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Arginase in the Mammary Gland.

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The liver has been considered as the only gland in the mammalian body capable of synthesizing urea. Hunter and Daupinee¹ reported that the liver contained large quantities of arginase which has not been reported for other glands in the mammalian body. Krebs and Henseleit² advanced the generally accepted hypothesis that arginase is one of the essentials in the formation of urea.

Since urea has been reported to be produced by the mammary gland by Graham, Houchin and Turner,³ it appeared probable that the method of formation was similar to that in the liver and that arginase may be present in the mammary gland.

Accordingly, both lactating and non-lactating mammary glands from cows were analyzed for arginase by the method described by Hunter and Daupinee.⁴ In each case 100 g of udder tissue were extracted with 100 ml of 75% glycerol. For the trials 5 ml of the glycerol extract were added to the arginine solution and the urea formed after 24 hours of incubation was determined by the urease method of Van Slyke and Cullen.⁵ Blanks were run identically with

TABLE I.
Urea Nitrogen Formed by Mammary Gland Extract.

Cow No.	Nitrogen as arginine HCl, mg	Urea nitrogen found in blank, mg	Total urea nitrogen found, mg	Remarks
1	6	.36	.80	Lactating glands
2	6	.13	.31	
3	6	.04	.10	
4	6	.22	.35	
5	6	.41	.78	
6	6	.28	.62	
7	6	.43	.92	
8	6	.24	.27	Non-lactating glands
9	6	.22	.26	
10	6	.00	.00	

¹ Hunter, A., and Daupinee, J. A., *Proc. Roy. Soc. London*, 1925, **97B**, 227.

² Krebs, H. A., and Henseleit, Kurt, *Hoppe-Seyler's Z. Physiol. Chem.*, 1932, **210**, 33.

³ Graham, W. R., Houchin, O. B., and Turner, C. W., *J. Biol. Chem.*, 1937, **120**, 29.

⁴ Hunter, A., and Daupinee, J. A., *J. Biol. Chem.*, 1929, **85**, 627.

⁵ Van Slyke, D. D., and Cullen, G. E., *J. Biol. Chem.*, 1916, **24**, 117.

the exception that arginine was omitted. The urea nitrogen in the blanks varied from 0.0 mg in the case of the dry glands to as much as 0.43 mg in the case of lactating glands. The amounts of urea nitrogen from 5 ml of glycerol extract as compared to 5 ml of glycerol extract and arginine hydrochloride are given in Table I.

From these data it is obvious that the active mammary gland contains appreciable arginase while the inactive gland contains less or none at all as revealed by the methods used.

It will be noted in the table that the amount of arginase in the mammary gland extract is proportional to the amount of preformed urea in the mammary gland extract, as shown by the blank determinations. This urea was probably formed in the gland or gland extract by arginase and urea precursors in the gland. Additional controls demonstrated that the arginine used did not contain free urea.

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Amino Acids and other Non-Protein Nitrogen Blood Substances in Relation to Milk Secretion.

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Since Cary¹ demonstrated that the amino-acid content of blood obtained from the mammary vein of lactating cows was significantly lower than that obtained from the jugular vein, it has been assumed that the amino-acids of the blood are the precursors of the milk proteins. Recently Graham,² and Shaw and Petersen³ have presented evidence that the blood amino-acids are not the sole precursors of milk proteins. Graham, *et al.*,⁴ have also demonstrated that the blood proteins may be involved in the protein metabolism of the mammary gland.

* The data in this paper are from a thesis presented by J. C. Shaw in partial fulfillment of the requirements for the degree of Doctor of Philosophy, University of Minnesota, Minnesota Agricultural Experiment Station.

¹ Cary, C. A., *J. Biol. Chem.*, 1920, **43**, 477.

² Graham, W. R., Jr., *J. Biol. Chem.*, 1937, **122**, 1.

³ Shaw, J. C., and Petersen, W. E., *Proc. Am. Physiol. Soc.*, March 30, 31, April 1, 2, 1938, 50th Annual Meeting, Baltimore, Maryland, p. 183.

⁴ Graham, W. R., Jr., Peterson, V. R., Houchin, O. B., and Turner, C. W., *J. Biol. Chem.*, 1938, **122**, 275.