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Modular RNA-based RNA sensors utilizing ADAR editing

Stanford researchers have developed ModulADAR - a novel RNA sensing platform that enables precise, cell-type or state-specific activation of mRNA expression using ADAR editing, offering unparalleled flexibility and specificity for targeted RNA therapeutics.

Targeting specific cell types or states within complex mixtures of cells is a significant challenge in research and medicine. Current methods for targeting cells often lack the precision required to manipulate subsets of cells, such as cancerous or immune cells. This lack of specificity hinders the development of advanced therapies that could precisely eliminate pathogenic cells or modify specific cell populations for therapeutic purposes, such as in cancer treatment or immune cell therapies. Additionally, current RNA-based technologies often lack the flexibility to respond to multiple RNA inputs, limiting their utility in a broad range of applications.

To address this challenge, Stanford researchers have developed ModulADAR, a novel solution that enables precise control of gene expression triggered by specific RNA sequences, allowing for the targeted manipulation of cells based on their type or state. This technology uses a modular RNA sensing system that incorporates ADAR editing, enabling the activation of mRNA translation only in the presence of predefined RNA triggers. This selective expression mechanism allows for the targeted activation in specific cell types or states, such as tumor cells or immune cells in vivo. Moreover, this modular system removes previous sequence constraints and provides greater flexibility, sensitivity, and specificity. This innovation opens new possibilities for developing precise RNA therapeutics and advancing research in molecular biology, cancer treatment, and immunology.

Stage of Development:

Research - in vitro

Applications

- Targeted RNA therapeutics
- RNA level measurement in living cells

Advantages

- Measures RNA expression in living cells with high precision
- Removes the need for rigid sequence constraints
- Modular and scalable platform
- Broad applicability across diverse cell types and states.
- Improved sensor features result in increased ADAR editing efficiency

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