# New deactivation mechanism of excited DNA discovered

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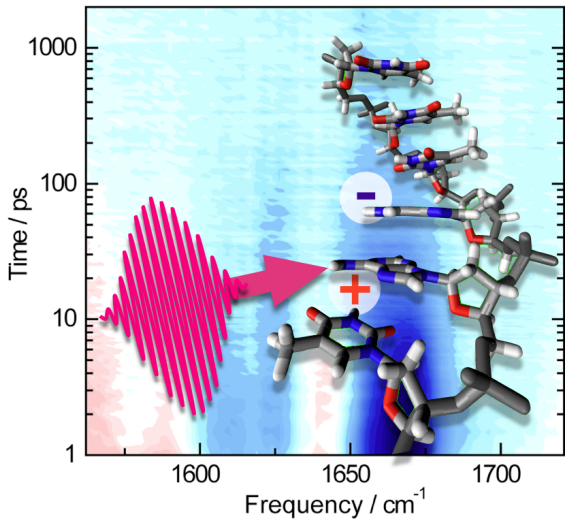


**Researchers at the LMU found a new deactivation mechanism of photoexcited DNA. The UV radiation leads to reactive DNA species, which may create lesions which have not been connected to UV light absorption so far.**

UV-radiation in the solar spectrum may damage skin and may cause cell death, mutations or skin cancer. On the molecular level, UV light absorption leads to photochemical reactions in DNA, the carrier of all genetic information. These photochemical reactions may eventually lead to mutations. Over time, nature has evolved molecular protection mechanism to prevent damaging processes. Most important, single nucleobases convert the damaging UV energy ultrafast and efficiently to heat, thus reducing lesion formation.
However, the genetic information of living organisms is not stored in single bases but in the sequence of DNA bases in the DNA strands. And this ordered assembly of single nucleobases in DNA strand changes the photochemical properties. It has been shown, that the efficient deactivation mechanism of single nucleobases plays only a minor role in DNA strands.

The groups of Prof. Zinth (Faculty of Physics) and Prof. Carell (Faculty of Chemitry and Pharmacy) were able to reveal the molecular decay mechanism of UV-excited DNA strands. In these studies, DNA strands were excited with ultrashort laser pulses and the evolution of the excited state was followed using time resolved infrared spectroscopy. IR spectroscopy enables them to identify molecular changes in DNA bases. The researchers observe charge-separated states which live 100 times longer than an excited single base. The direction of the charge separation is governed by the DNA sequence. The presence of long-living charged radicals in DNA strands after UV light absorption is in strong contrast to the fast and efficient deactivation of single bases.

Charged radicals in the DNA are usually thought to be products of chemical reactions with small reactive molecules, arising from cell respiration. The results of the Zinth and Carell groups show that these charged radicals are also generated by direct UV light absorption in the DNA. This newly discovered radical formation in DNA may lead to oxidative damage formation, currently not considered in DNA photochemistry.

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**Publication:**

“Charge separation and charge delocalization identified in long-living states of photoexcited DNA” Dominik B. Bucher, Bert M. Pilles, Thomas Carell and Wolfgang Zinth, PNAS, 2014, early edition (10.1073/pnas.1323700111)