Creating Synthetic Genome Switches to Control Cell Fate

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The ability to convert cells into desired cell types enables tissue engineering, disease modeling, and regenerative medicine; however, methods to generate desired cell types remain difficult, uncertain, and laborious. We developed a strategy to design gene switches that trigger cell fate changes. The synthetic molecules used in this study cooperatively bind DNA and activate genes in a synergistic manner. Subsequent identification of cell-fate defining transcriptional networks does not depend on prior knowledge. This powerful chemical-genomic approach enables direct cell state conversions as well as other challenging manipulations of cell fate.