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Fullerenes Can Induce Toxic Physical Changes of DNA FABIAN CZERWINSKI, LENE B. ODDERSHEDE, Niels Bohr Institute, Copenhagen, Denmark — Fullerenes are fascinating symmetric carbon nanostructures. Nowadays, they are widely used because of their characteristic physical and chemical properties. Until now research has mainly been focused on commercial applications of fullerenes. Only a few investigations have addressed the potential biological hazards, one of which is that fullerenes are believed to alter the elastic properties of DNA upon binding. In our experiments we use optical tweezers with sub-piconewton and nanometer resolution to probe the structural changes and the potential damages which fullerenes might induce on single DNA molecules. Therefore, force-extension relations can be obtained under physiological conditions while varying the concentration of different types of fullerenes. It has theoretically been predicted [1], that certain fullerenes can function as a minor-groove binder to double-stranded DNA, thus altering its elastic properties significantly. Fullerenes are capable of causing severe damage inside living organisms by forming DNA regions which are not accessible for proper enzymatic functions. A further goal of the study is to establish fullerenes as a tool for a more detailed investigation of DNA-protein interactions, such as the trafficing of polymerases or the packing by procaryotic proteins. [1] Zhao X, Striolo A, and Cummings PT: C_{60} Binds to and Deforms Nucleotides. BiophysJ (89):3856-62, 2005.

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