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In This Issue

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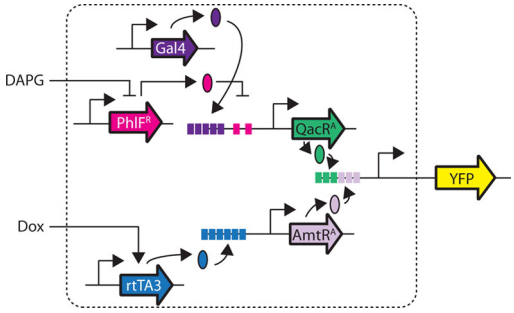
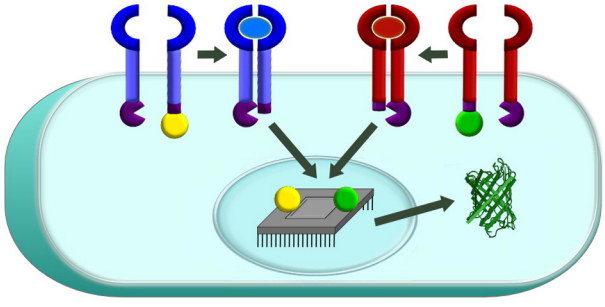
SYSTEMATIC TRANSFER OF PROKARYOTIC SENSORS AND CIRCUITS TO MAMMALIAN CELLS



Harnessing the full potential of engineering mammalian cells requires the construction of predictable synthetic sensors and circuits. Prokaryotic regulatory proteins respond to a several different signals and represent a rich resource for building these sensors and circuits. In this work, Stanton *et al.* (DOI: 10.1021/sb5002856) systematically convert multiple prokaryotic repressor proteins into potent mammalian transcriptional activators and repressors.

Furthermore, the authors configure these regulators to build both sensors and circuits in multiple cell types including both human embryonic kidney (HEK293) and Chinese hamster ovary (CHO) cells.

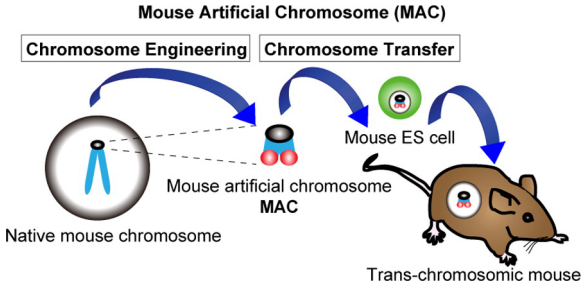
MODULAR EXTRACELLULAR SENSOR ARCHITECTURE FOR ENGINEERING MAMMALIAN CELL-BASED DEVICES



Engineering mammalian cells for therapeutic applications requires technologies for robustly interfacing engineered mammalian cell functions with host physiology. Here, Daringer *et al.* (DOI: 10.1021/sb400128g) describe a technology that addresses a key gap in the synthetic biology toolbox—a platform for engineering cells to sense exclusively extracellular cues, which include cytokines, chemokines, and other molecules that are important indicators of health and disease states.

The technology described here comprises a self-contained sensing and signal transduction platform, which maximizes orthogonality to native cellular processes. Additionally, the modular design and quantitative characterization described in this manuscript should enable other researchers to readily (a) develop engineered receptors that respond to novel ligands of interest and (b) couple this receptor technology to other intracellular synthetic biology technologies for implementation in a range of mammalian cellular contexts.

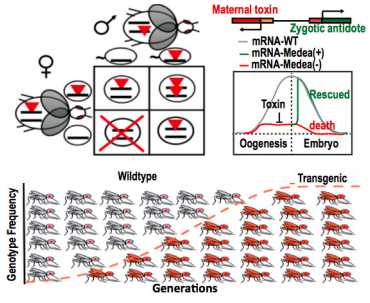
A NOVEL AND STABLE MOUSE ARTIFICIAL CHROMOSOME VECTOR



Toward a tool for mouse transgenesis, Takiguchi *et al.* (DOI: 10.1021/sb3000723) report the construction of the first mouse artificial chromosome vectors, with a native centromere from a natural mouse chromosome, using chromosome engineering technology.

These mouse artificial chromosome vectors are present independently of host mouse chromosomes, stable in mouse tissues, transmitted through the germline, and function as gene delivery vectors. Thus, these vectors have the potential to be powerful tools for gene function analysis and the production of humanized mice.

A THEORETICAL EXPLORATION OF *MEDEA*-DEPENDENT POPULATION SUPPRESSION



Replacement of wild insect populations with genetically modified individuals unable to transmit disease provides a potentially self-perpetuating method of disease prevention. However, because genes that mediate disease refractoriness are not expected to confer a fitness benefit to carriers, a gene drive mechanism is needed to spread these genes to high frequency. Here, Akbari *et al.* (DOI: 10.1021/sb300079h) describe novel *Medea* synthetic selfish genetic elements able to drive population replacement in *Drosophila* through manipulation of two different signaling pathways.

In addition, the authors use modeling to show how *Medea* selfish genetic elements carrying genes that result in environmental cue-dependent female lethality could be used to bring about population suppression or eradication following population replacement.

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