

# COMPENDIUM OF SCIENTIFIC LITERATURES



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# EXECUTIVE SUMMARY

The use of **ThickenUp® Clear\***, a xanthan gum-based instant food and drink thickener, leads to significant improvements in swallowing safety and efficiency by reducing the number of penetrations and aspirations without increasing residue. It is well accepted and tolerated by patients with dysphagia and can be used as a thickener in the assessment, diagnosis, and management of dysphagia. The 18 articles summarised in this document provide evidence from real-world studies, interventional studies, poster abstracts, prospective and retrospective studies, open-label and rheological studies on patients with oropharyngeal dysphagia in support of this thickener.

\* Can be found under another brand name, depending on the country: Resource® ThickenUp Clear, Clinutren® ThickenUp Clear, Resource® Espesante Clear.



## STUDY

# 1

## Dysphagia: the role of thickeners, specifically Resource® ThickenUp® Clear, in maintaining hydration

Nazarko L, Morgan J. *British Journal of Neuroscience Nursing* 2022;18(6):250-256.



### PRINCIPAL AIM

Examine the prevalence, causes, consequences and the role of thickening agents in the management of oropharyngeal dysphagia.

Describe three clinical cases among patients with oropharyngeal dysphagia (OD) and the impact of thickeners on anxiety and nutritional outcomes.

### MATERIAL & METHODS

- ▶ **Type of study:** Case series and literature review.
- ▶ **Study population:** Patients with oropharyngeal dysphagia. Clinical case 1: Patient with OD associated with Huntington's disease; Case 2: Patient with OD associated with Parkinson's disease; Case 3: Patient with OD associated with bowel surgery and wearing a feeding tube.
- ▶ **Product intervention:** ThickenUp® Clear.

## STUDY

# 1

## RESULTS

- ▶ ThickenUp® Clear improved control over both the oral and pharyngeal phases of swallowing, reduced stress levels and prolonged coughing attacks, and maintained adequate hydration and nutrition by maintaining a stable body weight in a patient with Huntington's disease (Case 1).
- ▶ Implementing appropriate intervention, with thickened drinks by using ThickenUp® Clear (IDDSI Level 1) and Texture Modified Diet (IDDSI Level 5) adapted the patient's swallowing function, helped reduce the anxiety of choking in a patient with Parkinson's Disease (Case 2).
- ▶ In a patient undergoing bowel surgery and using a feeding tube, ThickenUp® Clear (IDDSI Level 2) assisted in the transition from enteral to oral nutrition, preventing aspiration and the onset of chest infections, in addition to maintaining the patient's weight (Case 3).

## CONCLUSIONS

**ThickenUp® Clear** helps patients with oropharyngeal dysphagia feel safer while drinking by reducing anxiety and stress and preventing aspiration and the onset of chest infections.

## Determining the impact of thickened liquids on swallowing in patients undergoing irradiation for oropharynx cancer


Barbon CEA, Chepeha DB, Hope AJ, Peladeau-Pigeon M, Waito AA, Steele CM. *Otolaryngology-Head and Neck Surgery* 2022;166(3):511-514.

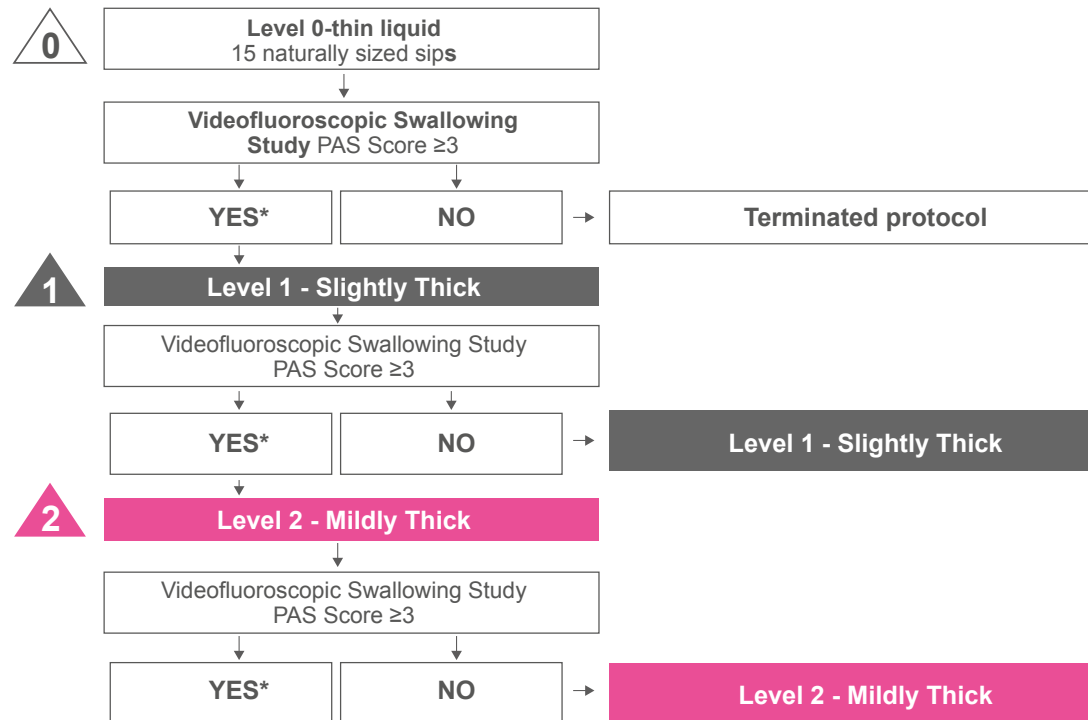


### PRINCIPAL AIM

To assess the swallowing safety and efficiency of IDDSI Level 1 - Slightly Thick and IDDSI Level 2 - Mildly Thick liquids on penetration-aspiration and residue by using two types of thickening agents among patients with oropharyngeal cancer.

### MATERIAL & METHODS

- ▶ **Study type:** Observational Study.
- ▶ **Study population:** 12 patients (mean age 63 y.o.) with oropharyngeal cancer who present post-radiotherapy dysphagia.
- ▶ **Products Intervention:** 20% w/v liquid barium was prepared at four-viscosity bolus (Thin liquid-Level 0, Mildly thick-Level 2, Moderately thick-Level 3 and Extremely thick-Level 4), prepared according to descriptors of the IDDSI Framework with ThickenUp® Clear (xanthan gum-based thickener) and ThickenUp® (starch-based thickener).
- ▶ **Assessments:** The penetration-aspiration and residue were analysed by using VFSS (videofluoroscopic swallowing study). The results of the VFSS were graded using the Penetration-Aspiration Scale (PAS). 



\*For safety, the protocol was terminated after 4 observations of penetration-aspiration.



## RESULTS

- ▶ Safety results:  
75% (9 out of 12) of participants had penetration and aspiration on thin liquids.
  - A significant reduction ( $p < 0.05$ ) in penetration-aspiration events was observed ( $p < 0.05$ ), by increasing the consistency in slightly thick and mildly thick liquid bolus. No difference in the frequency of unsafe swallows between slightly and mildly thick liquids were observed.
- ▶ Efficiency results:
  - Residue was shown in almost half (46%) of the participants with a thin liquid bolus.
  - With respect to Slightly thick and Mildly thick results, there were no significant differences across consistencies.

## CONCLUSIONS

Post-swallowing penetrations and aspirations with thin liquids are common in patients with oropharyngeal cancer, which can lead to pneumonia. **ThickenUp® Clear** at lower consistency (slightly thick-IDDSI Level 1, and Mildly thick-IDDSI Level 2) can be used to enhance the frequency of safe swallows in patients with oropharyngeal cancer who develop dysphagia in post-radiation therapy.

## STUDY

# 3

## Early Postoperative Oral Exercise Improves Swallowing Function Among Patients With Oral Cavity Cancer: A Randomised Controlled Trial

Hsiang C-C, Chen AW-G, Chen C-H, Chen M-K. *Ear, Nose & Throat Journal*. 2019;98(6):E73-E80.




### PRINCIPAL AIM

To assess the effect of early oral exercise, in addition to standard care in postoperative patients with oropharyngeal cancer to enhance the swallowing function due to its frequent compromise, which leads to high rates of oral and pharyngeal residue because of difficulty passing food through the oral cavity.

