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Title

Features of RNA 3D structures that constrain sequence variability

Abstract

RNA molecules form 3D structures with a variety of base-specific contacts including canonical Watson-Crick AU and GC basepairs, 12 types of non-canonical basepairs, and base-backbone interactions. The non-canonical interactions make networks which form hairpin loops, internal loops, and multi-helix junction loops within the secondary structure, plus long-range contacts that stabilize the 3D structure. Many of the loops and long-range contacts are recurrent motifs, and so may be present in new RNAs of interest. The base-specific interactions and motifs constrain sequence variability in known ways, which is important for understanding the effect of mutations on 3D structure and function. Conversely, patterns of variability in an alignment of sequences of a new RNA may make it possible to infer the non-canonical interactions and motifs in 3D structures, as part of predicting the 3D structure of a molecule. Recent developments in these areas will be highlighted.