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Multiscale modeling of a Chemofilter device for filtering chemotherapy toxins from blood[1] NAZANIN MAANI, SAMAN BEYHAGHI, University of Wisconsin Milwaukee, DARYL YEE, California Institute of Technology, MICHEAL NOSONOVSKY, University of Wisconsin Milwaukee, JULIA GREER, California Institute of Technology, STEVEN HETTS, University of California San Francisco, VITALIY RAYZ, University of Wisconsin Milwaukee — **Purpose**: Chemotherapy drugs injected intra-arterially to treat cancer can cause systemic toxic effects. A catheter-based Chemofilter device, temporarily deployed in a vein during the procedure can filter excessive drug from the blood thus reducing chemotherapy side-effects. CFD modeling is used to design the membrane of the Chemofilter in order to optimize its hemodynamic performance. **Methods**: Multiscale approach is used to model blood flow through the Chemofilter. The toxins bind to the Chemofilter's membrane formed by a lattice of numerous micro cells deployed in a blood vessel of much larger size. A detailed model of the flow through a 2x2 microcell matrix with periodic boundary conditions is used to determine the permeability of the membrane. The results are used to simulate the flow through the whole device modeled as a uniform porous membrane. The finite-volume solver Fluent is used to obtain the numerical solution. **Results**: The micro cell matrix has a porosity of 0.92. The pressure drop across the resolved microcells was found to be 630 Pa, resulting in the permeability of 6.21 x10^{-11} m^2 in the normal direction. These values were used to optimize the device geometry in order to increase the contact area of the membrane, while minimizing its obstruction to the flow.

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