# QCHFM – Biomedical Flow Example

This example illustrates how QCHFM (Quantum-Coherent Hybrid Flow Modeling) can be applied to simulate fluid flow in biomedical environments—specifically, blood flow in capillaries or microfluidic channels.

## Objective

To model capillary-scale blood flow with attention to vessel curvature, viscosity variation, and uncertainty from biological noise. This can assist in drug delivery research and medical device design.

## Simulation Setup

- Geometry: 3D bifurcating capillary model

- Scale: Micron-level resolution

- Viscosity: Modeled as variable with shear-thinning behavior

- Pulsatile flow: Modeled as time-dependent inlet velocity

## QCHFM Layers Applied

- Theoretic Core: Navier-Stokes equations under laminar conditions

- Practice Layer: Non-Newtonian fluid modeling and adaptive mesh

- Quantum Overlay: Introduces stochastic noise in regions of branching or turbulence

## Output

- Pressure and velocity profiles

- Streamlines and flow separation zones

- Confidence field highlighting zones with less predictable flow

## Insights

QCHFM highlighted areas at vessel bifurcations where confidence was lower—suggesting chaotic microflow. These zones may affect drug delivery efficiency or clot formation risks. Simulating confidence helps engineers test safety margins and optimize designs.

This shows QCHFM’s utility for biomedical modeling under uncertainty, especially for personalized healthcare and microfluidic systems.