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# 1 Shear and Extensional Rheological Characterization of Thickened 2 Fluid for Dysphagia Management

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## 5 **Abstract**

6 Thickened fluids are used in the medical management of individuals who suffer from  
7 swallowing difficulties (known as dysphagia). Recent studies show that understanding the  
8 rheological properties of thickened fluids is advantageous in designing better-controlled fluids.  
9 Whilst the rheological behavior of thickened fluids in shear deformation has been studied by  
10 several authors, studies on their extensional behavior are limited, despite their critical  
11 importance in influencing bolus flow and swallowing. Our aim in this work was to  
12 rheologically characterize extensional deformation of dysphagia fluids thickened with different  
13 types of commercial thickeners at varying concentrations using a filament stretching and  
14 break-up device. It was observed that the extensional viscosity increased and became more  
15 cohesive as the thickener concentration was increased. Additionally, it was observed that for  
16 similar shear viscosity at 50 s<sup>-1</sup>, the extensional viscosity of the fluid was dependent on the type  
17 of thickener. This study confirms that by thickening fluid with different types of thickeners,  
18 the cohesiveness of the fluid may be very different even at the same shear viscosity. Therefore,  
19 both shear and extensional rheology of thickened fluids should be considered for the  
20 management of dysphagia.

21 *Keywords: Rheology, Extensional viscosity, Dysphagia, Thickened fluids, Cohesiveness*

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