

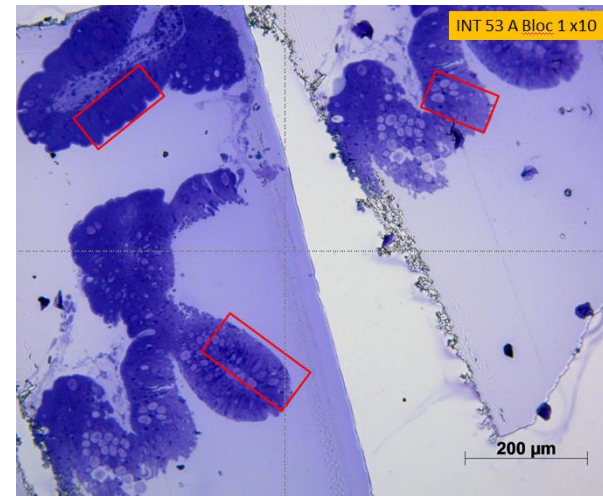
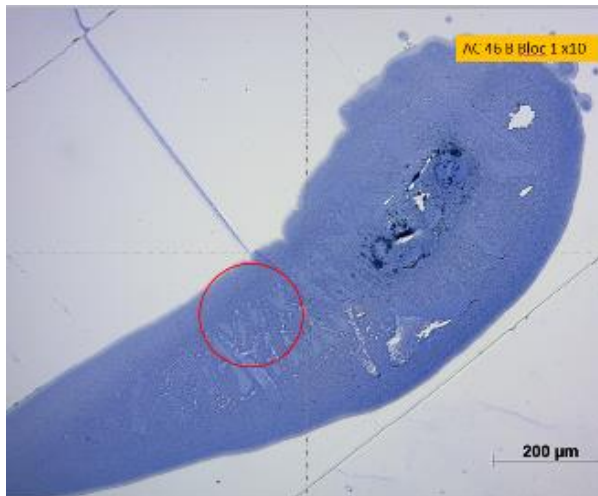
Element distribution in AQUAMAPMET samples by NanoSIMS imaging

Maria Angels SUBIRANA and Dirk SCHAUMLÖFFEL

*CNRS / Université de Pau et des Pays de l'Adour / E2S UPPA,
IPREM UMR 5254, Pau, France*

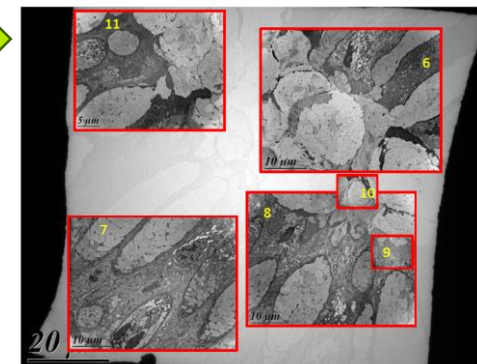
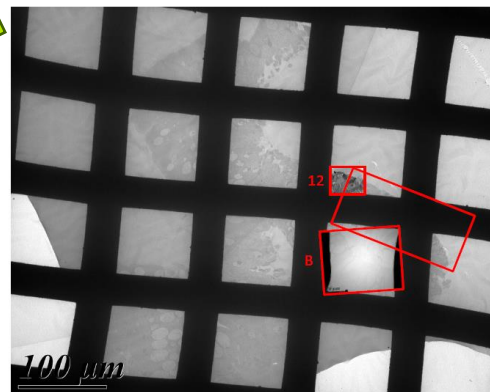
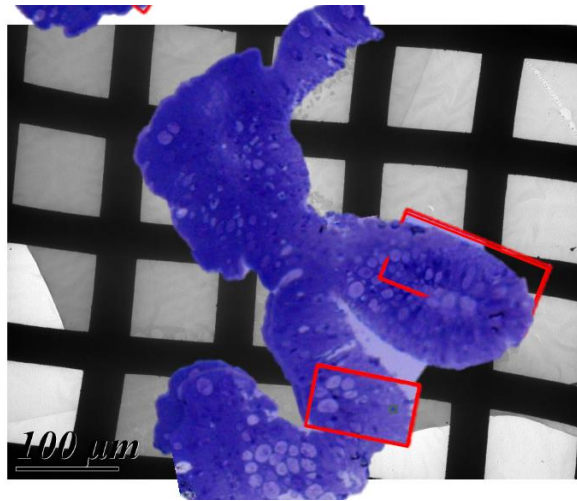
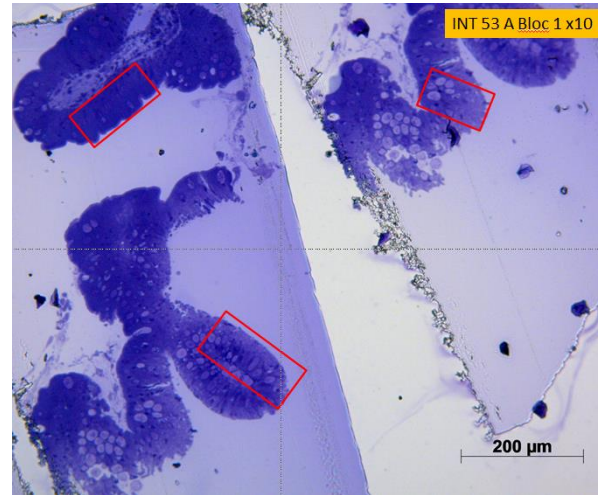
Sample preparation

PLACE		SAMPLES
Krka - Knin	exposed site	INTESTINE
		ACANTHOCEPHALAN
Krka - spring	reference site	INTESTINE
		ACANTHOCEPHALAN



