

Supplementary Materials

Table S1. Index flow, consistency and shear thinning effect from 50 to 300 s⁻¹ for daily condition (DC) doses.

DC doses			
Target viscosity (mPa·s) at 50 s ⁻¹	Index flow (<i>n</i>)	Consistency (K)	Shear thinning (%)
100	0.29	3.1	77.1
200	0.19	3.7	76.5
400	0.16	4.0	78.0
800	0.16	4.3	77.8
1600	0.17	4.6	77.2

DC: Daily condition.

Table S2. Viscosity values (mean±SD) by standing time for 200 and 800 mPa·s; *p* > 0.05 (ns).

200 mPa·s (Target viscosity at 50 s ⁻¹)				800 mPa·s (Target viscosity at 50 s ⁻¹)		
Standing time (min)	Viscosity (mPa·s) at 50 s ⁻¹ (mean±SD)	Differences 0-120 min (%)	<i>p</i> -value	Viscosity (mPa·s) at 50 s ⁻¹ (mean±SD)	Differences 0-120 min (%)	<i>p</i> -value
0	183.3±11.0	16.6	0.46	848.2±38.4	10.2	0.054
30	177.0±9.0			827.1±42.7		
60	169.5±8.3			784.9±32.7		
90	167.5±15.3			809.4±38.4		
120	152.9±19.1			762.1±39.4		
200 mPa·s (Target viscosity at 50 s ⁻¹)				800 mPa·s (Target viscosity at 50 s ⁻¹)		
Standing time (min)	Viscosity (mPa·s) at 300 s ⁻¹ (mean±SD)	Differences 0-120 min (%)	<i>p</i> -value	Viscosity (mPa·s) at 300 s ⁻¹ (mean±SD)	Differences 0-120 min (%)	<i>p</i> -value
0	42.1±2.0	14.9	0.051	166.0±35.3	3.9	0.40
30	41.1±1.5			157.7±5.9		
60	38.5±0.3			159.2±3.1		
90	39.2±2.2			159.4±2.3		
120	35.8±3.9			159.6±2.9		

Table S3. Viscosity values (mean±SD) by increasing temperature from 20°C to 40°C for 200 and 800 mPa·s levels for daily conditions doses; *p* > 0.05 (ns).

Temperature (°C)	200 mPa·s (Target viscosity at 50 s ⁻¹)			800 mPa·s (Target viscosity at 50 s ⁻¹)		
	Viscosity (mPa·s)	Differences 0-40°C (%)	<i>p</i> -value	Viscosity (mPa·s)	Differences 0-40°C (%)	<i>p</i> -value
	at 50 s ⁻¹ (mean±SD)			at 50 s ⁻¹ (mean±SD)		
20	190.2±6.5	6.3	0.17	848.2±38.4	5.9	0.09
25	180.5±5.8			827.1±42.7		
30	185.3±15.3			784.9±32.7		
35	181.6±5.6			809.4±38.4		
40	178.1±8.9			762.1±39.4		
Temperature (°C)	200 mPa·s (Target viscosity at 50 s ⁻¹)			800 mPa·s (Target viscosity at 50 s ⁻¹)		
	Viscosity (mPa·s)	Differences 0-40°C (%)	<i>p</i> -value	Viscosity (mPa·s)	Differences 0-40°C (%)	<i>p</i> -value
	at 300 s ⁻¹			at 300 s ⁻¹		

	(mean±SD)			(mean±SD)		
20	42.4±3.1			166.03±5.34		
25	39.7±0.9			157.70±5.90		
30	42.8±2.2	7.0	0.20	159.23±3.10	5.8	0.11
35	42.0±1.9			159.43±2.27		
40	39.4±0.3			159.57±2.87		

Table S4. Index flow, consistency and shear thinning effect from 50 to 300 s⁻¹ for VFS doses.

VFS doses			
Target viscosity at 50 s ⁻¹ (mPa·s)	Index flow (<i>n</i>)	Consistency (K)	Shear thinning (%)
100	0.32	3.1	70.2
200	0.23	3.7	75.5
400	0.16	4.1	77.4
800	0.16	4.4	78.1
1600	0.18	4.6	77.0

VFS: videofluoroscopy.

