

RESULTS.

Series 1. Normal Animals. (Age about 60 days.)

No. of animals		Mean lethal interval, min.		Mean diff.	Standard deviation of mean diff.
Control	M. B. injected*	Control	M. B. injected		
9	10	23.2	26.5	3.3	2.5
Series 2. Increased Basal Metabolic Rate—Thyroid Fed.					
Control	Thyroid fed	Control	Thyroid fed		
10	9	30.5	15.5	15	5.4
Thyroid fed	Thyroid fed and injected with M. B.	Thyroid fed	Thyroid fed and injected with M. B.		
9	11	15.5	9.7	5.8	3.6
Series 3. Increased Basal Metabolic Rate—Dinitrophenol Injected. (Age about 200 days.)					
Control	M. B. inj.	Control	M. B. inj.		
11	8	42.1	39.2	2.9	6.2
Control	M. B. and D. N. T. injected	Control	M. B. and D. N. T. injected		
11	15	42.1	26.5	15.6	5.8
Control	D. N. T. injected†	Control	D. N. T. injected		
11	17	42.1	23.9	18.2	5.8
D. N. T. inj.	D. N. T. and M. B. inj.	D. N. T. inj.	D. N. T. and M. B. inj.		
17	15	23.9	26.5	2.6	4.1

* Methylene Blue injected.

† Dinitrophenol

Summary and Conclusions. The data reported include the figures obtained in study of 100 animals. Many more were sacrificed in trial procedures. The results show no significant action by methylene blue as a prophylactic agent in illuminating gas poisoning. The very greatly decreased lethal interval in animals receiving desiccated thyroid or dinitrophenol is worthy of note.

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Measurement of Daily Heat Production of Albino Rat from the Insensible Water Loss.

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A method is needed for measuring the daily energy requirements of the albino rat. The 24-hour insensible loss of weight and the percentage of the total heat loss that was due to vaporization of water have been measured to ascertain whether or not the measurement of the imperceptible water loss would fulfill this need.

Johnston and Newburgh¹ have applied the method in man. Each rat was placed in a wire cage suspended above a porcelain pan in which the excreta was collected under mineral oil. The weighings were made every 24 to 48 hours on a balance accurate to 200 mg. The weights of the food, water and excreta were obtained from the difference in weight of the container and contents at the beginning and end of the period. The vaporization of water, from the mouth of the water container, averaged 1 gm. per day as measured by a control. The diet of casein 20%, corn starch 48%, lard 16%, cod liver oil 3%, salt mixture (Osborne and Mendell) 5%, dried yeast 8% contained 3.7% moisture but did not lose water at room temperature. The rats' 24-hour excreta under oil maintained a constant weight for a week. The temperature of the laboratory varied from 23 to 27°C. Changes in barometric pressure and humidity had no significant influence.

Three grown male rats were studied. The daily food consumption yielded 43.5, 34.6 and 29.7 calories for periods of 42, 29 and 24 days with changes in body weight of only 1.6, 0.5 and 1.0 gm. respectively. In calculating the caloric value of the diet the values 4, 4 and 9 were used for carbohydrate, protein and fat.

The vaporization of water is the only factor in the insensible loss of weight that removes heat from the body and was calculated by the formula of Isenschmid²: $\text{Ins. L. Wt.} = \text{H}_2\text{O} + (\text{CO}_2 - \text{O}_2)$. The carbon dioxide excreted and oxygen absorbed were calculated from the metabolic mixture by the constants for protein, carbohydrate and fat given by Newburgh, Johnston and Falcon-Lesses.³ The metabolic mixture was the same as the food ingested, since the animals were in nitrogen balance, and the weight remained nearly constant. The vaporization of one gram of water from the surface of a mammal requires 0.58 calorie. The heat lost by evaporation of water was compared with the caloric value of the metabolic mixture.

The calculations were by the following formula :

$(\text{Wt. rat beginning period} + \text{water} + \text{food}) - (\text{Wt. rat end period} + \text{excreta}) = \text{Ins. L. Wt. H}_2\text{O} = \text{Ins. L. Wt.} - (\text{CO}_2 - \text{O}_2)$. $\text{H}_2\text{O} \times 0.58 = \text{calories lost by vaporization of water.}$

The averages of the results for each animal are shown in Table I.

¹ Johnston, Margaret W., and Newburgh, L. H., *J. Clin. Invest.*, 1930, **8**, 147.

² Isenschmid, *Med. Klin.*, 1918, **14**, 1128.

³ Newburgh, L. H., Johnston, M. W., and Falcon-Lesses, M., *J. Clin. Invest.*, 1930, **8**, 161.

The daily variations in the insensible loss of weight of each rat were probably due to activity which was not measured, but when periods of 4 to 10 days are compared the variations are small (Table II). An average of 21.3% of the total heat loss was due

TABLE I.

Rat	Average daily			Daily caloric value of metabolic mixture	Average % total heat lost by Ins. water
	Ins. L. Wt.	Ins. water	Calories lost by Ins. water		
1	18.8	16.3	9.4	43.5	21.6
2	13.9	12.4	7.2	34.6	20.8
3	12.3	11.0	6.4	29.7	21.5
					Ave. 21.3

TABLE II.

Rat	No. days in period	Ave. Ins. L. Wt.	Ave. daily heat production from		Calories from metabolic mixt. daily	% variation
			Ins. water	metabolic mixt. daily		
1	7	18.3	42.8	43.5	-1.6	
	6	19.8	46.8	43.5	+7.1	
	9	18.8	44.2	43.5	+1.6	
	4	17.8	41.8	43.5	-3.9	
2	7	13.9	33.8	34.6	-2.3	
	7	14.5	35.3	34.6	+2.0	
	7	13.7	33.4	34.6	-3.5	
	7	13.9	33.9	34.6	-2.3	
	7	14.1	34.1	34.6	-1.4	
	7	13.5	32.9	34.6	-4.9	
	4	13.1	32.0	34.6	-7.5	
3	7	12.0	29.1	29.7	-2.0	
	7	14.0	34.1	29.7	+14.8	
	7	12.5	30.0	29.7	+1.0	
	10	12.3	30.0	29.7	+1.0	

to imperceptible water. This compares favorably with figures obtained for the rat in the basal state by Greene and Luce.⁴ When the average heat lost by the evaporation of water for periods of 4 to 10 days is considered to be 21.3% of the total as calculated from the metabolic mixture, the variations are no greater than those found in measuring the basal metabolism (Table II).

Summary. I. A method for measurement of the 24 hourly insensible loss of weight of the albino rat has been described. II. The results have shown that the daily heat production of the albino rat can be accurately determined from the weight of the insensible water loss. III. The heat lost by vaporization of water averaged 21.3% of the total calculated heat production in an environmental temperature of 23 to 27°C.

⁴ Greene, Jas. A., and Luce, R. P., *J. Nutrition*, 1931, 4, 371.