

Analysis of the role of Semaphorin 3A in the skin and hair follicle immune systems of Sema3A transgenic mouse and exploration of novel treatments with Semaphorin 3A

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Semaphorin 3A (Sema3A) is originally found the nerve guidance molecule. Sema3A can induce growth cone collapse and axon repulsion through interaction with a neuropilin-1/plexin-A receptor complex. In AD patients, Sema3A expression is decreased in epidermis that allows higher skin innervation. In addition to the role of nerve guidance, recent studies indicate sema3A as the immunomodulator in several immune reactions.

In this study, we found the novel role of sema3A in trichoimmunology via mast cell stimulation. We established B6-Tg (pK14-Sema3a) / UOEH mouse that express excess Sema3A in epidermis under K14 promotor. Interestingly, this mouse show hair loss lesion mainly on back skin. Histological analysis revealed a large number of mast cells in dermis and around hair follicles of hair loss lesions compared to healthy control and non hair loss lesion. Non hair loss lesion also shows significant infiltration of mast cells in dermis and around hair follicles compared to healthy control. On the other hand, MCP-1+ basophils are rarely found in dermis and around hair follicles. Next, we generate murine bone-marrow (BM) derived mast cells. The presence of Neuropilin-1/Plexin A1 expression was analyzed on FACScan. Furthermore, histamine releasing was studied in BM derived mast cells cultured with sema3A or PBS by ELISA. Sema3A was injected into the back skin after the induction of depilation induced murine hair cycle in order to know the affect of sema3A on murine hair cycle. In wild type C57BL/6 mice, sema3A is strongly expressed on Day8 in the depilation murine hair cycle that indicates the catagen induction by sema3A. In conclusion, sema3A may induce increasing and activation of mast cells with releasing of histamine that result in alopecic lesions in B6-Tg (pK14-Sema3a) / UOEH mouse. This study shows unique face of sema3A in trichoimmunology and skin immune systems, especially to mast cell.