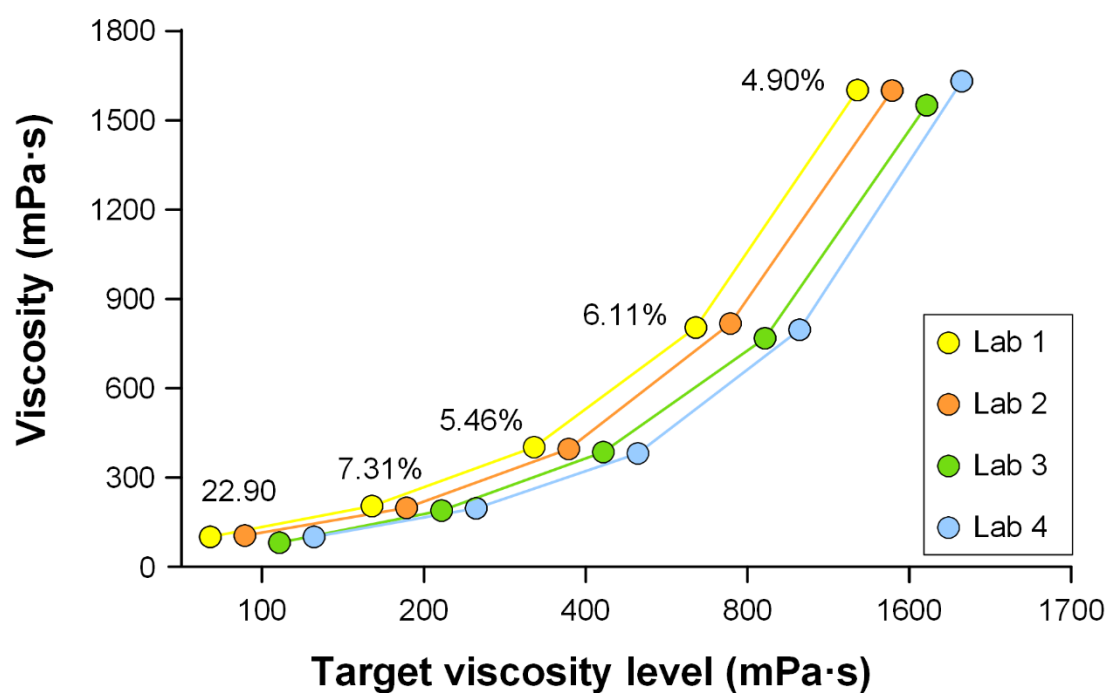


Figure S1. Inter-laboratory variability for each shear viscosity level tested (100, 200, 400, 800 and 1600 mPa·s).

