sults indicate that a depletion, or comparative paucity, of nutrient material is more important in promoting spore formation than is the accumulation of metabolites.

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Effects of Certain Broncho-Constricting Drugs on Intrapleural Pressure.*

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Report has previously been made[1] that following the administration to dogs of such typical broncho-dilating drugs as epinephrin and atropine, there is a definite increase in intrapleural pressure, *i. e.*, intrapleural pressure becomes more positive than is normally the case. This was interpreted as being due to lessened suction on expansion of the chest because of lessened resistance to the movement of air in and out of the lungs as a result of broncho-dilatation. It naturally became of interest to determine by direct observation whether or not the corollary is also true, viz., that broncho-constriction is followed by the development of more negative intrapleural pressure than is normally present.

We employed the same dogs as had been used in our former experiments, and we had sufficient observations on normal intrapleural pressures in these animals to enable us to judge whether or not changes following drug administration were beyond normal diurnal variation. The technique used was the same as that previously described.[1]

Following the subcutaneous injections of solutions of pilocarpine nitrate and physostigmine (eserine) salicylate, we found uniformly in 6 experiments with each drug that intrapleural pressure definitely became less, *i. e.*, more negative. The experiments were made on 3 dogs, with intervals of a week or more between experiments. We were unable to draw definite conclusions following the administration of histamine or of arecoline because of marked disturbances in character of respiration and in the condition of the animal. Quantitative data from sample experiments may be found in Table I.

* Supported in part by the J. J. and Nettie Mack and the Purington Research Funds.

[1] Brill, S., and Leake, C. D., PROC. SOC. EXP. BIOL. AND MED., 1930, **27**, 518.

TABLE I.

Dog—Wt. 18 kilos. Light sodium amytal anesthesia. Intrapleural pressure readings in left chest after subcutaneous administration of 10 mgm. eserine salicylate and of 20 mgm. pilocarpine hydrochloride on January 10 and January 20 respectively.

Time after drug.	I.P.P. in Cm. H_2O after eserine.	I.P.P. in Cm. H_2O after pilocarpine
Normal	—4.0 to —7.0	—4.0 to —6.4
5 minutes	—4.0 to —8.4	—3.4 to —6.2
10 "	—2.6 to —11.6	—3.5 to —7.0
15 "	+1.4 to —21.0	—5.2 to —10.8

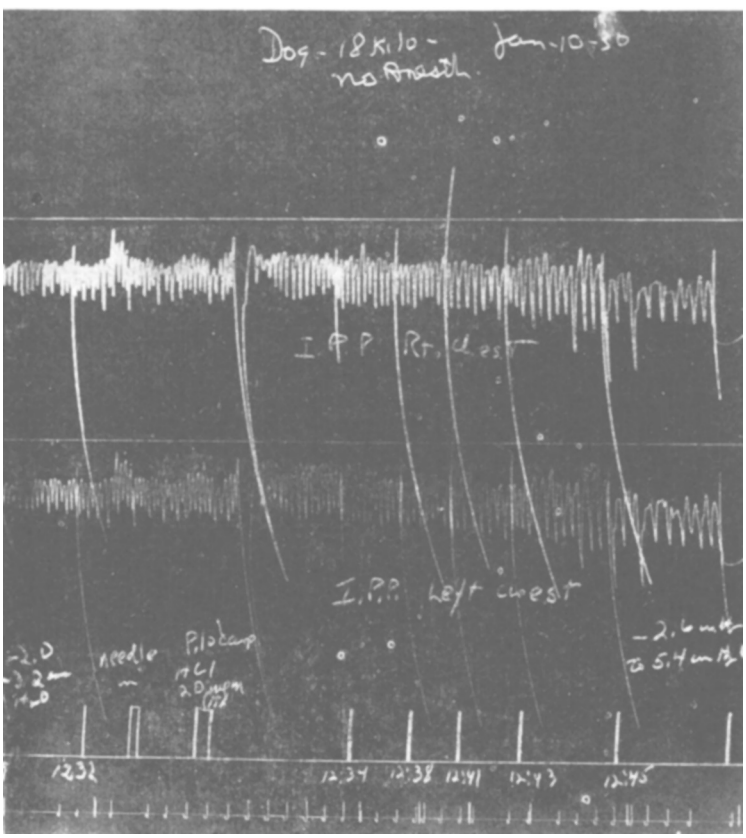

FIG. 1.
Kymographic record showing effects of pilocarpine on intrapleural pressure in a dog.

