

## Brief Note

### Single Cilia of Type II Pneumocytes in the Guinea Pig Lung

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**Key words :** single cilia — type II pneumocyte —  
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Cilia are usually motile and serve either to move a certain cell and an organism or to move materials over the surface.<sup>1)</sup> Recent studies have demonstrated ciliary structures in cells which are not normally ciliated.<sup>2)</sup> These are seen in cells not only of epithelial origin, but also of non-epithelial and mesenchymal origin, and have been called "single cilia", "solitary cilia", "primary cilia", or "sensory cilia". The ultrastructure of these cilia consists of nine peripherally placed doublets of microtubules without centrally located microtubules. Therefore, they are referred to as a (9+0) complex<sup>2,3)</sup> while ordinary cilia related to movement (kinetocilia) have nine peripheral doublets and two central

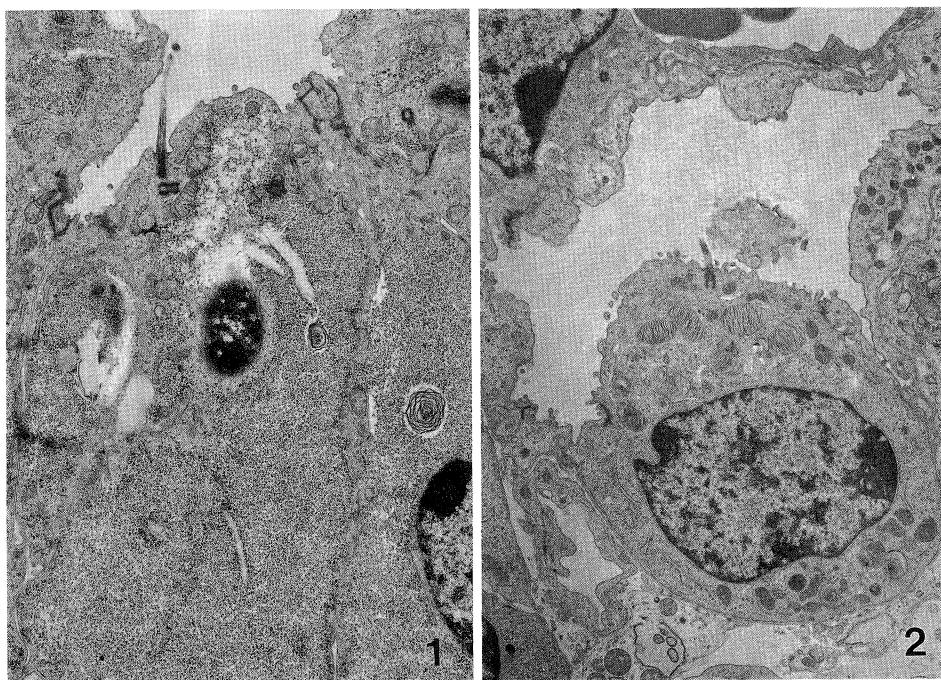


Fig. 1. A single cilium in an immature Type II cell (45th gestational day). The cell is filled with glycogen, but a few lamellar bodies are present. Mag.  $\times 6,700$

Fig. 2. A single cilium in a well-differentiated Type II cell (55th gestational day). Note many well-formed lamellar bodies in the cytoplasm. Mag.  $\times 5,000$

