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The Study of Elongation – Idea Notes

~~Perhaps could select for the empty (no DNA) bacterial capsules using the chain bacteria (Goksor 2003) – Mass production of bacterial capsules~~

~~Only the ones that have viable DNA parts are the ones that can age and die~~

~~Use finite number idea with (high) plasmid copy number → select after a time fastest growers to keep growing by separating the plasmids from the nuclear DNA or the needed TF~~

~~How would you visualize that you are selecting for the longest growers?~~

Goksor 2003 – there are large anucleate regions in the cellular compartments, but none of the data show completely anucleate compartments – some DNA is just clustered really close to the septum. So I don't think there could be any selection for empty bacterial capsules.

Or study elongation for the sake of better understanding the compartmental separation of bacterial elements (at least in this mutant chain species)

Other Ideas:

Study growth patterns in different media (Goksor tried in minimal media, Cooper 1989 discusses increased growth rate & overshoot when transfer to rich media)

See if you could get bacterial chains to act like nerve impulses – get a quorum sensing reaction down the chain – work into finite number effect with plasmid copy number/TF availability (Lux components on plasmid)

Usefulness?

How would you visualize this? (on um scale)

Proposal Outline II for Elongation

I. Introduction
   a. The purpose of this study is to explore elongation in the growth of bacterial cells with respect to stochastic behaviour and prokaryotic aging.
   b. A particular aim is to develop a method to control growth rate in an elongating strain of *E. coli* by utilizing biological noise – define (variation in gene expression in genotypically identical cells)
   c. The most notable manifestation of noise is the finite-number effect – with a smaller number of molecules affecting protein abundance in a compartment, noise increases

II. The mutant - description
    a. *E. coli* mutant ftsK15Δ1264–1329 lack part of the cytoplasmic domain of the FtsK transmembrane protein
    b. FtsK – septum formation and chromosome segregation (Goksor 2003), stationary phase survival and salt stress adaptation (Diez AA, Farewell A, Nannmark U, Nystrom T. (1997). A mutation in the ftsK gene of Escherichia coli affects cell-cell separation, stationary-phase survival, stress adaptation, and expression of the gene encoding the stress protein uspA. J Bacteriol 179: 5878 – 83.)
    c. Although division occurs at the wild-type rate in the ftsK mutants, dividing cells fail to properly fuse septum membrane to complete cell division and form two separate cells. Instead, this mutant forms fully septated chains of cell equivalents with separate cytosolic compartments. (Goksor 2003).
    d. While *ftsK::cat* mutant chains are restrict growth to a maximum of four cell equivalents, the *ftsK15Δ1264–1329* mutant chains are frequently longer (Goksor 2003)