### MATERIAL & METHODS

- ▶ **Type of study:** a single-institution, single-blind, randomised controlled trial performed in a tertiary medical centre.
- ▶ **Study population:** 50 patients with oropharyngeal dysphagia with oral and oropharyngeal cancer who underwent tumour resection, neck dissection, and reconstruction.
- ▶ **Intervention:** The intervention group received instructions regarding oral exercises (lips, jaw, and tongue), proper food and drink textures and swallowing positions. The control group did not receive instructions regarding oral exercises.
- ▶ **Assessments:** The Penetration-Aspiration Scale (PAS) was used to assess swallowing safety. ThickenUp® Clear was used to prepare the nectar-, honey-, and pudding-like thickness of liquids according to the National Dysphagia Diet Task Force.

## RESULTS

- ▶ Significant improvements of oral and pharyngeal residue in the exercise group combined with proper texture modification and swallowing positions of nectar, honey, and pudding-like consistencies prepared with ThickenUp® Clear were observed compared to the control group.
- ▶ Greater improvements in oral and pharyngeal residues were observed with thicker boluses (pudding-like thickness).  
*Figures 1 and 2.* 

## CONCLUSIONS

A comprehensive intervention that includes oral exercise, texture modification by using **ThickenUp® Clear** at thicker boluses, and swallowing position could help to improve the swallowing function by reducing oral and pharyngeal residue in patients with oral and oropharyngeal cancer who have undergone surgical intervention.

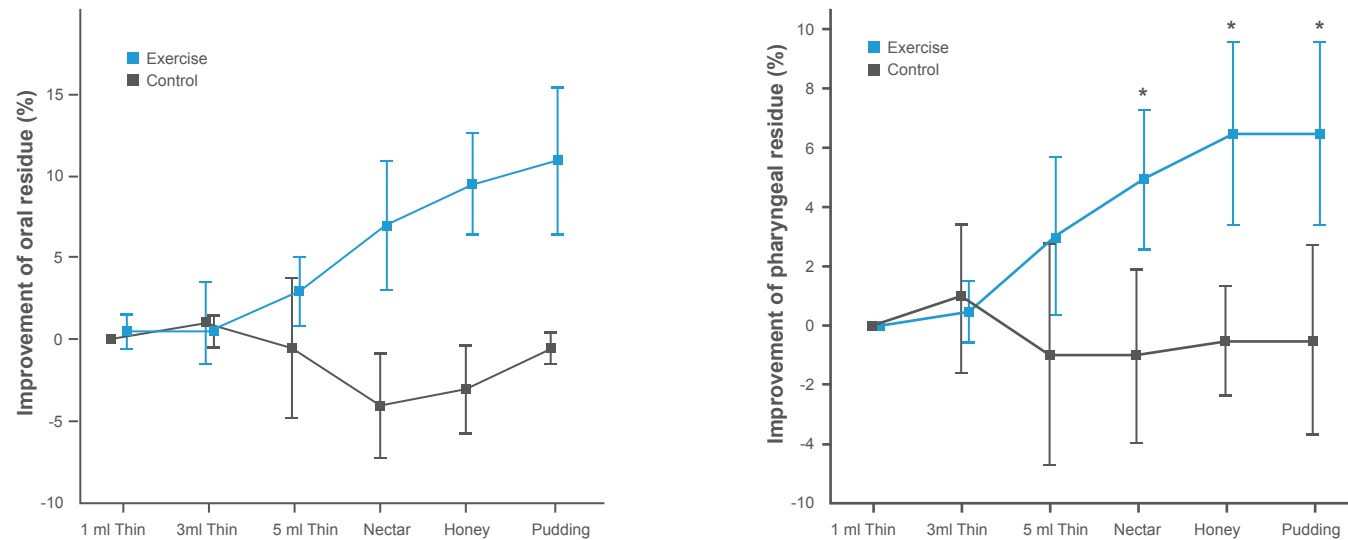


Figure: Improvement of oral and pharyngeal residue. Significant improvements in oral and pharyngeal residue were observed in the nectar ( $P < 0.001$ ), honey ( $P < 0.001$ ), and pudding-like ( $P < 0.001$ ) in the exercise group. Error bars represent the 95% confidence interval of the means. \*P value < .05. Reprinted by Permission of SAGE Publications

## STUDY

# 4

## The effect of "xanthan gum-based fluid thickener" on hydration, swallowing functions and nutritional status in total maxillectomy patients



Sezgin, B., Durusoy, D., Demirci, M.S, Ozturk K., Kaya I., Eyigor S, Gode S., Eur Arch Otorhinolaryngology 2018;275(12):2997-3005.

### PRINCIPAL AIM



To assess the role of a xanthan gum-based fluid thickener on swallowing function and hydration of maxillectomy patients in a randomised controlled trial.

### MATERIAL & METHODS

- ▶ **Study type:** uni-centre, prospective, randomised controlled trial.
- ▶ **Study population:** 22 patients (mean age: 56.6 y.o.) diagnosed with maxillary carcinoma and with planned total maxillectomy.
- ▶ **Experimental product:** ThickenUp® Clear was used to prepare thickening liquids up to 3 months postoperatively.
- ▶ **Assessments:** Multifrequency bioimpedance analysis, Functional Oral Intake Scale (FOIS), Functional Outcome Swallowing Scale (FOSS), MD Anderson Dysphagia Inventory (MDADI), and the Eating Assessment Tool-10 (EAT-10).

## RESULTS

After 3 months of surgery:

- ▶ Both intervention and control groups experienced a significant decrease in BMI, hip circumference, and waist circumference values due to impairment of oral intake. ( $p < 0.05$ ). Moreover, the control group shown a more reduction in body mass index than the study group.
- ▶ The intervention group preserved their intracellular water (ICW), extracellular water (ECW) and total body water (TBW) (*Figure 1*)  while the control group experienced a worse hydration status than the intervention group (*Figure 2*). 
- ▶ Both groups experienced higher scores on the EAT-10 questionnaire. However, the control group showed higher scores than the intervention group, which could lead to an increased of risk of aspiration and aspiration pneumonia.
- ▶ Both groups experienced a reduce of quality of life (MDADI), worse Functional Outcome Swallowing Scale (FOSS) and The Functional Oral Intake Scale (FOIS) scores.

## CONCLUSIONS

The use of **ThickenUp® Clear**, a xanthan gum-based thickener, helped maintain intracellular fluid, extracellular fluid, and bodily fluids (measured by bioimpedance) in patients with maxillary carcinoma undergoing a total maxillectomy

Figure 1.

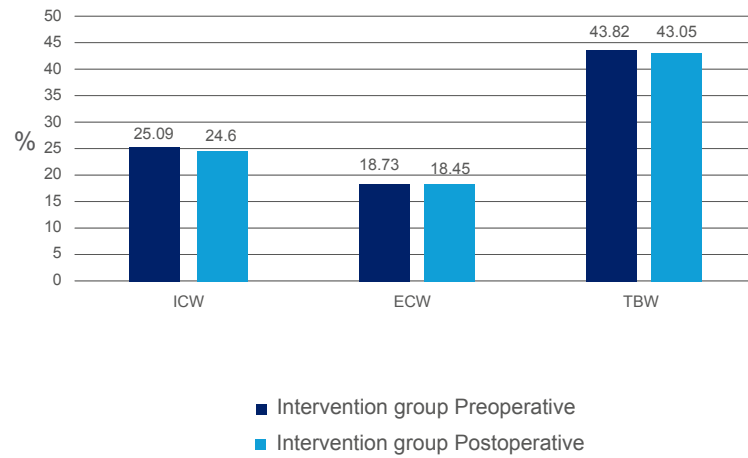


Figure 2.

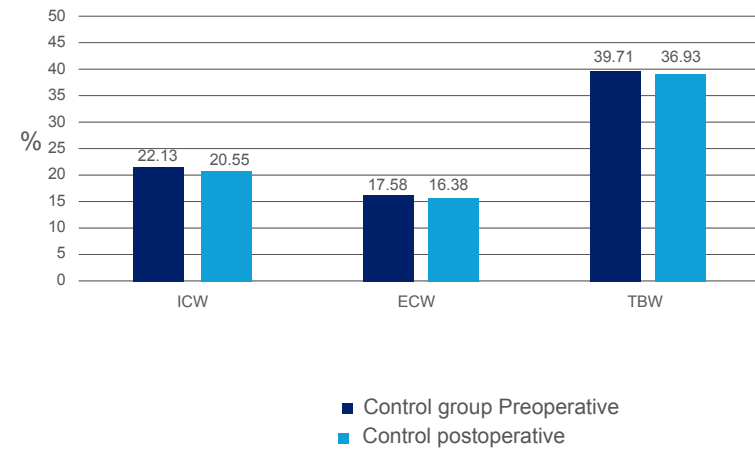


Figure1-2: % Intracellular water (ICW), extracellular water (ECW) and total body water (TBW) in the intervention group (Figure 1) and control group (Figure 2)

## Nutritional status of older patients with oropharyngeal dysphagia in a chronic versus acute clinical situation

Carrión S, Roca M, Costa A, Arreola V, Ortega O, Palomera E, Serra-Prat M, Cabré M, Clavé P. *Clinical Nutrition* 2017;36(4):1110-1116.



