <u>www.gelmix.com</u> or Amazon Prime
- Simply Thick (Ketogenic diet only, no preterms or patients with a history of NEC)

\*\*\* Other commercial thickening agents are not appropriate for use under 1 year of age



# RECIPES FOR NECTAR-THICK/LEVEL 2 MILDLY THICK CONSISTENCY

### THICKENING FOR CHILDREN OVER THE AGE OF 1 YEAR

- FOOD ALTERNATIVES
- Pudding: add 2 oz pudding to 2 oz milk or formula
- YoBaby yogurt: add 4 oz YoBaby yogurt to 2 oz milk or formula
- Stage 2 baby food applesauce: add 4 oz stage 2 baby food applesauce to 2 oz water or juice
- Stage 2 baby food bananas: add 2 oz stage 2 baby food bananas to 2 oz water, milk or juice
- Motts (or similar brand) applesauce: add 2 oz Motts applesauce to 2 oz water or juice



### THICKENING FOR CHILDREN OVER THE AGE OF 1 YEAR

- COMMONLY AVAILABLE COMMERCIAL THICKENER\*
- Follow recipes for "NECTAR-Thick" on the container
- ► Gel Mix <u>www.gelmix.com</u> or Amazon Prime
- Simply Thick <u>www.simplythick.com</u> 1 "nectar" packet Simply Thick per 4 oz liquid
  - For Pediasure, 1 "nectar" packet Simply Thick per 6 ounces liquid
- Nestle Resource Thicken-Up Clear\*\* www.thickenupclear.com
  - (only advised for patients over 3 years old)
- Thick-It www.thickitretail.com

- Nestle Resource Thicken-Up <u>www.nestle-nutrition.com</u>
- Hormel Thick and Easy www.hormelhealthlabs.com
- Hormel Thick and Easy Clear\*\* www.hormelhealthlabs.com
- Bob's Red Mill Guar Gum: 1/8 tsp Guar Gum per 2 oz liquid or ¼ tsp Guar Gum per 4 oz liquid



### COMMERCIALLY AVAILABLE NECTAR CONSISTENCY LIQUIDS

(no extra thickener needed)

- Gerber Yogurt Juice
- Dannon Drinkable Yogurt
- Danimals Smoothie
- Lifeway Organics: ProBugs Organic Whole Milk Kefir
- Naked Smoothies
- Thick & Easy nectar-thick beverages
- Avoid offering juicy fruits (oranges, pineapple, watermelon, etc.), foods that melt to a thin liquid in the mouth (ice cream, popsicles, Jell-O, etc.) and thin soup broths. Soup broths can be thickened by adding cornstarch, potato flakes, extra blended vegetables, flour, etc.



### IDDSI – Level 3 – Liquidised, Moderately Thick

- The old "Honey"
- Can drink from a cup



- Some effort when sucking through standard bore or wide bore straw
- Cannot be layered or molded on a plate
- Smooth texture with no bits, lumps, fibers, etc.
- Examples include: Infants' "first foods", sauces, gravies, fruit syrup



# How To Test - Level 3 – Liquidised, Moderately Thick

- Flow Test: Test liquid flows through a 10 mL slip tip syringe leaving >8 mL in the syringe after 10s
- Fork Drip Test:
  - Drips slowly in dollops through the prongs of a fork
  - Tines/Prongs of a fork do *not* leave a clear pattern on the surface
  - Spreads out if spilled onto a flat surface
- **Spoon Tilt Test:** Easily pours from spoon when tilted; does not stick to spoon







Level 3





# Level 3 – Liquidised

IDDSI Fork Drip Test IDDSI Spoon Tilt Test

Sesame Soup



# RECIPES FOR HONEY-THICK/LEVEL 3 MODERATELY THICK CONSISTENCY

### OATMEAL CEREAL

- Gerber: Add 2 Tablespoons (TBSP) oatmeal cereal to 2 oz formula
- Beech Nut: Add 2 Tablespoons (TBSP) oatmeal cereal to 2 oz formula

