README

Project title: Predicted impact of chronic Angiotensin II on renal tubular function in female rats.

Project description: this computational model describes the transport of water and 15 electrolytes along the renal tubule of a female rat. It incorporates the impact of chronic Angiotensin II (at 2 weeks) on the abundance of renal water, Na^+, and K^+ transporters, based on the experimental findings of Veiras et al. (2020).

Model inputs
- plasma and interstitial composition
- glomerular filtration rate

Model parameters
- Nephron segment size/anatomy
- Transporter abundance
- Transporter kinetics
- Permeabilities

Model outputs
- Water and electrolytes flows and fluxes at each position
- Concentrations and electric potentials at each position
- Urinary excretion rates

The model is based on ODEs representing conservation of mass and volume in the tubular lumen, epithelial cells, and lateral interspace compartment.

How to use the code:

The source file is main.f. It proceeds from one nephron segment to the next. For each segment X, parameter values are initialized in the "initX" file, and fluxes are computed in the "qfluxX" file. The ODEs are linearized using finite difference schemes, and solved in combination with other algebraic equations using Newton's method.

References:

Veiras LC, McFarlin BE, Ralph DL, Buncha V, Prescott J, Shirvani BS, McDonough JC, Ha D, Giani J, Gurley SB, Mamenko M, and McDonough AA. Electrolyte and transporter responses to angiotensin II induced hypertension in female and male rats and mice. *Acta physiologica (Oxford, England)* 229: e13448, 2020.