### PRINCIPAL AIM



To evaluate the nutritional status of older patients with oropharyngeal dysphagia in a chronic and acute clinical situation.

### MATERIAL & METHODS

- ▶ **Study type:** Observational Cross-sectional Study.
- ▶ **Study population:** 133 patients  $\geq 70$  y.o., of which 95 had OD associated with chronic neurological disease (CND) or aging, 23 were older adults with OD hospitalised with acute community-acquired pneumonia (CAP), and 15 were older controls (volunteers) without dysphagia or any acute condition (Group C).
- ▶ **Experimental product:** A xanthan gum-based thickener (ThickenUp® Clear) was used for performing the Swallowing Study at three-viscosity bolus (nectar, thin liquid, and spoon/pudding thick), prepared according to descriptors of the National Dysphagia Diet Task Force (US).
- ▶ **Assessments:** After diagnosis of OD, the nutritional status was assessed by the Mini-Nutritional Assessment (MNA®), biochemical nutritional markers, anthropometric measurements, and bioimpedance. Sarcopenia was assessed using the criteria by the European Working Group on Sarcopenia in Older People (EWGSOP).



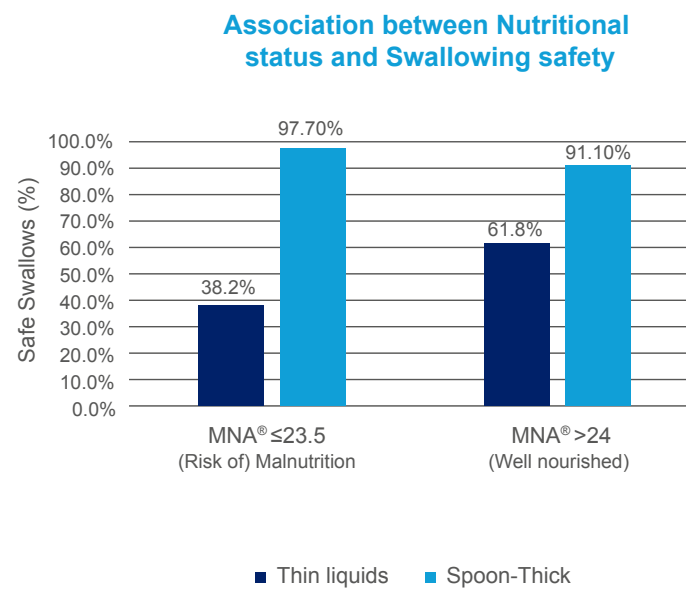
## RESULTS

- ▶ Prevalence of (risk of) Malnutrition and Sarcopenia is very high in patients with CND, and CAP associated with chronic disease or aging. 
- ▶ Prevalence of impaired swallowing safety was very high among CND and CAP patients on thin liquids and a strong therapeutic effect of increasing bolus viscosity with ThickenUp® Clear was observed with a maximal therapeutic effect on swallowing safety at spoon-thick viscosity. *Figure 1.* 
- ▶ Patients with poor nutritional condition who require spoon-thick viscosity experienced an impairment in swallowing efficiency caused by an increase in oropharyngeal residue.

## CONCLUSIONS

The prevalence of patients with impaired swallowing safety is very high among malnourished and sarcopenia patients with dysphagia, chronic neurological disease, and acute community-acquired pneumonia, which could be offset by increasing the viscosity of the liquids by using **ThickenUp® Clear**. However, due to the compromised nutritional status and sarcopenia of the patients, monitoring of oropharyngeal residue is needed.

Figure 1.



## A comparative study between modified starch and xanthan gum thickeners in post-stroke oropharyngeal dysphagia

Vilardell N, Rofes L, Arreola V, Speyer R, Clavé P. *Dysphagia* 2016; 31(2):169-79.




### PRINCIPAL AIM

To compare the efficacy of two types of thickening agents using clinical and videofluoroscopic exploration of swallowing safety and efficacy in post-stroke patients with oropharyngeal dysphagia (OD).

### MATERIAL & METHODS

- ▶ **Study type:** Retrospective Study.
- ▶ **Study population:** 122 patients (n=46 starch-based thickener, 76 xanthan gum-based thickener) with chronic oropharyngeal dysphagia as consequence of previous stroke episode.
- ▶ **Experimental products:** ThickenUp® (xanthan gum-based thickener), ThickenUp® (starch-based thickener) were compared.
- ▶ **Assessments:** For each thickener, three different viscosities (thin liquid, nectar, and spoon/pudding thick) were prepared according to viscosity ranges of the National Dysphagia Diet Task Force. The results of the clinical volume-viscosity swallow test (V-VST) and the videofluoroscopic (VFS) studies on two types of thickeners were analysed.

## RESULTS

- ▶ Both thickening agents were able to increase the prevalence of safe swallows without penetrations and/or aspirations compared to thin liquid, as well as significantly improving the penetration-aspiration scale (PAS) score.
- ▶ Greater efficacy in improving swallowing safety and efficacy was supported by ThickenUp® Clear compared with a starch-based thickening agent without increasing the prevalence of oral and pharyngeal residues. *Figure 1.* 

## CONCLUSIONS

Both ThickenUp® and **ThickenUp® Clear** are proven effective to improve swallowing safety in post-stroke patients. However, thanks to its exclusive composition, **ThickenUp® Clear** shows greater efficacy than a modified starch based thickening agent, as it does not increase the prevalence of oral and pharyngeal residue, better avoiding the risk of aspiration after the swallow.

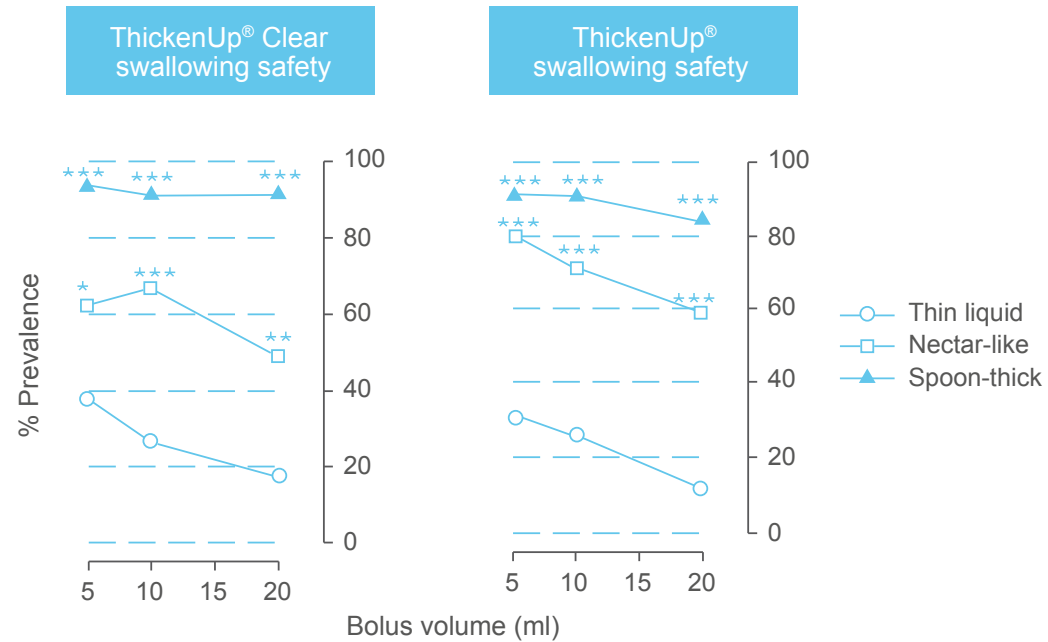


Figure 1. Prevalence of signs of impaired safety measured by VFS. (\*P<0.05, \*\*P<0.001 vs. thin liquid).

## The effects of a xanthan gum-based thickener on the swallowing function of patients with dysphagia

Rofes L, Arreola V, Mukherjee R, Swanson J, Clavé P. *Alimentary Pharmacology & Therapeutics* 2014;39(10):1169-79.



### PRINCIPAL AIM

To assess the swallowing safety and efficacy of different levels of viscosity of a xanthan gum-based thickening agent using clinical and videofluoroscopic exploration.


