

Influence of formulation and process parameters in the mechanical properties of prototypes prepared using Binder Jetting-3D printing technology

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Abstract:

It is known that the Binder Jetting methodology is among the most suitable 3D printing technologies for the preparation of orally disintegrating tablets (ODT) thanks to its characteristic of producing objects with high porosity. On the other hand, as for direct compression, the powder mixture used for the preparation of ODT with the Binder Jetting technique must have suitable flow characteristics and good cohesive properties. This work aimed to evaluate the feasibility of using co-processed excipients, commonly used for ODT preparation by direct compression, alone or blended with other excipients, and investigating how the amount of ink (binder solution) and some process parameters influence the mechanical properties of the prototypes printed. In particular, the impact of the height (0.1 mm and 0.2 mm) and extension speed (40% and 10%) of the powder layer on the physical characteristics of the tablets were evaluated.

An increase in the quantity of ink did not always lead to an improvement in the biopharmaceutical properties of the prototypes; on the contrary, it can produce deformations of the shapes and even produce too-resistant prototypes that fail the disintegration test for ODT formulations.

The studied co-processed excipients were suitable for the preparation of ODT using the Binder Jetting methodology. However, it was necessary to add them with binding agents, as well as use lower layer thickness to improve the mechanical resistance of the prototypes.