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Demonstration in Tracheal Secretion of the Causative Agent of Interstitial Plasma-Cell Pneumonia

By

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The first report on interstitial plasma-cell pneumonia, published in 1928 [27], dealt with the histological aspects of the disease. A decade later, almost coincidentally, several authors [5, 8, 23, 26] described a particular form of pneumonia they had observed in premature, underweight or marasmic infants. The first reports [4, 37] on the occurrence of the disease in Hungary were published in 1952 and 1953.

Opinion is still divided regarding the aetiology of interstitial plasma-cell pneumonia, a condition which takes a heavy toll among premature and atrophied infants. Vaňek et al. [34] demonstrated the presence in the lung of organisms 6 to 7 μ in diameter, staining a bluish violet with Gram—Weigert's method; they identified the organisms as *Pneumocystis carinii*, a protozoon fairly frequent in rodents [13 to 17, 30, 35, 36] and always demonstrable in the lung smear of infants who have died of interstitial plasma-cell pneumonia [9, 11, 12, 20, 24]. Some authors regard various fungi as the pathogenic factors [6, 7, 10, 19, 21, 29], others assume the disease to be of viral origin [1, 2, 3, 18, 38]. *Pneumocystis carinii* is now almost universally accepted as the pathogen but it is still controversial whether it is a fungus or a protozoon.

The diagnostic significance of clinical manifestations and of the radiographic picture has been emphasized ever since the earliest communications already [23, 26]. The pathogen was first demonstrated in the gastric contents in 1956 [28], and in pharyngeal secretion in 1957 [31]. Of decisive practical significance were the investigations of Le Tan Vinh et al. [32] who succeeded in staining the pathogen in the pharyngeal smear. They pointed to lung biopsy as a further diagnostic possibility, but recommended repeated analyses of the pharyngeal secretion in a later communication [33]. A negative result of such analyses does not yet exclude the possibility of interstitial plasma-cell pneumonia since even in grave cases it is sometimes necessary to make a number of attempts before being able to demonstrate the presence of *Pneumocystis*.

Material and Method

The possibility of demonstrating from a smear the causative agent of interstitial plasma-cell pneumonia has been studied in 28 premature and normal infants. We examined the pharyngeal secretion, as recommended by Le Tan Vinh, only in 3 babies in 11 instances and attempted to demonstrate the presence of the pathogen by means of examining the secretion aspired from the trachea through a laryngoscope. At the same time, a smear of the gastric contents was examined in most cases. The examinations were repeated at 2 or 3-day intervals (Table I). Twenty-two of the babies were either suspect of or suffering from manifest interstitial plasma-cell pneumonia at the time of the examination, while 6 control cases displayed no pathological symptoms. We have chosen these control babies because in the ward they were neighbours of the diseased infants.

Bronchial secretion was obtained by direct laryngoscopy from the main bronchi. The intervention was well tolerated even by gravely ill patients, and removal of the foamy secretion was felt as a relief. Pharyngeal secretion and gastric contents were collected in the usual way [33]. While tracheal secretion was taken at different times of the day, pharyngeal secretion and gastric contents were always withdrawn before breakfast. The tracheal and pharyngeal secretions were immediately fixed; the gastric contents were kept in rubber-stoppered bottles at 5°C and worked up after 10 to 12 hours. Smears were fixed and then stained by the Gram-Weigert method.

Results

In clinically positive cases of interstitial plasma-cell pneumonia, *Pneumocystis carinii* could always be demonstrated in the tracheal smear. The first examination was successful in 14 clinically and radiologically authenticated cases and in 5 cases in which the infants displayed neither clinical nor X-ray signs of the disease at the time of examination. In the latter cases the disease became manifest 7 to 10 days later. The tracheal smear was diagnostically much more reliable than were the pharyngeal exudate or the gastric contents, as with these repeated examinations were necessary to find the causative agent. This, with its bluish violet colour and a size corresponding to that of a small erythrocyte, was well distinguishable from tissue elements and bacteria; it often formed characteristic colonies and was easily recognized even under low power (Figs. 1, 2).

Discussion

According to literature, there exists no completely reliable method which would make it possible to diagnose interstitial plasma-cell pneumonia

Table I

Pneumocystis carinii in smears prepared from different secretions

Material examined	Pharyngeal secretion	Tracheal secretion	Tracheal and gastric secretion	Total
Number of cases	3	3	22	28
Number of examinations	11	13	120	144

prior to the appearance of clinical symptoms and radiological signs [25]. This is a great disadvantage since isolation and treatment of diseased infants are unduly delayed. Vague initial clinical manifestations, ambiguous X-ray findings and the lack of general symptoms render timely diagnosis fairly difficult. The serological reaction and the intradermal test yield sufficiently reliable diagnostic clues after the disease has fully developed. Demonstration of the pathogen in suitably stained smears offers a new diagnostic possibility, but examination of the throat swab has not proved to yield completely reliable results. Lung biopsy, though recommended by some authors, has its hazard and is not suitable as a routine test. On the other hand, examination of the tracheal and bronchial secretion aspired through the laryngoscope has been found by us to present a reliable means of confirming the presence of plasma-cell pneumonia and of excluding it in doubtful cases. That examinations of this kind are useful is illustrated by the 5 infants who had originally been selected to serve as controls but proved to be positive after the 4th or 5th examination in spite of a lack of symptoms. They developed symptoms and exhibited X-ray signs of the disease subsequently. Six controls whose tracheal and bronchial secretions were invariably negative remained free of the disease all along.

Demonstration of *Pneumocystis carinii* in the tracheal smear promises to yield valuable data regarding spread and excretion of the pathogen, the possible carriers and the manner of infection. Further pertinent investigations are in progress.

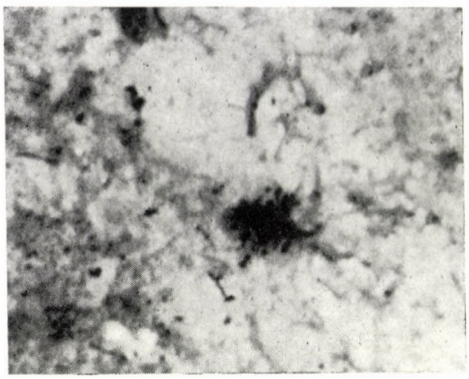

FIG. 1. Smear from tracheal secretion of a 7-week old infant. Gram-Weigert's stain. Low-power. Lens, × 10, Eyepiece, ×4

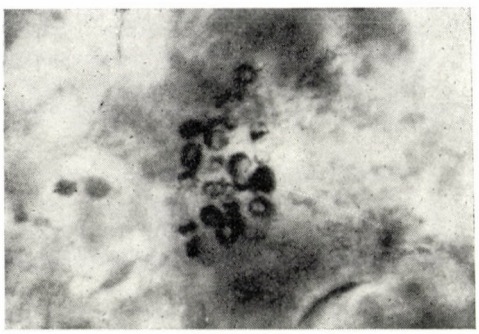

FIG. 2. Smear from tracheal secretion of a 7-week old infant. Gram-Weigert's stain. Oil immersion, × 90, Eyepiece ×4

SUMMARY

Demonstration of *Pneumocystis carinii* was successful from the tracheal and bronchial secretion as also from the gastric contents of 22 infants who were in an early phase of interstitial plasma-cell pneumonia.

Examination of the tracheal secretion appeared to be the most reliable method by means of which it was possible to demonstrate the presence of *Pneumocystis carinii* 7 to 10 days prior to the appearance of symptoms.

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