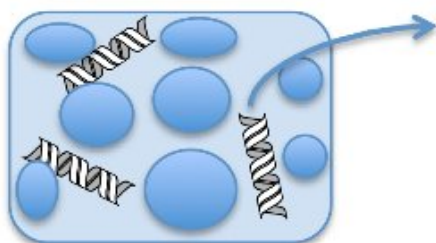


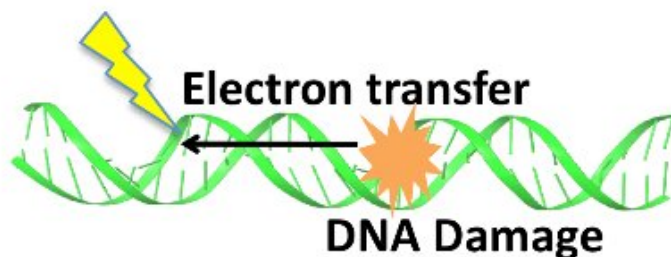
Electron transfer and oxidative damage in DNA in a biomimetic crowding environment

April 9 2018

Biomimetic crowding environment



Photoirradiation



Credit: University of Electro Communications

It is known that an electron hole moves through double helical DNA and induces oxidative damage at guanine sites. To date, this process has only been investigated in aqueous dilute solutions.

However, to clarify the unique characteristics of DNA in vivo, experiments must be performed under conditions close to biological environments because the intracellular environment is highly crowded with biomolecules comprising 20 to 40 percent of cellular weight.

Now, Makiko Tanaka at Department of Engineering Science and

colleagues have investigated the effect of the biomimetic medium on DNA damage via photo-induced [electron transfer](#), and found that molecular crowding mediums affected the electron transfer and the efficiency of DNA damage.

Upon photo-irradiation of pyrene moiety in pyrene-modified DNA, guanine sites in DNA were oxidized via electron transfer and decomposed. The researchers used [ethylene glycol](#), glycerol and poly(ethylene glycol) to produce crowding environments around DNA. The efficiencies of the [oxidative damage](#) were analyzed by high-performance liquid chromatography.

A high viscosity of the crowding environment reduced damage in DNA. When the DNA contained a mismatched base pair, a local structural change of DNA and a low dielectric constant of these crowding mediums promoted DNA damage via through-space electron transfer.

These results suggest that the electron transfer and the oxidative damage in DNA under intracellular environments have wide variety according to the situation.

More information: Makiko Tanaka et al. Effects of Molecular-crowding on Electron Transfer and Oxidative Damage in Pyrene-modified Oligonucleotides, *Chemistry Letters* (2017). [DOI: 10.1246/cl.170909](#)

Provided by University of Electro Communications

Citation: Electron transfer and oxidative damage in DNA in a biomimetic crowding environment (2018, April 9) retrieved 30 April 2024 from <https://phys.org/news/2018-04-electron-oxidative-dna-biomimetic-crowding.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.