

Abstract Submitted
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Multidrug efflux transporter activity in sea urchin embryos: Does localization provide a diffusive advantage? XIANFENG SONG, SIMA SETAYESHGAR, Department of Physics, Indiana University, Bloomington, BRYAN COLE, AMRO HAMDOUN, DAVID EPEL, Hopkins Marine Station, Stanford University, Pacific Grove — Experiments have shown upregulation of multidrug efflux transporter activity approximately 30 min after fertilization in the sea urchin embryo [1]. These ATP-hydrolyzing transporter proteins pump moderately hydrophobic molecules out of the cell and represent the cell's first line of defense against exogenous toxins. It has also been shown that transporters are moved in vesicles along microfilaments and localized to tips of microvilli prior to activation. We have constructed a geometrically realistic model of the embryo, including microvilli, to explore the functional role of this localization in the efficient elimination of toxins from the standpoint of diffusion. We compute diffusion of toxins in extracellular, membrane and intracellular spaces coupled with transporter activity, using experimentally derived values for physical parameters. For transporters uniformly distributed along microvilli and tip-localized transporters we compare regions in parameter space where each distribution provides diffusive advantage, and comment on the physically expected conditions. [1] A. M. Hamdoun, G. N. Cherr, T. A. Roepke and D. Epel, *Developmental Biology* **276** 452 (2004).

Xianfeng Song
Department of Physics, Indiana University, Bloomington

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