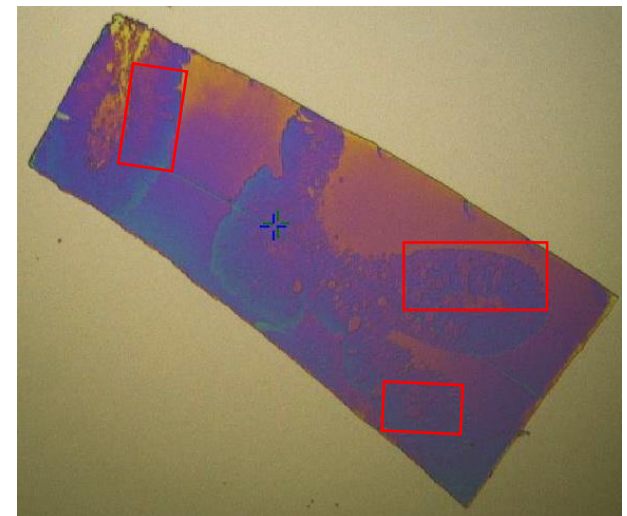
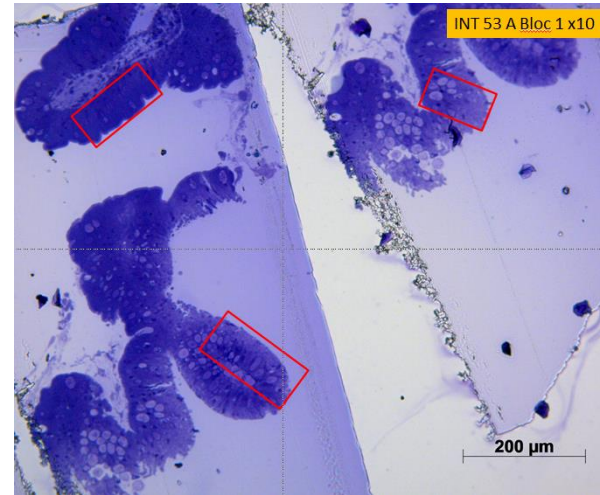
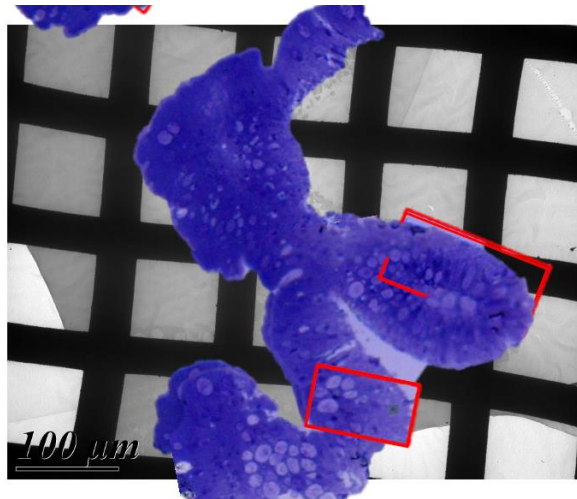
Sample preparation

- Sample preparation in Bordeaux Imaging Center:
 - Chemical fixation
 - Embedding with Spurr resin
 - Cut with ultramicrotome
 - TEM imaging



Sample preparation

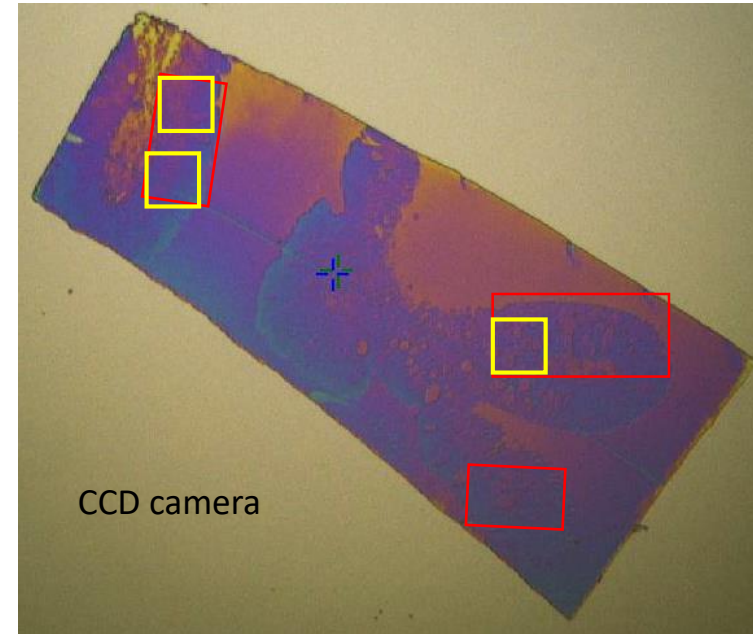
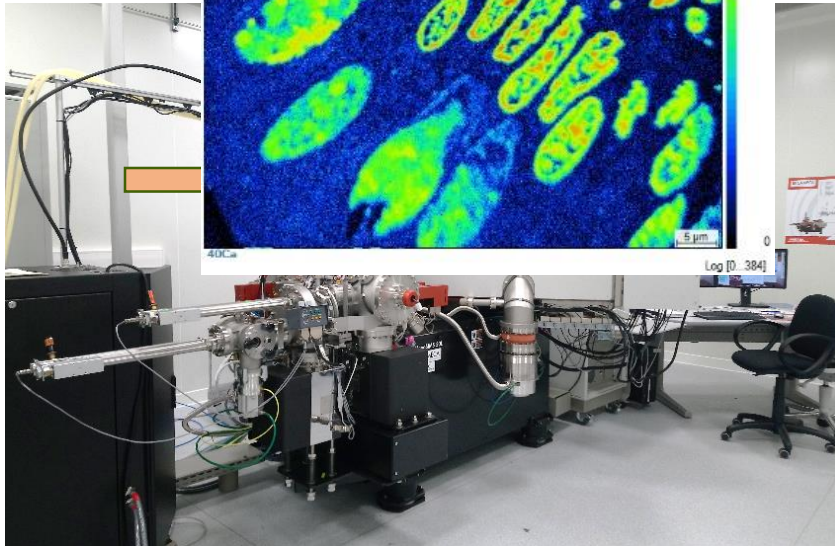
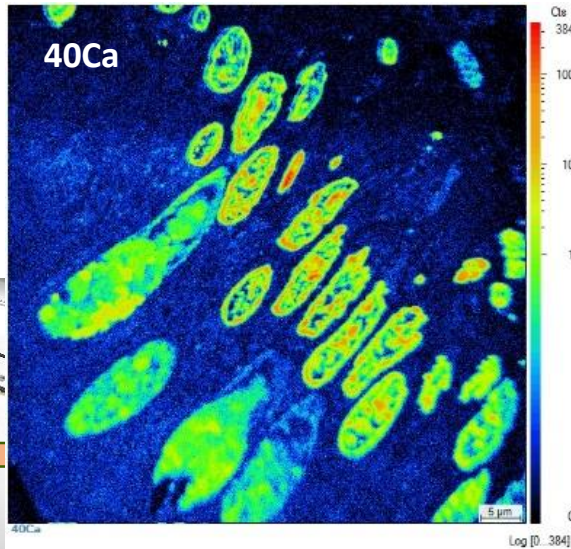
- Sample preparation in Bordeaux Imaging Center:
 - Chemical fixation
 - Embedding with Spurr resin
 - Cut with ultramicrotome
 - TEM imaging
 - NanoSIMS analysis