### RICE CEREAL

- Gerber: Add 5 teaspoons (tsp) rice cereal to 2 oz formula
- Beech Nut: Add 5 teaspoons (tsp) rice cereal to 2 oz formula



### **IDDSI Flow Test Comparison Levels 1 - 3**





### **Commercial Thickener Age Guidelines**

Brand	Manufacturer's Age Guidelines	Ingredients
Gelmix™	Not intended for full term infants <42 weeks gestational age or infants weighing < 6 pounds (2.72kg). May be used in preterm infants who are currently > 52 weeks post-menstrual age (PMA) Can be used at: -Half-nectar or Nectar-thick consistency for children <1 yrs. -Honey-thick consistency for children >1 yrs.	Organic tapioca maltodextrin, organic carob bean gum, calcium carbonate
Simply Thick® Easy Mix™	Not intended for use with preterm infants or infants under 12 months of age. Not intended for children under 12 years of age with history of NEC.	Water, soluble fiber, xanthan gum, glucono delta-lactone, gellan gum, potassium sorbate (preservative), calcium chloride, citric acid, sodium citrate, guar gum, pectin.
Thick-It®	Not to be used in preterm infants Age guideline not listed	Modified food starch and maltodextrin.



### **Commercial Thickener Age Guidelines**

Brand	Manufacturer's Age Guidelines	Ingredients
Nestle Resource® Thicken-Up®	3+ years	Modified Corn starch May contain soy, milk, egg, wheat (due to cross contamination)
Nestle Resource® Thicken-Up® Clear	3+ years	Maltodextrin, Xanthan gum, potassium chloride May contain milk due to cross contamination
Hormel Thick and Easy®	3+ years	Modified food starch.
Hormel Thick and Easy® Clear	3+ years	Maltodextrin, Xanthan Gum, Carragenan, Erythritol



# IDDSI – Level 4 – Extremely Thick, Pureed

Cannot drink from cup or suck via straw



- Shows some very slow movement under gravity but cannot be poured
- Falls off spoon in a single spoonful when tilted and continues to hold shape on plate
- No lumps & not sticky
- Liquid must not be able to separate from solid (yogurt?)



### How To Test - Level 4 – Extremely Thick, Pureed

- Fork Pressure Test: The tines/prongs of a fork can make a clear pattern on the surface, and /or the food retains the indentation from the fork. \*No lumps\*
- Fork Drip Test: Sample sits in a mound above the fork; a small amount may flow through and form a tail below the fork prongs

#### • Spoon Tilt Test:

- Holds shape on spoon
- Full spoonful must plop off spoon if the spoon is tilted or turned sideways a gentle flick may be necessary to dislodge
- May spread slightly on a flat plate

#### • Finger Test: It is JUST possible to hold a sample using fingers



### How To Test - Level 4 – Extremely Thick, Pureed

- Fork Pressure Test: The tines/prongs of a fork can make a clear pattern on the surface, and /or the food retains the indentation from the fork. \*No lumps\*
- Fork Drip Test: Sample sits in a mound above the fork; a small amount may flow through and form a tail below the fork prongs

#### Spoon Tilt Test:

- Holds shape on spoon
- Full spoonful must plop off spoon if the spoon is tilted or turned sideways a gentle flick may be necessary to dislodge
- May spread slightly on a flat plate
- Finger Test: It is possible to hold a sample of this texture using just the fingers



How To Test - Level 4 – Extremely Thick, Pureed

# Level 4 – Pureed

IDDSI Fork Pressure Test IDDSI Fork Drip Test IDDSI Spoon Tilt Test IDDSI Finger Test

### **Potato Puree**





Changing What's Possible

### IDDSI – Level 5 – Minced & Moist

- Soft and moist with no separate thin liquids
- Lumps are easy to mash with tongue
- Biting is not required and chewing is minimal

