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Nanocrystals for the Oral Route Using 3D Printing Technology †

Lucía Lopez-Vidal[1], Juan Pablo Real[1], Daniel Andrés Real[2], Nahuel Camacho[1], Alejandro Paredes[3], Santiago Daniel Palma[1,*]

[1] National University of Córdoba, Argentina; l.lopezvidal@unc.edu.ar (L.L.V.); juan.real@unc.edu.ar (J.P.R.); nahuelc03@gmail.com (N.C.); sdpalma@unc.edu.ar (S.D.P.)
[2] University of Chile – Advanced Center for Chronic Diseases, Chile ; real.daniel.andres@gmail.com (D.A.R.)
[3] School of Pharmacy, Queen's University Belfast, Medical Biology Centre; alejandrojparedes@gmail.com (A.P.)
* Correspondence: sdpalma@unc.edu.ar (S.D.P.)
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Abstract: Drug nanocrystals (NCs) are a valuable technology for solving problems related to insoluble drug formulation, increasing efficacy, and reducing adverse reactions. However, NCs are difficult to incorporate into oral solid dosage forms (OSDF). This work aimed to apply a specific 3D printing method (MESO-PP) to vehicleize NCs into OSDF. Using Albendazole (ABZ), Poloxamer 188 as a stabilizer, and a combination of bead-milling and spray-drying, we prepared ABZ-NC. Laboratory 3d-printer and a 45% PEG 1500, 5% propylene glycol, and 50% ABZ-NC ink were used to obtain 3D-printed tablets (3DT). ABZ-NC loaded in 3DT were characterized in terms of size and polydispersity index (PDI). Physicochemical properties were evaluated by differential scanning calorimetry (DSC), X-ray diffractometry (XRD), and Fourier transform infrared (FTIR). Measured by DLS, XRD and FTIR were repeated after 180 days. The dissolution profiles were analyzed by similarity factor (f2). 3DT loaded with 455nm sized ABZ-NC (PDI of 0.256) was obtained. The average weight of the 3DTs was 349±9mg. DSC, XRD, and FT-IR analyses demonstrated that ABZ remained physicochemically unchanged after the process. The stability of NCs in ink was demonstrated for 180 days. 3DT exhibited improved *in vitro* biopharmaceutical behavior compared to ABZ-NCs placed in hard gelatin capsules(f2=31). As observed, MESO-PP represents a promising strategy to vehicleize NCs into OSDF.

Keywords: nanocrystals; 3D printing; albendazole.

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Conflicts of Interest

The authors declare no conflict of interest.