

XANTHAN VS STARCH: THE ADVANTAGES ARE MORE THAN CLEAR

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For years, starch has been the primary agent used to thicken beverages for patients with dysphagia. More recently, xanthan gum and other polysaccharides have been introduced to thicken beverages with some distinct advantages over starch, such as stability, smooth texture and clarity.

AN INTRODUCTION TO STARCH AND XANTHAN

Modified cornstarch used for dysphagia nutrition contains high levels of amylopectin, an insoluble component that gels but does not solidify in liquids. It is translucent and builds high viscosity across a wide range of temperatures. When added to a beverage or food, the starch crystal swells, absorbing water and building viscosity. The more branched the starch crystal, the longer it takes to build viscosity. So it can take hours for the starch to become fully hydrated and ready for consumption.

Xanthan gum is a polysaccharide; its structure contains a cellulose backbone with branches of the sugars galactose and mannose. Like starch, it also builds viscosity over a wide variety of temperatures. Recently, producers have started clarifying xanthan to make it more transparent and aid in its functionality for dysphagia patients. Compared to starch, xanthan becomes fully hydrated faster, requires less product to build higher viscosity, and is more stable over time than starch.

THE CHALLENGES OF DYSPHAGIA

Patients with dysphagia have difficulty swallowing and are at greater risk of inhaling liquid or food as they eat and drink. This elevates their risk for developing aspiration pneumonia, a potentially fatal illness. Thickened beverages are easier for dysphagia patients to swallow correctly, reducing the risk of aspiration. When diagnosed with dysphagia, patients are often put on a protocol of thickened foods and beverages. The patient's physician or therapist will recommend the specific viscosity to best reduce the chance for aspiration.

THE RISKS OF ASPIRATION

Aspiration pneumonia is an inflammation of the lungs or bronchial tubes, caused by inhalation of foreign material, such as food, saliva, liquids or vomit. When it deposits in the lungs, the immune system produces localized inflammation to isolate the infected area from the rest of the lung. Aspiration pneumonia can be more difficult to identify and treat than other pneumonias, making reducing the risk of aspiration a top priority for patients with dysphagia.

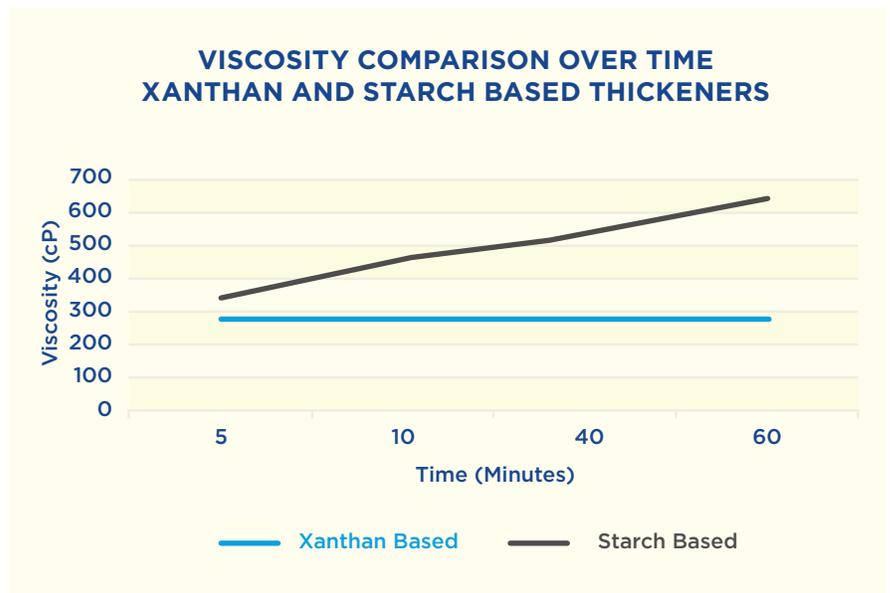
Xanthan maintains a more stable viscosity over time, providing caregivers more flexibility in serving beverages, as well as giving patients more time to safely consume them.

Compared to starch, it takes much less xanthan to achieve a desired consistency when thickening a beverage. If the patient does aspirate a starch-thickened item, the cilia (small hair like structures in the trachea that act to clear the lungs of foreign material) work hard to remove the aspirated starch. Xanthan-thickened food or drinks contain less thickening agent, so less thickener enters the respiratory tract if aspiration does occur. While the cilia still have to work hard to remove the aspirated xanthan, less energy is expended to clear it versus the larger volume of starch.