CCD camera

Sample preparation

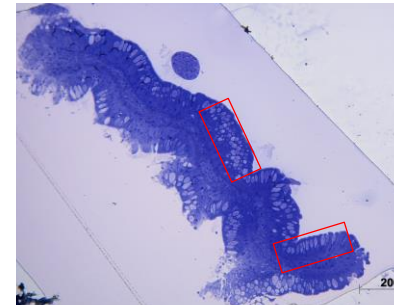
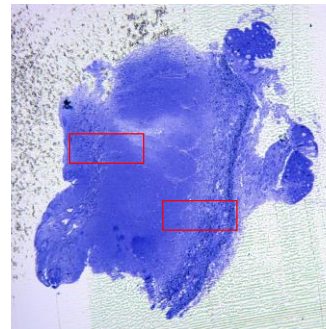
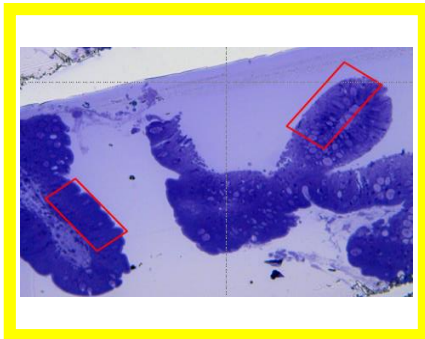
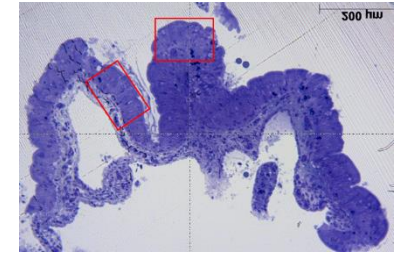
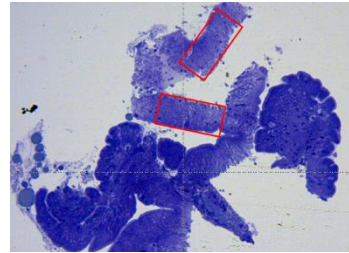
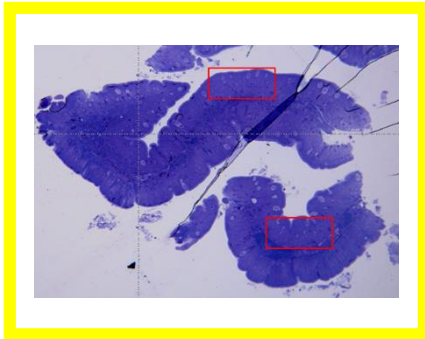
- NanoSIMS imaging:
 - Select the areas of interest (up to 65x65 μm each)
 - Select the elements to be analysed (up to 7)
 - Pre-sputter the area with the ion beam
 - Acquire the image



H	O ⁻ primary ions																He
Li	Be	Cs ⁺ primary ions										B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac															

NanoSIMS imaging

PLACE		SAMPLES
Krka - Knin	exposed site	INTESTINE
		ACANTHOCEPHALAN
Krka - spring	reference site	INTESTINE
		ACANTHOCEPHALAN

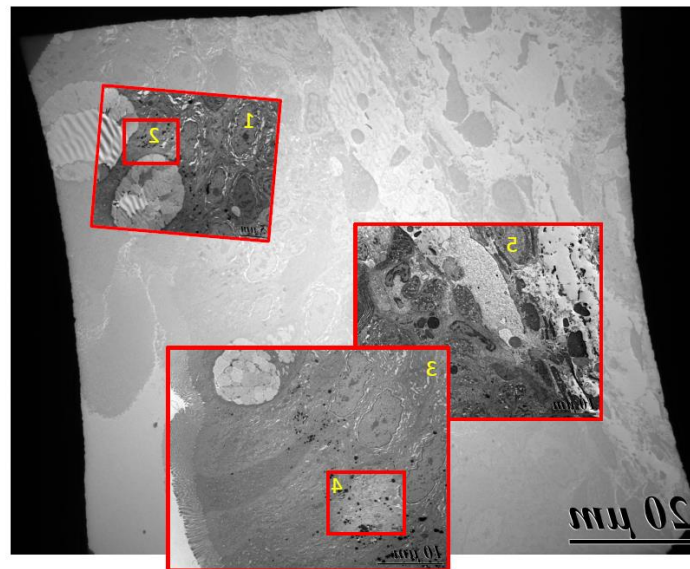
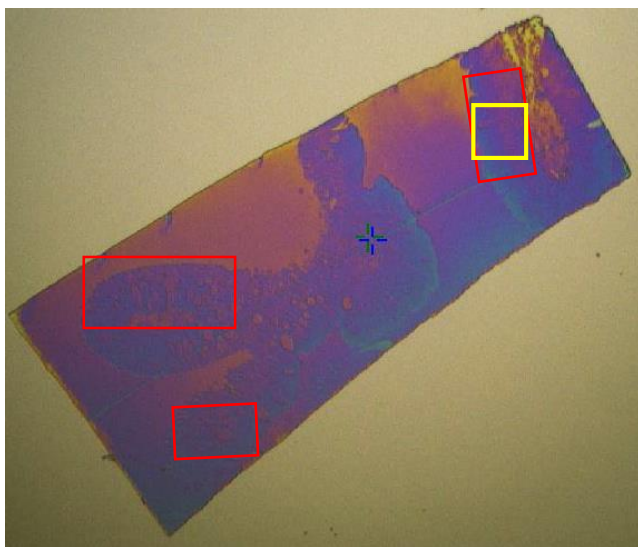
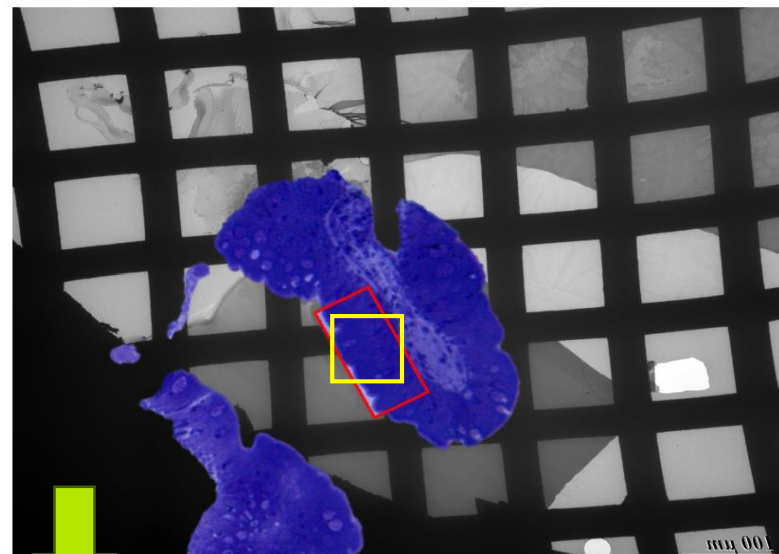
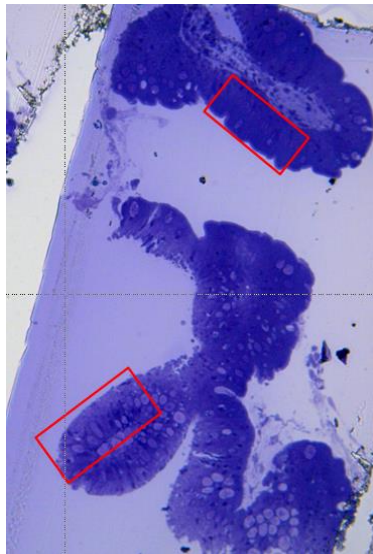


