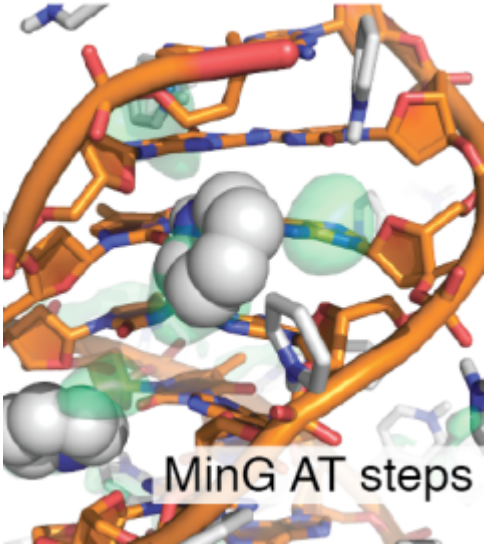
When a denaturant stabilizes DNA

Combination of two strong denaturants of DNA leads to stabilization of the structure. An unexpected finding that opens new fields to the biotechnological use of DNA



Pyridine, that is known to unfold DNA, can also have a strong stabilizing effect on it under acidic conditions. A study based in laboratory and computational experiments highlights the tuneable nature of pyridine as denaturant and opens new means to alter the thermal stability of nucleic acids. The results of this study are available from today at Angewandte Chemie, one of the leading journals in Chemistry.

The paper is based on experimental and theoretical evidences that pyridine effect on DNA changes drastically according PH conditions. While at neutral pH, Pyr reduces the stability of duplex DNA, even at low concentration, at acidic pH the opposite occurs.

Biotechnological implications

The results do provide for further studies on the relationship of pyridine and its derivatives with DNA with clear biotechnological implications. The structural origin of Pyr+ stabilization could be exploited in experiments where DNA should be kept stable while other macromolecules are unfolded, and to design new cationic pyridine derivatives for the delivery of genes which should act on acidic media.

Also, the similar mode of interaction between choline and Pyr+ cations with DNA detected suggests an avenue for the design of new DNA agents for nanobiotechnological applications (such as nanodevices with applications in photonics, litography and electronics), and the tunable denaturing/renaturing effect of Pyr could aid the development of programmable fluorophore-quencher DNA-based nanoswitches such as pH nanosensors with ability to respond to pH changes of their localized environment.

Authors

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