### MATERIAL & METHODS

- ▶ **Study type:** Prospective clinical Study.
- ▶ **Study population:** n=121 adults with oropharyngeal dysphagia associated with age (n=41) and/or neurological pathology (n=66 with stroke and n=13 with neurodegenerative disease) and healthy control volunteers (n=14).
- ▶ **Experimental products:** A xanthan gum-based thickener (ThickenUp® Clear) was studied.
- ▶ **Assessments:** For each thickener, two different viscosities (nectar and spoon/pudding thick) were prepared according to viscosity ranges of the National Dysphagia Diet Task Force. The results of the clinical volume-viscosity swallow test (V-VST), and the videofluoroscopic (VFS) studies on two types of thickeners were analysed. Volume-Viscosity Swallow Test (V-VST), Videofluoroscopy (VFS) signs, Penetration-Aspiration Scale (PAS).

## RESULTS

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### Swallowing Safety:

- ▶ Increasing the viscosity of the bolus to nectar and spoon/pudding thick texture using ThickenUp® Clear resulted in: *Figure 1.* 
- ▶ Increased swallowing safety in patients by reducing the prevalence of clinical signs of cough and voice effects measured by V-VST.
- ▶ A higher proportion of patients able to swallow safely, demonstrated by VFS measures and reduced number of penetrations and aspirations.

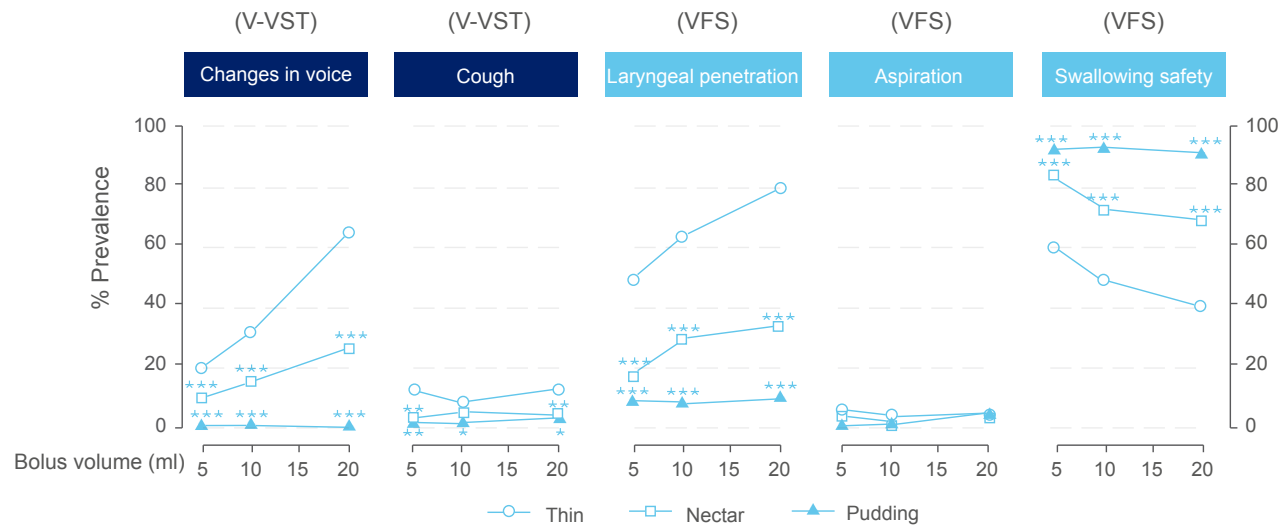



Figure 1. Prevalence of signs of impaired safety issues measured by V-VST and VFS. (\*P<0.05, \*\*P<0.001 vs. thin liquid).



## RESULTS

### Swallowing Efficacy:

- ▶ The increased viscosity of the bolus from thin to spoon/pudding thick texture showed a significant improvement in patients' effective lip closure ( $p < 0.05$ ). *Figure 2.* 
- ▶ The results of the VFS study showed that increased viscosity using ThickenUp® Clear did not increase oropharyngeal residue.
- ▶ In healthy volunteers, it was observed that increasing the viscosity to pudding slowed the time to open the upper oesophageal sphincter, eliciting changes in physiology.

## CONCLUSIONS

**ThickenUp® Clear** improves swallowing efficacy and improves swallowing safety by protecting against Penetration - Aspiration without increasing oropharyngeal residue in adults with oropharyngeal dysphagia associated with age and/or neurological pathology.

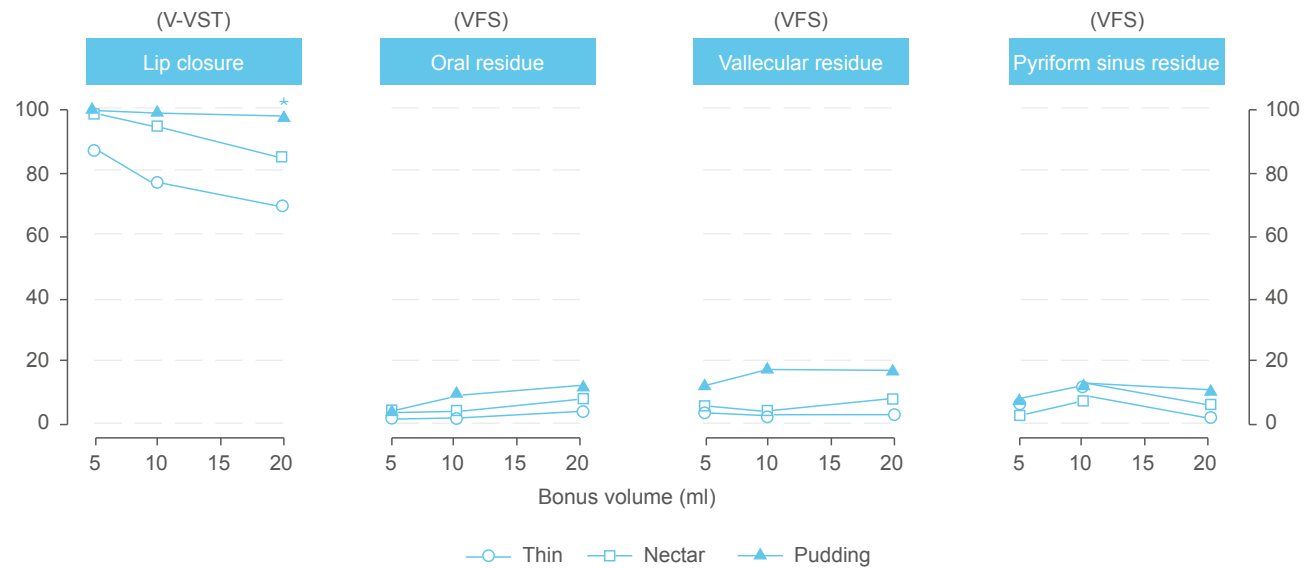


Figure 2. Prevalence of signs of impaired safety issues measured by V-VST and VFS. (\* $P < 0.05$ , \*\* $P < 0.001$  vs. thin liquid).

## Effects of Bolus Rheology on Aspiration in Patients with Dysphagia

Leonard RJ, White C, McKenzie S, Belafsky PC. *Journal of the Academy of Nutrition and Dietetics* 2014;114(4):590-4.




### PRINCIPAL AIM

To evaluate the effects on swallowing safety of nectar-thick liquids prepared with conventional starch-based and xanthan gum-based thickeners compared to thin liquid in patients with dysphagia caused by a range of medical conditions.

### MATERIAL & METHODS

- ▶ **Study type:** Prospective clinical trial.
- ▶ **Study population:** 100 patients with oropharyngeal dysphagia [Head and neck cancer (23%), history of gastroesophageal reflux disease or foreign body sensation (22%), neuromuscular or neurogenic (20%), medical (14%), structural anomaly (13%), and trauma (8%)].
- ▶ **Experimental products:** ThickenUp® Clear (xanthan gum-based thickener) and ThickenUp® (starch-based thickener) were used to prepare barium samples to nectar-thick viscosity according to viscosity ranges of the National Dysphagia Diet Task Force.
- ▶ **Assessments:** The potential aspiration was analysed by using VFSS (videofluoroscopic swallowing study). The results of VFSS were graded using the Penetration-Aspiration Scale (PAS).

## RESULTS

- ▶ The study revealed that both thickeners reduced the number of aspirations in dysphagia patients, with a statistically significant reduction in the incidence of penetration and aspiration using the xanthan gum-based thickener ( $p < 0.05$ ), ThickenUp® Clear.
- ▶ The mean penetration-aspiration scale (PAS) scores were significantly lower with ThickenUp® Clear, which better avoided aspiration/penetration than the thin liquid ( $p < 0.001$ ), while the difference between the starch-based thickener and the thin liquid was not significant. *Figure 1.* 

## CONCLUSIONS

Increasing the viscosity of the bolus with **ThickenUp® Clear** improves swallowing safety in dysphagia patients as it reduces the number of aspirations and the score on the penetration-aspiration scale (PAS).

