which they stir only for eating and other functions, or when alarmed. The animals, remaining more quiet because of the discomfort induced by movement in the warm cages, may thereby be spared some of the spread of the disease secondary to muscular activity, and the increased lymphatic and circulatory drainage that such activity induces, and thus show a more marked localization of the disease. It has been impossible for us so far to determine what effect rest obtained in any other way might have on the course of experimental tuberculosis in guinea pigs, but we cannot deny the possibility of such benefit.

This simple explanation, if true, would obviate any practical application of the warmth treatment, or moderate thermotherapy, in the treatment of pulmonary tuberculosis in man, in whom rest may be achieved by other, perhaps more pleasant means, but furnishes additional evidence for the generally accepted belief that rest is an important factor in aiding recovery from tuberculous infection.

9098 P

A Cinematic Study of Bronchiolar Reactions.*

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A cinematic record was shown of directly observed bronchiolar reactions. These were obtained by applying drugs to microscopic cross-sections of fresh bronchioles, and photographing through a low-power microscope.

Method. The excised lungs are filled with a warm solution of 10% gelatin in Ringer's, by intratracheal injection. The gelatin is hardened by placing the lungs in iced Ringer's, where excitability of the muscle is retained for several days. Free-hand sections are made with a razor. Each section is pinned onto a perforated piece of cork attached to the bottom of a Petri dish, and the dish is filled with Ringer's solution. The dish is placed on the warm-stage of a microscope, and drugs applied after a preliminary warming, approximately to body temperature, for at least 30 minutes. Reactions are recorded either by means of camera lucida drawings, or, as in this case, by taking cinematic records.

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Results. 1. *Cilia.* With this method, the cilia are very active in sections less than 8 hours old. After this time, the activity decreases or stops. With active cilia, most autonomic drugs have no visible effect. Nicotine 1:2500 has no effect; but 1:500 causes stoppage of cilia. Saturation of the Ringer's solution with chloroform causes marked decrease or stoppage of ciliary activity after about 20 minutes. Cyanide causes stoppage of cilia in one to 3 minutes.

2. *Rhythmic bronchiolar contractions.* These occur spontaneously in a large proportion of dog (puppy) bronchioles, and have also been observed in the cat, rabbit and rat. They are best brought out by keeping the preparation warm for an hour or two, and are usually augmented by a small amount of mecholyl (ca. 1:1,000,000). They may be pendular or tonic, or pendular superimposed on tonic. The rate of the pendular contractions sometimes approximates the normal respiratory rate.

Using short longitudinal sections of bronchioles, definite rhythmic peristaltic waves have been produced by mecholyl (sometimes followed by epinephrine) in the dog and cat. The waves travel sometimes peripherally and sometimes centrally, even in a single section.

3. *Drug Reactions.* Work with drugs has been for the most part qualitative, since the reactions of thin sections would hardly be comparable quantitatively with reactions of intact bronchioles. *Constrictors* include mecholyl (acetyl-β-methyl-choline chloride), histamine, barium, physostigmine, pilocarpine, cyanide, and nicotine, in about the order of their effectiveness. Histamine and mecholyl produce marked contraction of dog bronchioles in concentrations of 1:1,000,000. Of the *dilators,* atropine is highly effective against mecholyl, physostigmine, and pilocarpine; and less effective against histamine contraction. Epinephrine is generally effective against histamine and mecholyl (using cat and dog bronchioles). Magnesium is effective against barium. Papaverine is effective against most constrictors. Chloroform and ether are relatively ineffective.

4. *Anaphylaxis.* Egg albumin has no effect on normal bronchioles, but produces a marked contraction of bronchioles of rabbits sensitized 3 weeks previously by one cc. of 10% egg albumin hypodermically. The action of drugs on sensitized bronchioles does not differ materially from that on normal bronchioles.

5. *Limitations.* The guinea pig, which has been a favorite subject for the study of anaphylaxis and bronchiolar reactions, is

thus far unavailable for this method, since the sections contract shut as soon as the gelatin is melted from the lumen, and are not relaxed by any of the known dilators. Tentatively, this effect is attributed to the action of elastic tissue in the bronchial wall.

Conclusion. Fresh sections of excised lung may be used for microscopic study of ciliary activity, rhythmic contractions, peristalsis, and drug and anaphylactic reactions of bronchioles.

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A Method for Studying Changes in Diastolic Resistance to Blood Flow in the Coronary Arteries.

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In a series of recent articles[1, 2, 3] the blood flow from moment to moment in the various branches of the coronary arteries has been established by constructing differential pressure curves from a combination of the central and peripheral coronary pressure curves (after the latter had been raised to their proper ordinate value). The method, however, is time consuming and what is more important, may miss altogether very rapid and transient changes in coronary flow such as, for example, might follow nerve stimulation, since the necessary data for constructing a flow curve can not be obtained in less than 10-20 heart beats.

To offset these drawbacks, a simple method (requiring the registration of only 1-2 heart beats) is suggested for determining changes in diastolic resistance and in most cases this can be used as an index of qualitative changes in coronary diastolic blood flow.

The experimental setup and method are as follows: After opening the chest and pericardium of an anesthetized dog, optical records of aortic and coronary pressures are taken by inserting manometers of adequate frequency into the aorta through the subclavian artery and into a suitable side branch of a coronary artery. An electromagnetic clamp is placed on the coronary artery central to its recording

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2 Green, H. D., Gregg, D. E., and Wiggers, C. J., *Am. J. Physiol.*, 1935, **112**, 627.

3 Gregg, D. E., *Am. J. Physiol.* In press.