

Design of Hydrogel Nanoparticles for Direct Drug Delivery to Hair Follicles

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In the present study, we designed a dermal formulation containing 5% minoxidil nanoparticles (MXD-NP) using the bead mill method, and investigated the hair-growth effect of MXD-NP and a commercially available MXD solution (CA-MXD). Hair growth and skin permeation studies were conducted using C57BL/6 mice. Moreover, we examined the MXD contents in the upper (hair bulge) and the lower hair follicle (hair bulb). The mean particle size of the MXD in the MXD-NP was 99 nm. The hair-growth effect of the MXD-NP was higher than that of CA-MXD, and the MXD content in the hair bulge of mice treated with MXD-NP was 7.4-fold of that in the mice treated with CA-MXD. On the other hand, the plasma MXD levels in the mice treated with MXD-NP was lower in comparison with CA-MXD. In conclusion, we showed that MXD-NP enable the accumulation of MXD in the upper hair follicles more efficiently than CA-MXD, leading the activation of hair growth.