Title: Managing Dysphagia: Lack of Standardization in Food and Barium Test Viscosities May Compromise Patient Care.

Authors: Kyzima J, Strowd L, Pillsbury D, Rubin, BK
North Carolina Baptist Hospital and
Wake Forest School of Medicine
Winston-Salem, North Carolina

Abstract

This study was designed to compare the viscosity of dysphagia diet foods (DDF) and barium test feeds (BTF) to each other and to the National Dysphagia Diet (NDD) guidelines established in 2002 by the American Dietetic Association. We measured dynamic viscosity at a stress (shear rate) chosen to mimic a natural swallow. We used the TA-1000 Rheometer to measure the variability of pre-mixed DDF and BTF under different test conditions. These measured viscosities were then compared to the NDD guidelines. Our conclusions include implications for clinical practice and recommendations for future research.

Summary of Proposal

Hospitalized patients suspected of having aspiration risk due to dysphagia often undergo a diagnostic modified barium swallow study (MBSS).

In 2002, the American Dietetic Association published the National Dysphagia Diet (NDD) guidelines that suggested viscosity ranges for different categories of dysphagia diet foods (DDF). The NDD was meant to assign objective values to the subjective DDF categories of thin, nectar, and honey-thick. Members of the NDD task force referred to these initial guidelines as "a catalyst for more research." To our knowledge, there have been no published studies comparing the viscosity of DDF and barium test feeds (BTF) to the recommended NDD guidelines measuring dynamic viscosity at a stress (shear rate) chosen to mimic a natural swallow. This comparison is essential to safely recommend the least restrictive diet. If the viscosity of the BTF used during the MBSS is not equivalent to the DDF provided to the patients during and after their hospital stay, aspiration risk may be increase and patient care compromised.

We determined the variability of pre-mixed DDF and BTF under different test conditions and compared the measured viscosities to the NDD guidelines. The DDF studied were nectar- and honey-thick liquids (apple or orange flavored) from Hormel and Resource, and thin liquids from Carnation (Instant Breakfast) and Boost (Plus Energy Drink). The BTF were from E-Z-EM. Products tested were the Polibar™ Plus barium sulfate suspensions and the Varibar® barium contrast products developed specifically for MBSS. These were prepared and tested as thin-, nectar-, and honey-thick BTF.
We evaluated the viscosity of the pre-mixed DDF from different lots. We also evaluated stability over time initially at opening, at 30 minutes, and at two hours. Carnation and Boost liquid supplements and the two BTF were tested in the same manner. The Resource honey and nectar thick lots showed minimal variability between lots. The Hormel honey and nectar thick lots showed greater inter-lot variability, up to 38% for the Hormel honey thick. There was minimal change in viscosity over two hours with all products. Carnation, Boost, and Resource products all have product labels that recommend shaking before consuming. In the Resource and Boost products, there were significant changes in viscosity after shaking: a 20% increase in viscosity with the Resource nectar liquid, and a 340% increase in viscosity with the Boost liquid. Despite the increase in viscosity in the Resource Nectar liquid, it still fell within the NDD guidelines for Nectar. Based on this finding, we recommend shaking all products before using.

Comparing the DDF to NDD guidelines, each lot of Resource and Hormel honey-thick had viscosities within the NDD target range. The Resource nectar-thick DDF fell within the NDD guidelines, but the Hormel nectar-thick was more viscous and actually fell in the NDD honey-thick category. The Boost thin liquid had viscosity in the NDD thin range, while the Carnation thin liquid had viscosity in the NDD nectar range. It is essential for the speech pathologist to recognize these differences in order to make appropriate dietary recommendations.

We tested thin, nectar, and honey-thick barium solutions using the same methods. The Polibar BTF suspensions produced an initial high viscosity followed by a sudden decrease to near-thin liquid values. This pattern is characteristic of thixotropic materials like paint. The Varibar contrast products were developed specifically for the MBSS and are not thixotropic. However, Varibar has unique definitions and ranges for thin, nectar-thick, and honey-thick viscosities that differ from the NDD guidelines. The Varibar thin liquid most closely correlated with the Hormel nectar-thick DDF. The Varibar nectar thick correlated most closely Hormel honey-thick DDF. Both the Varibar thin-honey and honey-thick BTFs have viscosities that were higher than similarly-labeled DDFs.

The NDD viscosity ranges for each category of DDF are so large that a very wide range of viscosities can be classified as the same DDF category. Overall, the Resource brand DDFs were the most consistent with respect to the NDD guidelines and showed the most stability.

It was reassuring that there was minimal change in viscosity after each product was open for two hours, suggesting that up to a two-hour delay from product opening to patient consumption is acceptable. However, it appears that shaking the DDF before opening can make a great deal of difference in the viscosity of some formulae. Therefore we recommend that all DDF be shaken before administering to the patient.

The Polibar barium solutions produced an initial high viscosity followed by a sudden decrease in viscosity to thin liquid values. This pattern is seen in thixotropic liquids. Although ideal to rapidly coat and adhere to the intestinal walls (the intended use), this
poses serious problems when used for the MBSS where coating and thixotropic behavior makes data interpretation more difficult. The Polibar suspensions do not come pre-mixed and thus increases the risk for batch-to-batch inconsistency. We concluded that BTF products intended for intestinal imaging studies are inappropriate for MBSS. Varibar BTF was specifically designed for evaluating dysphagia, is not thixotropic, and comes pre-mixed with the exception of thin. However, as noted above, Varibar has a unique labeling range for viscosity that is much higher than the NDD guidelines and most DDF.

We believe it would be appropriate to redefine the NDD guidelines using objective measurements that correlate to the normal swallowing rate. Future research should evaluate other characteristics of the DDFs that contribute to the patient’s ability or willingness to swallow - for example, taste, mouth feel, and surface characteristics. Collaboration among manufacturers of the DDF and BTF and cooperation with the NDD panel can lead to a more consistent and coherent set of guidelines to ensure that patients who are diagnosed with dysphagia are given foods that are safe and palatable for their dietary needs.