Induction and patterning of the metanephric nephron.

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Public Summary:
In this review, we discuss what is known about the molecular and cellular mechanisms regulating the transition from nephron progenitor cells to nephron-forming cell types.

Scientific Abstract:
The functional unit of the mammalian metanephric kidney is the nephron: a complex tubular structure dedicated to blood filtration and maintenance of several important physiological functions. Nephrons are assembled from a nephron-restricted pool of mesenchymal progenitors over an extensive developmental period that is completed prior to (human), or shortly after (mouse), birth. An appropriate balance in the expansion and commitment of nephron progenitors to nephron formation is essential for normal kidney function. Too few nephrons increase risk of kidney disease later in life while the failure of normal progenitor differentiation in Wilm's tumor patients leads to massive growth of a nephroblast population often necessitating surgical removal of the kidney. An inductive process within the metanephric mesenchyme leads to the formation of a pretubular aggregate which transitions into an epithelial renal vesicle: the precursor for nephron assembly. Growth, morphogenesis and patterning transform this simple cyst-like structure into a highly elongated mature nephron with distinct cell types positioned along a proximal (glomerular) to distal (connecting segment) axis of functional organization. This review discusses our current understanding of the specification, maintenance and commitment of nephron progenitors, and the regulatory processes that transform the renal vesicle into a nephron.