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Biomedical imaging at the SYRMEP beamline of Elettra

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The SYnchrotron Radiation for MEdical Physics (SYRMEP) beamline at the Elettra light source in Trieste has several years of activity in the life sciences.
The beamline is equipped with two imaging stations for users'experiments, with monochromatic and white beam, and a radiological unit for mammographic studies on patients.
Phase contrast imaging in Free Propagation (FP) modality and Analyzer Based Imaging (ABI) are the most used imaging techniques. The beamline is well suited for imaging of small animals. For this purpose a protocol, based on FP microtomography (microCT), has been developed for the high resolution functional and morphological imaging of asthmatic mice. New staining procedures have been tested to increase the image contrast and facilitate tissues differentiation. These were applied for imaging of early atherosclerosis plaques formation in ApoE-deficient transgenic mice, mimicking human atherosclerosis, and for other purposes focused to image alterations in the morphology of mice brain.
The beamline is also extensively used for imaging engineered tissues and scaffolds, by evaluating their bio-integration in terms of new bone formation and vascularization.
For most of the experiments, single distance phase retrieval algorithms are applied to enhance the visibility of the different sample phases prior to the quantitative analysis.
To address the increased users'requests for a quantitative morphological and textural sample characterization, Pore3D, a software package for 3D image processing and analysis, has been developed. In the last years the tool had a widespread application and now is also available for external users.
The mammography program with patients is focused on the development of a new protocol for tomography. The implementation of an innovative CdTe detector and the optimization of exam procedure with CT reconstruction algorithm are the main issues of this project.
The talk will give an overview of the more recent results, giving a glance to the future development programs and research perspectives.

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