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Research highlight

New therapeutic target

Researchers have shed new light on the roles of a specific type of non-coding RNAs in bacteria¹. Such RNAs, known as riboswitches, aid in bacterial metabolic pathways by binding to small molecules and turning on specific genes, and are potential therapeutic targets in designing antibiotics.

Riboswitches are structural elements of messenger RNA that regulate the expression of genes. They consist of two distinct domains — one for binding to small metabolite and the other involved in genetic control.

Various riboswitches that sense distinct metabolites have been identified. Riboswitches that recognize S-adenosyl-L-methionine (SAM) have been shown to regulate sulphur metabolic pathways in certain bacteria. SAM also supports certain reactions of proteins, nucleic acids and other biomolecules in humans. A by-product of such reactions is S-adenosyl-L-homocysteine (SAH).

Five distinct classes of riboswitches (SAM-1, II, III, IV and V) respond to SAM and show preferential binding with SAM rather than with SAH. Prior work has investigated the functions of SAM-I and SAM-II. To find out how SAM-III works in bacteria such as lactic acid bacteria, the researchers used computer models of molecular dynamics. Five independent molecular dynamics simulations were performed, each lasting 50 ns.

Reactions involving binding to SAM-III were found to be more favourable in the presence of SAM than SAH. Furthermore, SAM-III was capable of discriminating SAM from SAH. The presence of the sulphonium group in SAM makes it preferable over SAH for such selective binding.

This research is significant as riboswitches have been used as potential drug targets for antibacterial and antifungal agents. In addition, artificial riboswitches have also been engineered for the manipulation of gene expression.

References

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