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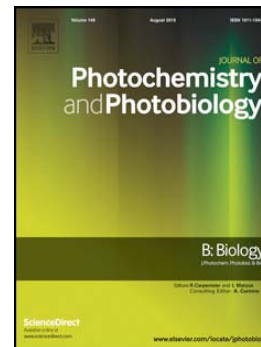
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# Morphological degradation of human hair cuticle due to simulated sunlight irradiation and washing

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## Abstract

Morphological changes in hair surface are undesirable, since they cause shine loss, roughness increase and split ends. These effects occur more frequently in the cuticle, which is the outermost layer of the hair strand, and thus the most exposed to the environmental damages. Sunlight irradiation contributes significantly to these morphological alterations, which motivates the investigation of this effect on hair degradation. In this work, the influence of irradiation and hand-washing steps on the morphology of pigmented and non-pigmented hair cuticle was investigated using field emission scanning electron microscopy (FESEM) and transmission electron microscopy (TEM). To simulate daily conditions, where hair is hand-washed and light exposed, samples of dark brown and gray hair underwent three different conditions: 1) irradiation with a mercury lamp for up to 600 h; 2) irradiation with the mercury lamp combined with washes with a sodium lauryl sulphate solution; and 3) only washing. A new preparation procedure was applied for TEM samples to minimize natural variations among different hair strands: a single hair strand was cut into two neighbouring halves and only one of them underwent irradiation and washing. The non-exposed half was used as a control, so that the real effects caused by the controlled irradiation and washing procedures could be highlighted in samples that had very similar morphologies initially. More than 25 images/sample were analysed using FESEM (total of 300 images) and *ca.* 150 images/samples were obtained with TEM (total of 900 images). The results presented herein show that the

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