Identifying the key control parameters driving collective multicellular signaling and pattern formation

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One of the key outstanding challenges in understanding coordinated multicellular pattern formation is identifying what single cells tune within themselves to change population-wide patterns. A major driver of multicellular patterns is oscillations in single-cell signaling networks, but it is unknown what features single cells naturally modulate in these oscillations to change global patterns. An ideal system for addressing this challenge exists in the social amoeba, *Dictyostelium discoideum*. *Dictyostelium* uses travelling waves of cyclic AMP as a chemoattractant between cells to drive aggregation into a multicellular state when starving. These waves originate within single cells that release cyclic AMP to the environment, and the single-cell signaling network phenomena that drive the creation of these waves are well-characterized[1]. Using new experimental data in conjunction with an existing phenomenological model[1,2], I explore what parameters single cells can modulate to control the properties of these signaling oscillations and the patterns they coordinate.

REFERENCES

[1] Sgro AE, et al. (2015) From intracellular signaling to population oscillations: bridging size- and time-scales in collective behavior. *Mol. Syst. Biol.* **11**, 779.

[2] Noorbakhsh J, et al. (2015) Modeling oscillations and spiral waves in *Dictyostelium* populations. *Phys. Rev. E* **91**, 062711.

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