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Itraconazol-Loaded Nanostructured Lipid Carriers (NLC) for Pulmonary Application

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Introduction: Aspergillosis is a common fungal infection in falcons. Standard treatment, systemic application of Itraconazol, is limited due to hepatotoxicity. The aim of the present study was to develop Itraconazol-loaded Nanostructured Lipid Carriers (NLC) for pulmonary application. NLC are a nanoparticulate carrier system composed of a blend of solid lipid and liquid lipid, with a particle matrix being solid at body temperature. NLC have shown many advantages for pulmonary application such as deep lung deposition due to the small particle size, adhesive properties leading to an accumulation in the lung, prolonged release properties leading to a reduction of dosing frequency and low toxicity due to the use of well tolerated excipients.

Material & Methods: NLC composed of 0.02% Itraconazol (Jai Rhades Sales, India), 4.5% Precirol ATO 5 (Gattefossé, Germany), 0.5% oleic acid (Croda, Germany), 2% Tween 20 (Cognis, Germany) and 92.81% Milli-Q water were prepared by hot-high pressure homogenization method (Panda K2, GEA Niro Soavi, Germany). The particle size of NLC was determined using a NanoSizer ZS (Malvern Instruments, UK). The melting point of NLC was assessed by differential scanning calorimetry using a DSC 204 F1 Phoenix (Netzsch, Germany). NLC dispersion was nebulized using a Nanonebulizer (Medic Activ, Germany). The particle size of the aerosol was analysed using a wide range aerosolspectrometer (Grimm Aerosol Technik, Germany).

Results & Discussion: Itraconazol-loaded NLC with an average particle size of 119 nm and a polydispersity index (PI) of 0.254 were obtained applying 5 homogenisation cycles at 500 bar. NLC showed a melting point of 45.1°C proving the solid state of the particle matrix of the carrier system. Nebulizing the NLC dispersion using a Nanonebulizer led to an aerosol with an average particle size of 265 ± 1.78 nm. The particle size of NLC in the aerosol was found to be of the same order of magnitude as before nebulization, which shows that after nebulization the favorable characteristics of the delivery system are maintained.

Conclusion: Nebulization of Itraconazol-loaded NLC using a Nanonebulizer by MedicActiv leads to an aerosol with favorable characteristics for pulmonary treatment of aspergillosis in falcons.

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