

DESIGN OF A NEW SPOON-THICK CONSISTENCY ORAL NUTRITION SUPPLEMENT USING RHEOLOGICAL SIMILARITY WITH A SWALLOW BARIUM TEST FEED

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ABSTRACT:

Control of food or bolus flow properties is part of several strategies to address aspiration pneumonia in dysphagic patients. An important alternative is the use of prescribed ready-to-use (RTU) oral nutritional supplements (ONS) specially designed for the nutritional support at different stages of dysphagia. However, it is clear that there are significant differences among products designed for the same level or stage of dysphagia. On the other hand, videofluoroscopy has become a key technique for the evaluation of swallowing and, thus, dysphagia. In this study, a new approach for designing RTU ONS products, specifically spoon-thick consistency products, has been carried out. The scientific approach has been based, first, on the characterization of the rheological properties of a standard barium-based commercial product used in videofluoroscopy studies and, then, matching the viscous flow properties of the RTU ONS product accordingly, by taking into consideration both formulation and process conditions. The results obtained clearly suggest that it is possible to obtain an excellent viscous flow behaviour similarity of both swallow barium test feed and RTU ONS produced at industrial scale. In this sense, both linear viscoelasticity properties and non-linear relaxation modulus have to be optimised to obtain the rheological similarity previously mentioned.

ZUSAMMENFASSUNG:

Die Kontrolle von Lebensmitteln oder Nahrungsströmungen stellt einen Bestandteil mehrerer Strategien dar, um die Pneumonie bei Schluckstörungen von Patienten zu heilen. Eine wichtige Alternative ist die Verwendung von vorgeschriebenen gebrauchsfertigen (RTU) oralen Ernährungssupplementen (ONS), die speziell für die Ernährungsunterstützung in unterschiedlichen Stadien von Schluckstörungen entwickelt worden sind. Es ist jedoch klar, dass signifikante Unterschiede zwischen den Produkten, die für den gleichen Grad oder das gleiche Stadium von Schluckstörungen bestimmt sind, existieren. Auf der anderen Seite ist Videofluoroskopie eine Schlüsseltechnologie für die Bewertung der Schluckvorgänge und somit von Schluckstörungen. In dieser Studie wird ein neuer Ansatz durchgeführt, um RTU ONS-Produkte herzustellen, insbesondere löffelfertige Produkte. Der wissenschaftliche Ansatz basiert zuerst auf der Charakterisierung der rheologischen Eigenschaften eines standardisierten Barium-basierten kommerziellen Produkts bei den Videofluoroskopiestudien und danach auf der Anpassung der viskosen Flieseigenschaften des RTU ONS-Produktes entsprechend der Formulierung und Prozessbedingungen. Die Resultate verdeutlichen in klarer Weise, dass es möglich ist, exzellente viskose Flieseigenschaften ähnlich der Bariumtestflüssigkeit und dem kommerziellen RTU ONS-Produkt zu erhalten. In diesem Sinne müssen die linear-viskoelastischen Eigenschaften und der nichtlineare Relaxationsmodul optimiert werden, um ähnliche rheologische Eigenschaften zu erhalten.

RÉSUMÉ:

Le contrôle des propriétés d'écoulement du bolus ou des aliments fait parti de plusieurs stratégies utilisées pour résoudre la pneumonie d'ingestion chez les patients dysphagiques. Une alternative importante est l'utilisation de suppléments nutritionnels oraux (ONS) prêts à l'emploi (RTU) et prescrits, spécialement élaborés pour le support nutritionnel aux différentes étapes de la dysphagie. Cependant, il est clair qu'il existe des différences importantes parmi les produits élaborés pour le même niveau ou état de dysphagie. D'un autre côté, la videofluoroscopie est devenue une technique centrale à l'évaluation de l'avalement, et donc de la dysphagie. Dans cette étude, nous avons utilisé une nouvelle approche afin d'élaborer des produits RTU ONS, qui ont spécifiquement une consistance épaisse dans une cuillère. L'approche scientifique est basée, en premier lieu, sur la caractérisa-

results obtained clearly suggest that it is possible to obtain an excellent rheological similarity of both SBTF and RTU ONS produced at industrial scale. Thus, the viscous flow curves for both products match in the whole shear rate range studied fairly well, as can be also deduced from the comparison of the values of the consistency index, K_s , and the flow index, n , no matter what RTU ONS product ageing was.

On the other hand, the linear viscoelasticity functions for the RTU ONS sample are superior to those of the SBTF. Likewise, a dramatic shear-induced pudding structural destruction takes place in the non-linear regime for both samples. However, this shear-induced microstructural breakdown is more important for the RTU ONS sample. In summary, both linear viscoelasticity properties and non-linear relaxation modulus have to be optimised to obtain the rheological (viscous flow) similarity to commercial standards for videofluoroscopic studies.

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