MEAT

- Finely minced or chopped, tender mince
  - Paediatric, 2mm lump size
  - Adult, 4mm lump size
- Serve in extremely thick, smooth, non-pouring sauce or gravy
- \*If texture cannot be finely minced it should be pureed

FISH

- Finely mashed in extremely thick smooth, nonpouring sauce or gravy
  - Paediatric, 2mm lump size
  - Adult, 4mm lump size

#### FRUIT

- Serve mashed
- Drain excess juice
  - o Paediatric, 2mm lump size
  - Adult, 4mm lump size

#### VEGETABLES

- Finely minced or chopped or mashed
- Drain any liquid
  - Paediatric, 2mm lump size
  - Adult, 4mm lump size

#### CEREAL

- Very thick and smooth with small soft lumps
  - o Paediatric, 2mm lump size
  - o Adult, 4mm lump size
- Texture fully softened
- Any milk/fluid must <u>not</u> separate away from cereal. Drain any excess fluid before serving BREAD
- Pre-gelled 'soaked' breads that are very moist and gelled through the entire thickness
- No regular, dry bread

MINCED & MOIST RICE

 <u>Not</u> sticky or glutinous (particularly short grain rice) and should <u>not</u> be particulate or separate into individual grains when cooked and served (particularly long grain rice)





Use slot between fork prongs (4mm) to determine whether minced pieces are the correct or incorrect size





Note - lump size requirements for all foods in Level 5 Minced & Moist:

- Paediatric, 2mm lump size
- Adult, 4mm lump size

### How To Test – Level 5 – Minced & Moist

#### • Fork Pressure Test:

- When pressed with a fork the particles should easily be separated between and come through the tines/prongs of a fork
- Can be easily mashed with little pressure for a fork (pressure should not make the nail blanch turn white)

#### • Fork Drip Test:

• A scooped sample sits in a pile or can mound on the fork and does not easily or completely flow or fall through the tines/prongs of a fork

#### • Spoon Tilt Test:

- Hold shape on spoon
- A full spoonful must slide/pour off the spoon if the spoon is tilted or turned sideways or shaken lightly (i.e. should not be sticky)
- A scooped mound may spread or slump very slightly on a plate

#### • Finger Test:

• It is possible to easily hold a sample of this texture using fingers. Can be easily squashed between fingers.





### IDDSI – Level 6 – Soft & Bite-Sized

- Can be eaten with fork or spoon
- Can be mashed or broken down w/pressure from utensil
- Knife not required to cut
- Chewing is required, but not biting
- Soft/tender & moist, but with no separate liquid
- Bite sized defined:
  - Peds, 8mm piece
  - Adults, 15 mm (1.5 cm piece)





### IDDSI – Level 6 – Soft & Bite-Sized

- Things to consider:
- Fibrous part (skin) is not suitable
- Vegetables must be steamed or boiled
- Rice should not be particulate, grainy, sticky, or glutinous
- Ability to chew "bite-sized" pieces is required
- Food can be mashed with a fork, knife is not required
- Bread
  - Pre-gelled or soaked breads that are very moist and gelled through the entire thickness
  - No regular or dry breads (unless approved on an individual basis)
- Cereal
  - Smooth, texture must be fully softened, any excess milk or fluid must be drained





### How To Test – Level 6 – Soft & Bite-Sized

#### Fork Pressure Test

- Pressure from a fork held on its side can be used to 'cut' or break into a smaller piece
- When a sample is pressed w/the base of a fork to pressure where the thumb nail blanches to white, the sample squashes & changes shape, and does *not* return to its original shape when the fork is removed

### Spoon Pressure Test

• Same as a fork

#### • Finger Test

 It is possible to squash sample using finger pressure such that the thumb/index finger nails blanch to white. Does not return to its initial shape



Sample squashes and does <u>not</u> return to its original shape when pressure is released







