A Loop Grammar to Understand the roles of miRNAs in the Tumor Cell

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A miRNA is a small non-coding RNA molecule that regulates gene expression. Current studies showed that miRNAs may function both as oncogenes and as tumor suppressors, but not revealed the precise conditions that cause miRNAs to alter gene expression of the cancer cells. In this study, we introduce a context-free grammar, *Loop Grammar*, that formalizes the primary and secondary structure as a composition of loops, corresponding to concatenation or nesting of hairpins. We also formalize the *concatenation* and *nesting* on *fatgraphs*, oriented surfaces with boundary, and we define a *Surface Loop Grammar*, whose algebraic expressions uniquely identify such surfaces associated to given RNA structures. The Loop Grammar has been used to model tumor and healthy miRNAs of the mir-515 family, and we observed that the mutations of elements of primary structure involved in loops formation changed the secondary structure of tumor miRNAs. The Surface Loop Grammar is useful to classify RNA structures in terms of loops and relations among them.

References:

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