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Acute aspiration of graphene sheets evokes transient airway hyperreactivity to methacholine in mice (660.4)

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Abstract

Concern exists that the use of graphene sheets (GS) in composite materials might expose manufacturing workers to an inhalation hazard. Studies have shown that GS are cytotoxic *in vitro* (PC12 cells, fibroblasts) and *in vivo* in mice (lung granuloma), and Roberts et al. (2013) found non-oxidized GS with larger lateral dimensions (蠅 5 μm) and a greater number of layers (~20) produced more lung inflammation up to 7 d after aspiration in mice when compared to smaller GS (<1 μm laterally, ~ 4 layers). The lung toxicity of various forms of GS has not been characterized completely. Here, we investigated the effects of GS on basal lung resistance (R_L), basal dynamic compliance (C_{Dyn}), and reactivity to inhaled methacholine (MCh) aerosol. Mice were given a non-oxidized GS (5 μm x 5 μm laterally, 7 nm thick equal to ~ 20 layers; 40 μg) suspended in dispersion medium (DM; Porter et al., 2008) or DM (control) *via* aspiration. R_L and C_{Dyn} and reactivity to increasing concentrations of MCh aerosol were measured 4 h – 2 mo after GS exposure. Basal R_L was increased 4 h post-exposure but at no other time; basal C_{Dyn} was unaffected at any time. Airway reactivity to MCh (as ΔR_L) was increased at 4 h post-exposure, and ΔC_{Dyn} responses were decreased. GS was essentially without effect on R_L or C_{Dyn} at 1 d, 1 wk, 1 mo and 2 mo after administration. The results indicate that a single exposure to GS increases transiently lung resistance and reactivity to MCh.

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