Elevated Histidine Decarboxylase Activity in the Kidney of the Pregnant Mouse

It has been found in this laboratory that the histamine-forming capacity is increased in certain kinds of normal and malignant rapid tissue growth[1-4]. Rat foetuses, particularly, exhibit very high levels of histidine decarboxylase activity.

The present results in mice reveal a new relationship between histamine metabolism and pregnancy. Adult mice weighing about 30 g were killed by decapitation and the kidenys examined for histidine decarboxylase activity by procedures developed by SCHAYER et al.[5] and described in detail by WHITE[6]. The results are summarized in the Table in which for comparison values from some of the richest known sources of mammalian histidine decarboxylase are included.

From the Table it is seen, first, that in the kidney of the non-pregnant female the enzyme level is about twenty times higher than in that of the male. Further, and most striking, in pregnancy the kidney enzyme level is elevated to about fifty times the non-pregnant values. This activation during pregnancy can hardly be due to differences in endogenous amounts of the coenzyme pyridoxal-5-phosphate, because addition of this compound to non-pregnant kidney mince during incubation with ^{14}C-histidine did not cause a significant increase in the rate of formation of ^{14}C-histamine.

The physiological significance of the increased histamine forming capacity in the mouse kidney during pregnancy is open to speculation. SCHAYER[7] demonstrated the existence of at least two varieties of mammalian histidine decarboxylase. It remains to characterize more specifically the nature of the female mouse kidney enzyme and to see to what extent the enzyme and its increase during pregnancy is species specific.

Zusammenfassung. Die Fähigkeit, ^{14}C-Histamin aus ^{14}C-Histidin zu bilden, steigt in der Niere der schwangeren Maus enorm an. Dieses Organ ist deshalb eine der reichsten Quellen von tierischer Histidindecarboxylase.

The histidine decarboxylase activity of kidneys in male, pregnant and non-pregnant mice. Each figure represents the observation from one mouse. For comparison the activity of rat gastric mucosa and rat foetal liver are shown.

Species	Tissue	Histamine formed (ng/g/3 h)
Mouse	male kidney	4
		8
		14
		58
		80
Mouse	female kidney, non-pregnant	120
		310
		390
		660
		1 880
Mouse	female kidney, pregnant	20 800
		26 500
		32 300
		38 900
		43 400
Rat	gastric mucosa	1 010
		1 340
		1 430
		1 540
Rat	foetal liver	21 400
		23 300
		37 000
		54 200

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Experimental Hypertension Elicited by Injections of Methyl Cellulose[1]

It has been shown that when various animal species are injected with methyl cellulose, storage cell macrophages and vascular endothelial cells incorporate the material thereby being converted into 'foam cells'[2-4], resembling the intravascular lipid-filled foam cells which occur in certain forms of human cardiovascular[5] and renal[6] disease. Kidney glomeruli are transformed into structures which have been likened to 'grape clusters' because of the marked and extensive endothelial swelling. Recent examination, in our laboratory, of histological material from rats which had been the recipients of hormone solutions containing methyl cellulose as a suspending agent, revealed that the glomerular capillaries were so occluded by endothelial swelling as to severely curtail the circulation of blood through them. Because of the relationship between 'renal ischemia' and hypertension[7,8] it seemed worthwhile to investigate the effect which such restriction of intraglomerular circulation might have on the blood pressure.

Method. 20 immature female rats of the Holtzman strain weighing 70–90 g were unilaterally nephrectomized and placed on a 1% NaCl intake, procedures which are known to facilitate induction of hormonal hypertension[9]. Ten of them received daily subcutaneous injections of a methyl cellulose solution which ranged between 1% and 0.25% concentration. Those which survived the full period of treatment received a total of 106 mg of the polysaccharide. The remaining ten received no injections. Blood pressures were measured periodically on unanesthetized animals by a tail-plethysmograph. The experiment was concluded on the 32nd day, surviving animals being killed with ether. Organs and tissues from them and those which died intercurrently were taken for weight and microscopic examination.

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