2. When the response is only partially extinguished, the percentage lost varies directly with the time elapsed.

3. Repeated establishment of the conditioned response leads to slower extinction.

## 4200

## Lymph Production and Heat Regulation.

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Heat regulation in the mammalian body consists of a distinctly correlated reaction of almost all body organs toward changes of external temperature, among which the liver undoubtedly plays a most important rôle.

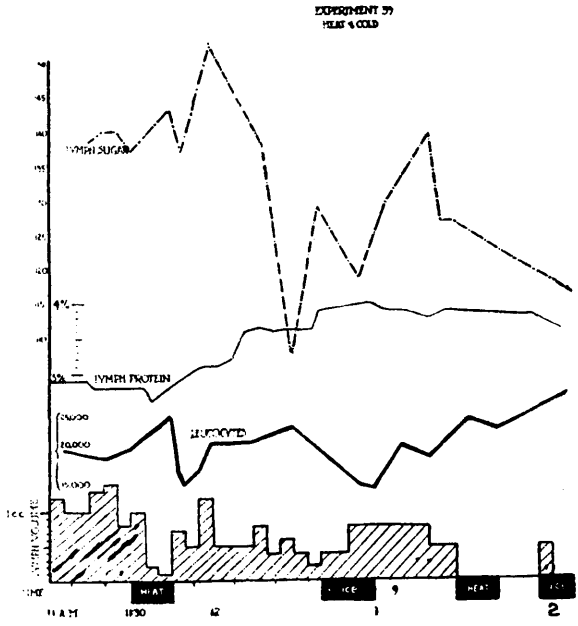
Changes of liver functions within this general reaction are only measurable from changes in the secretion from liver tissues. In order to draw some conclusions about the intensity of cellular activities, we have made experiments on lymph obtained from a thoracic duct cannula, since thoracic lymph originates almost entirely from the liver. It seemed advisable to test how cold or heat applied to the body surface of dogs would act upon lymph production in order to obtain further insight into the participation of the liver within the mechanism of heat regulation.

After a control period of about 1 hour (during which lymph was collected in 5 minutes samples) heat was applied by warm water bags or electric pads to the shaved abdominal skin while the dog was packed in cotton.

During such periods of heating a diminution could be observed, not only in lymph volume, but also a decrease of the percentage of lymph protein, indicating a possible decrease in cellular activity as well as in tissue permeability.

Application of cold (ice to the dog's skin by packing the animal into the ice mixture) altered the lymph production oppositely. Volume as well as the contents of lymph protein increased markedly under the influence of cold.

One of these tests charted below will best illustrate these correlations between the effect of temperature changes of the body surface and the alteration in lymph production as a manifestation of a simultaneously active liver reaction.




Usually we did not test heat and cold with the same animal, since it takes some time until the reaction toward the first temperature change cases.

Our observations show that intensive temperature changes applied to the body surface of dogs lead to an alteration in lymph production. This alteration must be the result of autonomic stimuli that reach the liver, since application of such cold or heat does not appreciably alter the temperature of deeper tissues. It has to be assumed that alteration of the body surface by marked temperature changes leads to a corresponding reaction of the peripheral tissues directly concerned which in turn gives rise to impulses that reach the liver, among other organs, and cause the described alteration of lymph production.

(1) Lymph production autonomically increases more or less markedly when intensive cold is applied to the body surface and decreases with the application of heat.

(2) This indicates that the autonomic reaction toward this alteration occurring in the peripheral tissues concerned (skin) is associated with a simultaneous transmission of impulses which stimulate, among other organs, the liver via preformed communications of the vegetative nervous system. The reaction produced is apparently oriented from that of the skin and other peripheral organs.