**CNS Diseases:**
- Neurologic Disorders such as Parkinson’s, Alzheimer’s, and Brain tumors affect more than 50 million Americans each year.
- Delivery of drugs to the brain is inhibited by the Blood Brain Barrier.

**Convection Enhanced Delivery:**
- Direct infusion into the brain parenchyma bypassing the Blood-Brain-Barrier.
- Bulk flow mechanism to deliver drugs to target site.

**Computational models:**
- Can predict the drug distribution in complex tissues using conservation laws of mass and momentum balance.
- Our models feature:
  - Realistic brain geometry of parenchyma and internal structures.
  - Accounting for tissue anisotropy and heterogeneity.

**Governing equations**

\[
\varepsilon \frac{\partial C}{\partial t} + \nabla \cdot (\vec{v} C) = \nabla \cdot \left( \overline{D} \left( \vec{x} \right) \nabla C \right) + R \left( C, \vec{x} \right) + S \left( C, \vec{x} \right)
\]

Conservation of mass: species transport equation

\[
\frac{\partial \vec{v}}{\partial t} + \nabla \cdot (\vec{v} \vec{v}) = -\nabla p + \frac{\nabla \cdot (\vec{v} \overline{D} \cdot \nabla C)}{\varepsilon} \vec{v}
\]

Conservation of momentum: Navier-Stokes for porous medium

Where, \( \overline{D} = \begin{bmatrix} D_{xx} & D_{xy} & D_{xz} \\ D_{yx} & D_{yy} & D_{yz} \\ D_{zx} & D_{zy} & D_{zz} \end{bmatrix} \) and \( \overline{D} = \begin{bmatrix} D_{xx} & D_{xy} & D_{xz} \\ D_{yx} & D_{yy} & D_{yz} \\ D_{zx} & D_{zy} & D_{zz} \end{bmatrix} \)

**Reconstruction of realistic brain geometry**

**DTI data processing and calibration**

**Simulations**

**Acknowledgements**

References