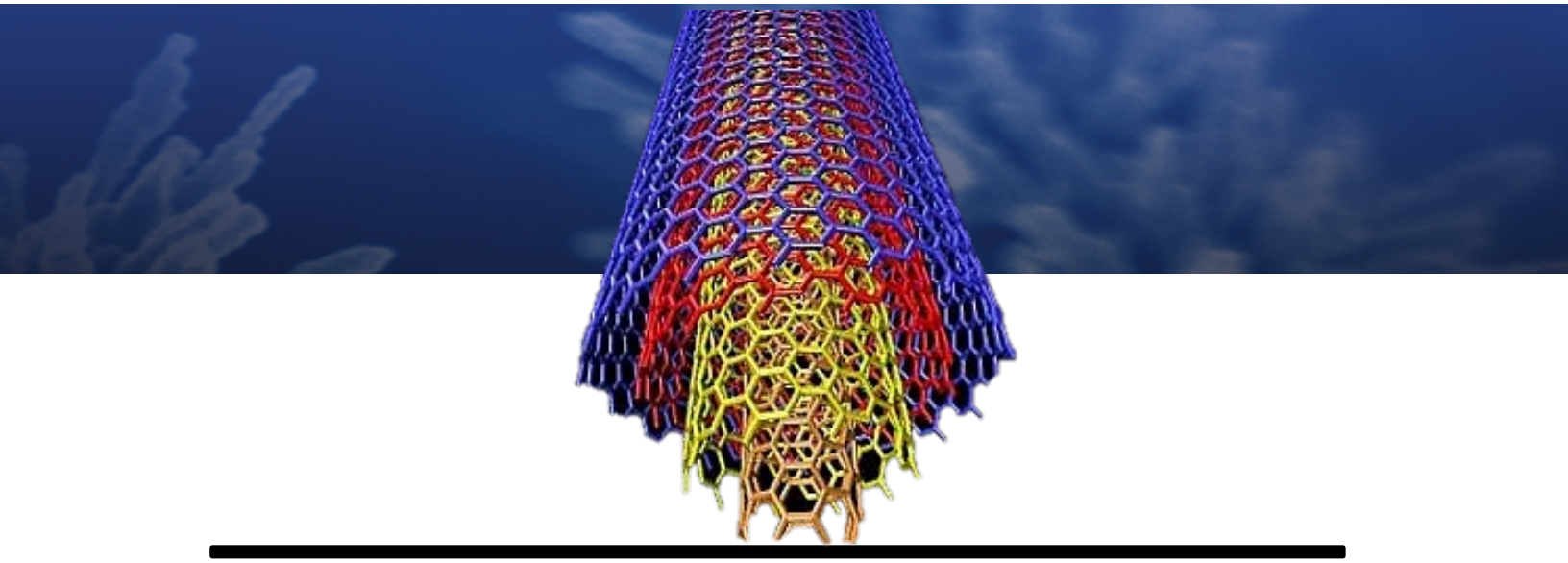
125. Long Term Exposure to Cellulose Nanocrystals Enhance Morphological Transformation of Human Lung Epithelial Cells

Elena R. Kisin[1], Autumn L. Menas[1], Mariana T. Farcas[1], Maria Russo[2], Diane Schwegler-Berry[1], Aleksander Star[3], Naveena Yanamala[1], Valerian E. Kagan[4], Anna A. Shvedova[1]. [1]NIOSH, CDC, Morgantown WV; [3]Department of Chemistry and [4]Environmental & Occupational Health and Center for Free Radical and Antioxidant Health, University of Pittsburgh, USA; [2]Institute of Public Health, Section of Occupational Medicine, Catholic University of the Sacred Heart, Italy.

Cellulose nanofibers have gained much attention due to their biodegradable nature, expedient chemical and mechanical properties, economic value and renewability.However, before these materials can be considered for potential uses, investigation of their toxicities is required. This is especially important because cellulose nanocrystals (CNC) have a high aspect ratio and stiffness, features that are shared by asbestos and carbon nanotubes that are linked to high toxicity and potential to induce cancer. Additionally, the conceptual framework of reduction, refinement and replacement of animal experiments (CAAT Vision/Mission Statement) has prompted the present study aimed at the evaluation of the potential carcinogenic effect of CNC using pulmonary epithelial cells (BEAS-2B and A549). Long term repeated exposure of the cells to occupationally relevant sub-toxic concentration of CNC derived from wood (powder and gel) enhanced neoplastic-like transformation as demonstrated by increased cell proliferation, anchorage-independent growth, migration and invasion. Analysis of apoptosis revealed no effect in A549 and inhibitory effect of CNC in BEAS-2B cells. CNC exposure induced a strong activation of cells as demonstrated by the high number of cytoplasmic vacuoles, surface finger-like protrusions, lipid droplets and multi-nucleation. The signaling mechanisms of the cells were precisely defined by their cytokine responses. The increased proliferation was synergistic and mediated by both pro-inflammatory and pro-carcinogenic cytokines. The results of detailed analysis of cytokines were in line with their proliferative and transformative potential of the different CNC materials investigated in this study. Overall, our results provide novel information and evidence to suggest the potential carcinogenic effect of CNC.

Keywords: Green nanomaterials, cellulose, cells proliferation, migration, transformation, occupational safety



8TH INTERNATIONAL NANOTOXICOLOGY CONGRESS

nanoTOX 2016

June 1-4, 2016
BOSTON, USA