Technology/ Title	A substance and applied method to sustain the self-renewal of hair follicle stem cells	
Subtitle	Promote hair growth by a novel substance	
Technology Type	■ Biotechnology	☐Device/Diagnostics
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Technology Description	Adult hair follicles undergo a cyclic anagen (growing phase), catagen (regressing phase), and telogen phase (resting phase). The club hair in telogen phase sheds normally. Defects in hair cycling may cause hair loss. The purpose of our invention is to enhance the hair follicle stem cells to initiate the growth phase and maintain the regenerative capability, which is beneficial to prevent aging and slow down androgenetic alopecia, as well as to revive alopecia after chemotherapy and radiation therapy. We abrogated Notch signaling effectors in mouse epidermis, and found that the hair follicles grew slower than that of control hair follicles during the growth phase. Applying repetitive plucking on the back skin, we found that the hair regeneration of the mutant mice was gradually deteriorating, showing a phenomenon of baldness compared with the control group. Because the Notch ligand is a transmembrane protein, we construct the extracellular part of the Notch ligand into a soluble-form recombinant protein. Using this soluble ligand, we found that mouse hair follicle stem cells cultured in vitro have enhanced self-renewal capability. The Notch soluble ligand was also prepared on Affi-gel beads and then injected under the skin of mice, and we found that the soluble ligand can initiate hair growth. These results indicate that topical application of a Notch soluble ligand can promote the hair growth and maintain the self-renewal of hair follicle stem cells. Our invention is unique in that we found a substance that can promote the anagen initiation in hair growth and sustain the self-renewal of hair follicle stem cells.	
Intellectual Property	USA Application No.: US 10716829 B2 Taiwan TW I713590 B.	

Key Publications	Hes1 regulates anagen initiation and hair follicle regeneration through modulation of Hedgehog signaling. Stem Cells. 2020;38(2):301-314
Business Opportunity	The self-renew ability of hair follicle stem cells is decreasing by age, and hair loss is a common concern for cancer patients when they receive radiation therapy or chemotherapy. Our invention can be used to sustain the self-renewal of hair follicle stem cells, which is of great help for people who lost their hair by aging or under stress. The invention can also be applied to accelerate the hair regrowth after radiation therapy and chemotherapy for cancer treatment. Treatment of hair loss/alopecia has a great market potential, and we predict that our invention can be applied to make shampoo or hair regrowth kit.