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INNOVATIVE SOLID NANOPARTICLES INTENDED FOR ORAL, DERMAL AND PARENTERAL ADMINISTRATION PREPARED BY NANO SPRAY DRYER®

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Introduction: The study of nanoparticle systems has gained wide prominence in recent years due to its potential use as drug targeting delivery systems[1, 2]. In general, formulations are obtained as aqueous suspensions which are systems relatively stable due to the small particle size, but if they are stored for a prolonged time period, some instability phenomena can take place[3]. Recently, our research group acquired a Nano Spray Dryer (Nano Spray Dryer B-90 Büchi, Switzerland) that is a new equipment that provides the conversion of liquid forms in their solid forms, helping to increase system stability. This equipment differs from the conventional Spray Dryer for providing the formation of nanoscale particles in an innovative way; it does not require prior preparation of nanoparticles since they will be formed at the time of drying and also allow the use of organic solvent[4]. Nano Spray Dryer uses a vibrating mesh to generate fine aerosol droplets, that is an innovative atomization principle, a laminar drying air flow in the spray chamber and an electrostatic particle collector[5]. In this way, it allows the use of small quantities of sample (mg) which facilitates the use of drugs with high added value and enables the achievement of high yields.
Objective: This study aims to obtain innovative solid particles at the nanometer scale by Nano Spray Dryer and to characterize them for later use in dosage forms intended for oral, dermal and parenteral use.
Materials and Methods: Initially formulations will be prepared using different polymers, polysaccharides, blends of polymers, surfactants and solvents. The proportions of substances will be varied in order to obtain a population of mostly solid with nanometrical size. Operational parameters such as temperature, type of membrane used (4.0 µm, 5.5 µm and 7.0 µm) and the percentage of spray used will also evaluated. The resulting powders will be characterized by size and polydispersity index, zeta potential, size after redispersibility, moisture content, bulk and tapped density (and consequent determination of the Carr Index and Hausner Factor), angle of repose and morphology. After, the applicability of the powers as intermediates in different dosage forms will be studied. The possibility of applying the powders in dosage forms intended for intravenous route will be evaluated considering the desagglomeration behavior in glucose or saline solution, determining particle size, zeta potential, pH and viscosity. After characterization of the powder for moisture content, flow, density and angle of repose will be evaluated the possibility of using the nanosized powders to prepare oral dosage forms such as capsules and tablets will evaluated. Finally, the nanopowders will be incorporated in Carbopol 0.5% hydrogels and emulsions for dermal application, and particle size, zeta potential, pH, stability and rheology will studied. Statistical analysis will be performed by Student's *t*-test for two groups, and one-way ANOVA for multiple groups ($\alpha = 0.05$).

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