### IDDSI – Level 7 – Regular

- Normal, everyday food of various textures
- Any method may be used to eat
- May be hard and crunchy or naturally soft
- Includes dual or mixed consistencies (cereal with milk, soup with vegetables)
- Ability to bite off pieces of food is required



### **Transitional Foods**

- Defined as any food that starts as one texture (i.e. a firm solid) and changes into another texture specifically when moisture is applied, or when a change in temperature occurs (e.g. heating)
- Examples include:
- Ice chips
- Ice cream
- Wafers
- Waffle cone
- Some crackers/cookies
- Cheese puffs
- Yogurt melts
- Gerber Puffs



### **Transitional Foods**

- Biting not required
- Minimal chewing required
- May be used to teach chewing skills
- Tongue pressure can be used to break these foods once the texture has been changed by moisture/saliva or temperature

#### Testing:

- Finger/Spoon Test:
  - After moisture or temperature has been applied, the sample can be easily deformed and does not recover its shape when the force is lifted
  - Place sample in 1mm of water. Apply fork pressure using the base of the fork until the thumbnail blanches white. The sample is considered transitional if:
    - The sample has been squashed/disintegrated and no longer looks like its original state
    - Or it has melted significantly and no longer looks like original state

#### • Finger Test:

• Place 1mm of water on sample and wait 1 minute. The sample will break apart by rubbing sample between thumb and index finger



# Food progressing in a typically developing child – Recommendations by AAP

- Exclusive breastfeeding for approximately 6 months
- Introduce solid foods around 6 months of age
  - Wide variety of healthy foods and offer a variety of textures
- After 9 months, offer 2-3 healthy and nutritious snacks per day.
  - Maintain fruit and vegetable consumption after finger foods are introduced.
- Try to avoid introducing juice until child is a toddler. If juice is introduced, wait until 6-9 months and limit consumption to 4-6 ounces.
  - Avoid introduction of sugar-sweetened beverages



## **IDDSI Testing Methods**

Testing for Liquid Variations			
Level 0 – Thin Liquids	Flow Test: Test liquid flows through a 10 mL slip tip syringe completely within 10s, leaving no residue		
Level 1 – Slightly Thick Liquids	<ul> <li>Flow Test: Test liquid flows through a 10 mL slip tip syringe leaving 1-4 mL in the syringe after 10s</li> </ul>		
Level 2 – Mildly Thick Liquids	<ul> <li>Flow Test: Test liquid flows through a 10 mL slip tip syringe leaving 4-8 mL in the syringe after 10s</li> </ul>		
Level 3 – Liquidised Moderately Thick	<ul> <li>Flow Test: Test liquid flows through a 10 mL slip tip syringe leaving &gt;8 mL in the syringe after 10s</li> <li>Fork Drip Test:         <ul> <li>Drips slowly in dollops through the prongs of a fork</li> <li>Tines/Prongs of a fork do <i>not</i> leave a clear pattern on the surface</li> <li>Spreads out if spilled onto a flat surface</li> </ul> </li> <li>Spoon Tilt Test: Easily pours from spoon when tilted; does not stick to spoon</li> </ul>		
Level 4- Pureed Extremely Thick	<ul> <li>Fork Pressure Test: The tines/prongs of a fork can make a clear pattern on the surface, and /or the food retains the indentation from the fork. *No lumps*</li> <li>Fork Drip Test: Sample sits in a mound above the fork; a small amount may flow through and form a tail below the fork prongs</li> <li>Spoon Tilt Test: <ul> <li>Holds shape on spoon</li> <li>Full spoonful must plop off spoon if the spoon is tilted or turned sideways – a gentle flick may be necessary to dislodge</li> <li>May spread slightly on a flat plate</li> </ul> </li> <li>Finger Test: It is JUST possible to hold a sample using fingers</li> </ul>		



### How Does Varibar Compare?

The Varibar® products come in 4 different liquid consistencies, labelled "thin", "nectar", "thin honey" and "honey", consistent with the terminology used in the National Dysphagia Diet (1992).

