

Test Report

Influence of Follicusan on Dermal Papilla Cells

As part of the bulb or root of a follicle the dermal papilla is essential for the growth of hair. During transition from the telogen to the early stages of anagen in the course of the hair cycle the dermal papilla provides the inductive stimuli for anagenic differentiation of the follicular epithelium. The dermal papilla and the dermal sheath are derived from specialized fibroblasts which are mesenchymal i.e. embryonic cells. Isolated dermal papilla cells were shown to induce follicle development when they were able to interact with epithelial cells (keratinocytes) derived from the hair bulb matrix, a germinative epidermis. The relationship and respective roles of the adult dermal papilla and the hair bulb matrix epithelium are similar to those of the embryonic development of a follicle.

Changes in the dermal papilla take place during the hair growth cycle in terms of cell morphology and volume of the extracellular matrix (ECM). The extensive ECM during anagen diminishes in volume during catagen and becomes almost non-existent in telogen.

The ECM of the dermal papilla has a distinctive composition that differs from that of the interfollicular dermis. The ECM is rich in basement membrane molecules, including Type IV collagen, laminin and heparan sulfate proteoglycan.

In vitro experiments with human dermal papilla cells have shown strong stimulatory influences exerted by Follicusan on this hair follicle cell line.

Dermal papilla cells, like all cell types in general, need energy for all kinds of cell functions. The amount of adenosine triphosphate (ATP) expresses the energy level of cells. Follicusan was shown to increase, in a dose-dependent manner, the ATP level of dermal papilla cells by up to 27% compared to control (Fig. 1).

Dermal papilla cells need doubling times of 5 to 6 days, which is a much longer time than that required by normal fibroblasts (24 hours). For this reason, the cells were cultured for 72 hours prior to adding Follicusan at different concentration levels. Cell responses were detected after periods ranging from 72 to 216 hours following addition of Follicusan. In all experiments, 5% fetal calf serum (FCS) was used as 100% control. The different concentration levels of Follicusan were added to 5% FCS.



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1. Stimulation of Proliferation

Stimulation of cell proliferation was assessed by measuring the content of BrdU (bromodeoxyuridine), a thymidine homologue. Follicusan was found to stimulate proliferation in a dose-dependent manner, i.e. by up to 72% when used at a concentration of 3.2% (Fig. 2).

2. Stimulation of the Synthesis of Basement Membrane Constituents

a) Type IV Collagen

Follicusan stimulates collagen synthesis in a dose-dependent manner, i.e. by up to 17% when used at a concentration of 3.2% (Fig. 3).

b) Heparan Sulfate Proteoglycan

Follicusan stimulates proteoglycan synthesis in a dose-dependent manner, i.e. by up to 21% when used at a concentration of 3.2% (Fig. 4).

The dermal papilla cells are differentiated mesenchymal cells. The function of these cells is essential for induction of hair growth and control of the hair cycle. This also includes reconstitution of stressed or damaged follicles. For this reason, the energizing effect produced by Follicusan not only on this cell type, but also on keratinocytes and fibroblasts in the scalp is essential for the hair condition. The further stimulatory influence of Follicusan shown on dermal papilla cells, especially on the synthesis of basement membrane constituents of this unique ECM, is an important hint to in vivo effects which could be expected from this hair active.



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Fig. 1





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Fig. 3



Fig. 4