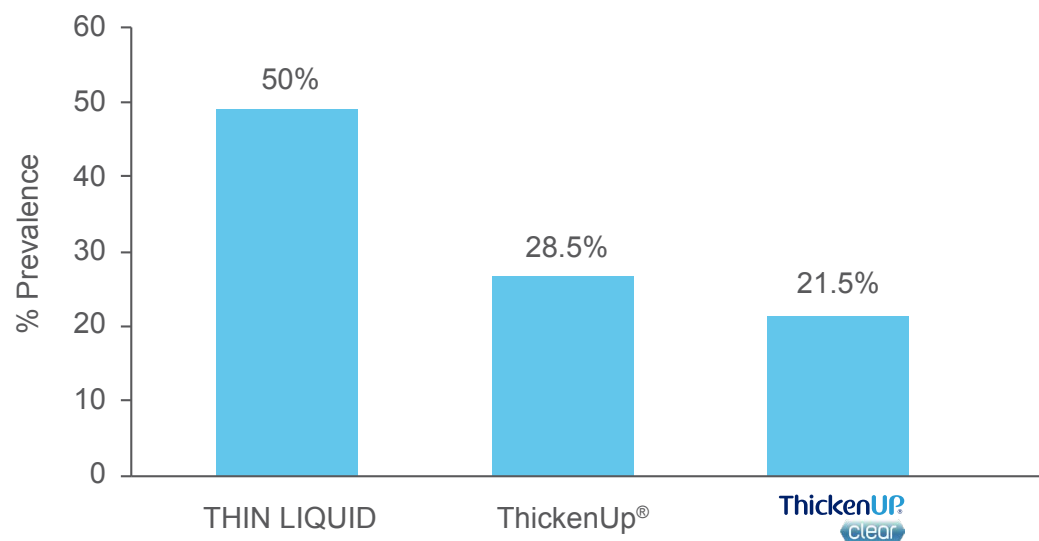


Figure 1. Prevalence of aspiration episodes, measured by VFS. \*  $p < 0.001$ .

## Tasteless thickeners? A competitive comparison

Schulz S, Scholz V, Lehnert B. HNO 2022;70:588-594.




### PRINCIPAL AIM

To examine the differences in taste between various thickeners available on the German market.

### MATERIAL & METHODS

- ▶ **Study type:** Observational Study.
- ▶ **Study population:** 37 healthy volunteers in the speech therapy department compared 8 thickeners against each other.
- ▶ **Experimental products:** Nutilis® Clear (#1), Fresubin® Clear (#2), Nutilis® Powder (#3), ThickenUp® Clear (#4), Jonova Clear (#5), ThickenUp® (#6), Jonova Powder (#7) and Thick & Easy® (#8).
- ▶ **Assessments:**
  - For each subject, a randomised experimental plan was created with up to seven paired comparisons to evaluate the taste properties of 8 thickeners. The participants had to choose their favourite thickener from each pair.
  - Relative overall quality of taste was defined based on a probabilistic model, including testing the significance of differences.

## RESULTS

- ▶ In total, the 37 participants made 224 paired comparisons.
- ▶ The result of the taste assessment revealed that ThickenUp® Clear was one of the most preferred in Germany.
- ▶ The probabilistic evaluation of the 224 paired taste comparisons showed that ThickenUp® Clear was the thickener that the participants liked the most. *Figure 1.* 

## CONCLUSIONS

This study revealed that **ThickenUp® Clear** is one of the thickeners that tasted best of those tested. Therefore, using a better-tasting thickener could improve patient compliance and ensure adequate fluid intake.

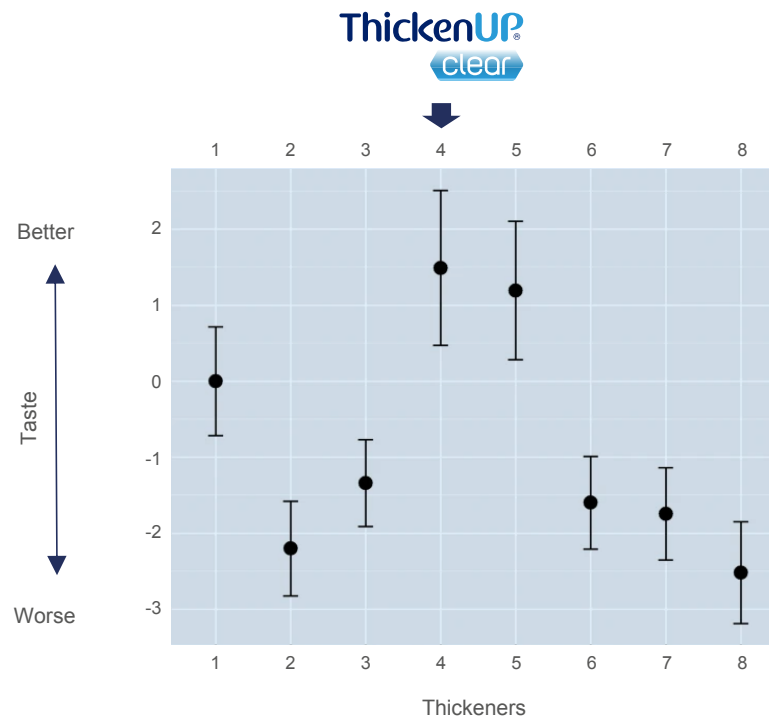


Figure 1. Evaluation of taste comparisons. Coefficients and 1.96 times their quasi-standard errors are shown.



## Performance-based preference for a novel xanthan gum-based thickener among clinicians treating patients with dysphagia

Herentry K, Busch A, Kaspar K. *European Geriatric Medicine* 2011;2(S24-S206).



### PRINCIPAL AIM

To assess the product performance of various commercial thickening agents as assessed by healthcare professionals responsible for managing dysphagia.

### MATERIAL & METHODS

- ▶ **Study type:** Observational Study.
- ▶ **Study population:** 130 healthcare professionals, which includes 50 physicians, 50 nurses, and 30 speech-language therapists.
- ▶ **Experimental products:** ThickenUp® Clear (xanthan-gum based thickener), Thick & Easy® (starch-based thickener), Nutilis® (blend of starch & gum thickener).
- ▶ **Assessments:** The visual appearance, taste, and consistency of thickeners were assessed at four different liquids (water and iced tea) prepared at nectar-thick viscosity and honey-thick viscosity according to the viscosity ranges of the National Dysphagia Diet Task Force.

## RESULTS

- ▶ 71%–81% of healthcare professionals reported preference for the ThickenUp® Clear compared to Nutilis®.
- ▶ 90% of healthcare professionals reported preference for the ThickenUp® Clear compared to Thick & Easy® Thicken.
- ▶ 96% of the participating clinicians reported that the ThickenUp® Clear “will help make patients feel more normal as thickened products look more natural”.
- ▶ 98% of healthcare professionals reported that the ThickenUp® Clear “will help improve patient compliance”.

## CONCLUSIONS

Health care providers caring for patients with dysphagia reported that **ThickenUp® Clear** is superior to similar products containing other thickening ingredients for the therapeutic medical management of these patients.

# Acceptance and Tolerance



## STUDY

# 11

## Acceptance, compliance, and tolerance of a novel xanthan gum-based thickener on patients with oropharyngeal dysphagia

Hibberd J. *Dysphagia* 2011;26(4):432-475.



### PRINCIPAL AIM


To evaluate the performance of a xanthan gum-based thickener in terms of dysphagia patient acceptance, compliance and gastrointestinal tolerance.

### MATERIAL & METHODS

- ▶ **Study type:** Observational Study.
- ▶ **Study population:** 19 nursing home residents (M=74years) with oropharyngeal dysphagia.
- ▶ **Experimental products:** ThickenUp® Clear was used to thicken a variety of beverages at different temperatures.
- ▶ **Assessments:**
  - Thickened fluids were prescribed based on the individual patient's swallowing function. Three different viscosities (Stage 1, Stage 2, Stage 3) were prepared according to viscosity ranges of The National Descriptors for Texture Modification in Adults (UK).
  - Acceptance (like/dislike of overall sensory characteristics), compliance (amount of fluid consumed vs. amount offered), and gastrointestinal (GI) tolerance (8 symptoms) were analysed using the thickening agent at various temperatures and liquid bases.

