

Integrating symbiotic relationship into *Escherichia coli*

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Microorganisms are routinely used to synthesize drugs and other useful compounds. Many compounds are synthesized in a series of steps, and using multiple microorganisms may represent a more efficient strategy. However, such co-cultures are frequently difficult to maintain in a continuous process because one species tends to dominate over the others. One potential solution is to artificially make all species dependent on one another for survival, so that all must remain in the culture.

Here we created two *E. coli* strains that need each other for survival. Each species synthesizes a different signaling molecule that is needed by the other in order to manufacture the proteins they each need for antimicrobial resistance. This was accomplished by constructing plasmids with the gene cassettes shown here.

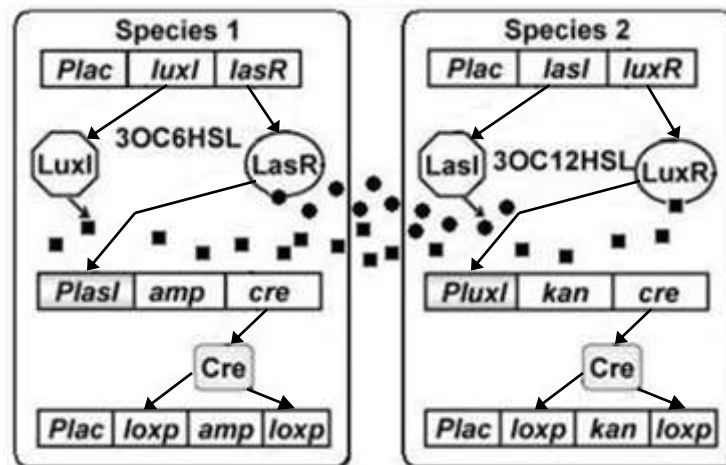


Figure: Blueprint of plasmids in ecosystem. The cre protein excises the DNA between the loxp sites. Thus following activation species 1 can no longer resist ampicillin, and species 2 can no longer resist kanamycin, without the respective inducer molecule synthesized by the opposite species. Adapted from: Kambam, P.K.R., Henson, M.A., and Sun, L.: *IET Syst. Biol.*, 2008.