EUROPEAN SYNCHROTRON RADIATION FACILITY

INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

Experiment Report Form

	Experiment title: **XRF anlayses to unravel the role of iron and other metals in endometriosis**	**Experiment number**: MD1363
Beamline:	**Date of experiment**: from: 25/05/2022 at 08:00 to: 30/05/2022 at 08:00	**Date of report**: 22.02.2023
Shifts:	**Local contact(s)**: Murielle Salomè	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

. Lorella Pascolo PhD IRCCS Burlo Garofolo- Institute for Maternal and Child Health-34137 Trieste- Italy

. Federica Zingaro University of Trieste – 34127 Trieste - Italy

Report:

Endometriosis is an inflammatory disease affecting about 10% of women of reproductive age, which is still poorly understood and that causes considerable suffering for a large number of women. Endometriosis, in fact, is a chronic condition characterized by the presence of endometrium, tissue that typically lines the uterus, in extrauterine sites such as the ovaries, bowel or vagina, thus leading to an inflammatory reaction in the pelvis and abdomen. In the pathology there is the role of a specific component of the immune system, namely the complement system, a veritable cascade of enzymes that participates in the process of defense against pathogens. A role of iron has been proposed and another aspect analyzed is that of disease development related to environmental factors. It is hypothesized that iron is involved in the genesis and progression of the disease, as this metal is released during cyclical bleeding and tends to accumulate in the tissues surrounding endometriotic lesions, especially at the level of the ovary, which could lead to an increased risk of infertility. We hipothize that iron accumulation is accompained by deposition of enviromental metals.

This beamtime aimed at investigating by XRF microscopy the appearance of environmental chemical elements, that possibly colocalize with the iron in the invading endometrium.

The high spatial and energy resolution that we can achieve at ID21 allowed us to gain unique information on the subcellular accumulation of iron togheter with the detection of some enviromental metals (further analysed at ID16B and TwinMic at Elettra -Trieste).

During beamtime the samples (endometrial lesions) from about 6 patients affected by endometriosis were analysed, and few normal endometrium contrls. Interestingly, the iron nanoaggregates resolved by XRF in the lesions seem to contain other chemical elements: like Al, Si, Cr etc.

Figure 1 is an example of XRF and Xanes analyses performed during the beamtime MD1336. Iron distribution cleraly confirn Fe presence in the epithelial and stroma cells also when the conventianl hystological staning Perls' is not sentitive enough. Xanes analyses are still under elaboration and at the moment seen not to clearly disciminate peculaliar speciation.

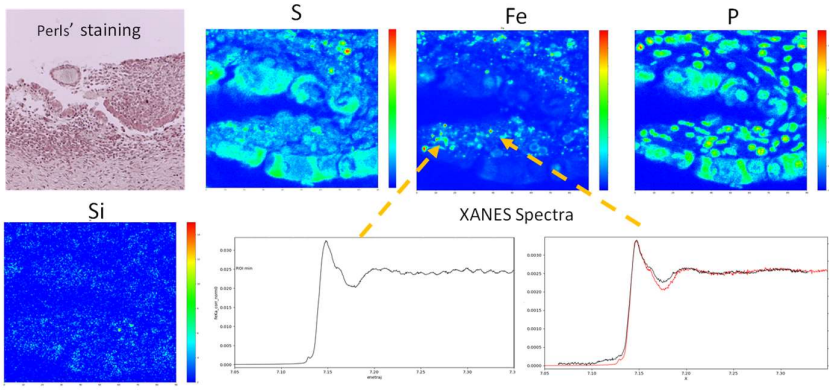

Figure 1. An edometrial ovarian lesion mapped at ID21. Iron distributio is resolved at nonmetric level. S and P allow to idetify different cell types (Endothelial, stromal and blood cells). Examples of Xanes spectra.

While some results of this succesfull beamtime were ultimate to publish the frst paper on the topic and conforming our hypotesis (Lorella Pascolo, Maria Pachetti, Anna Camillo, Alice Cernogoraz, Clara Rizzardi, Katarina Vogel Mikus, Fabrizio Zanconati, Murielle Salomé, Vanessa Tardillo Suárez, Federico Romano, Gabriella Zito, Alessandra Gianoncelli, Giuseppe Ricci, "Detention and mapping of iron and toxic environmental elements in human ovarian endometriosis: A suggested combined role" **Science of The Total Environment,**Volume 864, 2023, https://doi.org/10.1016/j.scitotenv.2022.161028) further analyses (and increased statistics) are necessary to better investigate the presence of enviromemtal elememts and their relation to iron metalbolism (as well as potential changes in chemical states).

The analyses will expand actual knowledge and could suggest therapeutic interventions.