
Contents

Small Regulatory RNAs in Bacteria

E. G. H. WAGNER, F. DARFEUILLE	1
1 Introduction	1
2 Searches and Discovery of sRNAs	2
2.1 The Early Years	3
2.2 Modern-Day sRNA Gene Searches	4
3 The Old and New Ones—Biological Functions	5
3.1 Many sRNAs Are Involved in Stress Response Regulation	7
4 What's Out There in Other Bacteria?	13
4.1 Regulation of Virulence	13
4.2 sRNAs and Quorum Sensing	14
4.3 Other Non <i>E. coli</i> sRNAs	15
5 Mechanisms: Antisense and Protein Sequestration	15
5.1 Antisense: <i>cis</i> -Versus <i>trans</i> -Encoded	16
5.2 Antisense: Sites of Action—Common Themes	17
5.3 Antisense: Mechanisms of Inhibition— Common Themes?	18
5.4 Antisense: Protein Helpers Required, And for What?	19
5.5 Antisense: the Specificity Problem	20
6 Concluding Remarks	23
References	25

Small Nucleolar RNAs: Identification, Structure, and Function

F. SÖDERBOM	31
1 Introduction	31
2 Experimental Isolation of ncRNAs	32
2.1 Specific Isolation	32
2.2 General Isolation	33
3 Computational Approaches to Find ncRNAs	34
4 Small Nucleolar RNAs	35
4.1 Box C/D snoRNAs	37
4.2 Box H/ACA snoRNAs	38
5 Small Cajal-Body-Specific RNAs	40

6	Protein Association and Function	41
6.1	Box C/D snoRNPs	41
6.2	Box H/ACA snoRNPs	42
7	Genomic Organization	43
8	Modification Guide RNAs—Targets and Function	45
9	Conclusion and Future Perspective	46
	References	47

A Computational Approach to Search for Non-Coding RNAs in Large Genomic Data

S. GRÄF, J.-H. TEUNE, D. STROTHMANN, S. KURTZ, G. STEGER	57
1 Introduction	57
2 Probability of Patterns	60
3 Design and Refinement of Patterns	62
4 Searching Patterns in Large Sequence Sets	68
5 WWW Tools	70
References	72

Experimental Strategies for the Identification and Validation of Target RNAs that Are Regulated by miRNAs

A. BOUTLA, M. TABLER	75
1 Introduction	76
1.1 History	76
1.2 Biogenesis	76
1.3 Computer Prediction	78
1.4 Families of miRNAs	78
1.5 Target Prediction by Data Base Search	79
1.6 Genetic Identification	79
1.7 Experimental Strategies for Target Identification	79
2 Post-Transcriptional Inhibition of miRNA Function by Antisense Sequences	80
3 Direct Identification of Target mRNA by a PCR Strategy Mimicking the miRNA Interaction	84
4 Validation of miRNA/mRNA Target Pairs by Sensor Constructs	85
5 Concluding Remarks	87
References	87

Protein Interactions with Double-Stranded RNA in Eukaryotic Cells

C. HAMMANN	91
1 Introduction	91

2	Occurrence and Origin of Cellular Double-Stranded RNA . .	92
2.1	Database Searches for Antisense RNA and Experimental Validation	92
2.2	Structural Features of Double-Stranded RNA	94
3	Protein Interactions	96
3.1	Protein Domains Interacting with Double-Stranded RNA	96
3.2	Molecular Architecture of dsRBD-Containing Proteins	99
4	Cellular Response to Double-Stranded RNA	107
4.1	Nuclear Processes	107
4.2	Cytoplasmic Processes	110
	References	111

Transitive and Systemic RNA Silencing: Both Involving an RNA Amplification Mechanism?

A. BLEYS, H. VAN HOUDT, A. DEPICKER	119
1 Introduction	119
2 RNA-Dependent RNA Polymerases and RNA Amplification .	121
3 RNA Amplification and Transitive Silencing	122
3.1 Transitive Silencing in <i>C. elegans</i>	122
3.2 Transitive Silencing in Plants	124
3.3 Transitive Silencing in Fungi	127
4 RNA Amplification and Systemic Silencing	128
4.1 Systemic Silencing in Plants	128
4.2 Systemic Silencing in <i>C. elegans</i>	132
5 Absence of Transitive and Systemic RNA Silencing in <i>Drosophila</i> and Mammals	133
References	135

RNA Interference and Antisense Mediated Gene Silencing

M. KUHLMANN, B. POPOVA, W. NELLEN		141
1	Introduction	141
2	Parts of the RNAi Machine	142
2.1	RNA-Directed RNA Polymerases	144
2.2	Multicopy Enhancers of RNAi	147
2.3	Inhibitors of Silencing	147
3	Antisense RNA Mediated Gene Silencing	149
4	Antisense RNA and RNAi	151
4.1	Small Interfering RNAs	151
4.2	RNA-Directed RNA Polymerases	151
4.3	HelF	152
5	Models	152
References		155

Epigenetic Silencing of Transposons

in the Green Alga *Chlamydomonas reinhardtii*

K. VAN DIJK, H. XU, H. CERUTTI	159
1 Introduction	159
2 Post-Transcriptional Gene Silencing	161
2.1 General Mechanisms	161
2.2 PTGS and Transposon Silencing	163
3 Transcriptional Gene Silencing	167
3.1 General Mechanisms	167
3.2 TGS and Transposon Silencing	169
4 Concluding Remarks	172
References	172

RNA-Dependent Gene Silencing and Epigenetics in Animals

M. PAULSEN, S. TIERLING, S. BARTH, J. WALTER	179
1 MicroRNAs and Small Interfering RNAs— Two Different Types of Small RNAs	179
2 Posttranscriptional RNAi	181
3 Developmental Gene Regulation by miRNA-Mediated RNAi	184
4 Epigenetic Gene Silencing	186
5 Small dsRNAs May Mediate Epigenetic Silencing of Genes	187
6 Epigenetic Silencing by Antisense Transcripts	189
7 Dose Compensation on Sex Chromosomes	191
8 The Role of <i>roX</i> RNAs in Dose Compensation in <i>Drosophila</i>	191
9 X Chromosome Inactivation in Mammals	192
10 Conclusions	194
References	195

Potentials of a Ribozyme-Based Gene Discovery System

M. SANO, K. TAIRA	201
1 Introduction	201
2 Randomized Ribozyme Libraries for Gene Discovery	202
3 Identification of Genes Involved in Hepatitis C Virus Internal Ribosome Entry Site Mediated Translation	205
4 Identification of Genes Involved in Cell Transformation	205
5 Identification of Genes Involved in the Pathway of Apoptosis	207
6 Identification of Metastasis-Related Genes	208
7 Identification of Genes Involved in Alzheimer's Disease	210
8 Conclusions	211
References	211

Subject Index	217
-------------------------	-----

Small RNAs:

Analysis and Regulatory Functions

Nellen, W.; Hammann, C. (Eds.)

2006, XII, 220 p., Softcover

ISBN: 978-3-540-74270-8