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# Antiparallel EmrE exports drugs by exchanging between asymmetric structures

Emma A. Morrison, Gregory T. DeKoster, Supratik Dutta, Reza Vafabakhsh, Michael W. Clarkson, Arjun Bahl, Dorothee Kern, Taekjip Ha & Katherine A. Henzler-Wildman

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*Nature* **481**, 45–50 (05 January 2012) | doi:10.1038/nature10703

Received 20 January 2011 | Accepted 07 November 2011 | Published online 18 December 2011

## Abstract

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Small multidrug resistance transporters provide an ideal system to study the minimal requirements for active transport. EmrE is one such transporter in *Escherichia coli*. It exports a broad class of polyaromatic cation substrates, thus conferring resistance to drug compounds matching this chemical description. However, a great deal of controversy has surrounded the topology of the EmrE homodimer. Here we show that asymmetric antiparallel EmrE exchanges between inward- and outward-facing states that are identical except that they have opposite orientation in the membrane. We quantitatively measure the global conformational exchange between these two states for substrate-bound EmrE in bicelles using solution NMR dynamics experiments. Förster resonance energy transfer reveals that the monomers within each dimer are antiparallel, and paramagnetic relaxation

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[1]Morrison, E. A., DeKoster, G. T., Dutta, S., Vafabakhsh, R., Clarkson, M. W., Bahl, A., . . . Henzler-Wildman, K. A. (2012). Antiparallel EmrE exports drugs by exchanging between asymmetric structures. [10.1038/nature10703]. *Nature*, 481(7379), 45-50. doi: <http://www.nature.com/nature/journal/v481/n7379/abs/nature10703.html#supplementary-information>