

*Chelodina* in doses up to 0.1 mgm./kgm. intraperitoneally and 0.02 mgm./kgm. intravenously did not evoke a melanophore response in either pale or dark animals. Although other workers have used much larger doses of adrenaline in other animals the above quantities were not exceeded since they were sufficient to evoke very large blood pressure responses.

Although only preliminary observations have been made it is apparent that the co-ordinating mechanism is dominantly humoral and this permits us to place another item in Waring's 1942 table<sup>7</sup>; the *Chelonia* are known as a separate order from Permian times and the family Chelyidae since Miocene.

These observations were made incidentally during an investigation of pituitary vasomotor effects in vertebrates. Grateful acknowledgment is made for a National and Medical Research Council (Australia) grant to Prof. H. Waring.

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<sup>1</sup>Parker, G. H., "Animal Colour Changes and their Neurohumours" (Cambridge Univ. Press, 1943).

<sup>2</sup>Hogben, L., *Proc. Roy. Soc.*, B, **131**, 111 (1942).

<sup>3</sup>Neill R. M., *J. Exp. Biol.*, **17**, 74 (1940).

<sup>4</sup>Hogben, L., "The Pigmentary Effector System" (Oliver and Boyd, London, 1924).

<sup>5</sup>Waring, H., *Proc. Roy. Soc.*, B, **128**, 343 (1940).

<sup>6</sup>Burgers, A. C. J., Investigation into the Action of Certain Hormones and other Substances on the Melanophores of the South African Clawed Toad, *Xenopus laevis* (V. W. Van Der Wiel and Co., Arnhem, 1956).

<sup>7</sup>Waring, H., *Biol. Rev.*, **17**, 120 (1942). Young, J. Z., "The Life of Vertebrates" (Clarendon Press, Oxford, 1954).

### Influence of Some Factors on the Relative Evaporation Rate from the Skin of Cattle

THE rate of evaporation from the skin plays an important part in the thermoregulatory adaptation mechanism of cattle in a high-temperature environment. In the present investigation a method for the determination of the relative evaporation-rates of the skin was examined and employed to determine the evaporation-rate for different regions of the body, its variability among cows, and the factors affecting this variability.

This method, previously used by Volcani and Schindler<sup>1</sup>, is based on the colour changes upon hydration of cobalt chloride anhydride. A solution of 10 per cent cobalt chloride was absorbed in filter paper which was afterwards dried, then cut into small disks of equal size, dried once more at 105° C. overnight, and finally transferred in test-tubes to a desiccator. To measure evaporation, a disk was introduced into a small cylindrical glass cup, which was immediately pressed on to the skin. The time taken for the colour to change from violet to bright rose was recorded by a stop watch. This depends on both the primary vapour pressure of water in the atmosphere of the cup and the rate of evaporation from the skin. Under constant primary vapour pressure, the time of colour change is inversely related to the evaporation-rate from the skin. Therefore this method is well suited for comparative measurements of evaporative-rates under constant vapour pressure of water in the air.

This experiment was carried out in the Jordan Valley on a group of 221 Holstein × Syrian  $F_1$ - $F_{10}$  cross-bred cows.

*Evaporation-rates of different body regions.* Evaporation-rates were measured at fourteen parts of the

body, namely, muzzle, forehead, lateral neck, ventral neck, thoracic back, sacral back, thigh, front flank, abdomen, udder (fore, lateral and rear), teat base and vulva. The highest evaporation-rates occurred in the following diminishing order: muzzle, lateral neck, vulva, ventral neck and front flank; whereas the slowest rates occurred on the abdomen, forehead and udder respectively. The differences were highly significant. These relations follow generally the regional distribution of the sweat glands' evaporative surface<sup>2</sup>.

White spots had a slower evaporation-rate than black spots, but the difference was not significant in the conditions of these experiments.

The increase in evaporation-rate due to shearing was great and highly significant. The interaction cows × shearing was significant, but the correlations between evaporation-rate and weight of hair per 100 cm.<sup>2</sup>, and that between evaporation-rate and density of hair per 100 cm.<sup>2</sup>, were very low and non-significant.

*Variation in evaporation-rate of different cows.* For this purpose, the front flank (black colour) was taken as the standard recording place. The variation found was highly significant. An analysis of the factors of variation revealed that increasing the percentage of relationship to the Holstein breed in the Holstein × Syrian cross-bred cows from 75 to 99.2 per cent did not influence the evaporation-rate. A highly significant variation was found among groups of the daughters of cows from different sires. The sires were of the Holstein breed (Canadian and Israeli origin), and Holstein × Syrian  $F_3$  cross-breds. The daughters of the Holstein × Syrian  $F_3$  cross-bred sires did not show a higher rate of evaporation than the daughters of the Holstein sires.

These results point to the possibility of increasing skin evaporation-rates in cattle by using sires capable of transmitting the characteristic of higher evaporation-rates to their offspring, and by shearing the coat of cattle, rather than by cross-breeding alone.

This investigation forms part of a progress report of work carried out under the guidance of Dr. R. Volcani in partial fulfilment of the requirements for the Ph.D. degree. A detailed account will be published elsewhere.

This study is part of an Agricultural Research Station, Rehovot, research project on acclimatization problems of dairy cattle in Israel.

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<sup>1</sup>Volcani, R., and Schindler, H., *Refuah Veterinarith*, **11**, 3, 177 (1954) (English translation).

<sup>2</sup>Findlay, J. D., and Yang, S. H., *J. Agric. Sci.*, **40**, 1, 2, 126 (1950).

### Graphical Methods in Enzyme Chemistry

AGREEING with Prof. J. B. S. Haldane's view that "Squabbles as to priority are undignified"<sup>1</sup>, I point out that in 1932 C. S. Hanes<sup>2</sup> used the linear form  $x/v = x/V + K/V$  of the Michaelis equation for his experimental results with amylase, where  $v$  is the initial rate of hydrolysis and  $x$  the initial concentration of starch.

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<sup>1</sup>Haldane, J. B. S., *Nature*, **179**, 832 (1957).

<sup>2</sup>Hanes, C. S., *Biochem. J.*, **26**, 1406 (1932).