Faculty Profile

Mentor: Juliane Soukup
Department: Chemistry/Biochemistry
Research Area: Examination of riboswitch RNA structure and function for the development of anti-biological agents

The Soukup laboratory has a general interest in the structure and function of non-coding RNAs, sequences in the genome that until recently were considered "junk". Dr. Soukup works on a specific group of non-coding RNAs called riboswitches, found in virtually all bacteria. Riboswitches are RNA structural elements that bind cellular metabolites and control expression of essential metabolic genes, providing a unique and distinct set of targets for development of new antibiotics for dangerous bacterial infections. When metabolites bind to riboswitch RNAs they induce a structural change that "switches" expression of a nearby gene off. The Soukup research group investigates exactly how bacterial riboswitches act through structure-function assays. This information allows for design of non-natural metabolites that bind these non-coding RNAs and upset normal riboswitch function. The Soukup laboratory is also interested in discovering new classes of riboswitches, particularly in eukaryotes. Although most riboswitches have been identified in bacteria and a few in plants, none have been identified in animals. The lab is currently characterizing a putative mammalian riboswitch by in-line probing, equilibrium dialysis, and additional biochemical analyses.

Keywords (Research Topics)
Noncoding RNA
Riboswitches
Metabolic gene expression
RNA structure-function assays
Antibiological drug development

Keywords (skills/techniques learned when conducting research)
RNA production • PCR, DNA/RNA purification by gel electrophoresis, DNA/RNA quantitation by UV absorbance
RNA biochemical structural characterization • In-line probing, equilibrium dialysis, isothermal titration calorimetry (ITC)
RNA biophysical structural characterization • X-ray crystallography, small angle X-ray scattering (SAXS)
Non-natural metabolite design, synthesis & purification
Minimum inhibitory concentration assays
Bacterial growth assays