

Effect of Clipping on Body Temperature of Restrained and Nonrestrained Rats Exposed to Cold. (23036)

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Small, lightly restrained mammals become rapidly and progressively hypothermic in a cold environment in which nonrestrained animals maintain normal temperatures(1). From observations of many hundred rats, it has become obvious to us that piloerection is less in restrained hypothermic rats than in nonrestrained controls. It was therefore reasoned that shaving restrained animals (where the less erected hair offers poor insulation) should not cause as great a fall in body temperature as in nonrestrained, usually normothermic, animals. If this were true, poor piloerection could be regarded as one cause of the hypothermia caused by restraint.

Methods and materials. Forty adult (225-275 g) male Sprague-Dawley rats were divided into 4 experimental groups: 10 nonrestrained, nonclipped; 10 nonrestrained, clipped; 10 restrained, nonclipped; and 10 restrained clipped animals. Restraint was produced by maintenance in loose fitting wire mesh cylinders flattened on the underside and closed at the ends. Clipping was as complete as possible with a conventional animal clipper. Exposures were at $3^{\circ} \pm 2^{\circ}\text{C}$ and were $2\frac{1}{2}$ hr in length unless falling body temperature and death terminated the experiments earlier. Colonic temperatures in both control and restrained animals were obtained from a Thermister inserted for each measurement 7 cm into the rectum. The body temperature determinations were not made on a definite time schedule. Thus, in Fig. 1, all the readings in the 0-25 min interval, 26-50 min interval, etc. have been averaged.

Results. As observed in Fig. 1, removing hair from restrained animals resulted in a much lesser additional body temperature fall than a similar treatment of nonrestrained animals. It therefore appears that the restrained rat becomes hypothermic at least partly as the result of an increased rate of heat loss per

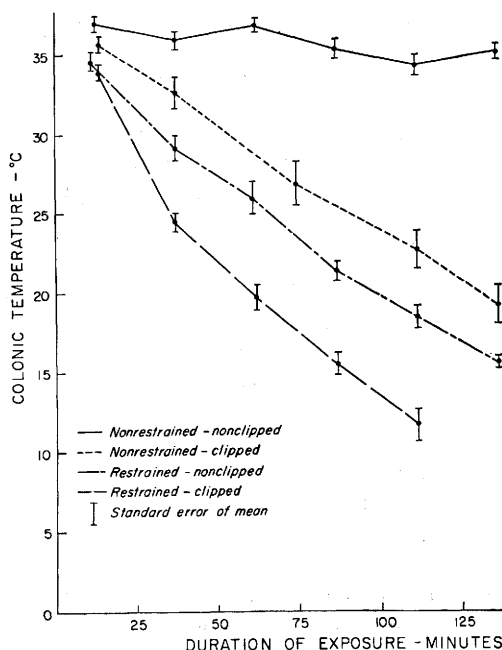


FIG. 1. Effect of clipping on body temp. of restrained and nonrestrained rats at $3^{\circ} \pm 2^{\circ}\text{C}$. Body temp. determinations were as frequent as possible and therefore temporally random. For graphic presentations, data have been grouped by time intervals, 25 min. apart. The 51-100 min. interval is presented as a single point in the nonrestrained clipped animals. The precipitous body temp. fall of restrained clipped animals resulted in termination of exposures at 125 min.

unit body surface exposure. That this is not the sole cause of hypothermia seems clear from the observation (Fig. 1) that restrained clipped animals became more hypothermic than nonrestrained clipped animals.

Increased convective heat loss in the restrained struggling rat may be another factor in the hypothermia production. Also, the body temperatures of both clipped nonrestrained and clipped restrained animals fell the same per cent of the range between the temperature of the respective nonclipped controls and the environmental temperature. Thus, although these experiments are taken

as presumptive evidence that inadequate piloerection is one factor in the production of restraint hypothermia, other mechanisms cannot be excluded.

Summary. Clipping of restrained rats resulted in a much lesser additional body temperature fall than a similar treatment of non-restrained animals. This is interpreted as

supporting the hypothesis that the less erected hair of the restrained animal results in a greater rate of heat loss than the fully erected hair of the nonrestrained animal.

1. Bartlett, R. G., Jr., Bohr, V. C., and Helmen-dach, R. H., *Physiol. Zool.*, 1956, v29, 256.

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Cytology and Hormone Content of Rat Pituitary Glands Following Adrenalectomy. (23037)

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The problem of the cellular source of corticotropin has been investigated most frequently in experimental animals by studying pituitary cytology after alteration of normal pituitary-adrenal gland relationship, accomplished by adrenalectomy, administration of pituitary extracts, corticotropin or adrenal cortical hormone. Because these experimental procedures influence also the secretion of hormones other than corticotropin(1-3), changes which occur in pituitary cytology should be interpreted not only in terms of the alteration produced in the secretion of corticotropin, but with respect to other pituitary hormones as well. The present investigation is an attempt to localize the site of corticotropin production by correlating cytological changes in the rat's pituitary gland following adrenalectomy with alterations in content of several of the hormones elaborated by this gland.

Materials and methods. Sprague-Dawley male rats weighing 200-250 g were bilaterally adrenalectomized and maintained on saline drinking water for 28, 56 and 100 days. Pituitary glands were investigated histologically with Masson trichrome stain, the PAS, acid hematin and Bodian protargol methods as described previously(4,5). An average of 1585 cells were counted in each gland in making differential cell counts from both trichrome- and protargol-stained sections. Pituitaries of control rats and animals adrenalectomized for 100 days were assayed for their

relative hormone content. Glands used for these analyses were either homogenized in saline and assayed the following day, or they were frozen in dry ice-acetone or liquid nitrogen, lyophilized and stored in a deep freezer. In separate assays, using 22- to 26-day-old hypophysectomized female rats as recipient test animals, the relative content of gonadotropins, thyrotropin and growth hormone was estimated by comparing ovarian and uterine weight and histology, thyroid weight and I^{131} uptake, and epiphyseal plate response(6) respectively. Recipient animals received a total of 5 or 10 mg of pituitary tissue (wet weight) injected in divided doses over a 4-day period. Pituitary thyrotropin content of 6 control and 6 adrenalectomized rats was assayed also according to Levey *et al.*(7). One dosage level was employed, an amount of donor pituitary tissue equivalent to 1/50th of the gland weight, was administered intravenously to 6 test animals for each pituitary gland assayed. Corticotropin content of the pituitary was measured by the ascorbic acid depletion test(8) with 3 dosage levels, according to Halmi and Bogdanove(9), being employed in each assay.

Results. Weight and cytology of pituitary glands. Pituitary glands of 193 adrenalectomized and 184 control animals were weighed, the mean weights 28, 56 and 100 days after adrenalectomy being 8.7, 9.3 and 11.1 mg respectively. Corresponding weights of glands