

in the spinal ganglia and these are the fibers which upon stimulation cause vasodilatation. It has been customary to characterize the activity of such fibers in the dorsal roots as antidromic. Inasmuch as such an explanation could not possibly be applied to similar fibers of the vagus nerve, the existence of true antidromic effects is questioned. Our findings would seem to impose a limitation on the general applicability of the Bell-Magendie hypothesis with regard to the nature of fibers whose cells of origin are in ganglia, other than sympathetic, outside the central nervous system.

6548

Further Evidence of the Virus Nature of Interstitial Bronchopneumonia.

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Interstitial bronchopneumonia in man is a characteristic feature in 3 epidemic diseases, measles, epidemic influenza, and whooping cough. In an experimental study of the pneumonia produced by vaccine virus, Muckenfuss and I¹ have shown that the interstitial tissue of bronchial and alveolar walls is thickened by an infiltration of mononuclear cells. In this respect vaccine virus pneumonia resembles interstitial bronchopneumonia in man, although the experimental lesion is not complete, because it lacks the exudate of polymorphonuclear leucocytes and fibrin commonly found in the lumen of the affected bronchi and surrounding alveoli. We have described² a method of reproducing the typical interstitial bronchopneumonia, as seen in man, by injecting vaccine virus into the lungs of animals and introducing, a day or 2 later, into the same animals, a suspension of pyogenic bacteria. The results strongly suggest that interstitial bronchopneumonia is the result of the combined action of a virus and bacteria; the virus producing the interstitial cellular infiltration and the bacteria calling forth the acute inflammatory exudate in the bronchus and neighboring alveoli.

Of the 3 human diseases associated with interstitial bronchopneumonia, measles is the only one now generally accepted as a virus

¹ Muckenfuss, R. S., McCordock, H. A., and Harter, J. S., *Am. J. Path.*, 1932, **8**, 63.

² McCordock, H. A., and Muckenfuss, R. S., *Am. J. Path.*, March, 1933, **9**.

disease. The etiology of epidemic influenza is unknown, but many investigators have suggested that it is caused by a virus; and in an anatomical study of this disease we have cited the similarity of the pulmonary changes to those of virus pneumonia in animals as indirect evidence in support of such a view.² Whooping cough, on the other hand, is universally regarded as a bacterial disease, due to the Bordet-Gengou bacillus. If a virus is necessary for the production of interstitial bronchopneumonia, as we maintain, on the basis of our experimental work, it was imperative that evidence be adduced for the presence of such an agent in whooping cough in order to account for the type of pneumonia that so frequently complicates this supposedly bacterial disease. I reported the finding of intranuclear inclusions in 12 out of 35 cases of pertussis and their absence in all but 2 children of a control series of 90 autopsies.³ The pneumonia associated with pertussis, on account of its interstitial character, was pointed out as being similar to that seen in other virus diseases, as well as to the experimental vaccine virus pneumonia that we had reported.⁴ The presence of these inclusions has since been confirmed by Rich,⁵ but he reports finding them in only 4 of his cases, and suggests that they are the result of aspirated herpes virus. We have injected an emulsion of tissue from several cases containing these inclusions into the brain, eye, or testicle of rabbits but never observed herpetic lesions in these animals. In experiments upon apes this investigator and his associates⁵ have produced a catarrh of the upper respiratory tract by injecting bacteria-free material, filtered sputum and citrated blood, from children ill with pertussis, but they regard the agent as the virus of the common cold or some hitherto unrecognized virus which acts as the primary infecting agent in whooping cough.

This communication records the presence of interstitial bronchopneumonia in dogs during the course of spontaneous distemper. I assisted Roman in a study of canine distemper,⁷ which definitely established the fact that distemper is due to a virus and is not a bacterial disease produced by *B. bronchisepticus*. This was confirmed by Dunkin and Laidlow.⁸ Roman was primarily interested in the lesions of the nervous system, while I studied the bacteriology and

² McCordock, H. A., *Proc. Soc. Exp. Biol. and Med.*, 1932, **29**, 1288.

⁴ Muekenfuss, R. S., and McCordock, H. A., *Am. J. Path.*, 1931, **7**, 552.

⁵ Rich, A. R., *et al.*, *Science*, Oct. 7, 1932, **76**, 330.

