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A Gastro-Intestinal Model for a Rational Design of in vitro Systems to Study Drugs Bioavailability

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Abstract : This work focuses on a mathematical model able to describe the gastro-intestinal physiology and providing a rational tool for the design of an artificial gastro-intestinal system. This latter is mainly devoted to analyse the absorption and bioavailability of drugs and nutrients through in vitro tests in order to overcome (or, at least, to partially replace) in vivo trials. The provided model realizes a conjunction ring (with extended prediction capability) between in vivo tests and mechanical-laboratory models emulating the human body. On this basis, no empirical equations controlling the gastric emptying are implemented in this model as frequent in the cited literature and all the sub-unit and the related system of equations are physiologically based. More in detail, the model structure consists of six compartments (stomach, duodenum, jejunum, ileum, colon and blood) interconnected through pipes and valves. Paracetamol, Ketoprofen, Irbesartan and Ketoconazole are considered and analysed in this work as reference drugs. The mathematical model has been validated against in vivo literature data. Results obtained show a very good model reliability and highlight the possibility to realize tailored simulations for different couples patient-drug, including food adsorption dynamics.

Keywords : gastro-intestinal model, drugs bioavailability, paracetamol, ketoprofen
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