

was allowed to proceed at 37.5°C for a maximum period of 24 hours. After an interval of one, 4, and 24 hours the amino nitrogen was determined in aliquots by means of the Van Slyke amino nitrogen apparatus. A blank contained the same as the sample, except that the tissue extracts were used after boiling for 10 minutes which destroyed trypsin and erepsin.

The results were expressed in percentage of total amino nitrogen, which was determined by acid hydrolysis. The total amino nitrogen for casein was 9.75% and for lactalbumin 10.7%.

A summary of the final average results is submitted in Table I. It will be noted from the speed of liberation of amino nitrogen that a significantly better digestion was observed with casein than with lactalbumin after the first hour incubation with all 3 concentrations of protein. There is also a noteworthy increase of digestion of casein after the fourth hour with 180 mg. protein. In the case of 210 mg. protein, there is a constant increase of amino nitrogen liberation in casein versus lactalbumin throughout the 24 hours of digestion.

It is, therefore, concluded that lactalbumin is less readily digested than casein *in vitro* by trypsin and erepsin when the incubation of these proteins is carried out under standard and comparable conditions.

8556 P

Segmental Differentiation in the Proximal Convoluted Tubule of the Mammalian Nephron.

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Edwards,¹ in discussing the proximal convoluted tubule of the mammalian nephron, refers to "its functional differentiation as manifest segmentally unaccompanied by obvious cytological change." Edwards and Schnitter² state that the proximal convoluted tubule of the mammal "is cytologically uniform throughout its length." In his most recent publication, Edwards³ mentions the "unisegmental appearance" of the mammalian proximal

¹ Edwards, J. G., *Anat. Rec.*, 1933, **55**, 343.

² Edwards, J. G., assisted by C. Schnitter, *Am. J. Anat.*, 1933, **53**, 55.

³ Edwards, J. G., *Anat. Rec.*, 1935, **63**, 263.

convolution, and states that "it is probable that the obvious presence of definite segments in the proximal convolution of the renal tubule in fish has been cytologically concealed but functionally retained in this convolution in the kidney of other vertebrates."

Contrary to the statements of Edwards, convincing evidence of at least a bisegmental differentiation of the mammalian proximal convoluted tubule on cytological grounds was presented 25 years ago by Zimmermann.⁴ In the dog and cat he found, in the pars recta, an abrupt transition from an epithelium with markedly irregular cell outlines (to be designated here as first segment) to one with sharp, rectilinear cell outlines, in general hexagonal in shape (to be designated here as second segment). In the cat the cells of the first segment showed abundant vacuoles (fat), while the second segment was entirely free of them. In the dog, on the other hand, just the opposite was true, the vacuoles being confined to the second segment. The striking difference, with respect to fat storage, in the terminal portion of the proximal convoluted tubule in these two animals had been described previously by Peter.⁵ In his study of the cat Modell⁶ missed the fat-free terminal portion entirely, and has been rightly criticized by Nakamura.⁷

An investigation of one aspect of this problem, namely, quantitative data upon the relative lengths of the two segments of the proximal convoluted tubule, is reported here. Four cats were killed instantaneously and their kidneys fixed in formalin. Small blocks were macerated in hydrochloric acid and then stained with Scharlach R or Sudan III. From each animal 15 proximal convoluted tubules were teased, mounted, drawn and measured. The relative lengths of the 2 segments were determined on the basis of fat content, the second segment being free of fat, as described above. The results are summarized in the accompanying table, in which the ranges of length (expressed in millimeters) and percentage are given for the 15 tubules studied from each specimen.

TABLE I.

Cat. No.	Total length Prox. C.T.	Length of 1st segment	Length of 2nd segment	2nd Seg.—% of total length
4	8.83-13.22	6.61-11.89	1.33-2.90	13.3-25.0
5	11.42-16.10	9.62-13.70	1.27-3.83	9.8-28.7
6	7.07-11.10	5.37- 9.12	1.39-2.54	14.8-27.5
7	6.70- 9.92	4.71- 8.25	1.58-2.76	16.9-31.8

⁴ Zimmermann, K. W., *Arch. mikr. Anat.*, 1911, **78**, 199.

⁵ Peter, K., *Untersuchungen über Bau und Entwicklung der Niere*, Jena, 1909.

⁶ Modell, W., *Anat. Rec.*, 1933, **57**, 13.

⁷ Nakamura, S., *Fol. Anat. Jap.*, 1935, **13**, 45.

The average percentage length of the second segment in the 4 animals is 17.7, 15.5, 20.7 and 23.9% respectively. The average for the entire series of 60 tubules is 19.5%.

The evidence for the subdivision of the mammalian proximal convoluted tubule into at least 2 cytologically distinct segments is entirely convincing. A more extensive segmental differentiation has been postulated by Suzuki,⁸ but no critical cytological proof in support of his contention has yet been adduced.

8557 C

Effect of Combined Administration of Oestrone and Progesterone in Adult Ovariectomized Rats.

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Previous experiments^{1, 2, 3, 4} have shown that the mucification of the vagina which is usually observed in pregnant rats may be elicited during lactation if large doses of oestrin are administered. Since administration of similar doses of oestrin in ovariectomized rats would lead to cornification of the vaginal epithelium, the mucification reaction was ascribed to the simultaneous action of oestrin and corpus luteum hormone. Similarly the epithelial lining of the uterus shows only a moderate degree of progestational proliferation during lactation or pseudo-pregnancy in the rat, while in the second half of pregnancy the proliferation of the endometrium and the growth of the uterus *in toto* is much more marked and of a different nature. Various reasons which are discussed in more detail in the papers quoted above led us to the conclusion that the endometrial changes during lactation, pseudo-pregnancy, and early pregnancy, are mainly due to the hormone of the corpus luteum, and we called this reaction "the first stage of pro-

⁸ Suzuki, T., *Zur Morphologie der Nierensekretion unter physiologischen und pathologischen Bedingungen*, Jena, 1912.

¹ Selye, H., Harlow, C., and McKeown, T., *Proc. Soc. Exp. Biol. and Med.*, 1935, **32**, 1253.

² Selye, H., Collip, J. B., and Thomson, D. L., *Endocrinol.*, 1935, **19**, 151.

³ Selye, H., Collip, J. B., and Thomson, D. L., *Proc. Soc. Exp. Biol. and Med.*, 1935, **32**, 1377.

⁴ Selye, H., and McKeown, T., *Proc. Roy. Soc., B*, 1935, **119**, 1.