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Spreadsheet analysis of ion channel data using a linearized permeation model PETER HUGO NELSON, ASHLEY RINK, Benedictine University — A linearization of a recent ion channel permeation model [Nelson, *J. Chem. Phys.* **177** (2002) 11396-11403] is proposed. The linearization enables rapid visual screening of current-voltage-concentration data sets to determine whether they can be successfully modeled using the permeation theory. To test this approach, we compared an extensive set of permeation data published by the Busath group [Cole *et al.*, *Biophys. J.* **83**, 1974 (2002)] for both native and fluorinated variants of gramicidin A in diphytanoylphosphatidylcholine and glyceryl monoolein bilayers. Using the linearized model, we were able to show that both the electrical dissociation distance and the association rate constant were independent of fluorination, being determined by the composition of the bilayer and the identity of the permeant ion. We found that the electrostatic modulation of current flow by fluorination could be accounted for by varying only the dissociation rate constant, in agreement with electrostatic predictions. As a result, we conclude that modification of permeant ion binding affinity is the primary effect of fluorination. In contrast, when Cole *et al.* analyzed their data, with a traditional site-based model, they concluded that a reduced translocation barrier was required for three of the eight channel analogs. Sample spreadsheet(s) illustrating how the linearized model can be used to rapidly screen permeation data are available online at http://circle4.com/rink-nelson/

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