

Abstract Submitted
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Preprotein translocation across the endoplasmic reticulum membrane in milieus crowded by proteins JOSÉ ANTONIO VÉLEZ, ORLANDO GUZMÁN, Universidad Autónoma Metropolitana Iztapalapa, FERNANDO NAVARRO, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional — Translocation of preproteins chains between the cytoplasm and the endoplasmic reticulum lumen takes place in a milieu crowded primarily by proteins. We compute translocation and retrotranslocation times for chains of different length in a milieu crowded by spherical agents at volume fractions equivalent to that found in cells. These numerical times obtained from a diffusion-equation model subject to a potential given by the free energy of one chain, indicate that crowding increases the translocation time by up to five times compared to those in dilute conditions for average-size chains and by up to a thousand times for long chains. Retrotranslocation times become smaller than translocation ones, in approximately 75%. Translocation rates obtained in this work are similar to those found in a theoretical model for Brownian-ratchet translocation and coincide with in vitro experimental results (1-8 aminoacid/s) only in the limit of very long chains; for shorter chains, translocation rates are much faster. Our prediction that for long chains translocation rates would be significantly slowed by crowding can be tested experimentally using vesicles. Discrepancy of time-scales with experiments for short chains indicates that other factors beside crowding must be included in our model.

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