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New dynamic digestion model reactor with simulated gastrointestinal function

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A new dynamic model with simulated gastrointestinal function was designed by using elastic and contractile silica gel with gastrointestinal rugae and folds to simulate the stomach and the large intestine and using silica gel with intestinal folds and villi to simulate small intestines. The mixing time of Newtonian fluid and non-Newtonian fluid was compared and analyzed. When using dynamic model reactor, the time needed for mixing Newtonian fluid with Reynolds number at 1-2000 and non-Newtonian fluid with Reynolds number at 1-100 was shorter compared with using traditional Stirred Tank Reactor (STR). The gastric pressure of the stomach at different digestion phases (20-220 mm Hg) can be simulated by adopting different motion models. A maximum force of 0.72 N was tested by using agar beads. The folds and villi designed to simulate the tract increased the surface area of small and large intestine walls by 112% and 52% respectively, greatly improving the mixing and grinding effects and the water and nutrients absorption of gastrointestinal tract.

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