

Mathematical modelling of hysteresis in the epithelial-mesenchymal transition

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Cancer progression is facilitated by a reversible process known as epithelial-mesenchymal transition (EMT), where epithelial cells transform into mesenchymal cells. Building upon recent findings, our objective is to shed more light on the process and to explain the hysteretic dynamics of reverse transformation following varying exposure of cells to Transforming Growth Factor Beta (TGF- β) [1]. The model is based on differential equations and includes the interactions between key molecular players including ZEB1/2, MicroRNA-200, and E-cadherin. We introduce a distributed delay kernel to represent biological delays better and investigate the effects of short versus prolonged TGF- β exposures on the reversibility of EMT.

References

- [1] Celiá-Terrassa, T., Bastian, C., Liu, D.D. et al., *Hysteresis control of epithelial-mesenchymal transition dynamics conveys a distinct program with enhanced metastatic ability.*, Nat Commun 9, 5005 (2018)

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