## RESULTS

The results with the xanthan gum-based thickening agent ThickenUp® Clear showed:

- ▶ It is useful to thicken a wide range of liquids at different temperatures.
- ▶ The patients expressed a high level of acceptance rate (94%) of the thickened drink they consumed (maximum rating on the scale of acceptance proposed).
- ▶ 86% of patients consumed  $\geq 75\%$  of all liquids offered.  
*Figure 1.* 
- ▶ No symptoms of GI intolerance were reported in the sample studied.

## CONCLUSIONS

A high degree of satisfaction was observed with **ThickenUp® Clear** on the basis of its sensory characteristics, good compliance, excellent gastrointestinal tolerance and wide versatility in use with different beverages at different temperatures.

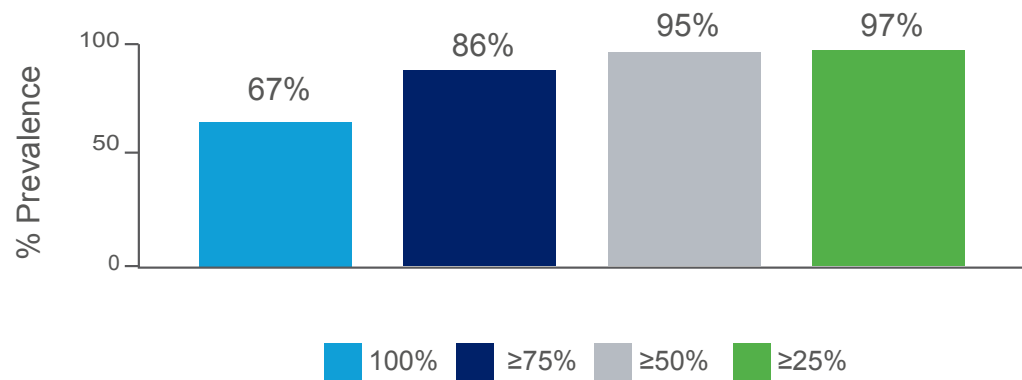


Figure 1. Degree of compliance according to the amount of thickened liquids prescribed.

## Development of a non-invasive device for swallow screening in patients at risk of oropharyngeal dysphagia: findings from a prospective exploratory study



*Steele CM, Mukherjee R, Kortelainen JM, Pölönen H, Jedwab M, Brady SL, Theimer KB, Langmore S, Riquelme LF, Swigert NB, Bath PM, Goldstein LB, Hughes RL, Leifer D, Lees KR, Atte Meretoja A, Muehleman N. Dysphagia 2019;34:698-707.*

### AIM



To report the results of prevalence of impaired swallowing safety and impaired swallowing efficiency after a comprehensive analysis of the 4229 videofluoroscopic swallowing study (VFSS) during swallows at different consistencies.

### MATERIAL & METHODS

- ▶ **Study type:** Prospective Study.
- ▶ **Study population:** 332 participants with stroke, other brain injury, and adults with oropharyngeal dysphagia risk aged 50+.
- ▶ **Experimental products:** A xanthan gum-based thickener (ThickenUp® Clear) was used for performing the Swallowing Study at four-viscosity bolus (Thin liquid-Level 0, Mildly thick-Level 2, Moderately thick-Level 3 and Extremely thick-Level 4), prepared according to descriptors of the IDDSI Framework.
- ▶ **Assessments:** Swallowing safety and efficiency were measured from VFSS recordings.

## RESULTS

VFSS data for 1730 Thin, 872 Mildly thick, 833 Moderately thick and 794 Extremely thick boluses were analysed.

- ▶ Clinical signs of impaired safety decreased with the consumption of thicker consistency liquids. *Figure 1.* 
- ▶ The rate of residues did not increase with consumption of thicker consistency liquids, indicated by the percentage of impaired efficiency at participant level data. *Figure 2.* 

## CONCLUSIONS

**ThickenUp® Clear** is an effective therapeutic strategy for oropharyngeal dysphagia as it improves swallowing safety without worsening post-swallow symptoms in stroke patients, brain injury, and adults with oropharyngeal dysphagia risk.

Figure 1.

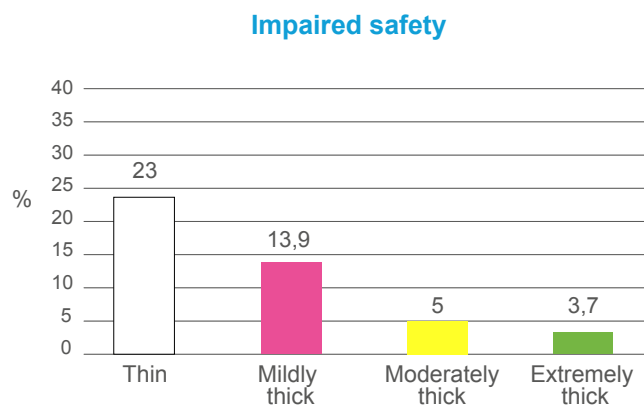
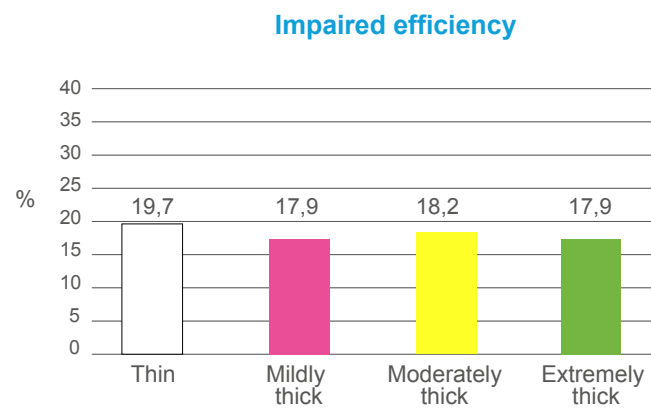


Figure 2.





## Sensitivity and specificity of the eating assessment tool and the volume-viscosity swallow test (V-VST) for clinical evaluation of oropharyngeal dysphagia

Rofes L, Arreola V, Mukherjee R, Clavé P. *Neurogastroenterol Motil* 2014 Sep;26:1256-65.



### PRINCIPAL AIM

To evaluate the accuracy of the eating assessment tool (EAT-10) and re-validate the accuracy Volume-Viscosity Swallow Test (V-VST) against videofluoroscopic swallowing study (VFSS) by using liquids thickened with a xanthan gum-based thickener.

### MATERIAL & METHODS

- ▶ **Study type:** Prospective Study.
- ▶ **Study population:** 120 patients (mean age 74.4 y.o.) with oropharyngeal dysphagia (OD) associated with aging, stroke, and neurodegenerative diseases, and 14 adult healthy volunteers (control).
- ▶ **Experimental products:** A xanthan gum-based thickener (ThickenUp® Clear) was used as a method to perform the V-VST and VFSS at two-viscosity bolus (nectar and spoon/pudding thick, according to viscosity ranges of the National Dysphagia Diet Task Force).
- ▶ **Assessments:** The accuracy of the eating assessment tool (EAT-10) and the volume-viscosity swallow test (V-VST) for clinical evaluation of oropharyngeal dysphagia was analysed and compared to the videofluoroscopic swallowing study (VFSS) as a reference test.

## RESULTS

The study showed the V-VST using ThickenUp® Clear has a high sensitivity in detecting patients with swallowing difficulty.

- ▶ Efficiency:
  - Sensitivity of 0.94 and specificity of 0.88 in detecting oropharyngeal dysphagia.
  - Sensitivity of 0.79 and specificity of 0.75 in detecting impaired efficacy.
- ▶ Safety:
  - Sensitivity of 0.87 and specificity of 0.81 in detecting impaired safety.
  - Sensitivity of 0.91 and specificity of 0.28 in detecting aspirations.

The EAT-10 was also deemed to have a high discriminating ability to detect dysphagia.

## CONCLUSIONS

The V-VST performed with **ThickenUp® Clear** to assess the safety and efficacy signs of swallowing is a validated method against VFSS for the detection of oropharyngeal dysphagia.

Using the EAT-10 and V-VST can ensure comprehensive dysphagia care for people at risk of OD. The results of this study should not extend to other commercially available xanthan gum-based thickeners.

## Matching the rheological properties of videofluoroscopic contrast agents and thickened liquid prescriptions

Nita SP, Murith M, Chisholm H, Engmann J. *Dysphagia* 2013;28(2):245-52.





### PRINCIPAL AIM

To assess the rheological properties of videofluoroscopic contrast agents and liquids thickened with two commercial thickeners used in the instrumental diagnosis of dysphagia.

