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Molecular sieve in bovine descemets membrane as revealed by negative staining.

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Abstract

Descemet's membrane was isolated from the corneas of cows and observed by electron microscopy after negative staining with 1% phosphotungstic acid solution, pH 7.2. Ultrastructurally, bovine Descement's membrane had a very regular hexagonal pattern. Nodes were connected to the six others around each of them by thin filaments to form a hexagon. The distance between the nodes was approximately 120 nm, the diameter of the nodes approximately 30 nm, and the width of the connecting filaments approximately 10 nm. Bovine Descement's membrane was a molecular sieve composed of nodes and filaments substantiating our molecular sieve theory of basement membranes.

KEYWORDS: basement membrance, cornea, Descemet's membrance, electron microscopy

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—— BRIEF NOTE ——

MOLECULAR SIEVE IN BOVINE DESCEMETS MEMBRANE AS REVEALED BY NEGATIVE STAINING

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Abstract. Descemet's membrane was isolated from the corneas of cows and observed by electron microscopy after negative staining with 1 % phosphotungstic acid solution, pH 7.3. Ultrastructurally, bovine Descemet's membrane had a very regular hexagonal pattern. Nodes were connected to the six others around each of them by thin filaments to form a hexagon. The distance between the nodes was approximately 120 nm, the diameter of the nodes approximately 30 nm, and the width of the connecting filaments approximately 10 nm. Bovine Descemet's membrane was a molecular sieve composed of nodes and filaments substantiating our molecular sieve theory of basement membranes.

Key words: basement membrane, cornea, Descemet's membrane, electron microscopy.

We previously demonstrated that renal glomerular (1, 2) and tubular (3, 4) basement membranes had a three-dimensional fine meshwork structure composed of pores and strands by electron microscopy after negative staining. We proposed, therefore, a molecular sieve theory of basement membranes. The present paper reports a study of the ultrastructure of bovine Descemet's membrane, a basement membrane, as seen by negative staining under the electron microscope.

Corneas were dissected from bovine eyes within a few hours of sacrifice. The Descemet's membrane was stripped from the cornea by free-hand dissection, sonicated in 1 M NaCl and washed in distilled water. The pellet from centrifugation was studied by electron mcroscopy using negative staining with 1 % phosphotungstic adid, pH 7.3.

The surface of the small fragment had a very regular hexagonal pattern composed of nodes and thin internodal filaments. The filaments connected each node with the six others around it to form a hexagon (Fig. 1). The average distance between the nodes was approximately 110 nm, the diameter of the nodes was approximately 30 nm, and the width of the connecting filaments was approximately 10 nm.

Kaye *et al.* (5) demonstrated the free diffusion of thorium dioxide particles

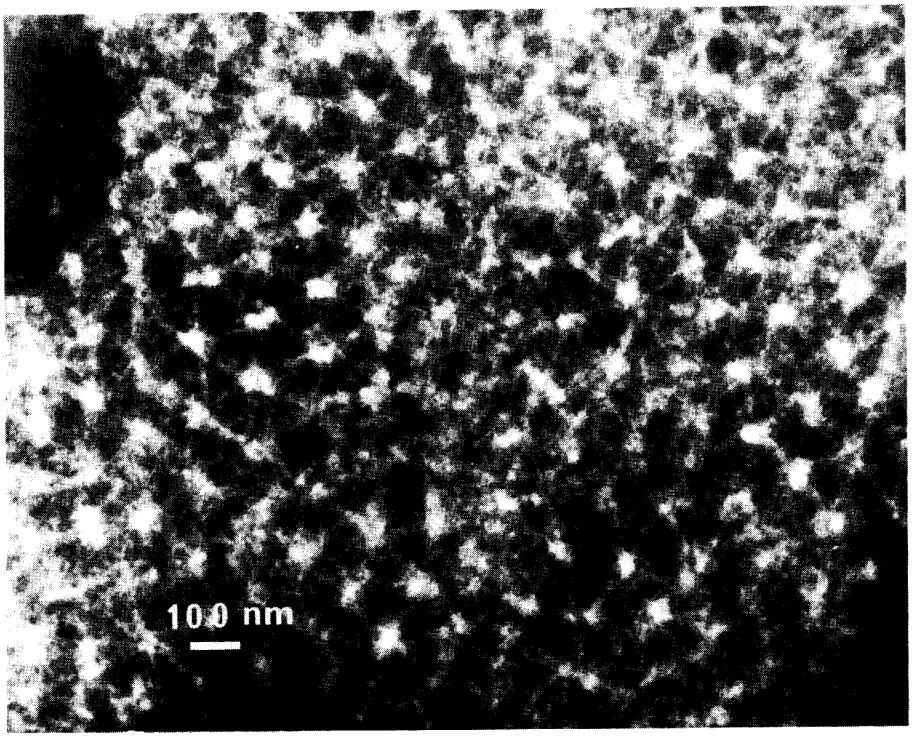

Fig. 1. Negative staining of unfixed bovine Descemet's membrane with 1 % PTA. ×67,000.

whose size ranged from 10 to 15 nm through Descemet's membrane. Our observation by negative staining was very similar to that by ultrathin sectioning (6). Since negative staining revealed Descemet's membrane to have a meshwork structure, we were able to confirm our molecular sieve theory of basement membranes.

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