

Cryo-EM reveals conformational dynamics in a multifunctional viral RNA

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RNA's functional diversity is provided by a rich variety of folded three-dimensional structures. Viruses have been a rich source of RNA structural information and they contain many compactly folded structured RNAs performing more than one function. These multifunctional RNAs often use conformational dynamics to control or organize their different roles. However, visualizing dynamic RNA structures has been difficult by traditional methods. Using cryo-EM, we visualized the structure of a mysterious multifunctional viral tRNA-like structure from brome mosaic virus, revealing a mix of both static and dynamic RNA elements. This programmed conformational flexibility allows the RNA to undergo a large structural rearrangement to bind a cellular enzyme. Thus, this RNA provides an excellent example of the link between RNA structure, conformational dynamics, and function. In addition, this shows the utility of cryo-EM for visualizing small conformationally dynamic structured RNAs.