



Title of Research:

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Establishment of mechanism based assay protocol for hazard and carcinogenic risk of carbon based nanomaterials

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Summary of Research:

For the purpose of evaluating the toxicity and carcinogenicity of nanomaterials, particularly carbon nanotubes, we are establishing a method that is suitable for risk assessment and is far cheaper than whole body inhalation exposure. Whole body inhalation exposure requires specialized equipment and is exceedingly expensive, making it impossible to use except for a very small number of research institutes. Consequently, whole body inhalation testing can not be used to test the large number of inhalable carcinogens being produced. The method we are establishing for toxicity and carcinogenicity testing uses Trans-tracheal Intra-pulmonary Spraying (TIPS). In contrast to whole body inhalation exposure, TIPS can be used by many hundreds of researchers, making it possible to test all of the carcinogens workers and users are being exposed to. To examine the usefulness of the TIPS methods for practical use, we are currently testing MWCNT-7 (a known carcinogen composed of 40 layers of graphene) and Double-Walled Carbon Nanotubes (DWCNT) (2 layers). Method: Based on preliminary results using another DWCNT available from Sigma-Aldrich, 10 week old male F344 rats were treated with the test DWCNT or MWCNT-7 suspended in a vehicle containing 0.5% PF68 (a polyoxyethylene-polyoxypropylene block copolymer) on alternate days for 15 days (8 times in total) at final doses of 0.25 and 0.5mg/rat of the CNTs. Rats were sacrificed at 3 and 8 weeks after the start of administration, and the lung, tracheal lung lavage fluid (BALF), and supernatant and cell pellet of the thoracic lavage fluid (PLF) were analyzed.

Results: An inflammatory reaction was induced by DWCNT but the reaction was markedly less in rats administered DWCNT compared to rats administered MWCNT-7.

Timeline:

March, 2017 – February, 2018

Topics:

The 5th Research Achievement Presentation Meeting

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Publications:

None