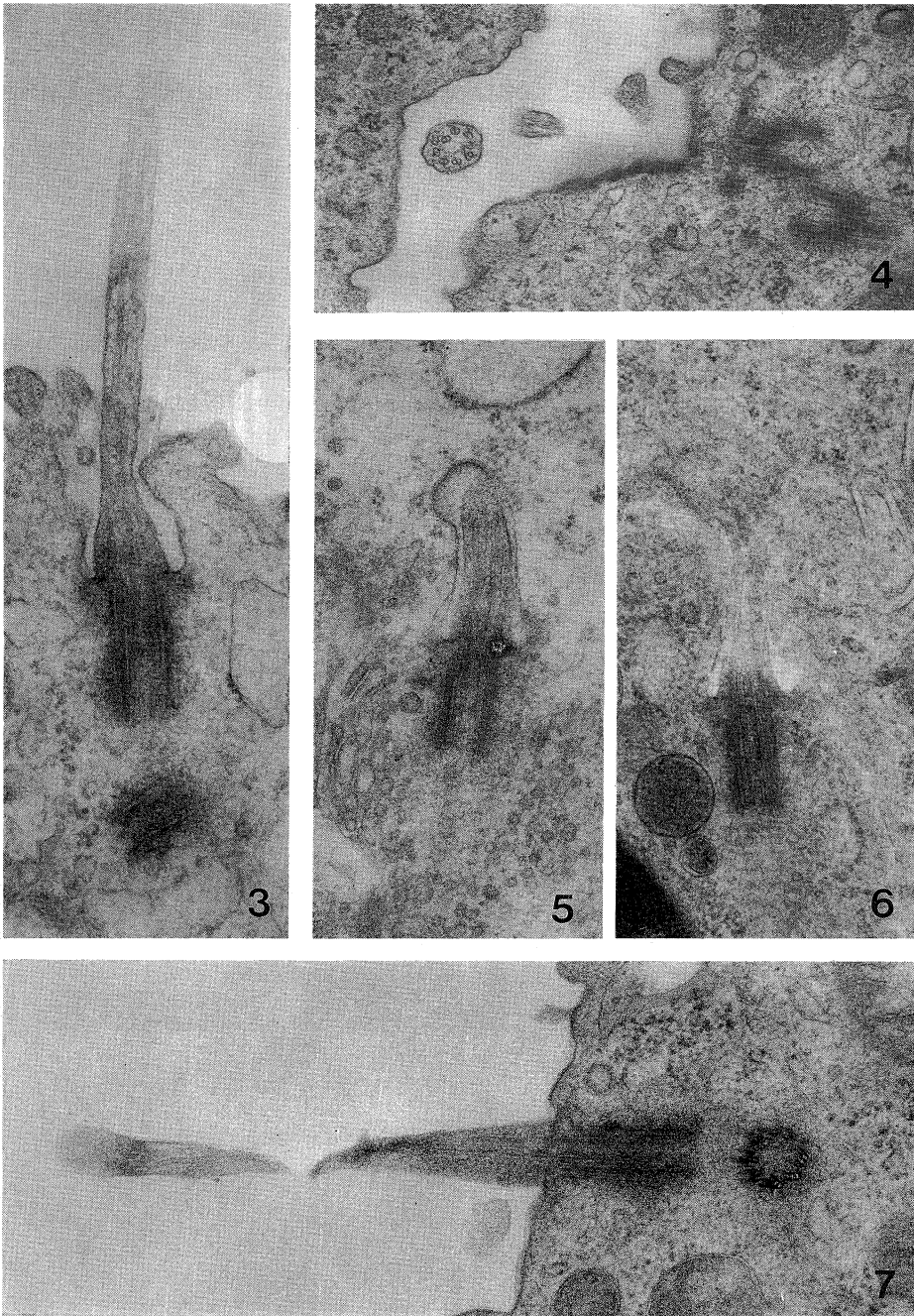


Fig. 3. A single cilium. The adjacent plasma membrane is invaginated to some extent. Mag.  $\times 55,000$

Fig. 4. A transverse section of the cilium showing a (9+0) complex of microtubules. Mag.  $\times 30,000$

Fig. 5. A completely encased ciliary structure. Mag.  $\times 30,000$

Fig. 6. A cilium exists in the lateral plasma membrane abutting neighboring cells. Mag.  $\times 30,000$

Fig. 7. A single cilium. Note the close association with a centriole with 9 triplets. Mag.  $\times 38,000$

microtubules (9 + 2 complex).<sup>1,3)</sup> In this paper, the term "single cilium or cilia" is used because one cilium is usually found per cell, and because its function still remains uncertain.

In the lung, such cilia have been demonstrated in a variety of cell types during formation of the lung and its glands<sup>3-4)</sup>—fibroblasts, chondrocytes, mesothelial cells, myocytes, epithelial cells of the trachea and bronchi, and immature goblet cells. Personally, we also have seen them in the tracheobronchial epithelial cells and fibroblasts of guinea pigs and rats, the smooth muscle cells of rats, and the mesothelial cells of rabbits in their fetal and neonatal stages (unpublished observation). However, we are not aware of their presence in type II pneumocytes in either the fetal or adult stages of any species.

Herein reported is the presence of such ciliary structures in type II pneumocytes of the guinea pig lung. Single cilia were found in type II pneumocytes not only in their early differentional stage (Fig. 1), but also in the fully differentiated stage (Fig. 2). A single cilium was composed of a shaft, a basal body, and an associated centriole. In the shaft, it ranged from 0.15 to 0.20  $\mu\text{m}$  in diameter and measured up to 2.5  $\mu\text{m}$  in length (Fig. 3). In transverse sections, nine doublets of microtubules were arranged in a circular fashion with some disarray (Fig. 4). No central microtubules were present. The basal body was located in close association with and perpendicular to the surface plasma membrane (Figs. 3 & 7), which sometimes invaginated to encase the ciliary shaft (Fig. 3). A cilium could be seen entirely enclosed in deep invagination of the cell membrane (Fig. 5). Rarely did a cilium face toward adjacent epithelial cells (Fig. 6). The basal body lay over the closely associated centriole, which consisted of nine triplets of microtubules (Fig. 7). These two structures were seen not always in close association with the nucleus but with Golgi apparatus.

The significance and function of single cilia in normal and neoplastic conditions have been discussed by several authors.<sup>5-15)</sup> Readers who wish further information should refer to those articles. The presence of single cilia during fetal period suggests that they may play an important role in development and/or differentiation.

**Toshiaki MANABE and Hiromi IKEDA**

*Department of Pathology,  
Kawasaki Medical School,  
Kurashiki 701-01, Japan*

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