The factors involved in the development of more negative intrapleural pressure following broncho-constriction are not as easy to evaluate as might be expected. With broncho-constriction greater resistance is offered to the passage of air in and out of the alveoli

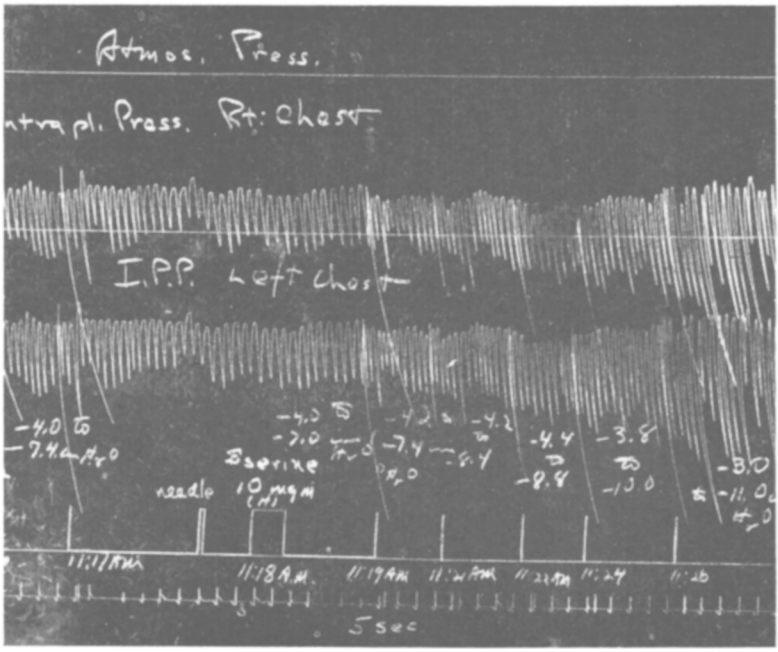

FIG. 2.
Kymographic record showing effects of eserine on intrapleural pressure in a dog.

than is ordinarily the case. With usual inspiratory effort one would expect then that more suction is developed on expanding the chest than normally, and that this should be reflected in a more negative intrapleural pressure than normal. But on expiration one would expect the reverse to occur, *i. e.*, that more pressure would be developed on relaxation of the chest, or in active expiratory effort, and that this would be reflected in more positive intrapleural pressure than normal. While we observed, with broncho-constriction caused by pilocarpine or eserine, the development of a more positive intrapleural pressure on expiration, it was by no means proportional to the development of a more negative intrapleural pressure on inspiration. This suggests the operation of some other factor. Resistance to the passage of air in and out of alveoli may be expected to be accompanied by a gradual increase of carbon dioxide tension in the alveoli and blood. Davies, Haldane and Priestley[2] showed that cotton-wool resistance to nasal breathing definitely increased alveolar carbon dioxide percentage, and Meakins[3] found carbon

[2] Davies, H. W., Haldane, J. S., and Priestley, J. G., *J. Physiol.*, 1919, **53**, 60.

[3] Meakins, J. C., and Davies, H. W., Respiratory Function in Disease, Edinburgh, 1925, 195.

dioxide retention in paroxysmal asthma. We thought it expedient, therefore, to investigate the effect of direct alterations of alveolar carbon dioxide tensions on intrapleural pressure, and our observations in this regard will be presented later.