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CHANGES IN ANGIOGENIC FACTORS ACCOMPANIED WITH  
HYPERPLASIA OF BROWN ADIPOSE TISSUE IN RATS

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Angiogenesis is essential in normal growth of tissue. It is suggested that polypeptide cell mitogens, vascular endothelial growth factor (VEGF) and basic fibroblast growth factor (bFGF), are involved in angiogenesis. It is known cold exposure produces a marked hyperplasia of brown adipose tissue (BAT), the major site of metabolic heat production. In this study, to elucidate the role of growth factors on angiogenesis associated with hyperplasia of BAT, mRNA levels of VEGF and bFGF were measured in rats.

When rats were exposed to cold at 4°C, the VEGF mRNA level of BAT was increased significantly after 1–4 hr, but returned to the basal level after 1 day. A similar response of VEGF mRNA was also found in the heart. However, the VEGF mRNA level was not changed during cold exposure in the lung and kidney, the tissues expressing a large amount of VEGF. bFGF mRNA was also detected in BAT, but its level was much less than that of VEGF mRNA and was not changed during cold exposure.

The VEGF mRNA level was also increased 4 hr after the administration of norepinephrine or a  $\beta_3$ -adrenoceptor agonist CL316,243 in BAT, but not in heart. All these results suggest 1) that VEGF more than bFGF, may participate in angiogenesis in BAT accompanied with hyperplasia of this tissue, and 2) that VEGF expression is enhanced by adrenergic stimulation of the  $\beta_3$ -adrenoceptor in brown adipocytes.