

IMMUNOHISTOCHEMICAL STUDY OF NEPHROGENESIS DURING THE FETAL PERIOD

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The kidneys develop from the metanephritic blastema that comes from the intermediate mesoderm and the ureteric bud of the mesonephric duct.

Nephrogenesis is initiated by the reciprocal induction of the ureteric bud and metanephritic mesenchyme, and lasts until intrauterine weeks 32 to 36. The nephrogenic area is not present in the newborn. This process is controlled by a wide range of proteins.

The histological structure of the renal parenchyma is similar to that of a gland, but it has modified secreting units and a network of specialized ducts. The larger functional unit of the kidneys is the renal segment, while the structural and functional unit is the nephron. Histological sections of the kidney display two distinct areas: an internal zone, the renal medulla, and an external, peripheral zone, the renal cortex. During the fetal period the nephrogenic zone is a band located at the periphery of the cortex, where the nephrons develop and pass through different stages: initially the renal vesicle appears, which then elongates and makes up the comma- and S-shaped bodies.

Pax2 and Pax8 regulate the expression of genes responsible for the mesenchymal-epithelial transition, as these are specific to cells of undifferentiated mesenchyme and to structures of the ureteric bud in different stages of development

AQP1 has been described in the epithelium of the proximal tubule and descending limb of loop of Henle, while AQP2 is present in the collecting duct and connecting tubule.

Connexins are present in endothelial cells and in the epithelium of tubular structures, but they have also been described in the juxtaglomerular apparatus. Cx36 is present in the tubular part of the nephron and in the collecting duct, while Cx43 is specific to vascular structures.

We found statistically significant positive correlations between the kidney's superoinferior diameter, mediolateral diameter and the fetus' vertex-coccyx length. These diameters show statistically significant positive correlations between each other, with statistically significant regression.

Cortical and medullar thickness growth show statistically significant positive correlation with the increase of vertex-coccyx length. The growth of the nephrogenic zone shows negative correlation with cortical and medullar growth, and also with increase of vertex-coccyx length. The increase in diameter of renal corpuscles shows statistically significant negative correlation with cortical and medullar growth.

The studied markers are topographically localized to different segments of the developing nephron in different stages of development and those of the fully developed nephron.

In the first weeks of the fetal period, expression of the Pax2 protein is present both in the epithelium of the ureteric bud and the surrounding mesenchyme, and after intrauterine week 13 its expression is confined to the epithelium of the ureteric bud and its derivatives.

Pax8 protein expression is localized to the ureteric bud and its derivatives, the visceral layer of Bowman's capsule, the proximal tubule, loop of Henle and the collecting duct. AQP1 expression is very strong in the renal tubules that play an essential role in water reabsorption: the proximal tubule and the descending limb of the loop of Henle. At the beginning of the fetal period AQP2 is present in the cytoplasm of epithelial cells of the collecting duct, and later in the distal connecting tubule as well. During the fetal period AQP2 expression of the collecting ducts becomes stronger at the apical part of the cells. Cx36 protein is present especially in the proximal tubules and collecting ducts. Cx43 expression is localized to the glomerular endothelium, peritubular vessel endothelium and proximal tubules.

The current study contributes scientific data regarding nephrogenesis studied in different species and immunoexpression of these markers during renal development in the fetal period.