THE ENERGY COST OF STANDING IN HORSES[1]

THAT basal metabolism of the horse may be determined while the animal is standing is suggested by the fact that it appears to rest as comfortably standing as lying, and actually spends more sleeping time in the former than in the latter position. Resting metabolism data have been obtained on two pony mares trained from infancy to lie at command, and to tolerate a metabolism mask connected to a large spirometer of the Benedict-Collins type. While the difference is insignificant, metabolism of lying animals was found to exceed that of the horses in the standing position, as shown in Table I.

TABLE I

METABOLISM OF HORSES IN STANDING AND LYING POSITIONS

	Three year old filly Weight 700 lbs. (19 trials in each position)		Four year old lactating mare Weight 800 lbs. (9 trials in each position)	
	Standing	Lying	Standing	Lying
O_2 consumption, Cal/hr.	403.9 ± 19.8	432.3 ± 12.0	406.6 ± 40.2	448.3 ± 23.3
Ventilation rate, Liters/minute	86.8 ± 5.3	114.5 ± 2.9	69.9 ± 9.4	107.3 ± 3.7
Respiration rate, Resp./minute	13.3 ± 0.4	20.9 ± 0.5	11.6 ± 0.9	20.8 ± 1.1

The significant increases in ventilation and respiration rates observed in the lying position suggest that lying may interfere in some way with ease of respiration, and this in turn may increase metabolism. This, combined with the effect of the powerful suspensory and check ligaments which are doubtless an important factor in decreasing the energy cost of standing in horses, may explain the observation that metabolism of the horse is no higher, and indeed may be lower, in the standing than in the lying position. On the other hand, cattle and sheep, species which lack these powerful ligaments, exhibit an energy cost of standing of 10 per cent.[2]

The mares, on lying, usually assumed the characteristic position on one side of the chest in preference to that on the side with legs extended. Oxygen consumption ordinarily was determined once with the animal in the standing position, and once in a lying position on a given day. On some occasions the first determination was made with the animal in the standing position, while on other days this order was reversed. Lying down appeared to have no significant effect on pulse rate of the animals.

Since oxygen consumption of horses is no greater when the animals stand than when they lie, the latter position offers no advantage over the former in the measurement of basal metabolism.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

SIMPLIFIED PHOTOMICROGRAPHY WITH A HAND CAMERA

THE relative ease with which good photomicrographs can be made, utilizing a box or folding hand camera and roll film, has not been generally recognized by visual microscopists, nor have the increased opportunities for making such photographs which are provided thereby because no darkrooms are required.

Most of the articles which have been published on simplified photomicrography recommend removal of the camera lens. The method described here consists in first independently focusing the microscope visually and then placing above (or behind) the ocular a roll-film or film-pack camera which has been focused at infinity or at another predetermined distance. Almost any type of personal camera can be used efficiently without mutilation and with the camera available immediately for other use. That the camera can be loaded in daylight and the films sent to the nearest drugstore for development and printing may be the chief advantages of the method to microscopists with no photographic facilities or experience.

The optical efficiency of this method is high if used properly; the definition of the pictures will be equal to that obtained with professional procedure and equipment. The optical considerations involved and the basis of the specific procedure that should be followed to obtain satisfactory results will be discussed more completely in a forthcoming article in a photographic journal. The Ramsden disk or eyepoint of the microscope should lie on the middle of the front surface of the camera lens ("vertex focus"), in which case the effective aperture of this lens is extremely small and the common optical aberrations become

[1] Journal Series number 849.

[2] Warren C. Hall and Samuel Brody, *University of Missouri Agricultural Research Bulletin* 180, 1933.