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Effect of Relative Humidity on Skin and Rectal Temperatures of the Newborn Infant.*

JOHN A. ANDERSON. (Introduced by Irvine McQuarrie.)

From the Department of Pediatrics, University of Minnesota, Minneapolis.

In a previous investigation[1] on unclothed newborn, male infants the author showed that an increase in the environmental relative humidity resulted in a decrease in the rate of insensible weight loss. In an attempt to explain the physiologic processes involved in the adjustment of the heat loss mechanism of the body induced by high humidity, measurements of the surface and rectal temperatures were made under similar experimental conditions. The skin surface temperatures of the forehead, abdomen, and dorsum of the hand and foot were determined by means of copper constantin thermocouples. A pessor catheter containing a thermocouple was used for obtaining the rectal temperature. The insensible weight loss and the skin and rectal temperatures of twelve unclothed, newborn infants were determined first at a low relative humidity and, after a period of adjustment of 45 to 60 minutes, again at a higher humidity.

The results obtained are presented in Table I.

In the cases in which sweating did not occur (Cases 1-9), for an

TABLE I.
Changes in Skin and Rectal Temperatures Induced by Change in Relative Humidity.

Case No.	Change % relative humidity	Change Temperature degrees C						I.L. change g
		Air	Forehead	Hand	Abdomen	Foot	Rectal	
1	47	.0	.0	+1.7	+0.6	+2.4		—2.06
2	38	+ .1		+2.8	+1.1	+3.2	+.4	—1.65
3	34	+ .8		+1.7	+1.2	+2.0	+.9	—1.72
4	40	+ .3		+0.8	—1.0	+2.5	+.8	—1.35
5	56	+ .8	+ .9	+2.1	+1.0	+4.3		—2.34
6	34	+ .3	+1.0	+2.1	+0.9	+1.6		—1.82
7	26	+ .7		+0.2	+1.6		.0	—0.44
8	25	+ .1		0.0	+0.2	+0.8	.0	—0.56
9	44	+2.2	+ .9	+2.6		+3.5	+.7	—2.76
Avg	38	+0.4	+ .7	+1.5	+0.8	+2.5	+.4	—1.63
		Cases in Which Sweating Occurred.						
10	24	.0	+ .1	+1.1	+0.3	.0	.0	+0.04
11	24	+ .2			.0	+2.0	+.2	+1.25
12	46	+1.0	+1.8		+1.7	+4.5	.0	+0.64

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1 Anderson, J. A., PROC. SOC. EXP. BIOL. AND MED., 1940, **44**, 464.

average increase of 38% relative humidity there was an average increase in the surface temperature of the body which occurred in the following manner: the foot—2.5°C, the hand—1.5°C, the abdomen—0.8°C, and the forehead—0.7°C. Accompanying these changes, the average decrease in the rate of insensible weight loss was 1.63 g per hour.

There were two types of response of the skin temperatures of these infants. Six of the infants responded by an increase in the surface temperature of the dorsum of the hand and foot, which occurred within 10 minutes after the change from the low to the high humidity. When the high humidity was maintained at a constant level, an increase in the temperature of the abdomen and forehead occurred if the experiment was prolonged or if the increase in humidity was excessive. At this time all surface temperatures continued to increase uniformly to a level just below that of the rectal temperature, which usually remained constant. The remaining 6 infants had an increase in the surface temperatures of all parts of the body at the same time, which usually occurred within 10 minutes following the increase in relative humidity. These skin temperatures tended to stabilize at a higher level with moderate increases in humidity; or if the humidity increase was excessive, they approached the rectal temperature, which also increased slightly. Detectable sweating then occurred, followed by a fall in rectal temperature to or below the original level. The decrease of the rate of insensible weight loss was noted in both groups up to the time of the occurrence of sweating.

The increase in the surface temperature of the newborn infant induced by increasing the relative humidity of the environmental air offers an explanation of the mechanism involved in the decrease of the insensible weight loss under the same conditions. The systematic manner in which the surface temperatures of the foot, hand, abdomen, and forehead increase with the increase in relative humidity is similar to that reported by Freeman and Lengyel for adult human subjects.[2]

Summary. In unclothed, newborn male infants the decrease in the rate of insensible weight loss is accompanied by an increase in the surface temperature of the skin at high relative humidity. The vasomotor responses necessary for this adjustment in the heat loss mechanism under these conditions appears to be as fully developed in one-half of the infants studied as in adult subjects.

[2] Freeman, H., and Lengyel, B. A., *J. Nutrition*, 1939, **17**, 43.