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Microspherical Particles of Solid Dispersion of Polyvinylpyrrolidone K29-32 for Inhalation Administration

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Abstract

© 2018 L. S. Usmanova et al. Inhalation administration is a promising alternative to the invasive drug delivery methods. The particle size required for ideal drug aerosol preparation is between 1 and 3 μm. The application of microspherical particles of solid dispersions enhances bioavailability of poorly soluble drugs due to the solubilization. In the present work, the spray drying process of the production of microspherical particles of solid dispersions of polyvinylpyrrolidone K29-32 with model hydrophobic drug, phenacetin, was optimized using the results of DSC, PXRD, and viscometry. The diameter of the obtained particles is within 1-3 μm range. The Gibbs energy of dissolution in water was shown to be negative for the mixture with polymer/phenacetin mass ratio 5: 1. We have demonstrated that the optimal size distribution for the inhalation administration is obtained for microspherical particles produced using spray caps with 7.0 μm hole size. The dissolution rates of phenacetin from the produced microspherical particles were faster than that of drug powder. As evidenced by powder X-ray diffraction data, phenacetin stayed in amorphous state for 4 months in microspherical particles of solid dispersions. According to the obtained results, strategic application of the spray drying process could be beneficial for the improvement of the pharmaceutical properties of model drug, phenacetin.

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