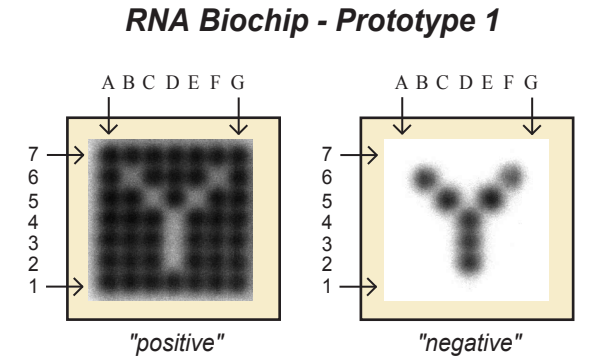
Breaker Laboratory

Molecule of the Year 2000

RNA Biochips

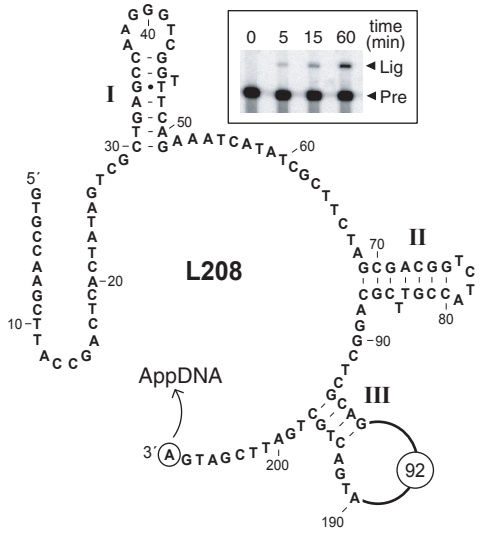
Fig. 1. An array of RNA molecular switches constructed using seven distinct effector-modulated riobzymes based on the hammerhead self-cleaving ribozyme.



Rows 1-7: RNA switches AR1-AR7. Columns A-G: (-); T; F; cA, cC, cG; F; T; (-). (-) = no effector; T = theophylline; F = flavin mononucleotide; cA = 3',5'-cyclic AMP; cC = 3',5'-cyclic CMP; cG= 3',5'-cyclic GMP.

Ligase Deoxyribozymes

Fig. 2. Structure and activity of a deoxyribozyme with DNAligase activity. AppDNA is a deoxyribozyme that first self-adenylates using ATP, and subsequently serves as the substrate for the L208 ligase deoxyribozyme.



In recognition of the construction of the first RNA biochip and in recognition of the isolation of the first ATP-dependent self-ligating DNA, the status of Breaker Laboratory "Molecule of the Year" has been jointly conferred upon these two systems.

Biopolymer array technologies are proving to be of enormous utility in basic research and in commercial applications that require massive-parallel analysis of analytes. RNA biochips that are comprised of analyte-responsive ribozymes offer new potential for the analysis of complex chemical and biological mixtures for "metabolomics" or "zomics" applications. Similarly, DNA molecules that catalyze their own ligation could be adapted for the construction of "smart" DNA biochips that function as next-generation biosensors. The L208 deoxyribozyme depicted above, which operates via a T4 DNA ligase-like mechanism, could be adapted to function as a molecular switch like its RNA counterpart or even to serve as a subdomain of complex "DNA nanoprobes".

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