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Transversal mixing in the gastrointestinal tract DMITRI VAINCHTEIN, PERRY ORTHEY, HENRY PARKMAN, Temple University — We discuss results of numerical simulations and analytical modeling of transversal intraluminal mixing in the GI tract produced by segmentation and peristaltic contractions. Particles that start in different parts of the small intestine are traced over several contractions and mixing is described using the particles' probability distribution function. We show that there is optimal set of parameters of contractions, such as the depth and frequency, that produces the most efficient mixing. We show that contractions create well-defined advection patterns in transversal direction. The research is inspired by several applications. First, there is the study of bacteria populating the walls of the intestine, which rely on fluid mixing for nutrients. Second, there are gastrointestinal diseases, such as Crohns disease, which can be treated effectively using a drug delivery capsule through GI tract, for which it is needed to know how long it takes for a released drug to reach the intestinal wall. And finally, certain neurological and muscular deceases change the parameters of contractions, thus reducing the efficiency of mixing. Understanding an admissible range of the parameters (when mixing is still sufficient for biological purposes) may indicate when the medical action is required.

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