NanoSIMS imaging

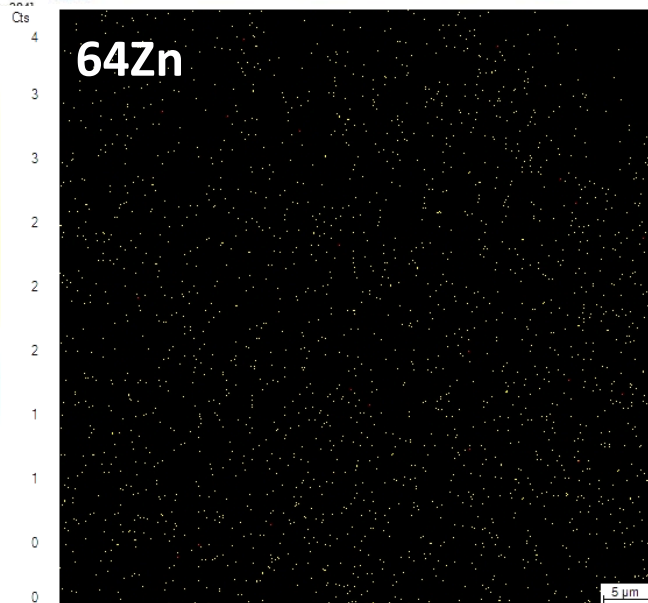
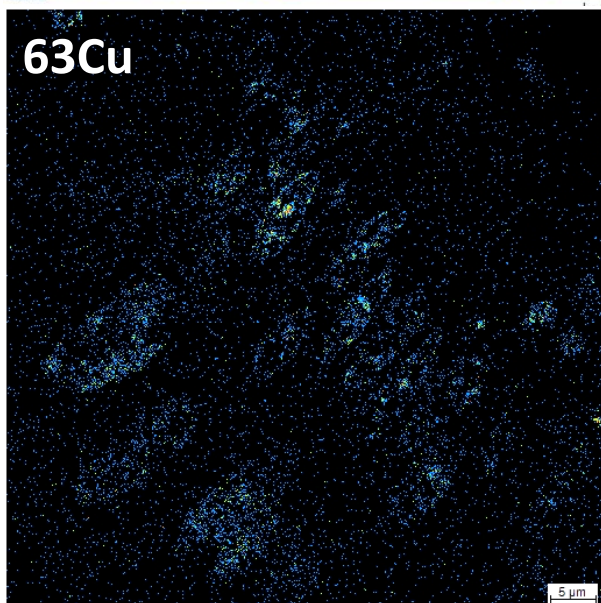
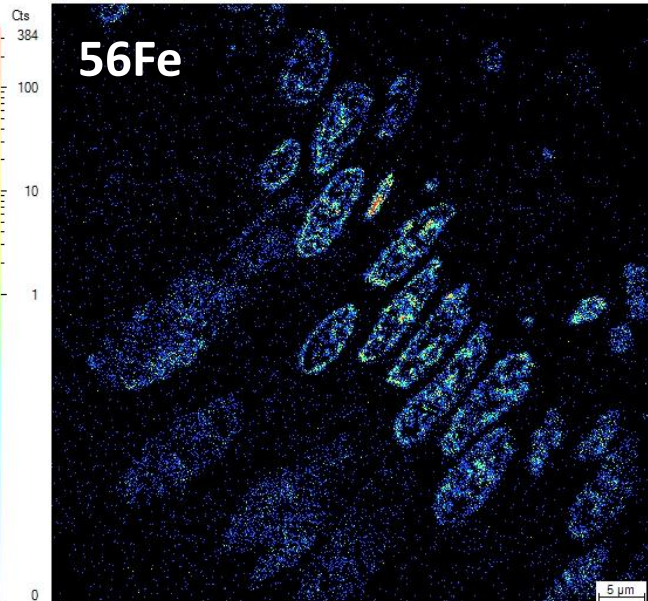
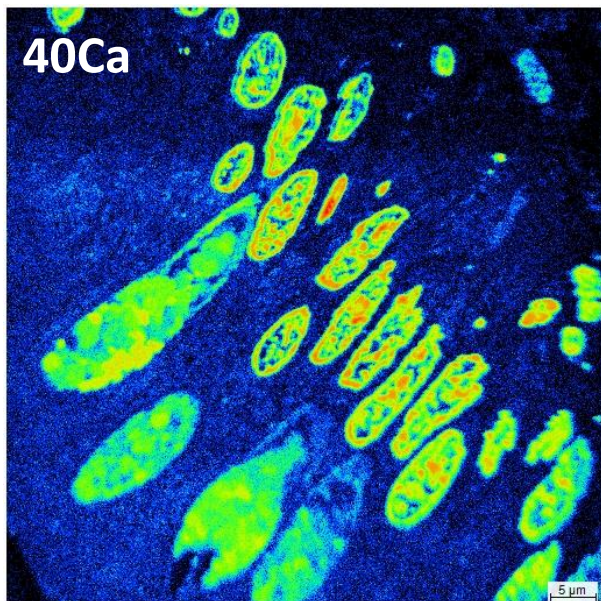
Krka - spring