### MATERIAL & METHODS

- ▶ **Study type:** Rheological Study.
- ▶ **Experimental products:** ThickenUp® and ThickenUp® Clear were used to prepare the samples, along with Barium sulfate (Varibar®) and ionic iodinated contrast media (Gastrografin®) at four incremental viscosities (water, nectar-like, honey-like, and pudding-like).
- ▶ **Assessments:** The rheological properties such as viscosity profile and shear rate were performed and analysed and compared according to the viscosity ranges of the National Dysphagia Diet Task Force.

## RESULTS

- ▶ The time taken to reach the desired viscosity levels vary depending on the contrast and thickening agents used.
- ▶ The viscosity of the Varibar®/ThickenUp® Clear solution at different times proved to be stable over time, resulting in great flexibility of use (*Figure 1*).  However, the viscosities of the Gastrografin®/ThickenUp® Clear solution experiences significant changes, becoming less viscous over time (*Figure 2*). 

## CONCLUSIONS

For optimal patient outcomes, only diagnostic materials and thickeners with reliable viscosity data should be used, such as **ThickenUp® Clear**, as demonstrated in this study.

Figure 1.

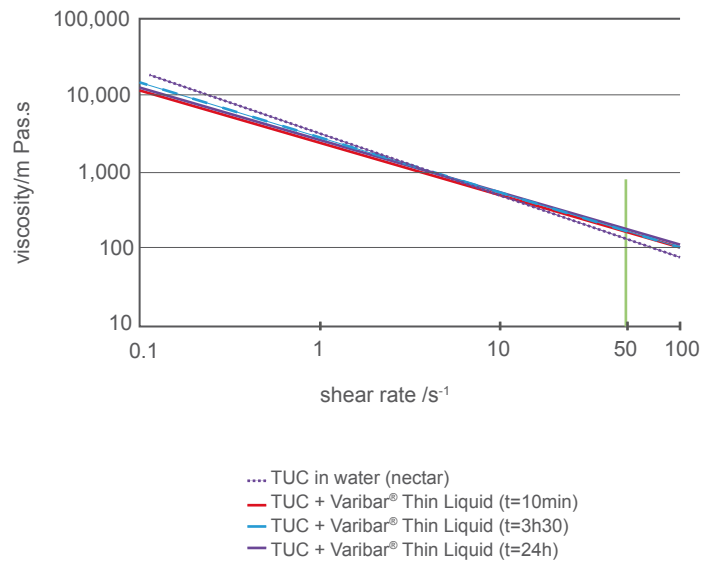


Figure 2.

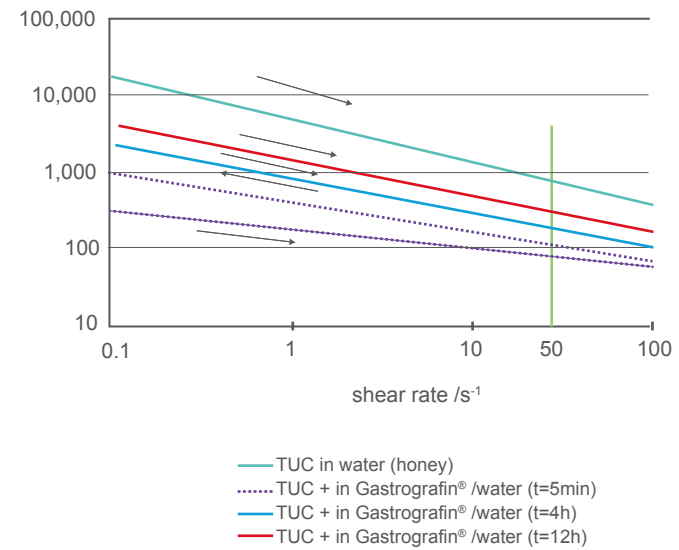


Figure1. Viscosities of solutions Varibar<sup>®</sup>/ThickenUp<sup>®</sup> Clear (TUC) at nectar viscosity; Figure2. Viscosities of solutions Gastrografin<sup>®</sup>/(GG) / ThickenUp<sup>®</sup> Clear (TUC) at honey viscosity.

## The importance of shear and extensional rheology and tribology as the design tools for developing food thickeners for managing dysphagia



*Gamonpilas C, Kongjaroen A, Methacanon P. Food Hydrocolloids 2023;140:108603.*


### PRINCIPAL AIM

To assess the morphology, rheological, and tribological properties of thickened water using three commercial thickening powders to obtain insights from the current products and to develop novel dysphagia powder thickeners, which are required for swallowing safety.

### MATERIAL & METHODS

- ▶ **Study type:** Rheological Study.
- ▶ **Experimental products:** Three thickeners commonly used in Thailand were analysed: ThickenUp® Clear, a xanthan gum-based thickener (TUC); Supercol™, a guar gum-based thickener (SP), and ThickenUp®, a starch-based thickener (TU).
- ▶ **Assessments:**
  - Thickened water was prepared using 3 thickeners at different concentrations based on the IDDSI Framework (Level 1, 2 and 3).
  - The morphology, oscillatory shear, surface tension, extensional rheology and tribological measurements were performed and analysed.

## RESULTS

- ▶ Assessed by optical microscopy and appearance, TUC thickened liquid appeared to be the most translucent, compared with those samples prepared from thickening based on guar gum (SP) and modified starch (TU). *Figure 1.* 
- ▶ The TUC sample provides a higher thickening effect in water than both guar gum and modified starch (SP and TU).
- ▶ The TUC sample exhibited the highest resistance to the initial thinning, thus displaying a longer breakup time compared to the other thickened liquids, which may also imply that there is improved cohesiveness of the thickened liquids.
- ▶ The TUC sample exhibited distinctively better lubrication properties compared to the other two thickeners.
- ▶ The TUC sample exhibited the highest elasticity and extensional viscosity, at the same consistency of IDDSI.

## CONCLUSIONS

**ThickenUp® Clear** is more transparent than the other two thickeners, which could make it a more appealing option for drinking clear beverages such as water.

**ThickenUp® Clear** provides a higher thickening effect, elasticity, and better lubrication properties, which could make it easier and safer to swallow compared to the other two thickeners.



**ThickenUp® Clear  
(TUC)**



**Supercol™  
(SP)**



**ThickenUp®  
(TU)**

Figure 1. Appearance of thickened water using three commercial thickening powders.



## Shear and extensional rheological characterisation of thickened fluid for managing dysphagia

Hadde EK, Chen J. *Journal of Food Engineering* 2019 Mar;245:18-23.



### PRINCIPAL AIM

Shear and extensional viscosity of fluids thickened are properties that impact bolus flow, breakage/endure of the bolus, and residue in the pharynx or throat, influencing swallowing safety and efficiency in patients with dysphagia. This study aimed to assess the extensional deformation of fluids thickened with different commercial thickeners used for dysphagia care.

### MATERIAL & METHODS

- ▶ **Study type:** Rheological Study.
- ▶ **Experimental products:** Thickened water was prepared at four-viscosity bolus (Slightly thick-Level 1, Mildly thick-Level 2, Moderately thick-Level 3 and Extremely thick-Level 4), prepared according to descriptors of the IDDSI Framework using 3 different thickeners: a xanthan gum-based thickener (ThickenUp® Clear), a xanthan gum and potato starch thickener (Hehongchun), and ThickenUp® (modified maize starch).
- ▶ **Assessments:**
  - Shear viscosity, filament stretching and break-up of thick fluids at different consistencies were analysed using a variety of devices.

## RESULTS

- ▶ Increasing the thickener concentration resulted in increased extensional viscosity, which is the property that resists bolus stretching during elongation, and more cohesion.
- ▶ At similar shear viscosity (bolus flow), ThickenUp® Clear samples exhibited the highest maximum extensional viscosity (extended filament lifetime or cohesiveness) compared to Hehongchun and ThickenUp® samples with the potential to help keep the bolus together and prevent it from getting stuck in the pharynx as residue.

## CONCLUSIONS

The study revealed that the cohesiveness of thickened fluids may be different depending on the thickening agent even though the shear viscosity is similar.

**ThickenUp® Clear** demonstrated enhanced filament thinning ability, which is important for safe swallowing in people with dysphagia.

**ThickenUp® Clear** demonstrated the highest maximum extensional viscosity (extended filament lifetime or cohesiveness) compared to other thickeners, with the potential to maintain bolus consistency while preventing bolus fragmentation, which is crucial for safe swallowing in patients with dysphagia.

## Characterising the flow of thickened barium and non-barium liquid recipes using the IDDSI flow test

Barbon CEA, Steele CM. *Dysphagia* 2019;34:73-79.




