

Inverse Problem for an intestinal crypt model

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Abstract. We consider an intestinal crypt model including microbiota-derived regulations. The simplified model considers a coupled system of 2 degenerate parabolic equations with cross diffusion whose unknowns are the density of progenitor cells (pc) and stem cells (sc). Additionally, the density of deep crypt secretory (DCS) cells acts as a function that we can assume to be known and that is known to affect the population dynamics in the crypt. The inverse problem consists in determining the parameters that define the shape of the density function of the DCS cells (slopes and position), from partial measurements of stem and progenitor cells. For this, we propose a classical method of adjoint state.

The general intestinal crypt model (considering 4 cell types) was introduced by Beatrice Laroche from INRAE, France, and her PhD student Marie Haghebaert who has used BGK schemes to successfully simulate the dynamics of the phenomenon.