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UDC 611.24-018.72:577.175]+611.24-018.82

KEY WORDS: lungs; apudocytes; neuroepithelial bodies

Attention was drawn to the presence of pale cells in the bronchial epithelium for the first time in 1938 and it was suggested that they are endocrine in nature [3]. It was later shown that pale cells in the lungs can be revealed by argyrophilic methods [4]. The difficulty of studying endocrine cells in the lungs is attributable to their infrequency among epitheliocytes. Not until 1965 was the ultrastructure of these cells in the lungs described [2]. In 1969 these cells were classed in the APUD-system [7], and they have therefore come to be called apudocytes [1]. Besides single apudocytes in the bronchial epithelium of mammals and man groups of argyrophilic cells, so-called neuroepithelial bodies (NEB), also are found [5]. Nerve fibers whose terminals form synapses with their cells penetrate deeply into these NEB [5, 6]. In recent years apudocytes and NEB have received parallel study.

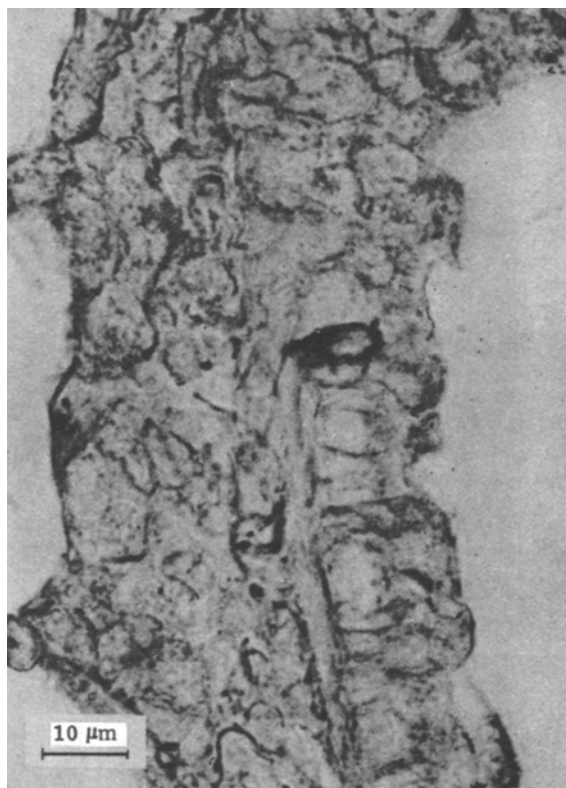


Fig. 1. Argyrophilic endocrine cell (apudocyte) in bronchial epithelium of adult rat. Here and in Figs. 2 and 3: impregnation by Grimelius' method: Ocular 10, objective 100.

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Fig. 2. Single apudocyte and group of three argyrophilic cells in bronchial epithelium of a rat aged 10 days.

The aim of the present investigation was to describe the morphology and distribution of apudocytes and NEB in the lungs of rats of different ages.

EXPERIMENTAL METHOD

Material for the investigation consisted of the lungs of 14 noninbred male and female rats aged 1, 7, 15, 21, and 30 days, and adults (5-6 months). The animals were anesthetized with pentobarbital sodium and killed by division of the abdominal aorta. The lungs were fixed by immersion in Bouin's fluid. The usual general histological methods of investigation, the argyrophilic test of Grimelius, and the Masson-Hamperl argentaffin reaction were used. The respiratory passages were drawn by means of the RA-2 drawing apparatus, and the true length of the bronchi and bronchioles was determined in millimeters by calculation from the measurements made. Argyrophilic elements of apudocytes and NEB in 1 mm of the epithelial lining were then counted.

EXPERIMENTAL RESULTS

Argyrophilic cells and groups of them were found in the bronchial epithelium at all age periods. Single argyrophilic apudocytes were distributed among epitheliocytes and varied in shape: oval, arranged in columns, or triangular (Fig. 1). As a rule the base of the cells was more strongly impregnated than the apical part. The cells possessed a large, round nucleus. Argyrophilic granules could not be seen in the cytoplasm because of the dense arrangement of the small granules. Stem cells were arranged in small groups consisting of 2 or 3 apudocytes (Fig. 2) or they formed large complexes with "organ" structure (NEB). The NEB always lay in a depression of the basement membrane, they occupied the whole thickness of the epithelial layer, and they projected a little into the lumen of the respiratory passages. By impregnation of serial sections and their reconstruction it was shown that the NEB are bean-shaped or have a figure-of-eight configuration. The length of the bodies reached 70 μ and their width from 9 to 30 μ. The height of the NEB varied, and was most frequently 13.5 μ, ranging from 7.5 to 24 μ. In some cases nerve fibers could be seen to penetrate into the depth of the body, and to give off branches between its cells (Fig. 3).

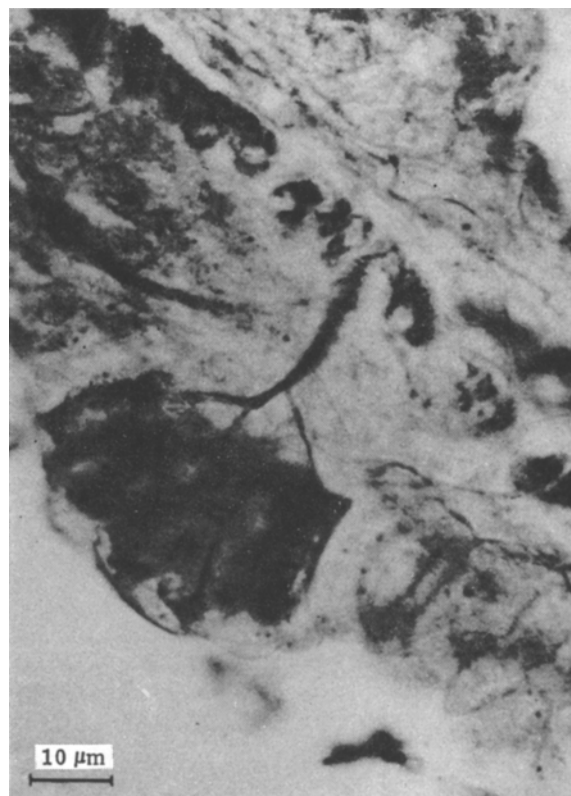


Fig. 3. NEB in bronchial epithelium of rat aged 3 days.

Counting the argyrophilic cells at different levels of the bronchial tree revealed the following picture. One day after birth the number of apudocytes and NEB per millimeter of the large bronchi was 0.28, in the small bronchi 0.83, and the terminal bronchi 0.45. Seven days after birth they numbered 0.13, 0.30, and 0.22, and 15 days after birth — 0.20, 0.37, and 0.05, respectively.

Thus at these times after birth argyrophilic cells were found in larger numbers in the distal portions of the bronchi than in the proximal. Their number gradually diminished, especially in the terminal bronchioles. In rats 21 and 30 days after birth and in adult animals (5–6 months) only solitary apudocytes and NEB were seen in the bronchi. Argyrophilic cells and groups of them were found very rarely in the acini of the respiratory portion of the lungs of these animals. The argentaffin reaction was negative in all cases.

This investigation showed that apudocytes and NEB are more numerous in the lungs of young rats aged 1–15 days than in those aged 21–30 days and in adult rats. Argyrophilic cells are located more often in the small than in the large bronchi. Apudocytes and NEB evidently play a particularly active role in the early postnatal development of the rat lung.

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