

a degree of protection due to the original type II infection, in that the lesions produced were limited in extent, and the temperatures of reinoculated animals were lower on the average than those of control animals. The ulcers formed may be indicative of an allergic condition set up coincident with a state of partial immunity.

### 10960 P

#### Conductive Cooling of Living Human Tissue.\*

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In the course of studies of temperature changes in the posterior male urethra, I investigated the effect of running cold water through a hollow metal rectal applicator. I found (as Table I indicates) that this procedure caused a definite fall in the temperature of the posterior urethra.

The posterior urethral temperatures were determined by means of a thermocouple (made of iron-constantan) with its tip protruding through an opening at the end of a silk woven catheter. The catheter was pushed beyond the cut-off muscle. The thermocouple was permitted to remain in the posterior urethra during the course of the experiment. The greatest fall in urethral temperature was 23.8°F, occurring in experiment No. 5. Before and after each experiment the accuracy of the thermocouple was checked by comparing its readings with standard thermometers.

Because of the marked effect of cold when applied conductively in this region, investigations of the influence of this measure were made in several other parts of the human body.

TABLE I.

Experiment No.	Urethral temperature °F		Temperature of water passing through rectal applicator	Duration of experiment	
	At start	At end		Hr.	Min.
1	99.1	95.2	70	1	15
2	99.1	93.3	62	1	10
3	99.	95.9	64		30
4	98.8	77.7	44	1	30
5	98.4	74.6	44	1	25

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Ice bags were placed laterally on either side of the calf. An iron-constantan thermocouple (made by Leeds and Northrup) placed within a hollow needle 2 inches in length was inserted into the muscles of the calf. The thermocouple tip lay about 2 inches beneath the surface of that portion of the skin through which it was inserted and about 1½ inches away from either ice bag. The accuracy of this thermocouple was checked as previously described. The changes in the temperature of the calf muscle are shown in Table II. The greatest lowering of temperature (26.4°F) occurred in Experiment 1.

TABLE II.

Experiment No.	Temperature °F		Duration of experiment	
	Initial	At end	Hr.	Min.
1	95.4	69.2	2	10
2	96.4	77.2	1	50
3	93.8	79.8	1	10
4	93.	78.	2	
5	92.	78.8	2	
6	97.4	77.	2	
7	97.	85.	1	30

A flat hollow metal applicator kept cold by circulating water through it (temperature 50-52°F) was placed on the outer side of the cheek. The temperature of the inner side of the cheek in the corresponding area was measured by means of an alcohol thermometer, with the lower portion of its stem bent at a right angle so as to permit good contact between its circular flattened base and the buccal mucosa. The changes in the temperature on the inner side of the cheek are shown in Table III.

TABLE III.

Experiment No.	Temperature		Duration, min.
	Initial	At end	
1	96.	86.8	24
2	96.2	85.4	40
3	95.6	84.3	50
4	96.5	84.1	32
5	97.	85.5	32

A hollow metal cylindrical applicator was inserted into the vagina. It was cooled by circulating water through it. The temperature of the vaginal applicator and the changes produced within the rectum and urethra as determined by mercury thermometers are shown in Table IV.

In experiment No. 6, the urethral temperatures were observed for 10 minutes. The urethral thermometer was then pushed back into

TABLE IV.

Experiment No.	Vaginal applicator temperature		Rectal temperature		Urethral temperature		Duration	
	Initial	At end	Initial	At end	Initial	At end	Hr.	Min.
1	98.	52.	98.	73.5	98.	72.	1	
2	95.	52.5	99.	82.	97.5	90.5	1	25
3	90.	51.	97.	78.	97.	82.		30
4	98.	52.	98.	73.5	98.	93.	1	
5	93.5	47.5	96.5	73.	97.3	87.5	2	20
6	71.5	47.	99.2	70.	99.2	91.		50

the urinary bladder. During the subsequent 40 minutes the bladder temperature diminished from 91.8° to 86°F.

*Conclusions.* These observations show that it is possible to cause a substantial lowering of the temperature of the tissues of the living human body at a distance from a cold applicator placed in contact with the body surfaces. An explanation for this phenomenon is the occurrence of vasoconstriction and conductive cooling. These findings offer a basis for the therapeutic application of cold and indicate possibilities for its more extended use in the treatment of disease.

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10961

### Blood Volume Changes in the Mammary Gland.\*

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In the studies of the metabolism of the mammary gland made by arteriovenous differences either no cognizance has been taken of blood volume changes or the data taken have been corrected on the basis of such changes. Blackwood and Stirling<sup>1</sup> were unable to demonstrate any blood volume changes in the mammary gland from their analyses of bloods for iron hemoglobin and cell volume. Lintzel<sup>2</sup>

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<sup>1</sup> Blackwood, J. H., and Stirling, J. D., *Biochem. J.*, 1932, **26**, 357.

<sup>2</sup> Lintzel, W., *Z. Zucht., Reihe B.*, 1934, **29**, 219.