ESRF	**Experiment title:** SAXS studies of breast tissue samples carrying malignant tumours	**Experiment number:** MD1
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Shifts: 9	**Local contact(s):** P. Panine	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):
* P. Suortti, Dept. of physical Sciences, University of Helsinki.
*M. Fernández, Dept. of physical Sciences, University of Helsinki.
J. Keyriläinen, Dept. of physical Sciences, University of Helsinki.
J.I. Morlanes, Dept. of physical Sciences, University of Helsinki.

Report:

The experiment was the continuation of other two previously reported experiments (LS-1695 and LS-2096). The same method was used. SAXS patterns were acquired from thin breast tissue samples. The samples were scanned through the beam in small steps, and scattering patterns were recorded with a two-dimensional detector. The positions of measurement were selected after inspecting histological sections of the samples, which were prepared prior to the experiment. The regions of interest included different tissue types, as the earlier experiments demonstrated that the SAXS patterns are characteristic to the tissues. Especially interesting were regions that included collagen. The SAXS pattern of collagen has several typical features, which arise from the supra-molecular structure of the tissue. The previous experiments had indicated that there are differences between the patterns from benign and malignant regions.

Upon invasion of cancer there are small but distinct changes in the collagen SAXS pattern. The axial period of collagen fibrils in healthy tissue is about 65 nm, and this increases by 0.3 nm in the invaded tissue. At the same time, there is a large increase of intensity from the invaded tissue, and the intensity modulations due to packing and regular shape of the fibrils tend to disappear. These changes are interpreted to indicate poor ordering and disintegration of collagen in cancer-invaded regions. The results give new information about the molecular changes associated with cancer growth, and the SAXS patterns may even be used for diagnostic purposes.

There were several new aspects and results in the last experiment. First, the samples were stored in formalin instead of being transported frozen and let thaw before the experiment. The changes in the collagen structure due to invasion of cancer were the same in both cases. The use of formalin-fixed samples makes the handling of the samples much easier. Second, diffraction-enhanced images (DEI) were taken from some of the samples, and together with the histological slices these served as guides for selection of the regions of interest. Third, several samples contained benign and malignant regions, so that it was possible to study the transition region, where the invasion of cancers develops.

A systematic analysis of the results is in progress, and it concentrates on mapping the tissues on the basis of histology, DEI, and SAXS patterns. One new observation is illustrated in Fig. 1. There is some variation in the packing period of the triglyceride layers, which give rise to the 001 reflection at s = 0.235 nm-1, depending on the exact location of the probed spot.

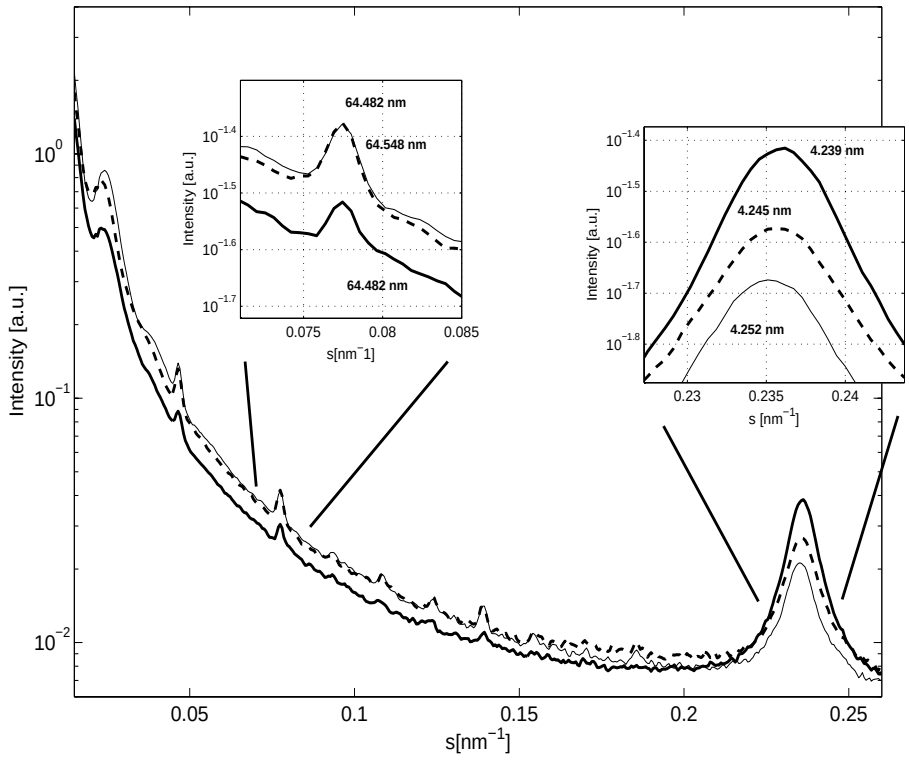

Figure 1: Azimuthally averaged scattering curves from tree spots of the same sample. Histological examination shows that these spots are close to or inside invaded fat regions.