Abstract

Previously our laboratory (Rim et al., Int. J. Pharm. 32:79-84. 1986) described an in vitro blood-brain barrier (BBB) model consisting of cultured bovine brain microvessel endothelial cells (BMECs) grown onto regenerated cellulose acetate membranes. However, the utility of this in vitro BBB model system was limited because the regenerated cellulose acetate membrane and not the monolayer of bovine BMECs was rate limiting for the permeability of very lipophilic compounds. Therefore, in this study we have evaluated polycarbonate membranes as supports for growing bovine BMECs and for conducting in vitro drug permeability studies. Bovine BMECs were cultured on collagen-coated polycarbonate membranes (13-mm diameter, 12-microns pore size) which were then mounted into side-by-side diffusion cells for transport studies. The permeabilities of a series of solutes of varying lipophilicity (progesterone, estrone, testosterone, haloperidol, propranolol, antipyrine, caffeine, urea, acyclovir, ganciclovir, ribavirin, and glycerol) were determined and an excellent correlation ($r = 0.97$) was established between the permeability coefficients of the solutes and their log partition coefficients (PC)/(MW)1/2. These results suggest that bovine BMECs cultured onto polycarbonate membranes can be used as an in vitro model system for estimating the potential permeability of a solute through the BBB in vivo.