

Summary of the Thesis for the Degree of Doctor of Philosophy (Ph.D.)

New mechanisms in the biological processes of human hair growth regulation

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In the first part of our experiments the presence of transient receptor potential vanilloid-3 (TRPV3), at both protein (immunohistochemistry) and mRNA levels (q-PCR), was identified in isolated human hair follicle cultures. We have shown that different TRPV3 activators inhibited hair growth, reduced the amount of the proliferating cells (Ki-67, nuclear proliferation marker), and stimulated apoptosis (TUNEL reaction, DNA fragmentation) in the hair bulb, and induced catagen transformation in a dose-dependent manner. The functional presence of TRPV3 in ORS keratinocytes cultures has also been successfully demonstrated; since the activation of the channel induced membrane currents and elevated Ca^{2+} levels, which lead to the suppression of cell proliferation and induction of apoptosis. These have proven to be TRPV3-specific on ORS keratinocytes, since TRPV3-specific gene silencing antagonized these actions. Based on these results, we can conclude that certain cells of the human hair follicles express TRPV3 channels, which play a significant role in the regulation of follicular growth and hence the processes of hair cycling.

The effects of thyroid-stimulating hormone (TSH) were then investigated on the human hair follicle, which – based on recent studies – is uniquely hormone sensitive tissue. The presence of the TSH receptor specific mRNA and immunoreactivity was detected in the mesenchymal areas of human skin. In addition, the stimulation of TSH receptor resulted in an increase in cAMP levels in cultures of hair follicles and DP fibroblasts, and led to a change in the expression levels of certain classical and so far unknown TSH target genes as well. Although further studies are required to fully understand of the exact function of TSH in the biological processes of human hair follicle, our novel findings introduce the hair follicles as an interesting, new extra-thyroid target for TSH.

Keywords: hair follicle organ culture, hair cycle, catagen transformation

Kulcsszavak: szőrtüsző szervkultúra, hajciklus, katagén átalakulás