reference site

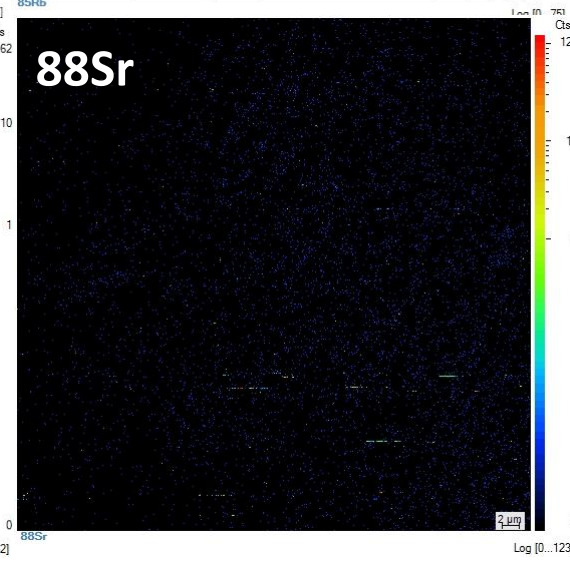
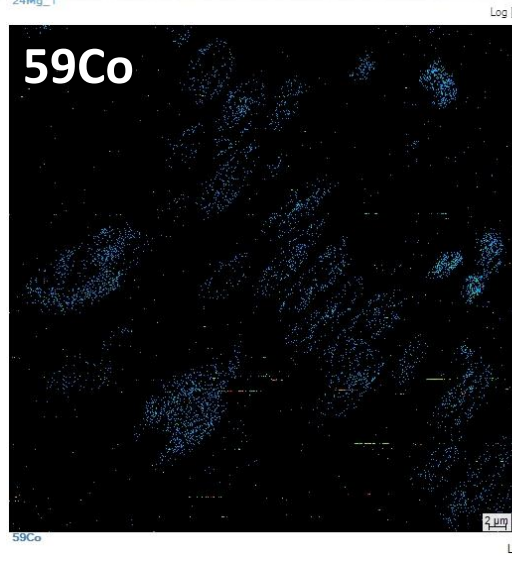
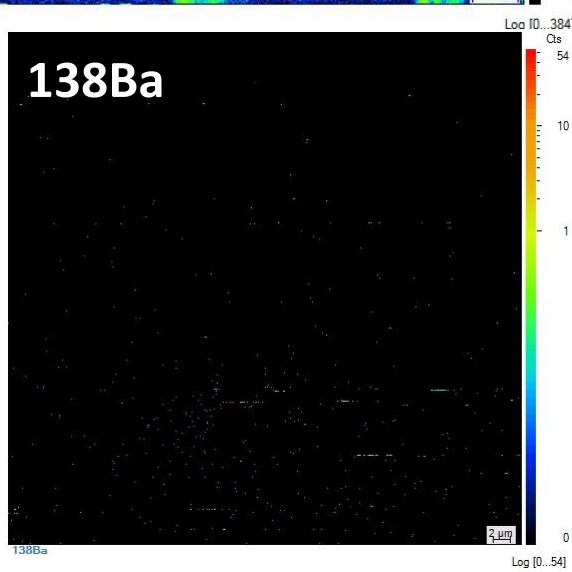
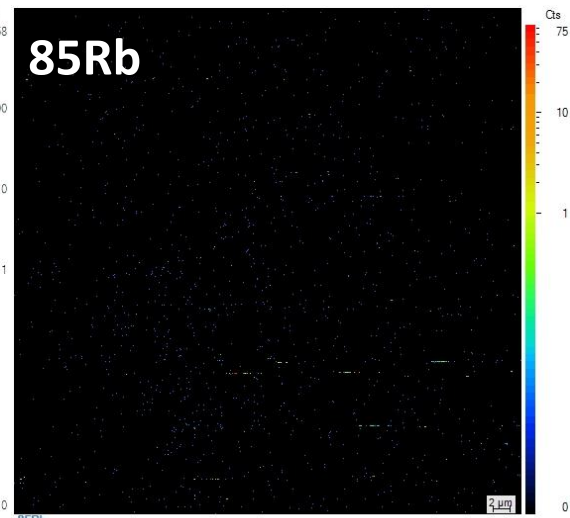
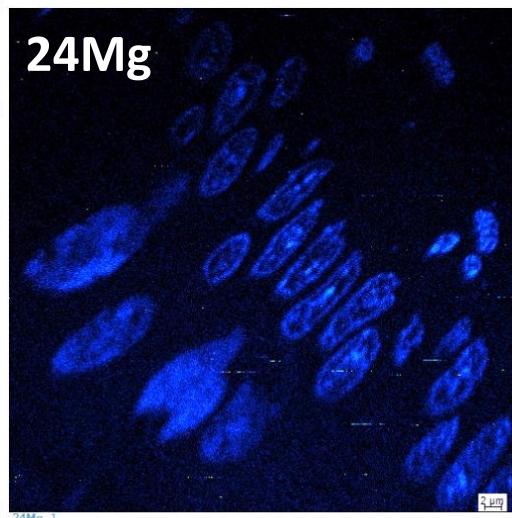
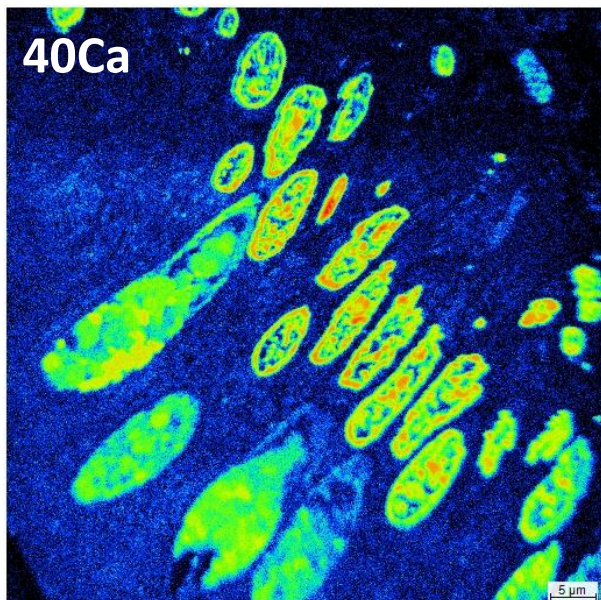
INTESTINE



