

## **Regulators of BMP and WNT signaling pathways in homeostasis of hair follicle stem cells**

Hair follicle (HF) is a dynamic miniorgan which undergoes cyclic phases of growth, degradation and quiescence. In every HF, in place referred as a bulge, reside small population of hair follicle Stem Cell (hfSCs) capable regeneration of epidermis, sebaceous glands and whole hair follicle. They comprise excellent model for studying an adult stem cell biology, because hair and skin are easily accessible materials and they can be maintained and multiplied outside of the body in artificial conditions, without losing their capability to regeneration.

Molecular studies on factors that precisely regulate maintenance of inner balance between variety signaling pathways in regeneration cycle of hfSCs is important issue in biology and regenerative medicine. Hair stem cells are involved in tissue renewal and wound healing, and their malfunctioning may result in baldness or skin cancer.

Our previous results indicate, that activity of hfSCs in HF is controlled by constant competition between two signaling pathways: BMP (Bone Morphogenic Protein) and WNT (Wingless-type MMTV integration site family). The main goal of proposed research is to figure out how hair regeneration cycle is regulated by both pathways, using skin and hair as a research model. Discovery of the mechanism how regulatory factors manage inner balance of signaling pathways is one of the most important task in the field of biology and regenerative medicine. In proposed research function of selected regulators of BMP and WNT pathways will be investigated by hair and skin reconstruction assay under natural conditions in living mice. Unique research models, created by our group using genetic engineering, will comprise perfect tools to study function of these regulators and SCs properties to regenerate skin and HF.

Understanding of basic biological processes that occur with participation of these regulators, has fundamental meaning for application of hfSCs in regenerative medicine, in effective therapy in disease such as burns, ulcers, baldness and skin cancer. Generation a fully functional skin with appendages is one of the most challenging issue in cutting-edge medicine because present method of skin wound healing very often cause a scar formation without skin appendages such as hair follicles, which is still far away from perfect regeneration.

Moreover BMP and WNT signaling pathways play a key role in maintenance the cellular balance in variety types of SCs. Therefore, conducting presented research may be important for understanding of universal mechanism in regulation of SCs activity and may have much broader contribution to others fields of biology and medicine.