

## A. Riboswitches in Bacteria

What are riboswitches? How do they work? How do they control gene expression? How can they be identified in bacteria? Are there special motifs one can look for?

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## B. RNA Folding

What is RNA secondary structure? Why is it important? What is the idea behind the algorithms that predict secondary structures? What are the best tools available for predicting how RNA folds?

1. Eddy SR, "How do RNA folding algorithms work?" *Nat Biotechnol.* 2004 Nov;22(11):1457-8
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## C. Metagenomics

What is metagenomics? What is the Human Microbiome Project? How can it be used to study the "microbiome"? What tools and resources are available for studying microbiomes and to analyze large metagenomes?

1. Wooley JC, Godzik A, Friedberg I, "A primer on metagenomics," *PLoS Comput Biol.* 2010 Feb 26;6(2):e1000667.
2. Pennisi E, "Human genome 10th anniversary. Digging deep into the microbiome," *Science.* 2011 Feb 25;331(6020):1008-9.
3. Chen K, Pachter L, "Bioinformatics for whole-genome shotgun sequencing of microbial communities," *PLoS Comput Biol.* 2005 Jul;1(2):106-12.
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5. Erb-Downward JR, Thompson DL, Han MK, Freeman CM, McCloskey L, Schmidt LA, Young VB, Toews GB, Curtis JL, Sundaram B, Martinez FJ, Huffnagle GB, "Analysis of the lung microbiome in the "healthy" smoker and in COPD," *PLoS One.* 2011 Feb 22;6(2):e16384.

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## D. Pathogen Detection

What techniques, resources, and tools are available for pathogen detection and how does it relate to bioterrorism applications?

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- Zhou CE, Smith J, Lam M, Zemla A, Dyer MD, Slezak T, "MvirDB – a microbial database of protein toxins, virulence factors and antibiotic resistance genes for bio-defence applications," *Nucleic Acids Res.* 2007 Jan;35(Database issue):D391-4. Epub 2006 Nov 7.
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- Chen EC, Miller SA, DeRisi JL, Chiu CY, "Using a pan-viral microarray assay (Virochip) to screen clinical samples for viral pathogens," *J Vis Exp.* 2011 Apr 27;(50). pii: 2536. doi: 10.3791/2536.

## E. Horizontal Gene Transfer

What is horizontal gene transfer (HGT) in bacteria? How does it happen? What are its implications? How can they be detected? What resources and tools are available for the detection/prediction of HGT?

- Koonin EV, "Horizontal gene transfer: the path to maturity," *Mol Microbiol.* 2003 Nov;50(3):725-7.
- Olendzenski L, Gogarten JP, "Gene transfer: who benefits?" *Methods Mol Biol.* 2009;532:3-9.
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## F. Comparing Large Genomes

What tools, techniques and resources are available for aligning and comparing pairs of large sequences such as genomes? How about multiple sequence alignments of large sequences?

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## G. Reverse Vaccinology

How are vaccines designed? How can bioinformatic tools be used to perform *in silico* screening of genomes of pathogens to identify vaccine targets? What is reverse vaccinology? What tools are available?

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## H. Other topics?