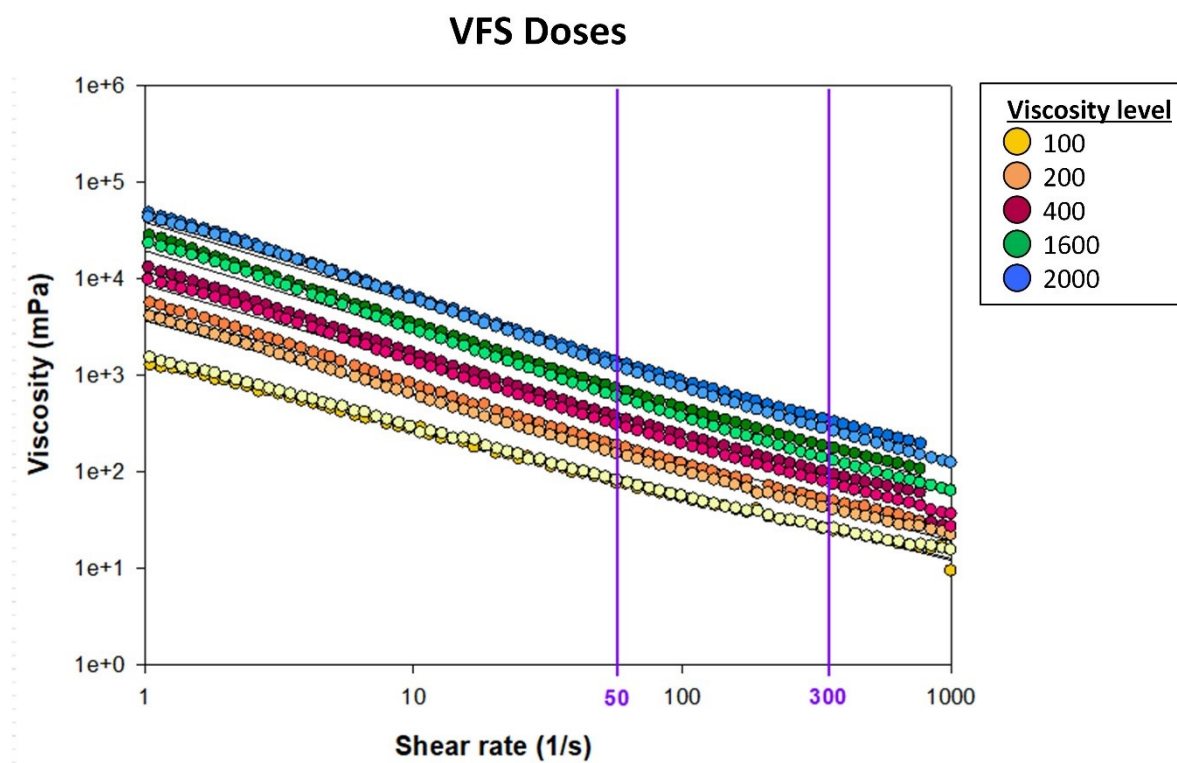


Figure S2. Viscosity curves from a shear rate range of 1–1000 s^{−1} for videofluoroscopy doses before and after oral incubation in healthy volunteers. Dark colors correspond to viscosity levels pre-oral incubation. Soft colors correspond to viscosity post-oral incubation. Purple lines mark the two main shear rate landmarks (50 and 300 s^{−1}) during deglutition in patients with oropharyngeal dysphagia.

Supplementary Information S1: Normalized protocol to determine shear viscosity for thickening

1. Material and equipment

- Solvent: thickening product
- Dissolvent: mineral water, alimentary fluid, X-ray contrast
- Equipment to measure shear viscosity: viscometer or rheometer
- Stirrer: Metallic spatula
- Container: Glass beakers or clear plastic cups
- Chronometer
- Plastic Syringe (minimal volume: 20 mm)

2. Participants

In order to perform the *ex vivo* salivary amylase effect, participants will be needed to

3. Preparation mode

- a) Weigh the dissolvent in a clear plastic cup
- b) Weigh the solvent in another cup
- c) Initiate the chronometer and add the solvent to the dissolvent over 5 s while stirring at 4 rps with a metallic spatula
- d) Continue stirring for 30 s at the same velocity

- e) Leave the prepared sample resting for 10min

3. Sample analysis

In vitro shear rate effect

- f) Analyze viscosity by increasing shear rate from 0 to 1000 s⁻¹ in a 10 minute test at 25°C
- g) Interpolate the viscosity values at 50 and 300 s⁻¹ to obtain the apparent viscosity value in the oral and pharyngeal phase, respectively
- h) Repeat the process from step 'a' to 'e' two times more to obtain triplicates

Ex vivo salivary amylase effect

- f) Volunteer / patient preparation: give to the patient water to clean the mouth performing intra-oral movements for 10 s. Remove the water.
- g) Take 15 ml of the prepared sample with a plastic syringe and give it to the volunteer / patient. Ask them to maintain the sample in the oral cavity by performing intra-oral movements for 30s and then to spit it
- h) Analyze viscosity by increasing shear rate from 0 to 1000 s⁻¹ in a 10 minute test at 25°C
- i) Interpolate the viscosity values at 50 and 300 s⁻¹ to obtain the apparent viscosity value in the oral and pharyngeal phase, respectively
- j) Repeat the process from step 'a' to 'e' two times more to obtain triplicates
- k) Repeat the process for the needed number of participants