15076 P

A Characteristic of Human Temperature Regulation.*

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The temperature regulatory mechanism maintains rectal temperature of non-basal men sitting at rest in a comfortable environment slightly above 37° C. In certain cold environments which cause shivering, rectal temperature declines to about 35 or 36° C where it tends to become stabilized. This was observed in experiments in which subjects sat immersed to the neck line in well-stirred water baths maintained at 20, 25, or 30° C. (Table I). Rectal temperatures were obtained with thermocouples placed 10 or 15 cm within the rectum. Gastric temperatures taken toward the end of experiments by means of thermocouples inserted in modified Levine tubes were somewhat higher (about 36° C) than rectal temperatures (Table II). Temperatures taken within the stomach are possibly a more reliable index of deep body temperature under the conditions of these experiments than measurements made within the rectum, because the close proximity of surrounding cold water to the junction of the rectal thermocouple may cause falsely low readings.

The fact that deep body temperature became stabilized at approximately the same temperature in all experiments, even though the intensity of shivering necessary to produce sufficient metabolic heat to maintain this temperature varied considerably (Table III), shows that 36° C is a critical temperature at which the thermoregulatory mechanism initiates or attempts to initiate shivering of adequate intensity to prevent further body cooling under these experimental conditions. As might be expected, shivering did not reach its greatest intensity in the experiments until

TABLE I.
Average Rectal Temperatures of Human Subjects During Immersion in Cold Water to the Level of the Neck.

Tw (°C)	No. of subj.	Duration of immersion (min.) 0	15	30	45	60	75	90	105	120	135	150
20	5	37.5	37.2	36.6	36.1	35.8	35.6	35.4	35.4	35.3	—	—
25	4	37.4	37.3	36.9	36.4	36.2	36.0	35.9	35.8	35.6	35.4	35.5
30	4	37.2	37.3	37.0	36.7	36.5	36.3	36.2	36.1	36.1	36.2	36.0

TABLE II.
Comparison of Mean and Extreme Values of Gastric and Rectal Temperatures Existing at the End of the Experiments. All of the Subjects of Table I Who Succeeded in Swallowing the Gastric Thermocouple Are Included.

Tw (°C)	No. of subj.	T rectal (°C)	T gastric (°C)
20	4	35.1 (34.8-35.9)	35.9 (35.2-36.5)
25	3	35.0 (34.2-35.8)	36.2 (36.0-36.5)
30	4	36.0 (35.6-36.8)	36.4 (35.7-37.2)
Mean		35.4 (34.2-36.8)	36.2 (35.2-37.2)

TABLE III.
Average Rate of Metabolic Heat Production (kg-cal/m²/hr) During Immersion in Cold Water. Heat Production Was Calculated from Measurements of the Rate of Oxygen Utilization.

Tw (°C)	No. subj.	Duration of immersion (min.) 0	30	60	90	120	140
20	5	49	174	210	219	—	—
25	4	58	111	138	125	121	140
30	4	53	54	54	58	59	63

* The material in this article should be construed only as the personal opinion of the writer and not as representing the opinion of the Navy Department officially.

body temperature had declined to about this temperature level (Table III). Evidence that 36° C is a temperature in some way important to human thermoregulation has been obtained by others. For example, the results obtained by Burton and Bazett[1] in experiments in which subjects were immersed in relatively warm water showed that metabolic heat production increased above basal level as rectal temperature approached 36° C. DuBois[2] found 36° C to be approximately the lower limit of a series of rectal temperature measurements obtained on a large group of hospital patients. Careful observation under a variety of experimental conditions might elucidate in greater detail the significance to human thermoregulation of this seemingly important deep body temperature level.

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Tolerance Curve of Vitamin C.*

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The suggestion has been made that intravenous injection of vitamin C, preoperatively, might be of value in preventing the resultant traumatic shock.[1-3] Oral administration has a more prolonged effect upon the blood ascorbic acid concentration and results in greater retention of the vitamin.[4-9] This study was made in an attempt to determine the quantity of synthetic ascorbic acid which, on ingestion, would produce a high concentration of the vitamin in the blood plasma and maintain an increase for a relatively long period of time.

The results of 80 tolerance curves are herein reported. With a lapse of at least one week between each observation, 12 young college women were given 250, 500, 750 and 1000 mg of ascorbic acid, orally. All tests began early in the morning, with omission of breakfast. Lunch was limited, consisting only of vitamin C-free foods. Fasting bloods were taken just before ingestion of the test dose, and subsequent blood samples were drawn each hour thereafter for 6 to 10 hours, depending upon the amount of synthetic vitamin given. Determination of the vitamin C content of the blood plasma was made by the Farmer-Abt micro-method.[10]

The 80 fasting values thus obtained ranged from 0.36 mg to 1.36 mg of ascorbic acid per 100 cc of plasma, the average concentration being 0.79 mg %. During the 3-month period

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