Supplementary Materials

Molecule-resolved visualization of particulate matter on human skin using multimodal nonlinear optical imaging

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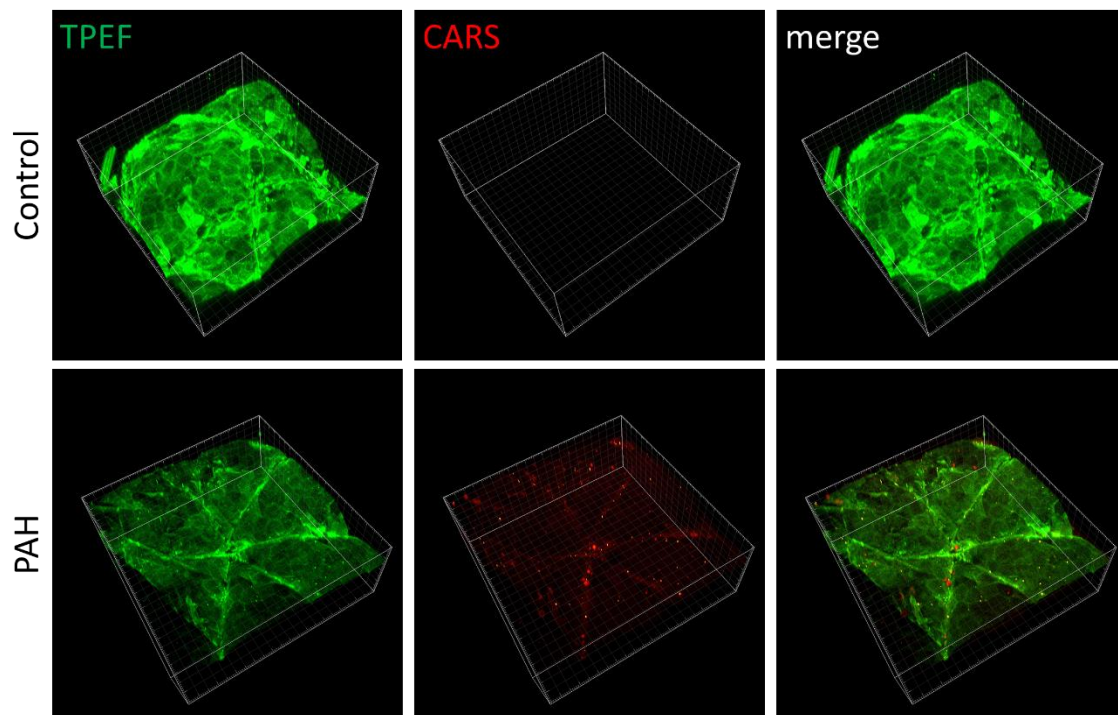[4]Department of Medical Physics, University of Science and Technology, Daejeon 34113, Rep. of Korea

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Contents

Supplementary Figure S1. *En face* MNLO imaging of human skin biopsy samples treated with PAH.

Supplementary Video S1. Visualization of $PM_{2.5}$ in human skin by *en face* 3D MNLO imaging.

Supplementary Video S2. Visualization and analysis of $PM_{2.5}$ penetration into human skin by MNLO imaging.

Supplementary Figure S1. *En face* MNLO imaging of human skin biopsy samples treated with PAH. 0.6 μg/ml of PAH- or vehicle-treated samples for 24 h. TPEF signals (green) were measured at Ex.810 nm/Em. 495–540 nm and C–C CARS signals (red) were obtained at 2693 cm^{-1}. Measurement volume was 420 (x) x 420 (y) x 200 (z) μm^3.

Supplementary Video S1. Visualization of $PM_{2.5}$ in human skin by *en face* 3D MNLO imaging. *En face* MNLO images of the label-free stratum corneum (TPEF, green) and $PM_{2.5}$ (CARS, red in upper panel and yellow in lower panel) in human skin biopsy samples after $PM_{2.5}$ exposure. Consecutive *en face* MNLO image slices were reconstructed in 3D.

Supplementary Video S2. Visualization and analysis of $PM_{2.5}$ penetration into human skin by MNLO imaging. MNLO images of label-free elastin and keratin (TPEF, green), $PM_{2.5}$ (CARS, red), and collagen (SHG, magenta) in cross-sectioned $PM_{2.5}$-exposed human skin biopsy samples after 50 strippings. Consecutive *en face* MNLO image slices were reconstructed in 3D.