⁶ Rich, A. R., *Bull. Johns Hopkins Hosp.*, Dec., 1932, **51**, 346.

⁷ Roman, B., and Lapp, C. M., *Bull. Buffalo Gen. Hosp.*, 1925, **3**, 40.

⁸ Dunkin, G. W., and Laidlow, P. P., *J. Comp. Path. and T.*, 1926, **39**, 213.

the pathological anatomy of the pulmonary manifestations in spontaneously infected animals.

The records of 21 dogs and 5 silver foxes studied at that time are still available; of these 15 showed interstitial bronchopneumonia. In an additional recent series, 6 out of 8 dogs with distemper presented pulmonary lesions similar to those found in man following influenza, measles, or whooping cough. The lungs of dogs with typical interstitial bronchopneumonia show, on section, small grayish nodules encircling the smaller bronchi and often surrounded by red hemorrhagic areas. Patches of lobular consolidation are also frequently found. These vary greatly in size and occasionally become confluent and may cause an entire lobe to appear almost uniformly solid. Pleurisy, empyema, and small abscesses have also been seen. In the more acute examples of the disease dark red to purplish areas of lobular consolidation, similar to those seen in early influenzal pneumonia in man, are found, most frequently in the lower lobes.

Microscopically, the changes are practically the same as those encountered in man in interstitial bronchopneumonia. The mildest change in a bronchus consists of an edema and an infiltration of the wall with large mononuclear cells, lymphocytes and plasma cells. A plug of exudate consisting of polymorphonuclear leucocytes, fibrin and bacteria is often found in the lumen of an involved bronchiole, and a similar exudate is present in adjacent alveoli. In more advanced lesions, the epithelium of the bronchus is either partly or completely destroyed and the necrotic debris may fuse with the bronchial exudate. In some instances the entire bronchial wall, with the exception of the cartilaginous plate in the case of larger bronchi, becomes necrotic and an abscess-like mass of leucocytes, bacteria and dead tissue marks the site of the destroyed bronchus. The alveoli about these severely involved bronchi frequently contain dense fibrinous plugs. Large mononuclear cells also are found in the alveoli as well as giant cells, as described by Hecht, and by Karsner and Myers in children following measles or whooping cough. Areas of confluent lobular pneumonia, or simple lobular patches of leucocytic consolidation, are frequently found. Large areas of necrosis have also been observed, and such necrotic tissue is usually sprinkled with colonies of bacteria, which often are Gram-positive cocci.

The dark red areas of lobular consolidation seen in acute cases are found on section to consist in large part of necrotic material together with hemorrhage into the alveoli. These areas somewhat

resemble recent hemorrhagic infarcts. Similar lesions are found in individuals dying a few days after the onset of symptoms of epidemic influenza, and we have described them in acute vaccine virus pneumonia and have applied the term "hemorrhagic virus pneumonia" to this condition.

Conclusion. The presence of interstitial bronchopneumonia and associated lesions in spontaneous cases of canine distemper, a known virus disease, supports and strengthens our previously published conclusion that this type of pneumonia is in all probability produced by the combined action of a virus and bacteria.

6549

The Examination of Neoplasms of the Breast and Skin by the Method of Micro-incineration.

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An investigation of the inorganic salt content of neoplasms seemed appropriate since the technique of micro-incineration, recently adapted to cytological problems (Scott¹) offers a precise method for ascertaining whether the mineral salts in malignant tissues differ in kind and amount from the normal. An examination by micro-incineration of those questionable lesions, considered by many as precancerous or having some relation to subsequent malignant change, seemed of especial interest. This report is limited to an investigation of neoplasms of the breast and skin, including mucous membranes covered with squamous epithelium, by the method described by Policard² and by Scott.³

Breast. The ash obtained by micro-incineration of a section of normal resting breast is flat white, indicating (according to Policard) the presence of calcium. The residue is more dense in the epithelium lining the ducts and alveoli than in the connective tissue. In the former the original cell outlines are readily determined because of the heavy ash concentration in the nuclei. Here the particles may vary in size, while in the cytoplasm minerals are depos-

¹ Scott, G. H., *Proc. Soc. Exp. Biol. and Med.*, 1932, **29**, 349.

² Policard, A., and Okkels, H., *Anat. Rec.*, 1930, **44**, 349.

³ Scott, G. H., *Am. J. Anat.*, in press.