SIGNIFICANCE STATEMENT

Conserved and divergent molecular and anatomical features of mouse and human nephron patterning. Nephrons are the functional unit of the kidney. Mouse studies have provided a general framework for nephron formation but how nephrons develop in the human kidney is unclear. We analyzed human fetal kidney development demonstrating similar inductive processes at play in human and mouse kidney development, albeit with species-specific dynamics. Using high-resolution mapping of transcriptional factors, we compared the emergence of cellular diversity during human and mouse nephrogenesis. A deep conservation was observed in the emerging patterns that likely reflects similar underlying regulatory processes between mouse and man. These data, which also address the first appearance of mature cell markers within developing nephrons, benchmark human nephron development and will inform *in vitro* model systems to recapitulate normal human nephrogenesis.