

reactions are successively modified so that the peristome of *Spathidium* is brought gradually nearer and nearer until it grasps the *Colpidium*. In brief, *Spathidium* in the majority of cases recovers its lost prey, even though the latter may have become removed a distance equal to several times the length of the *Spathidium*.

The factors involved here may be products derived from the dead *Colpidium*, but more probably are directly related to the poisonous secretion liberated by *Spathidium* itself. In any event, the complex series of reactions exhibited by *Spathidium* afford, it is believed, a remarkable example of sensing at a distance by a unicellular organism.

The complete paper will appear in the Journal of Experimental Zoology.

91 (1673)

The rôle of the nervous system in the regulation against cold.¹

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One of us has shown that a dog placed in an ice-water bath up to the neck exhibits as one of the reactions to cold a concentration of the blood, losing approximately 10 per cent. of its blood fluid. Such extreme temperatures, however, even well-nourished dogs are unable to resist, the rectal temperature falling rapidly.

Investigating further the mechanism of regulation against cold we attempted to find first a bath temperature which, while not sufficiently cold to lower the body temperature, would arouse distinctly the regulation against cooling. Secondly, on dogs deprived of their nervous regulatory mechanism by section of the cord between the sixth and seventh cervical segment, it was attempted to determine whether the failure to resist the temperature of baths not too cold to be normally withstood is associated with inability to concentrate the blood.

It has been found that normal dogs will exhibit a fairly efficient

¹ From investigations aided by the Elizabeth Thompson Science Fund.

regulation against cooling in a bath the temperature of which is maintained for a half hour or more at 20° C. In two such dogs there were net gains in body temperature as a result of exposure to the bath (respectively 0.1° C. and 0.4° C. in forty minutes). In a third animal the temperature fell 1.5° C. during the first twenty minutes but in the following thirty-five minutes showed a gain of 0.8° C., thus showing that the regulation against cooling was established after a delay.

In these three normal experiments the increases in blood solids were 1, 2.1 and 1.8 per cent. respectively. The following table illustrates these points. In all of the experiments here reported the room was kept at a standard temperature of 22° C.

TABLE I.
EFFECTS OF 20° C. BATHS IN NORMAL DOGS.

Dog Number.	Percentage Blood Solids.		Rectal Temperature, °C.			
	Before.	After.	Before.	After 20 Min.	After 40 Min.	After 55 Min.
48.....	19.3	20.3	39.9	40.1	40.0	
23.....	20.4	22.6	38.3	38.4	38.7	
27.....	14.7	16.5	39.4	37.9	38.4	38.7

With the above should be contrasted the effects of similar baths upon three dogs with transection of the cervical cord, as shown in Table II.

TABLE II.
EFFECTS OF 20° C. BATHS UPON DOGS WITH CERVICAL CORD SECTION.

Dog Number.	Days After Operation.	Percentage Blood Solids.		Rectal Temperature, °C.	
		Before.	After.	Before.	After 40 Min.
21 ¹	1	19.5	19.9	34.5	31.0
42.....	7	18.1	18.9	36.5	32.6
27.....	2	17.3	17.6	37.5	34.6

The second table shows that dogs with cord section between the sixth and seventh cervical segment are quite unable to withstand baths of 20° C., exhibiting a rapid fall in body temperature, usually to a dangerous level within forty minutes. Unlike the normal dogs they fail to exhibit shivering. As regards the concentration of the blood, all of these dogs exhibited an abnormally low blood solid percentage as a result of the operation.

¹ Bath 17.5° C.

The cold stimulus was unable to evoke more than a very weak response. This inability to reduce the blood volume and thereby diminish the flow through the body surface helps to account for the very rapid loss of body temperature. In the second cord dog the regulation appeared somewhat better; this experiment was, however, performed seven days after operation instead of one or two days, as in the other experiments, and there may have been time for some readjustment of the development of the mechanism. This increase in blood solids from 18.1 to 18.9 per cent. in forty minutes did not, however, suffice to prevent the rapid fall in body temperature.

Dogs made poikilothermic by cervical cord section are deprived of reactions which may be set up between the temperature sense nerve endings and the circulation. The shifting of water from the blood to the tissues is evidently such a reaction. It is therefore concluded that the rôle of the nervous system in the reaction against cold is to convey impulses from the temperature sense nerve endings to "heat centers" which in turn, besides shivering and vasoconstriction, incite blood thickening. Hemo-concentration lessens the water available either for heat dissipation by evaporation or for providing blood bulk enough to flood the peripheral vessels.

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The effects of environmental temperature changes upon blood concentration.¹

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Experiments upon normal dogs, kept at rest in hot and cold baths up to the neck, have shown regular changes in total blood solids. Blood solids were determined simply by weighing a sample of 15-16 drops shed freely from the ear vein and drying to constant weight.

Exposure to hot baths for various intervals is illustrated by Table I, to cold baths by Table II.

¹ From investigations aided by the Elizabeth Thompson Science Fund.