MONITORING INDIVIDUAL POLLUTANT PARTICLE BEHAVIOUR ON INTACT LIVE AIRWAYS USING SYNCHROTRON X-RAY IMAGING

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Background

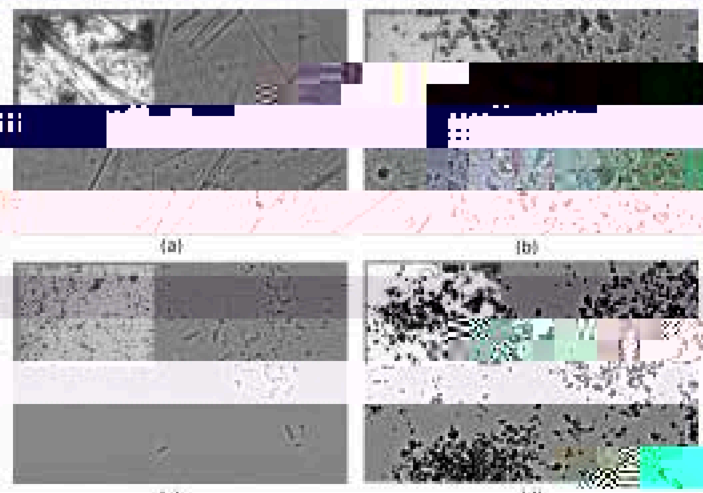
Non-biological particles small enough to be suspended in the air are continually inhaled as we breathe, and deposit on airway surfaces where they can remain and affect lung health. Pollutant particles from vehicles, buil... and industrial dusts have the potential to cause immediate and delayed health problems. Due to their small size, it has not been possible to non-in... how individual par... deposit on ... airway surface after deposition. Using live intact mouse airways we have begun to examine particle behavior after deposit... on the airway wall, dynam... invasively, using synchrotron phase contrast X-ray imaging ...).

Materials and Methods

Experiments were performed on the BL20XU beamline at the SPring-8 ... Japan. Using PCXI, the in vivo detecta... particulates was determined. Asbestos ... quarry dust, lead sulphate ... com... particulates wer... nu... (CD1-*Foxn1-nu*). Mice were secured head-high on an imaging board, and the X-ray beam (dimensions 10 x 6mm) was directed ventro-dorsally through the mouse to image the nasal airways (where the ciliated epithelium is used as a model for the conducting airways of the human lung).

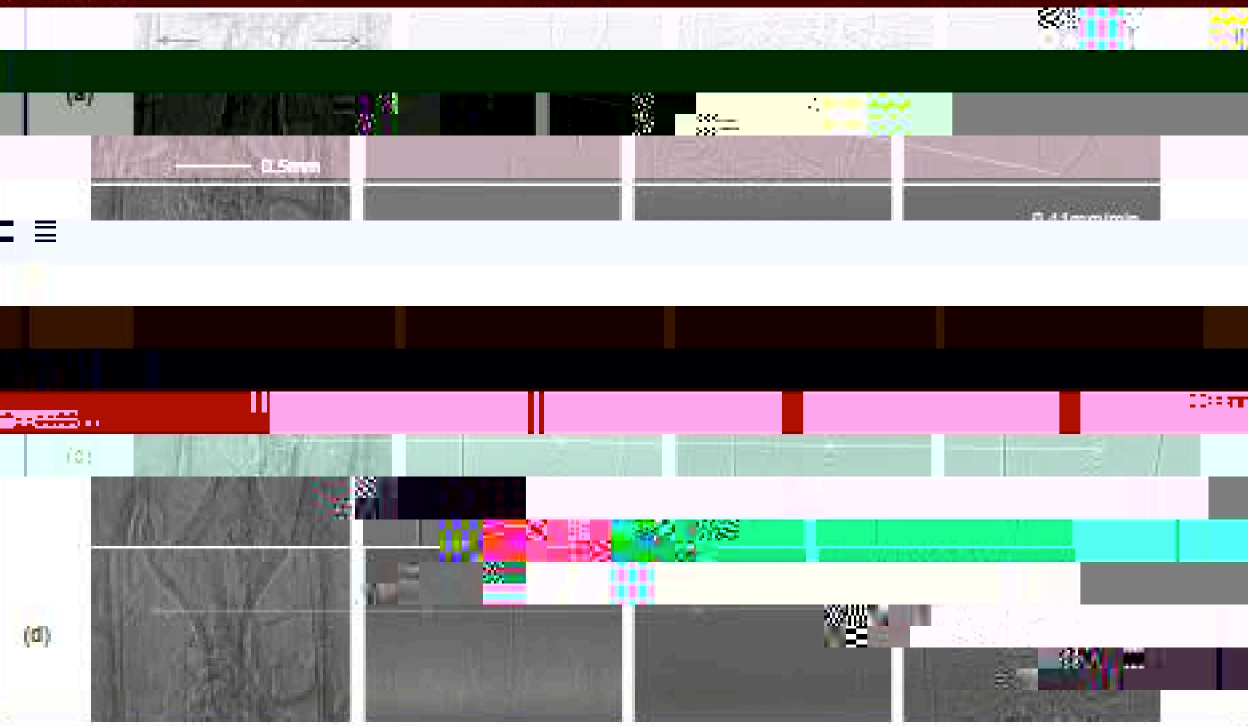
In-vitro Results

In-vitro dry particulate samples under PCXI (main pictures) and light micr... asbestos, (b) quarry dust, (c) fi... morphology of each of the particulates is clearly very different. The largely carbon-based particulates — combusted diesel, PM10 and laser printer toner — were not sufficiently visible to warrant *in-vivo* testing.



In-vivo Results

The two panels on the left show the original PCXI image and its corr... motion-detected frame that revealed the moving object on the airway. Th... mark the nasal airw... oss the ... s each separated by 5 seconds.



Conclusion

... individual particulates non-invasively in live airways ... further refineme... particulate and delivery techniques PCXI should provide a novel approach monitoring the behaviour of pa...

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