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Title: Nonlinear modeling of electrical conduction in biological tissues.

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Abstract: The behavior for large times of models of electrical conduction in biological tissues becomes relevant in connection with applications, e.g., with electrical impedance tomography, when the boundary data are time periodic. Indeed this is the feature which makes comparison with currently used phenomenological models possible.

We consider both microscopic and macroscopic models. The microscopic problems involve the equation for the electric potential u and a condition prescribed on the interface separating the intra- and extra-cellular spaces. This condition relates in a nonlinear fashion the time evolution of the jump of the potential u across the interface to the resistive behavior of the membrane and to the electric current flowing through the membrane.

We discuss the asymptotic behavior of these models as well as of their homogenized macroscopic versions. The homogenization limit is performed as the spatial period of the micro-structure (i.e., the cells) becomes vanishingly small.