Researchers study DNA polymerases at the molecular level

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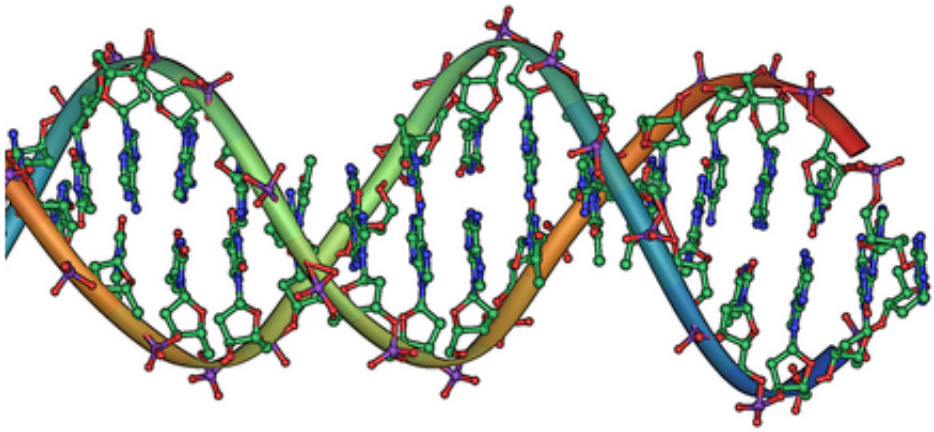

DNA double helix. Credit: public domain

Complex biological systems can be described as a network of chemical processes that take place in molecules. The scientists of the "ChemLife" research initiative at the University of Konstanz are working together in an equally active network with dynamic interconnections—both subject-specific and interdisciplinary. Recent insights into DNA polymerases acquired through interdisciplinary cooperation between organic chemistry, biochemistry, structural biology and theoretical chemistry show just how productive and mutually inspiring the interaction of

biological and chemical know-how can be. These new findings at the molecular level of polymerases can be used for genome sequencing and other areas of molecular biology-based diagnostics. The research results were published on 17 September 2018 in the *Proceedings of the National Academy of Sciences (PNAS)*.

The recognition processes of DNA polymerases with modified substrates, which are essential in many biotechnological areas, have not been widely studied at the molecular level. As genome synthesis machines, these polymerases are responsible for the doubling of DNA during cell division. Professor Andreas Marx, Professor Kay Diederichs and Professor Christine Peter have obtained detailed structural insights into polymerases in interaction with modified substrates. This knowledge creates a platform for further investigations on a broader scale and in its many variants. For the researchers in Konstanz involved in the "ChemLife" initiative, practical applications and social relevance are particularly important aspects. Knowledge of how such a modification progresses through a DNA polymerase can be used, for example, to advance genome sequencing: "Many processes in molecular biology diagnostics are based on the use of modified building blocks," explains Professor Andreas Marx, who is a member of the "ChemLife" initiative at the University of Konstanz.

Numerous collaborative projects, the Konstanz Research School Chemical Biology as well as the two Collaborative Research Centres "Chemical and Biological Principles of Cellular Proteostasis" and "Anisotropic Particles as Building Blocks: Tailoring Shape, Interactions and Structures" are interacting on a major scale—with a highly productive effect: The new research results on DNA polymerase line up alongside the latest article on the structural analysis of the FAT 10 protein by Professor Christine Peter and Professor Markus Goettrup in a collection of over 200 publications that have resulted from collaborative research work over the last few years. "ChemLife" wants to continue to

use these special dynamics in future, too, and develop new systems and materials with optimized properties at the interface between biology, chemistry and computer science.

More information: Heike Maria Kropp et al. Snapshots of a modified nucleotide moving through the confines of a DNA polymerase, *Proceedings of the National Academy of Sciences* (2018). DOI: 10.1073/pnas.1811518115

Provided by University of Konstanz

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