6S RNA

A RNA template for the DNA dependent RNA polymerase

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Introduction: History of 6S RNA

- 1967: identified in E. coli
- 1985: no obvious growth defects
- 2000: accumulation during stationary phase
- 2004: overexpression leads to inhibition of transcription
- 2005: specific binding of 6S RNA to RNAP¹
- 2005: conserved in many bacteria
- 2006: RNA synthesis similar to DNA-templated transcription²
- 2006: release of RNAP when 6S RNA:pRNA duplexes are formed



¹RNAP = RNA polymerase

²6S RNA templated transcripts are called pRNAs









































Deep sequencing of pRNAs

poly(A) library

Length	Reads	Sequence
14	35	GUUCGGUCAAAACU
13	48	GUUCGGUCAAAAC
8-12	492	GUUCGGUCaaaa
7	7	GUUCGGU



Illumina sequencing (RNAs \leq 200 nt) from B. subtilis

Deep sequencing of pRNAs

poly(A) library

Length	Reads	Sequence
14	35	GUUCGGUCAAAACU
13	48	GUUCGGUCAAAAC
8-12	492	GUUCGGUCaaaa
7	7	GUUCGGU



poly(C) library

14	109	GUUCGGUCAAAACU
12-13	97	GUUCGGUCAAAAc
11	253	GUUCGGUCAAA
10	368	GUUCGGUCAA
9	497	GUUCGGUCA

7-8 200 GUUCGGUc



Illumina sequencing (RNAs \leq 200 nt) from *B. subtilis*

3D model



Source: Steuten et al., 2014

3D model open conformation

closed conformation









Source: Wikipedia

















length longest axis length shortest axis

= Measure for Bend





 $\mathsf{LNA}=\mathsf{modified}\ \mathsf{RNA}$ that binds much more tightly

6S RNA paralogs in Firmicutes





Source: Wehner et al., 2014

6S-2 RNA in B. subtilis



6S-2 RNA - sequence and structure conservation



6S-2 RNA - is a bona fide 6S RNA

Similarities

- conserved structure
- conserved pRNA sequences
- inhibition of transcription from DNA promoters
- pRNA transcription

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Differences

- accumulates in exponential phase (rather than stationary)
- less efficient pRNA transcription
- 6S-2 RNA:pRNA hybrids are less stable

Thank you

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