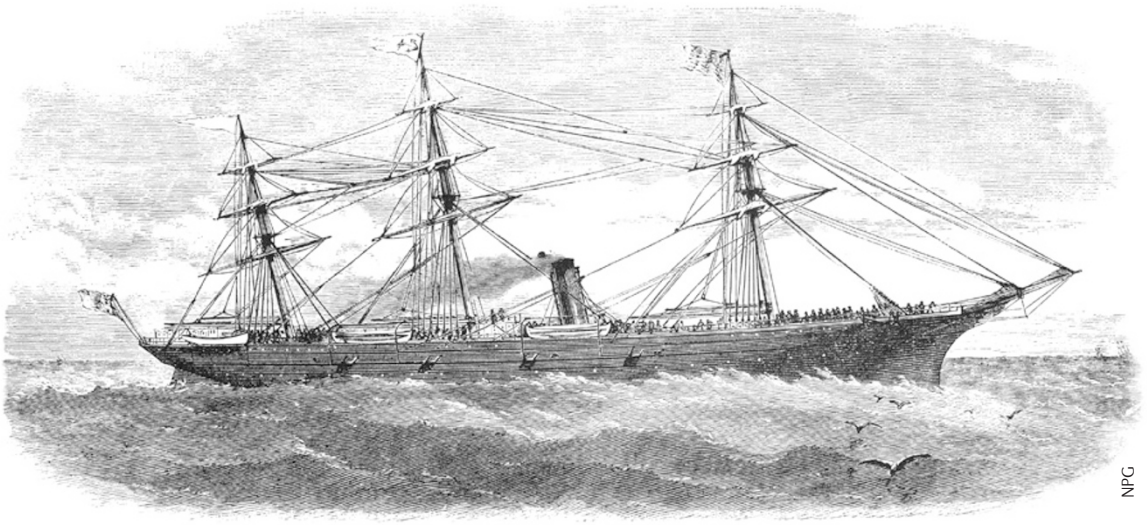

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BACTERIAL PHYSIOLOGY

Bacterial argonaute sets sail

In eukaryotes, argonaute proteins have important roles in small RNA-mediated gene silencing. In a recent issue of *Molecular Cell*, Alexei Aravin and colleagues demonstrate a role for a bacterial argonaute protein in silencing foreign nucleic acids.

Argonaute proteins have been identified in a range of bacteria and archaea. Although several crystallographic structures have been made available, and there has been a preliminary characterization of the substrate-binding properties of some bacterial argonaute proteins, few experimental insights into their *in vivo* biological functions have been gained thus far.

The authors were interested in the nucleic acid-binding properties of the argonaute protein from *Rhodobacter sphaeroides* and began by expressing and purifying the protein, before characterizing the bound nucleic acids. Two distinct fractions of bound nucleic acids were detected: a fraction of small RNAs, which were mostly 15–19 nucleotides in length, and a fraction of small DNAs, which were mostly 22–24 nucleotides in length.

Cloning and sequencing of the argonaute-bound RNAs (which the authors refer to as DNA-interacting RNAs (diRNAs)) highlighted a strong bias towards RNAs that had uridine at the first position — a feature that is also present in many of the small RNAs bound by eukaryotic argonaute proteins. The authors found that the diRNAs mapped to the majority of the sense transcripts from the *R. sphaeroides* chromosomes and endogenous plasmids, in addition to showing a strong bias towards the argonaute expression plasmid. There was no evidence of a preference for a particular primary or secondary structure in the RNA precursor. This suggests that diRNAs are either directly derived from mRNAs or are derived from the products of mRNA degradation.

A similar in-depth analysis of the *R. sphaeroides* argonaute-bound 22–24 nucleotide small DNA fraction (which the authors refer to as RNA-interacting DNAs (riDNAs)) was then carried out. The riDNAs were complementary to the diRNAs and, similarly to the diRNAs, mapped to the *R. sphaeroides* chromosomes and endogenous plasmids, although they showed a stronger bias towards the argonaute expression plasmid than the diRNAs. Further analysis of the riDNAs showed enrichment for multi-copy transposon and phage genes.

To investigate the ability of the argonaute protein to recognize foreign nucleic acids, the authors used *Escherichia coli* as a heterologous host and found that expression of *R. sphaeroides* argonaute reduced the yield of the expression plasmid and resulted in the degradation of plasmid DNA. Comparative analysis of the transcriptomes of wild-type and argonaute-deficient *R. sphaeroides* showed no difference in overall gene expression; however, when a plasmid that expressed luciferase and LacI was introduced into the *R. sphaeroides* argonaute-deficient strain, there was a twofold increase in the levels of the luciferase and LacI transcripts, which suggests that *R. sphaeroides* argonaute can repress gene expression from an exogenous plasmid.

Clearly, there is a long way to go to refine the details of the molecular mechanisms involved, but this study provides the first experimental evidence to support the hypothesis that bacterial argonaute proteins target foreign nucleic acids.

Sheilagh Molloy

> “*R. sphaeroides* argonaute can repress gene expression from an exogenous plasmid”

ORIGINAL RESEARCH PAPER Olovnikov, I. *et al.* Bacterial argonaute samples the transcriptome to identify foreign DNA. *Mol. Cell* **51**, 594–605 (2013)