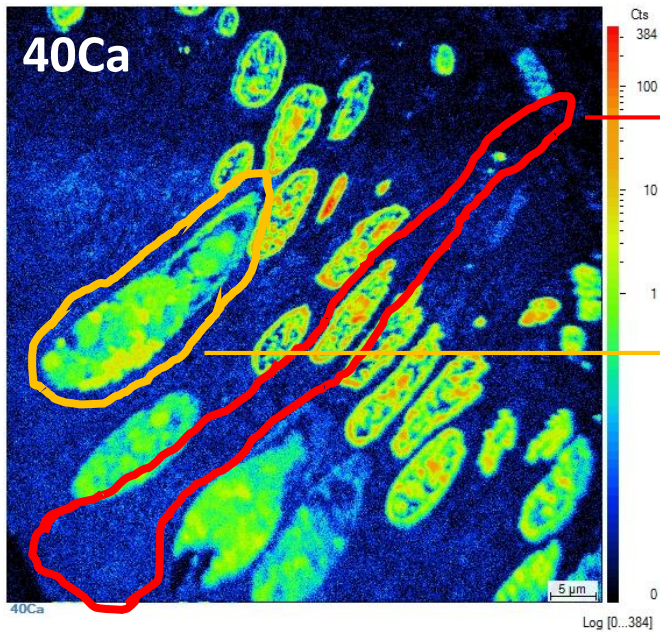
NanoSIMS imaging



NanoSIMS imaging



NanoSIMS imaging

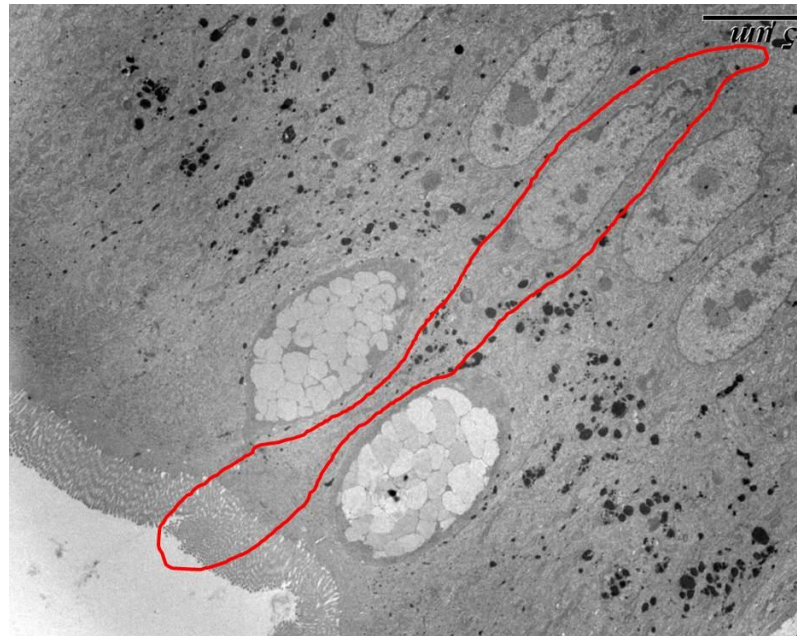


Enterocyte cells

- cells organized as monolayer
- metals accumulated in the nuclei

Goblet cells

- High metal accumulation

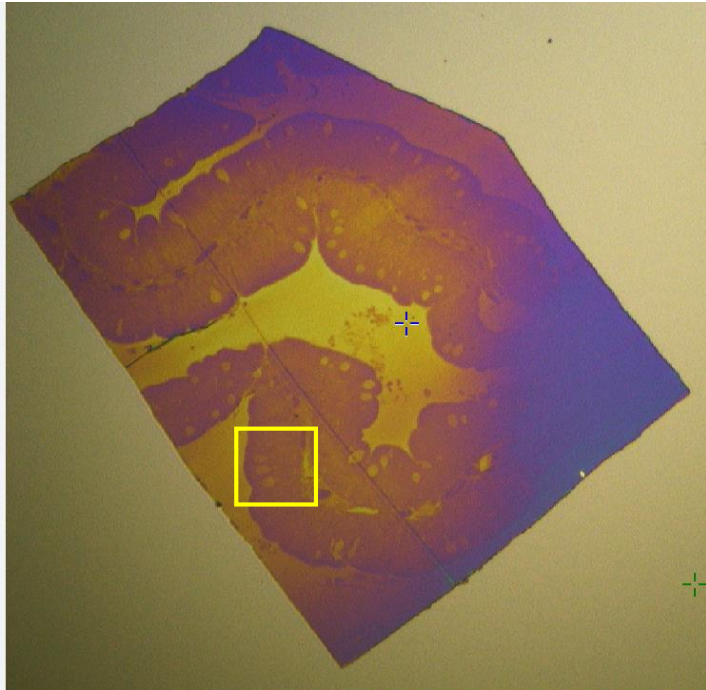
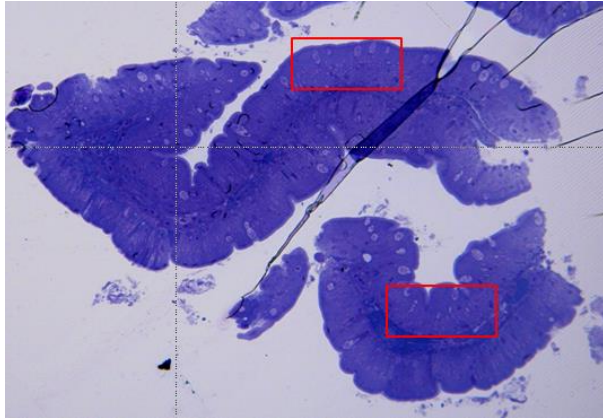


