Transfer across the Peritoneum: Passive or Active

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Sir, The peritoneum has been defined as a semipermeable [1] or as a leaky membrane [2,3] and the passage of water and solutes through the peritoneum has been explained in terms of a passive diffusion. Semipermeability is strictly connected to pores filled with a medium usually considered to be water through which diffusion occurs only by differences of chemical potential [1,2].

Pappenheimer's prediction [4] that the capillary walls are pierced by numerous ultramicroscopic openings which are in general too small to allow the passage of plasma protein molecules, has been extended to the peritoneum [5,6]; this has been supported by observations that the kinetics of solute transfer across the peritoneal membrane is an exponential one.

The concept of pores which is useful in physiological thinking needs the support of morphological terms [7]. Gaps on the endothelial wall of sporadic venules of the cat mesentery were reported by Wayland [8], after topical application of histamine in concentrations well above those likely to occur physiologically. However, actual gaps have never been observed on the capillary peritoneal endothelium nor on the mesothelial layer. In addition, kinetics compatible with the laws of diffusion (i.e., exponential changes) can be caused by a process other than simple passive diffusion; thus, an active process which removes a solute from one compartment may produce exponential changes provided that the rate of removal is not limited by the capacity of the process itself [9]. Indeed, carrier transport, under low saturation conditions, is indistinguishable from that of simple diffusion [10].

The possibility of an active role of the mesothelial cells in the absorption of isotonic solutions from the peritoneal cavity was first raised by Orlow [11] and Starling and Tubby [12] and more extensively examined by Cunningham [13].

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The presence of microvilli in the free border of the mesothelial cells, similar to those of the striated border of the intestinal epithelia [14,15] supports the possibility of an active absorptive capability. Odor [16] raised the possibility that pinocytosis (i. e., vesicular transport across cells) may play an important role in the absorption of colloidal substances by the mesothelial cells.

This is supported by the observation that on EM the mesothelial cells are full of vesicles, some of whom communicate with the peritoneal cavity and others with the interstitial space. Cascarano et al. [17] reported evidence which supports the idea that oxidative metabolism and ATP formation are intimately linked with the passage of some solutes through diaphragmatic peritoneum. In vitro studies showed the high sensitivity of mesenteric permeability to temperature changes, to the Ca^{++} concentration in the dialysate, its pH and to anoxia [1,18,19]. All this work casts some

doubts upon the presently accepted hypothesis that the peritoneal membrane is a passive, inert one, and underlines the need for a reappraisal of the whole subject of peritoneal physiology, and permeability.

We believe that a living membrane cannot behave as an artificial one, and that mesothelial cells may play an important role in the transfer of solutes or water across the peritoneum. We hope that the increasing use of peritoneal dialysis as a life-supporting therapy will open the way for intensive research work on peritoneal physiology.

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