### PRINCIPAL AIM

Understanding the flow stability of contrast agents post-mixed with thickening agents is crucial to relying on videofluoroscopic swallowing study results. This study aimed to assess the flow characteristics of barium and non-barium stimuli prepared using two different commercial thickeners at different temperatures.

### MATERIAL & METHODS

- ▶ **Study type:** Rheological Study.
- ▶ **Experimental products:** The samples were prepared with ThickenUp® and ThickenUp® Clear, with barium and lemon-flavoured water in three consistencies (Slightly thick-Level 1, Mildly thick-Level 2, and Moderately thick-Level 3) according to IDDSI Framework.
- ▶ **Assessments:**
  - The flow characteristics of each type of contrast prepared at different concentrations and temperatures (at room-temperature and refrigerated) were determined by using the gravity-flow test recommended by IDDSI.
  - The flow stability was tested post mixing over different timepoints (1, 2, and 3h).

## RESULTS

- ▶ Using xanthan gum rather than starch-based thickeners reduces the need for thickener to achieve any given level of thickness on the IDDSI continuum.
- ▶ The combination of barium and thickeners led to additional thickening, particularly when starch-based thickener was used.
- ▶ Over the course of 3 hours, all the barium-based recipes yielded stable IDDSI gravity-flow test. *Figure 1.* 
- ▶ There was no statistically significant difference between the flow of refrigerated or room-temperature barium stimuli.

## CONCLUSIONS

**ThickenUp® Clear** demonstrated its stability over the course of 3 hours after mixing with barium at different IDDSI levels. These results provide evidence for the use of **ThickenUp® Clear** for instrumental testing and the management of dysphagia.

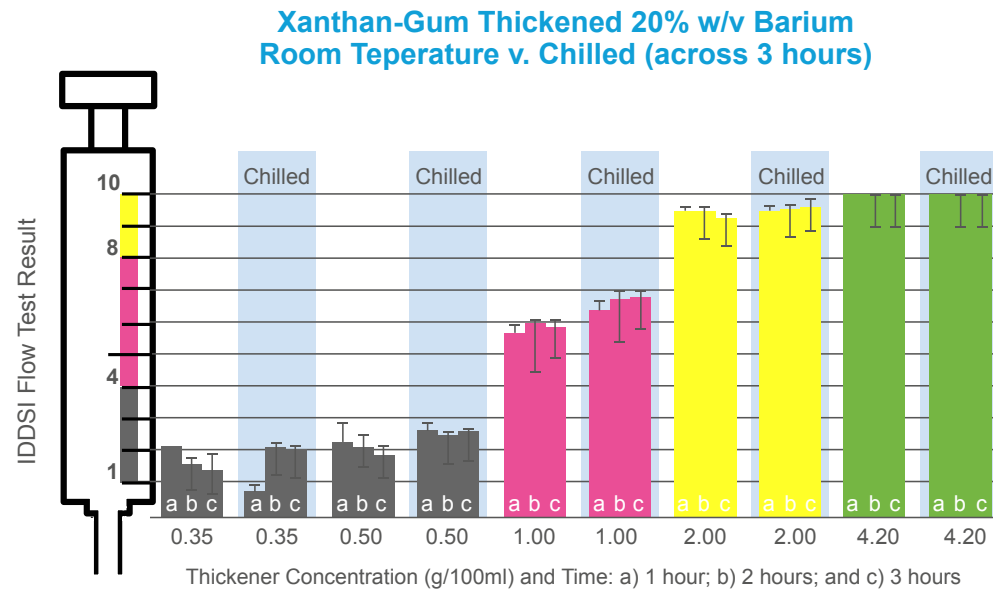


Figure 1. Results over 3h for ThickenUp® Clear with barium.

## Rheological characterisation of thickened fluids under different temperature, pH and fat contents

Hadde EK, Nicholson TM, Cichero JAY. *Nutrition & Food Science* 2015;45(2):270-285.



### PRINCIPAL AIM

To study the rheological characteristics of thickened fluids under different temperatures, pH of the medium and fat contents and the time required to achieve viscosity stability.

### MATERIAL & METHODS

- ▶ **Study type:** Rheological Study.
- ▶ **Experimental products:** Tap water and three types of milk with different fat contents (full cream, semi-skim and skim milk) were prepared with ThickenUp® Clear at three viscosity levels (Level 150, Level 400 or Level 900) according to the Australian Fluid Viscosity Descriptors. To decrease the pH of the samples, hydrochloric acid was used.
- ▶ **Assessments:**
  - Eight different samples of thickened water and milk were studied.
  - The time required for the fluids to achieve equilibrium viscosity was determined at different temperatures (8, 20 and 40°C), and pH conditions (from 2.7 to 9.5).
  - The rheological characteristics such as density, thickening dynamics, viscosity profile, and yield stress were analysed with a rheometer.

## RESULTS

- ▶ The analysis showed that despite the temperature or pH of the fluid, the thickened water with ThickenUp® Clear remained clear and smooth and took less than 2 minutes to reach viscosity equilibrium due to the side chains of the xanthan gum molecular structure protecting the backbone structure.
- ▶ Thickened milk due to it is a complex medium composed of carbohydrates, water, protein, fat and minerals required a much longer time to reach a stable viscosity than water. Approximately 15 minutes was required to reach equilibrium viscosity, regardless of the fat content present in the milk.
- ▶ Thickening milk with high fat levels led to an increase in viscosity and yield stress. Patients with weak tongue strength or fatigue may struggle to pass very thick liquids through the oral cavity and into the pharynx.

## CONCLUSIONS

Under various temperature and pH conditions, **ThickenUp® Clear** demonstrated rapid achievement of equilibrium viscosity for thickened water (2 minutes) and much longer time (15 minutes) for milk, a complex medium composed for macro and micronutrients.

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# ThickenUp® Clear



**Improves  
swallowing safety  
and efficiency**



**Doesn't thicken  
over time**



**Mixes and  
dissolves easily**



**Lump-free**



**Tasteless and  
Odorless**



## NUTRITION INFORMATION

### DESCRIPTION

ThickenUp® Clear is a xanthan gum based instant food and drink thickener. It is a Food for Special Medical Purposes for the dietary management of patients with swallowing difficulties and must be used under medical supervision.

### INGREDIENTS

Maltodextrin, Xanthan Gum, Potassium Chloride. May contain milk.



GLUTEN FREE



HALAL



KOSHER

### Typical values

(When mixed with  
200ml of water)

**1.2g**

**2.4g**

**4.8g**

**7.2g**

**100g**

### General

Energy kJ/kcal	15/3.7	31/7.3	61.8/14.7	92.7/22	1287/306
Fat (0% kcal) g	0	0	0	0	0
of which saturates g	0	0	0	0	0
Carbohydrate (81%) kcal g	0.74	1.5	3.0	4.5	62
of which sugars g	0.02	0.04	0.09	0.13	1.80
Fibre (18% kcal) g	0.32	0.65	1.30	1.9	27
Protein (1% kcal) g	0	0	0	0.07	1
Salt g	0.032	0.064	0.13	0.19	2.7

### Mineral

Sodium mg/mmol	13/0.56	25/1.1	51/2.2	76/3.3	1060/46.1
Potassium mg/mmol	4.8/0.12	9.6/0.24	19/0.24	29/0.49	400/10.2

## PREPARATION INSTRUCTIONS FOR THICKENING LIQUIDS

1.



### POWER FIRST

Use the dosage scoop included in the tin. For best results add the powder to a clean dry cup, glass or beaker.

2.



### ADD LIQUID

Add the liquid to the powder.

3.



### STIR

Stir for at least one minute, until the powder is dissolved.

4.



### SERVE

Leave to stand for at least one minute, until desired consistency achieved.\*\*

## ADMINISTRATION AND DOSAGE

The consistency should be recommended by a healthcare professional. It is the responsibility of the person administering ThickenUp® Clear to ensure the liquid consistency.

### ThickenUp® Clear DOSAGE CHART

#### SCOOPS

LIQUIDS	LEVEL 1 (SLIGHTLY THICK)	LEVEL 2 (MILDLY THICK)	LEVEL 3 (MODELATELY THICK)	LEVEL 4* (EXTREMELY THICK)
200 ml	1	2	4	6
600 ml	3	6	12	18
1000 ml	5	10	20	30
2000 ml	10	20	40	60

\*For level 4 Extremely thick liquids, evaluated IDDSI compliant based on Spoon Tilt Test.

1 scoop/sachet = 1.2 g

\*\* Liquids other than water may take up to 20 minutes to reach the desired consistency.

# ThickenUp® Clear your partner in Dysphagia *care*

