

Regulation of Endothelial Transport

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ABSTRACT: The microvascular endothelial cell monolayer localized at the critical interface between the blood and vessel wall has the vital functions of regulating tissue - fluid balance and supplying the essential nutrients needed for the survival of the organism. The endothelial cell is an exquisite “sensor” that responds to diverse signals generated in the blood, sub-endothelium, and interacting cells. The cell can dynamically regulate its paracellular and transcellular pathways for transport of plasma proteins, solutes, and liquid. The semi-permeable characteristic of the endothelium is crucial for establishing the transendothelial protein gradient (the colloid osmotic gradient) required for tissue fluid homeostasis. Inter-endothelial junctions comprise a complex array of proteins in series with the extracellular matrix constituents and serve to limit the transport of albumin and other plasma proteins by the paracellular pathway. This pathway is highly regulated by the activation of specific extrinsic and intrinsic signaling pathways. Recent evidence has also highlighted the importance of the heretofore enigmatic transcellular pathway in mediating albumin transport via transcytosis. Caveolae, the vesicular carriers filled with receptor-bound and unbound free solutes, have been shown to shuttle between the vascular and extravascular space, depositing their contents outside the cell. A unique set of signaling mechanisms regulate paracellular and transcellular transport pathways and enable cross-talk between the pathways to maintain tissue fluid balance. These mechanisms will be described in the presentation.

KEYWORDS: endothelial barrier function, caveolae, inter-endothelial junctions, transcellular, paracellular, cross-talk, albumin flux

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