Optimizing Nephron Endowment

Chronic Kidney Disease (CKD) has a high global prevalence, with an estimated 15% of the population (30 million adults) of the US affected. Even more individuals are effected by hypertension, with 35% of the US population and 1.5 billion people worldwide projected to be affected within the next decade. As a lower number of nephrons at birth results in decreased kidney function, which leads to CKD, high blood pressure, and cardiovascular disease in adulthood, it is a significant contributor and predisposing factor to kidney disease and high blood pressure later in life.

Interventions in animal models that increase embryonic nephron numbers reduce the development of hypertension later in life, supporting the causal role of now nephron number in the development of this disease. Despite this strong association, there are currently no available strategies to improve nephron number at birth or for nephron regeneration to repair kidney injury. Developing treatments and regimens to optimize nephrogenesis, both *in utero* and for nephron repair later in life, can significantly reduce the burden of cardiovascular and kidney disease.

Metabolic Control of Nephron Development

The lab of **Zubaida Saufudeen** is studying how cellular metabolism can control the balance between Nephron Progenitor Cells' (NPCs) self-renewal and differentiation to optimize nephrogenesis, with an eye towards developing nutrition-based treatments that can boost nephron number. The lab is one of the few investigation metabolism and nutritional modulation *in utero* as a treatment and preventative measure for low nephron number. This approach is advantageous due to the ease with which it could be implemented. The treatment strategy of using nutrition to protect against possible complications with fetal development has already been employed to great effect, with folic acid supplements protecting against neural tube defects during development.

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Metabolic Control... (cont.)

Using established animal models that result in low nephron number alongside human iPSC-derived kidney organoids to identify the necessary metabolites for nephrogenesis, the lab is able to merge basic research with immediate clinical applications.

Sustainable, cost-effective treatments options to increase nephron number can potentially save and improve the lives of at-risk individuals.

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