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Possible Etiologic Factors in the Production of Pulmonary Osteoarthropathy.*

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(Introduced by Edmund Andrews.)

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Periosteal new bone formation secondary to intrathoracic lesions such as pneumonia, empyema, bronchogenic carcinoma or tuberculosis, spoken of as pulmonary osteoarthropathy or generalized osteophytosis,[1] is a well recognized clinical entity. Theories of the factors responsible for the new bone formation have varied from that of toxic absorption from focal infections in the chest[2] to changes in the acid-base equilibrium through decreased aeration as a result of constriction of the bronchi or of lung compression and collapse.

To explain the etiologic factor responsible for these peripheral bone changes, we have attempted to produce them in experimental animals. Before and after creating intrathoracic complications in dogs, roentgenograms were made of the long bones of the lower extremities and the calcium and phosphorus and carbon dioxide content and H ion concentration of the blood serum were determined. These studies were repeated at varying intervals and no significant changes in the blood chemistry were found.

Of 9 dogs, into whose right pleural cavity from 100 to 300 cc. of parafin were injected, one survived 9 months and 2 are still alive after a period of nearly 18 months. In each instance, in addition to the mechanical pressure on the lung by the parafin, there was a prompt pleural effusion which almost completely displaced air-containing tissue on the right half of the chest. No periosteal reaction or new bone formation along the shafts of the long bones could be demonstrated in any of these dogs although frequent x-ray examinations were made. Blood chemistry studies were made at frequent intervals. No consistent or significant blood changes were noted following the injection of the parafin.

Using a method described by one of us,[3] collapse of one or more

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1 Crump, *Virchows Archiv. f. Path. Anat.*, 1929, **272**, 467.

2 Mills and Mumey, *Arch. Int. Med.*, 1929, **43**, 516.

3 Adams, W. E., and Livingston, H. M., *Ann. Surg.*, in press.

lobes of the lungs of 13 dogs was accomplished. One of the dogs developed a lung abscess and lobectomy was performed upon 5 dogs at varying intervals following collapse of the lobe or of the corresponding lung. Roentgenograms were taken and examinations were made of the calcium and phosphorus and carbon dioxide content and of the H ion concentration of the blood serum of these dogs. In no instance were we able to demonstrate changes in the long bones similar to those described as pulmonary osteoarthropathy and there was no consistent change in the blood chemistry.

We were thus unsuccessful in our attempts to produce new periosteal bone by pressure upon a lung from a foreign body in the pleural cavity; stenosis of a primary or secondary bronchus; collapse or total absence of a lobe or of an entire lung; pleurisy with effusion; and solitary lung abscess. It should be pointed out, however, that none of the above procedures produced any marked respiratory embarrassment and that they were not attended by any definite changes in acid-base balance or in the calcium and phosphorus content of the blood serum. More extensive studies are being undertaken to explain this strange clinical phenomenon.

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Agglutinins Produced by the Injection of Related and Unrelated Antigens.

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In making observations upon the formation of agglutinins in response to injection with typhoid vaccine it was noted that there was a wide individual variation in the response. Some students who had repeatedly received typhoid vaccine on previous occasions failed to develop agglutinins when injected with typhoid vaccine in this department. Others who had never received typhoid vaccine previously developed high titers. The problem presented itself of determining whether this difference was due to a more responsive antibody-forming mechanism in general or due only to the individual's response to a particular antigen.

Forty-five students were given the routine 3 doses of TAB vaccine, and in addition were given 3 doses of a vaccine containing *Staphylococcus aureus* and a coccus isolated from the blood of a