KEY PROPERTIES OF XANTHAN AND STARCH

Clearly, avoiding aspiration is a primary concern in the care of dysphagia patients. Both starch and xanthan serve to reduce the risk of aspiration. But there are several properties differentiating the two.

Stability: The ability to maintain a consistent viscosity over time is an important feature of a thickening product. In an institutional setting, beverages are often made up well before serving. Some thickening agents continue to thicken over time. A beverage that was mixed at a nectar consistency can develop a honey consistency by the time it is served. Xanthan maintains a more stable viscosity over time, providing caregivers more flexibility in preparing and serving foods and beverages, as well as giving patients more time to safely consume them.



Freezing starch products can result in separation of the starch from the liquid. Xanthan maintains its consistency throughout freezing and thawing without separating.



Consistency: Thinning of a dysphagia product can also cause concern. Starch tends to thin in acidic conditions found in many juices and foods. It is also less temperature stable than xanthan. As heat increases, starch swells and thickens, while xanthan remains more stable. Freezing starch products followed by thawing can result in separation of the starch from the liquid, increasing the risk of aspiration. Xanthan maintains its consistency throughout freezing and thawing without separating. J. Kemboi and C. Karunanithy, University of Wisconsin–Stout, conducted stability studies of several popular dysphagia products, revealing that—compared to starch—xanthan products are much more stable over time and after being mixed with various supplements.

Human saliva contains an enzyme called amylase. Amylase breaks down amylose and amylopectin, the two components of starch, separating the starch and water and thinning the beverage. A patient with dysphagia generally takes more time to eat than someone who does not suffer from the condition. The longer the saliva is exposed to the starch product, the more the starch breaks down and the more separation of liquid and thickening agent occurs. Xanthan products are amylase resistant. Unlike starch, the enzyme has no effect on the xanthan molecule, reducing the risk of aspiration.

Clarity: Aesthetics play a large part in how we perceive and enjoy food and beverages. We expect water to be clear. Starch makes water appear cloudy rather than transparent. Water mixed with xanthan is much clearer. This can make it more appetizing to the patient, which may lead to better compliance, influencing the patient to stay better hydrated. In addition, xanthan has a smooth texture. Starch tends to be grainy, especially right after mixing with liquid.

In conclusion, xanthan is a more effective choice of beverage and food thickener for patients with dysphagia. Compared to starch, less product is needed to achieve a desired viscosity; it maintains a more stable viscosity over time and remains consistent over a range of temperatures; it does not cloud beverages; and it presents a lower risk of aspiration.

Some information sourced from Dysphagia (2014) 29:737-807 p744-5

GLOSSARY OF TERMS

Amylase — An enzyme that catalyses the hydrolysis of starch into sugars. It is present in the saliva of humans and some other mammals, where it begins the process of digestion.

Amylopectin — A soluble polysaccharide and highly branched polymer of glucose found in plants. It is one of the two components of starch, the other being amylose. Glucose units are linked in a linear way with alpha glycosidic bonds.

Amylose — A helical polymer made of alpha-D-glucose units, bound to each other through alpha glycosidic bonds. This polysaccharide is one of the two components of starch.

Aspiration — The action or process of drawing breath. A condition in which food, liquids, saliva or vomit is breathed into the airways.

Cilia — An organelle found in eukaryotic cells. Cilia are thick protuberances that project from the cell body. In the lungs, function to clear foreign material.

Dysphagia — Difficulty or discomfort in swallowing, as a symptom of a disease.

Enzyme — Biological molecules consisting of proteins that act as catalysts and help complex reactions occur in life.

Polysaccharide — Polymeric carbohydrate molecules composed of long chains of monosaccharide units bound together by glycosidic linkages and on hydrolysis give the constituent monosaccharides or oligosaccharides. They range in structure from linear to highly branched.

Starch — A carbohydrate consisting of a large number of glucose units joined by glycosidic bonds.

Thickened Protocol — Or Thickened Liquid Protocol, those patients who have difficulty swallowing that must drink thickened liquids to prevent choking and stop fluid from entering the lungs. The three common consistencies of thickened liquids are nectar thick, honey thick, and pudding (or spoon) thick.

Viscosity — The state of being thick, sticky, and semifluid in consistency, due to internal friction. A quantity expressing the magnitude of internal friction, as measured by the force per unit area resisting a flow in which parallel layers unit distance apart have unit speed relative to one another.

Xanthan Gum — A polysaccharide secreted by the bacterium *Xanthomonas campestris*, used as a food additive and rheology modifier. It is composed of pentasaccharide repeat units comprising glucose, mannose and glucouronic acid.

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