RESERVE RENIN PRODUCTION BY GLOMERULAR MESANGIAL CELLS AFTER EXPERIMENTAL REDUCTION OF THE RENAL CIRCULATION

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The abdominal aorta of rats was constricted between the orifices of the renal arteries. Renin activity was studied separately in the capillary part of the isolated glomeruli and in their arterioles. Renin activity was found in the capillary part of the glomeruli 3-4 weeks after the operation, and evidence of activation of the granular and agranular endoplasmic reticulum and Golgi complex was found in the mesangial cells. The results are interpreted as confirmation of the postulated reserve production of renin by the mesangial cells during a prolonged reduction in the renal circulation.

KEY WORDS: renin; mesangial cells; juxtaglomerular apparatus; renal hypertension; body reserves.

Many morphological investigations have shown a common origin of the juxtaglomerular (JGC) and mesangial (MC) cells and the appearance of similar changes in them in various situations. However, the physiology of MC has not yet been studied. Theoretical views of reserve powers in physiological systems [3], based on biogenetic principles and data in the literature on the morphology of MC during stimulation of the juxtaglomerular apparatus (JGA), have suggested that MC are reserve sources of renin [4].

The investigation described below was carried out to test this hypothesis.

EXPERIMENTAL METHOD

A nichrome wire loop was tied around the abdominal aorta of Wistar rats weighing 160-250 g, between the orifices of the renal arteries. The diameter of the loop was chosen so as to reduce the blood flow in the left kidney by about 75% [2]. The animals were killed at weekly intervals during the first 1.5 months of the experiment, and then 2 and 3 months after the operation. Intact rats served as the control. The blood pressure in the carotid artery of all the animals was measured before sacrifice by means of a strain gauge. Individual glomeruli and their JGA were isolated from the left kidney by the method of Dahlheim et al. [7] and the fragment containing arterioles was separated from the capillary glomerulus proper (the capillary fragment) by microdissection. Renin activity (RA) was determined in each fragment by the writers' modification of the
Fig. 1. Dynamics of blood pressure (squares) and RA in course of experiment in arteriolar (circles) and capillary (triangles) fragments. Filled symbols - rats of group 1; empty - rats of group 2. C) Control. ×) RA found in 100% of samples; ××) RA found in 60% of samples.

Fig. 2. Ultrastructure of MC. a) Control: weak development of organelles of synthesis and secretion (40,000 ×); b) 6 weeks of ischemia: activation of synthetic and secretory processes (36,000 ×). GER) Granular endoplasmic reticulum, AGER) agranular endoplasmic reticulum; GC) Golgi complex; L) lysosomes.