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Engineering Analysis and Control of Transport Across the Intestinal Mucosal Barrier

By

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Transport phenomena in the intestinal lumen are highly significant to effective oral drug delivery, nutrient absorption, and interactions between microbes and intestinal tissue. Our laboratory is studying the impact of ingested materials, such as lipids in drug delivery systems or food, on transport and overall absorption of orally delivered compounds. Our approach includes mechanistic studies paired with systems-based models of processes key to overall oral absorption, including dissolution and permeation through intestinal membranes. Quantitative mechanistic understanding of transport phenomena in the drug delivery environment is critical to rational design of drug delivery systems enabling oral delivery of agents that may otherwise require injection. One aspect of permeation through the intestinal membrane, transport through mucus, is being investigated in detail. Results to date highlight the dependence of mucosal permeation on physical and chemical properties of penetrating material (drug, particle, microbe) as well as the significance of intestinal lumen contents in altering the mucus barrier. Our findings suggest that mild stimuli, such as those presented by food, can modulate the intestinal barrier, for example to impact oral drug delivery or microbial invasion.

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