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New Insights on the Structure of a Periciliary Layer of Lungs¹ LIHENG CAI, BRIAN BUTTON, RICHARD BOUCHER, MICHAEL RUBIN-STEIN, University of North Carolina at Chapel Hill — The human airway surface layer (ASL) consists of two parts: an upper mucus layer in contact with air and a lower periciliary layer (PCL) protecting epithelial cells from mucus and pathogens it contains. We study the polymer size and concentration dependence of penetration depth of fractionated labeled dextran from solutions into PCL. We find that dextran with molecule size smaller than 20 nm can penetrate into PCL from dilute solutions. The penetration depth of dextran into PCL increases with decreasing molecular size below 20 nm. Semidilute solutions of high molecular weight dextran with molecule size larger than 50 nm can penetrate into PCL as long as the solution correlation length is smaller than 20 nm. The penetration depth dependence on correlation length for semidilute solutions is similar to penetration depth dependence on dextran size for the case of dilute solutions. The coincidence of the two penetration depth dependence suggests the existence of a brush-like protective barrier inside PCL with mesh size decreasing from top to bottom of this layer.

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Liheng Cai University of North Carolina at Chapel Hill

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