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Hydrodynamic Enhancements of Dissolution from Drug Particles: *In vivo* vs. *In vitro* JAMES BRASSEUR, Penn State, YANXING WANG, Georgia Tech — Absorption of drug molecules into the blood stream is generally limited by dissolution-rate in the intestines. Dissolution occurs via diffusion enhanced by a response to the hydrodynamic flow environment, a process that is very different in the human intestine than in a USP-II dissolution apparatus, commonly used by drug companies to validate new drug formulations. Whereas *in vivo* hydrodynamics are driven by the motility of intestinal wall muscles, the USP-II apparatus is a rotating paddle to mix drug particles during dissolution testing. These differences are of current interest to agencies that regulate drug product development. Through lattice-Boltzmann-based computer simulation of point particles transported through human intestine, we analyze the hydrodynamic parameters associated with convection that quantify the extent to which *in vitro* dissolution tests are or are not relevant to *in vivo* hydrodynamics. . We show that for drug particles less that ˜100-200 microns, effects of convection are negligible in the intestines. However, we discover a previously unappreciated phenomenon that significantly enhances dissolution-rate and that distinguishes *in vitro* from *in vivo* dissolution: the fluid shear rate at the particle. *Supported by NSF and AstraZeneca.*

[X] Prefer Oral Session
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