ESRF	**Experiment title:** Phase-contrast computed microtomography of human lung tissues impacted with asbestos fibers	**Experiment number:** LS2480
Beamline: ID17	**Date of experiment:** from: 17-06-2016 to: 21-06-2016	**Date of report:** 23-02-2017
Shifts: 12	**Local contact(s):** Alberto Bravin, Herwig Requardt	*Received at ESRF:*

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Report:

Project summary

The aim of the experiment was to perform phase-contrast tomography on human lung tissue impacted with asbestos fibres with minimal sample processing. After prolonged stay in the lungs, these fibres develop a ferruginous coating that is believed to enhance their toxicological outcome. Revealing the morphology and the location of the fibres in intact lung tissue samples can help undertanding the carcinogenic mechanism of asbestos. The data acquired in this experiment are part of a project that has recently been funded by the European Commission (Marie Sklodowska-Curie Individual Fellowships; Project title: Revealing the composition and formation mechanism of carcinogenic asbestos bodies in human lungs; acronym: BiominAB-3D; website: http://biominab3d.altervista.org/), and that led to a recent publication on Scientific Reports [1].

Samples

Lung tissue samples from two individuals were brought to the ESRF in the form of 2-3 cm fragments preserved in formalin. The fragments were then cut into smaller pieces of suitable size and submerged in agar agar gel to keep them immobile during measurements.

Phase-contrast tomography measurements

Tomographs were collected at a resolution of 0.67 µm, allowing for a field of view of 2-3 mm^3. This resolution/field of view combination, allowed to probe relatively large volumes of lung tissue, while keeping a resolution able to reveal fine details on the fibres and their coating (i.e. on the asbestos bodies).

Preliminary results

Although the experimental setup used was not a standard setup at ID17 (lower resolution optics are normally used to allow for much larger field of view), the experiment was successful. The analisys is still ongoing, but preliminary processing of the data show that it will be possible to obtain information from phase-contrast and on the distribution of the fibres in intact lung tissue samples (see **Figure 1**). The data acquired during this experiment will also reveal some details of the asbestos bodies with unprecedented level of detail. These data will be complemented by higher resolution (60nm) phase-contrast tomography recently performed at ID16A (LS2548). The inforamtion that can be obtained from the two set of data is complementary because they are related to two different spatial scales (mm vs µm). In addition the data collected in the present experiment were acquired on intact lung tissue samples, while to increase the resolution it has been necessary to embed to samples in paraffin and cut thin (10 µm) histological sections (see experimental report LS2548).

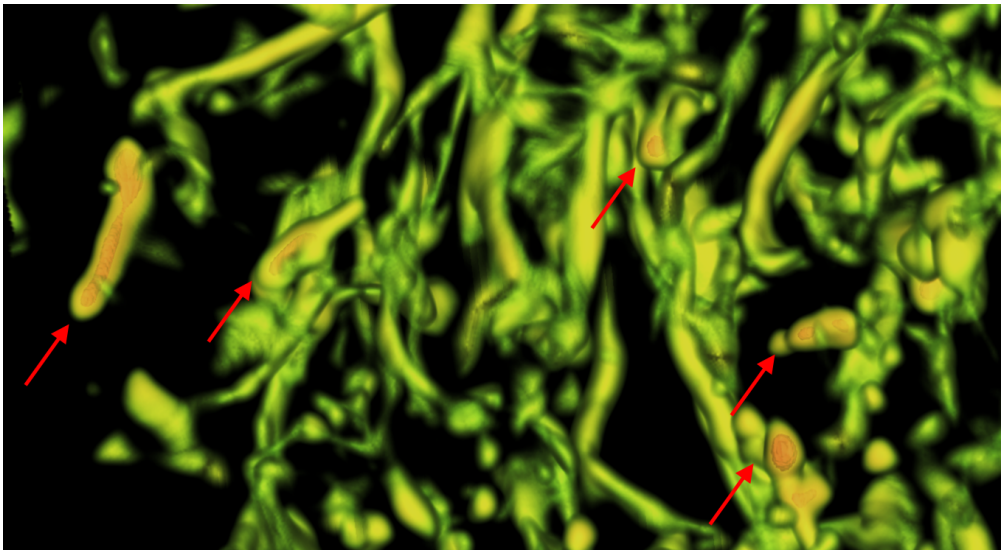

Figure 1. Volume reconstruction obtained from phase-contrast tomographic data acquired at ID17. The red arrows show the asbestos bodies embedded in the alveolar network.

[1] F. Bardelli et al. New insights on the biomineralisation process developing in human lungs around inhaled asbestos fibres. *Scientific Reports* (in press).