Growth Control in Capillary Endothelium

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The phenomenon of angiogenesis depends upon several biological processes including enzymatic degradation of matrix, chemotaxis, lumen formation, tissue remodeling, and matrix control of differentiation. These processes are expressed in a sequential order during the growth of a capillary and during its regression.

Capillary endothelial cells and endothelial cells of embryonic and fetal origin have the capacity to express the information necessary to build a complete capillary network. However, the signals that initiate this expression usually come from other cell types, such as tumor cells, macrophages, lymphocytes or adipocytes.

The rate of capillary growth can also be modulated by mast cells which normally reside in the neighborhood of mature capillaries and venules. Mast cell heparin appears to be responsible for the enhancement of tumor-induced angiogenesis under experimental conditions.

Heparin or specific fragments of heparin have been found to act either as positive or negative regulators of angiogenesis. Although one mechanism that has been suggested is the high affinity of heparin for endothelial growth factors, the detailed mechanisms by which heparin regulates angiogenesis have yet to be discovered. Furthermore, it is not known whether enhancing or inhibiting activities of heparin vis-à-vis endothelial cells and angiogenesis can be assigned to specific heparin fragments or to specific isomers of these fragments.

Nevertheless, this field of investigation may possibly yield an increased understanding of the biological processes which comprise angiogenesis, and may also lead to the development of new pharmacologic agents for the regulation of capillary blood vessel proliferation.

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