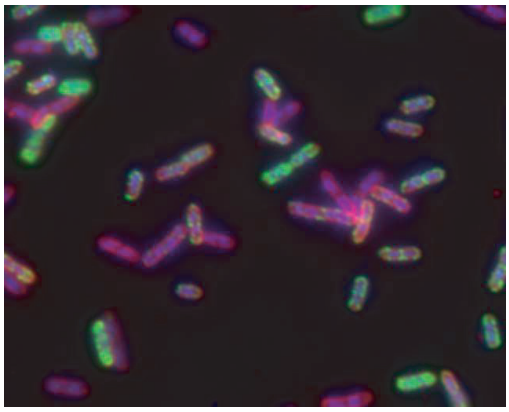
Breaker Laboratory

Molecule of the Year 2010

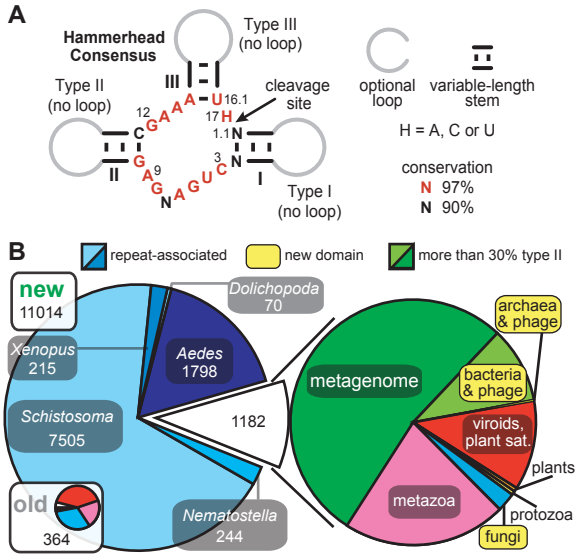
Membrane Phenotypes for OLE

Fig. 1. Image of OLE RNAs associating with bacterial membranes. Depicted is an image of a membrane stain (red) merged with an image of a fluorescent probe for OLE RNA (green) in Bacillus subtilis cells expressing both OLE RNA and OAP protein. OLE RNA is largely located at the periphery of cells.



Variant Hammerhead Ribozymes

Fig. 2. (A) Consensus sequence and secondary structure of hammerhead ribozymes. (**B**) Distribution of hammerheads.



In recognition of the discovery that OLE RNAs associate with membranes[1] and the loss of OLE RNA causes ethanol sensitivity[2], and in recognition of the discovery of ~30-fold more hammerhead ribozymes[3], the status of Breaker Laboratory "Molecule of the Year" is conferred upon these findings.

OLE RNA is one of a number of large noncoding RNAs recently discovered in bacteria that likely have complex biochemical functions. The discovery that OLE RNAs are localized to membranes and that its deletion causes sensitivity to ethanol implicates this RNA as important for membrane biochemistry in extremophilic bacteria. Such findings reinforce the hypothesis that other large noncoding RNAs will also have surprising functions. On the opposite end of the spectrum is the long-studied hammerhead class of self-cleaving ribozymes. This RNA was known to have a small and highly-conserved catalytic core that uses accessory structures to stabilize its active state. Our bioinformatics searches have revealed the existance of more than 10,000 examples of this RNA class in all three domains of life, including examples in fungi and mammals. Furthermore, new-found variants (e.g. type II architectures) and supportive tertiary contacts (e.g. pseudoknots) have been identified, which reveals the true functional and structural diversity of this ribozyme class.

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1. *K. F. Block, E. Puerta-Fernandez, J. G. Wallace and R. R. Breaker. Association of OLE RNA with bacterial membranes via an RNA-protein interaction. Mol. Microbiol. (in press).*

2. *J. G. Wallace, Z. Zhou and R. R. Breaker (unpublished data).*

3. *J. P. Perreault et al. Identification of hammerhead ribozymes in all domains of life reveals novel structural variations. (submitted).*