Veriber Dreduct	IDDSI Syringe Flow Test Result (ml)		IDDSI Result (Lough # and Name)
Varibar Product	Mean	Standard Deviation	IDDSI Result (Level # and Name)
Thin 40%	0.0	0.0	Level 0 - Thin
Nectar 40%	4.9	0.4	Level 2 - Mildly-thick
Thin Honey 40%	9.8	0.0	Level 3 - Moderately-thick
Honey 40%	9.9	0.1	? Level 4 - Extremely-thick

Table 2. IDDSI Syringe Flow Test results for Bracco Varibar® barium products.



Figure 1. IDDSI Syringe Flow Test Results for Bracco Varibar® barium products.



Changing What's Possible





### **IDDSI Flow Test**







### References

- Arvedson, J. C., & Lefton-Greif, M. A. (1996). Anatomy, physiology, and development of feeding. Seminars in Speech & Language, 17(4), 261-8.
- Arvedson, J. C., & Lefton-Greif, M. A. (2007). Ethical and legal challenges in feeding and swallowing intervention for infants and children. Seminars in Speech and Language, 28(3), 232-238.
- Arvedson, J. C., & Simon, D. M. (1998). Acquired neurologic deficits in young children: A diagnostic journey with dora. Seminars in Speech & Language, 19(1), 71-80; quiz 80-1.
- Beal, J., Silverman, B., Bellant, J., Young, T., Klontz, K. (2012). Late Onset Necrotizing Enterocolitis in Infants following Use of a Xantham Gum-Containing Thickening Agent. *The Journal of Pediatrics*. 161, 354-6.
- Cichero, J., Nicholson, T., Dodrill, P. (2011). Liquid Barium is not Representative of Infant Formula: Characterisation of Rheological and Material Properties. Dysphagia, 26, 264-271.
- Cichero, J., Nicholson, T., September, C. (2013). Thickened Milk for the Management of Feeding and Swallowing Issues in Infants: A Call for Interdisciplinary Professional Guidelines. *Journal of Human Lactation, XX(X), 1-4.*
- Damian, L. A., & Johnson, K. (n.d.). Nipple Flow Rates: What are they really and how does this affect our clinical practice? Retrieved February 8, 2020, from Dr. Brown's Medical website: https://www.drbrownsbaby.com/medical/wpcontent/uploads/2016/08/DBM-MilkFlowRates-Dayton-Article.pdf
- Duncan, D. R., Mitchell, P. D., Larson, K., & Rosen, R. L. (2018). Presenting Signs and Symptoms do not Predict Aspiration Risk in Children. *The Journal of pediatrics*, 201, 141–146. doi:10.1016/j.jpeds.2018.05.030
- Goldfield, E.C., Smith, V., Buonomo, C., Perez, J., Larson, K. (2013). Preterm Infant Swallowing of Thin and Nectar-Thick Liquids: Changes in Lingual Palatal Coordination and Relation to Bolus Transit. *Dysphagia, 28, 234-244.*



### **References continued**

- Lefton-Greif, M. A., Carroll, J. L., & Loughlin, G. M. (2006a). Longterm follow-up of oropharyngeal dysphagia in children without apparent risk factors. *Pediatr. Pulmonol.*, 41, 1040-1040-1048.
- Lefton-Greif, M. A., & Arvedson, J. C. (1997). Pediatric feeding/swallowing teams. Seminars in Speech & Language, 18(1), 5-11; quiz 12.
- Martin-Harris, B., Brodsky, M. B., Michel, Y., Castell, D. O., Schleicher, M., Sandidge, J., et al. (2008). MBS measurement tool for swallow impairment-MBSImp: Establishing a standard. *Dysphagia*, 23, 392-392-405.

