Accepted Manuscript

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PII: S0378-5173(17)30998-5
DOI: https://doi.org/doi:10.1016/j.ijpharm.2017.10.028
Reference: IJP 17084

To appear in: *International Journal of Pharmaceutics*

Received date: 8-6-2017
Revised date: 10-10-2017
Accepted date: 12-10-2017

Please cite this article as: M. Marconati, S. Raut, A. Burbidge, J. Engmann, M. Ramaioli, An *in vitro* experiment to simulate how easy tablets are to swallow, *<![CDATA[International Journal of Pharmaceutics]]>* (2017), https://doi.org/10.1016/j.ijpharm.2017.10.028

An *in vitro* experiment to simulate how easy tablets are to swallow

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Abstract

The compliance of patients to solid oral dosage forms is heavily conditioned by the perceived ease of swallowing, especially in geriatric and pediatric populations. This study proposes a method, based on an *in vitro* model of the human oropharyngeal cavity, to quantitatively study the oral phase of human swallowing in presence of single or multiple tablets. The dynamics of swallowing was investigated varying the size and shape of model tablets and adjusting the applied force to the mechanical setup to simulate tongue pressure variations among individuals. The evolution of the velocity of the bolus, the oral transit time, and the relative position of the solid oral dosage form within the liquid bolus were measured quantitatively from high speed camera recordings. Whenever the solid dosage forms were big enough to interact with the walls of the *in vitro* oral cavity, a strong effect of the volume of the medication in respect of its swallowing velocity was observed, with elongated tablets flowing faster than spherical tablets. Conversely, the geometrical properties of the solid oral dosage forms did not significantly affect the bolus dynamics when the cross section of the tablet was lower than 40% of that of the bolus. The oral phase of swallowing multiple tablets was also considered in the study by comparing different sizes while maintaining a constant total mass. The predictive power of different theories was also evaluated against the experimental results, providing a mechanistic interpretation of the dynamics of the *in vitro* oral phase of swallowing. These findings and this approach could pave the way for a better design of solid oral medications to address the special needs of children or patients with swallowing disorders and could help designing more successful sensory evaluations and clinical studies.

Keywords: Bolus, Swallowing, Capsules, Tablets, Solid oral dosage forms, Oral cavity, Palate.

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