NanoSIMS imaging

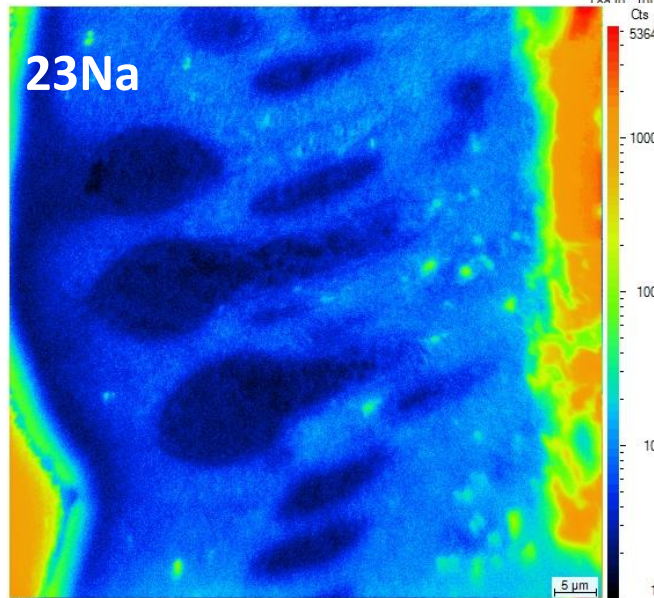
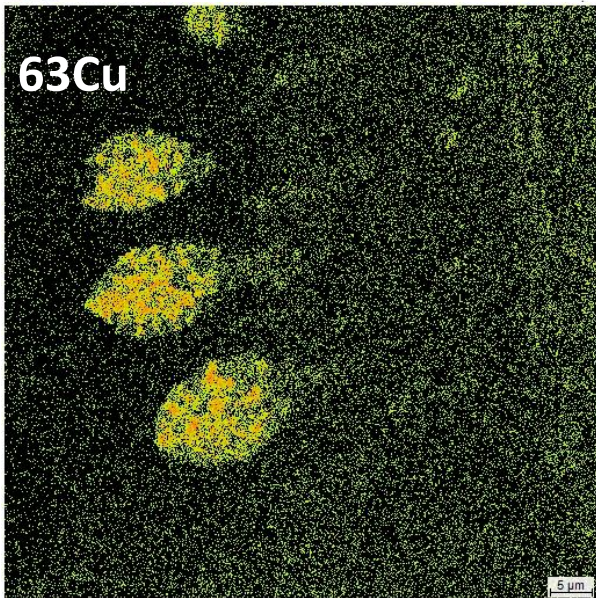
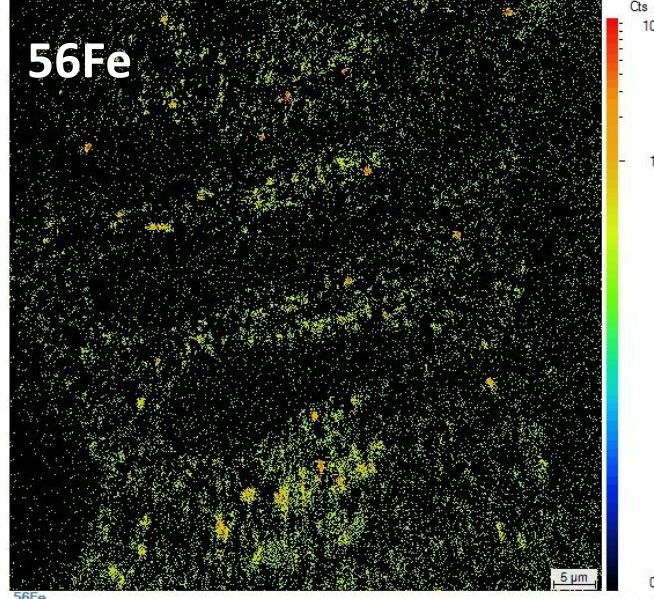
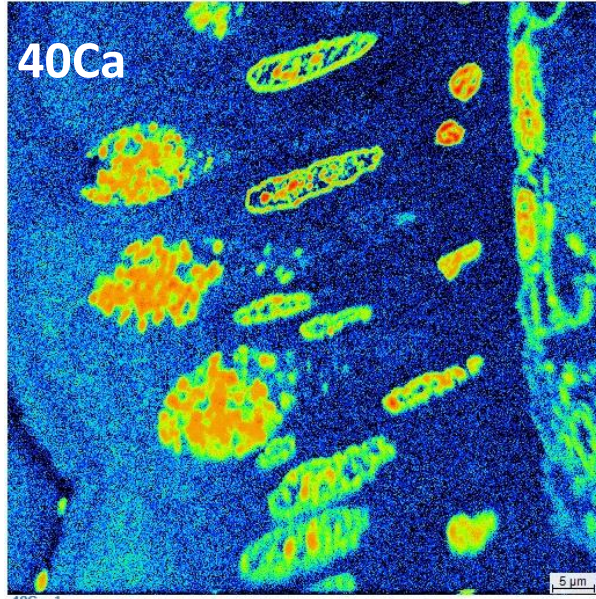
Krka - Knin

exposed site

INTESTINE



NanoSIMS imaging



Log [0...10]

