Detecting DNA Damage Using Molecular Beacons and Reverse-Phase Microarrays

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Target DNA strands were attached to epoxide-coated reverse-phase microarray slides via an imino linkage to see if thymine photoproducts and oxidative damage could be detected using fluorophore-labeled DNA hairpin probes. Thymine photoproducts were formed by irradiating the slides with 255 nm light. Oxidative damage was formed by irradiating the slides with UVA light in the presence of riboflavin. A decrease in fluorescence signal was observed with increasing irradiation times for both the thymine photoproduct and oxidative damage experiments. This decrease is attributed to damage of the target DNA strands resulting in weaker binding of the hairpin probes. Cross-binding of probes to non-complementary targets was found to be minimal. The effects of neighbouring bases in the formation of thymine photoproducts, the development of a positive probe for oxidative damage detection and the normalization of printing variations will also be discussed. These results demonstrate the feasibility of multiply-parallel photochemical studies on biomolecules.