

**Simultaneous effects of tocopheryl polyethylene glycol succinate (TPGS) on local hair growth promotion and systemic absorption of topically applied minoxidil in a mouse model.**

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**Abstract**

In this study, topical minoxidil solutions supplemented with TPGS in cosolvent systems of various compositions consisting of water, alcohol, and polyethylene glycol 400 were designed to evaluate the efficacy of promoting hair growth after topical application and the safety in terms of the amount of minoxidil absorbed through the skin into the circulation using C57BL/6J mice as a model. The commercial product of 2% Regaine) was used as the positive control. The role, which sulfotransferase activity plays in hair growth with treatment using minoxidil, was determined as well. The results revealed that the addition of 0.5% TPGS was able to enhance the proliferation of hair, but an increase in the amount of TPGS to 2% led to deterioration in the enhancement of hair growth. At the higher added amount (2.0%) of TPGS, the promotion of hair growth was slightly reduced for both cosolvent formulations F1 (100% water) and F3 (100% PEG 400), whereas it was reduced to a greater extent for the cosolvent formulations F8-F10. In comparison, the influences of cosolvent compositions with TPGS amounts of 0.0 and 2.0% on the promotion of hair growth were similar. On the contrary, variability in the promotion of hair growth by different solvent formulations was minimal when the added amount of TPGS was 0.5%. In general, a relationship between hair growth and sulfotransferase activities after topical application of 2% Regaine and minoxidil formulations containing various amounts of TPGS was not demonstrated. Plasma concentrations of minoxidil with 2% Regaine were found to be greater than those of 2% minoxidil in those cosolvent formulations containing various amounts of TPGS, while showing insignificant differences among those 10 cosolvent formulations with a fixed amount of TPGS. A tendency for the plasma concentration of minoxidil to increase after the topical administration of minoxidil formulations containing the higher amount of TPGS (2%) was noted.