lating blood prevents the overheating of the wall. Hence, no changes result in the experiments in which there is no interference with the free circulation. Added proof to this explanation is the fact that a slight searing of the vessel with a hot wire leads to almost identical changes.

The vessels with the media practically gone become much dilated but they do not rupture. After several months the media has been replaced by a dense hyaline connective tissue with a scanty elastic network. No muscle fibres can be detected. The intima is thickened and also the adventitia has increased much in thickness and density.

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Comparison Between Morphine and Feeding as Agents in Production of Conditioned Salivary Response.

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In a quantitative study of the conditioned salivation in the dog developed through daily injections of morphine[1] it was found that the flow of saliva was unusually copious. Thus the total quantity of saliva secreted conditionally by a 12 to 14 kilo dog would run as high as 400 cc. in one hour. The conditioned stimulus in this case consisted in placing the dog in a stand where it remained for a definite period of time (usually 30 minutes), before receiving a subcutaneous injection of morphine. In the work of Pavlov and others[2] where food or acid was employed as an unconditioned stimulus, the "delay" between the beginning of the action of the conditioned stimulus and the application of the unconditioned stimulus was a matter of 2 to 3 minutes or even less. This suggested the possibility that the long "delay" employed in the case of the morphine-produced response might be responsible for the large amounts of saliva secreted. To test this, 3 dogs, with fistulae of the submaxillary glands, were placed in a stand for 30 minutes daily, for periods of 22, 27, and 76 days respectively. Each day, at the end of the 30 minutes in the stand, they were fed a meal of ground beef heart. The unconditioned salivary response to feeding was greater than to

[1] Kleitman and Crisler, *Am. J. Physiol.*, 1927, lxxix, 571.

[2] Pavlov, "Conditioned Reflexes," 1927, Oxford University Press, New York.

the injection of morphine (3-6 cc. compared to 1-3 cc.), but none of the 3 dogs showed any conditioned secretion before feeding. All these dogs developed the conditioned salivary response to morphine on subsequent occasions in the course of a few days.

It seems that in the development of conditioned salivation, using the same conditioned stimulus, daily injections of morphine are efficacious, whereas daily feeding is not.

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Spontaneous Extinction of Morphine Salivary Conditioned Response in Dog.

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The conditioned response to morphine is developed by placing a dog, with a fistula of the duct of the submaxillary gland, into a stand for a definite period of time daily, and injecting about 30 mgm. of morphine subcutaneously at the end of each period. The injection of morphine, among other effects, produces a flow of saliva. After a few days, placing the dog in the stand is found to act as a conditioned stimulus, salivation starting before the injection of morphine. If, while continuing the daily placing of the dog in the stand, the injections of morphine be stopped, the conditioned response becomes weaker and gradually disappears.[1] This has been termed experimental extinction, and, as had been shown by Pavlov and others, it always follows the repeated application of the conditioned stimulus without "reinforcement" by the unconditioned stimulus. The present investigation was undertaken to determine whether the conditioned response to morphine would persist when not experimentally extinguished. After the dogs had fully developed the conditioned response they were left alone for from 3 to 15 days, and at the end of that interval of time placed in the stand once more, and the magnitude of the conditioned response (if any) determined. In this manner we determined the percentage of retention of the response. Five dogs were used, and each was put through 2 or more "forgetting" tests. The following facts were established:

1. The conditioned salivary response to morphine becomes partially or completely extinguished spontaneously, within a few days.

[1]Kleitman and Crisler, *Am. J. Physiol.*, 1927, lxxix, 571.