Expression and localization of the vascular endothelial growth factor and changes of microvessel density during hair follicle development of Liaoning cashmere goats

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ABSTRACT. Vascular endothelial growth factors (VEGFs) play important roles in neovascularization, tissue development, and angiogenesis. In this study, changes in VEGF expression patterns and microvessel density (MVD), and their correlations, were investigated during hair follicle development in epidermal appendages of Liaoning cashmere goats. Polyclonal antibodies to VEGF and microvessels were used for monthly immunohistochemical examinations of normal skin specimens from adult female goats for one year. VEGF was expressed in the hair bulb of primary and secondary hair follicles, the outer and inner root sheaths, sebaceous glands (ductal and secretory portions), eccrine sweat glands (ductal and secretory portions), and the epidermis. Abundant expression of VEGF was observed in the follicular basement membrane...
zone surrounding the bulb matrix and in ductal and secretory portions of eccrine sweat glands. The change in VEGFs in primary hair follicles showed a bimodal pattern, with the first peak observed from March to May, and the second in August. Maximal expression in secondary hair follicles occurred in May and August. Therefore, VEGF expression in primary and secondary hair follicles is synchronized throughout the year, and is correlated to hair development. In the later telogen and anagen phases, VEGF expression was higher in the secondary, compared to the primary, hair follicle. Changes in MVD also showed a bimodal pattern with peaks in May and August. VEGF expression and MVD showed moderate and strongly positive correlation in the primary and secondary hair follicles, respectively. Therefore, MVD and VEGF are closely related to the processes involved in hair cycle regulation.

**Key words:** Adult Liaoling cashmere goats; VEGF; MVD; Hair follicle cycle