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Translocation dynamics of pre-packaged polymers CHANDRA BERGMANN, AJAY GOPINATHAN, UC Merced — Cells contain polymers such as proteins and nucleic acids that, in many cases, translocate through pores only after being more tightly packaged by transport factors with an affinity for the inside of the pore. Examples include the export of large mRNA complexes and the import of the HIVgenome through the nuclear pore complex. Here, we use a Fokker-Planck formalism to model how the properties of these transport factors affect the time of translocation. In the simplest models, translocation time decreases as both the packaging fraction and transport factor affinity increase. If we take into account that the diffusion constant of the polymer is reduced both by increasing the packaging fraction and increasing the affinity of the transport factor with the pore interior, we are able to identify optimal and sub-optimal regimes of the parameter space, where deviations from the optimal regime can increase the time of polymer translocation drastically. In vivo, our results suggest that transport factor properties need to be carefully tuned to lie in the optimal regime in order to ensure function and that making relatively small changes to these properties can interfere with or enhance translocation.

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