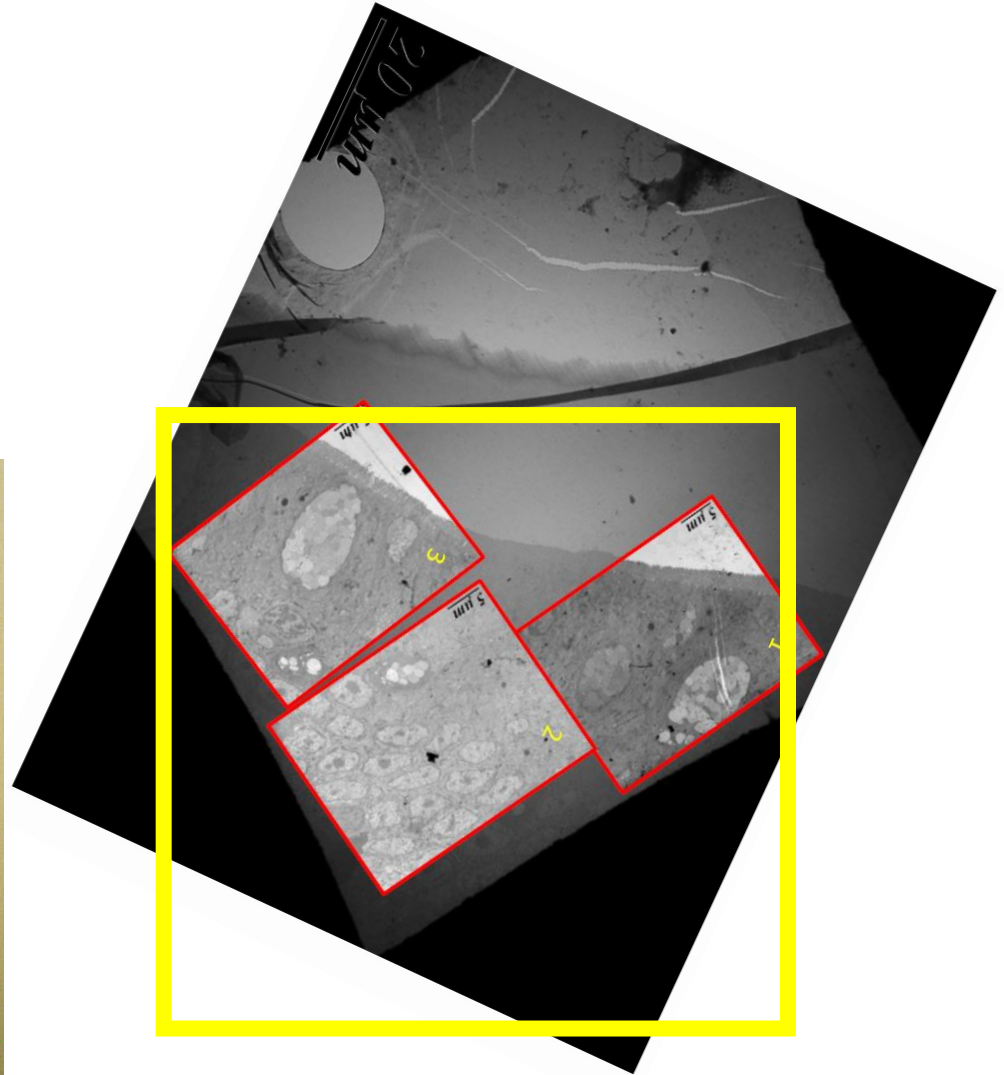
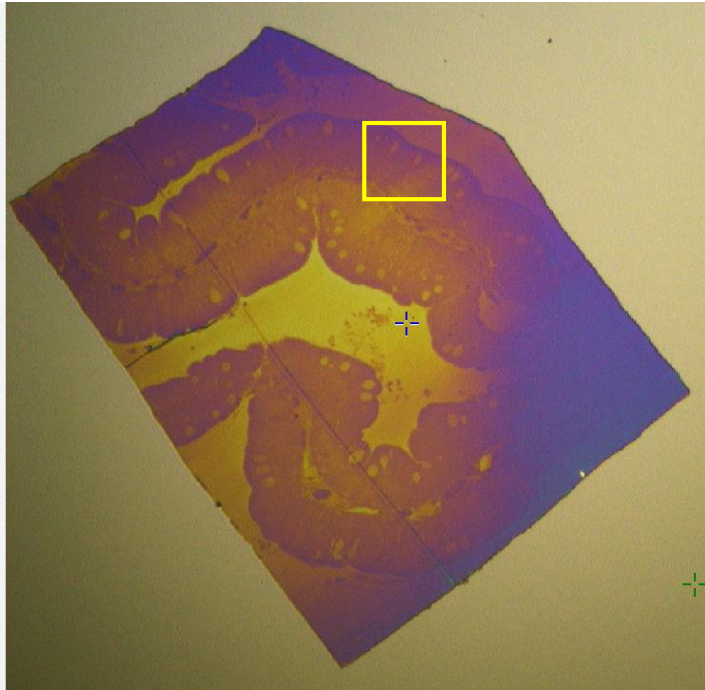
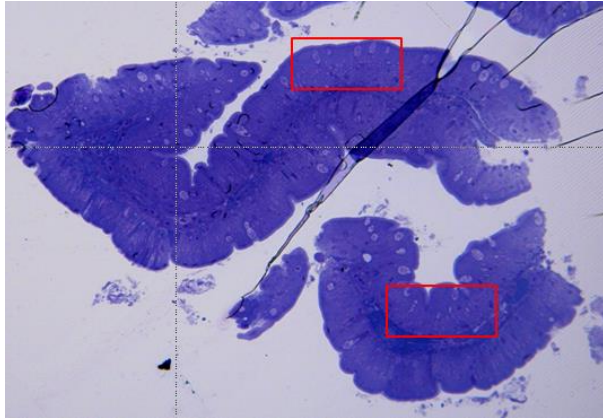
Log [1...5364]

NanoSIMS imaging

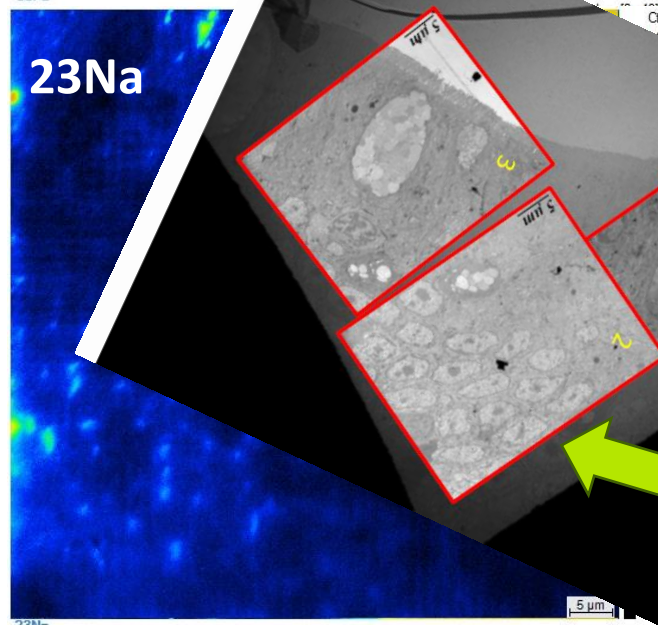
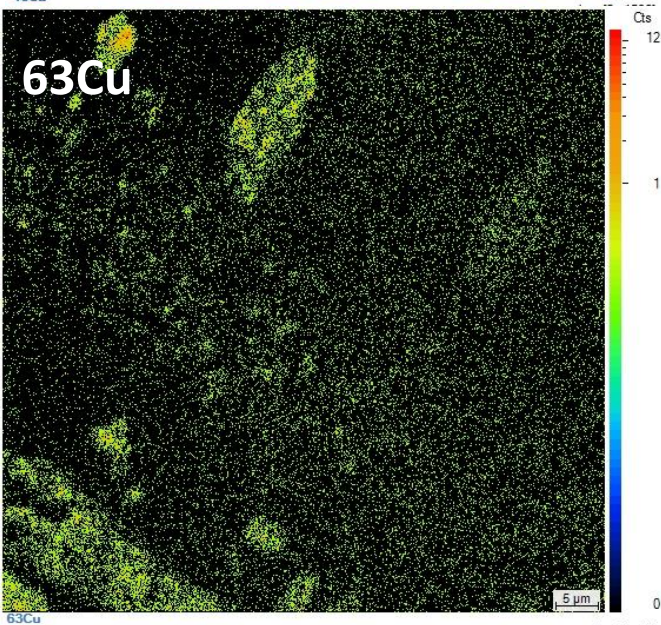
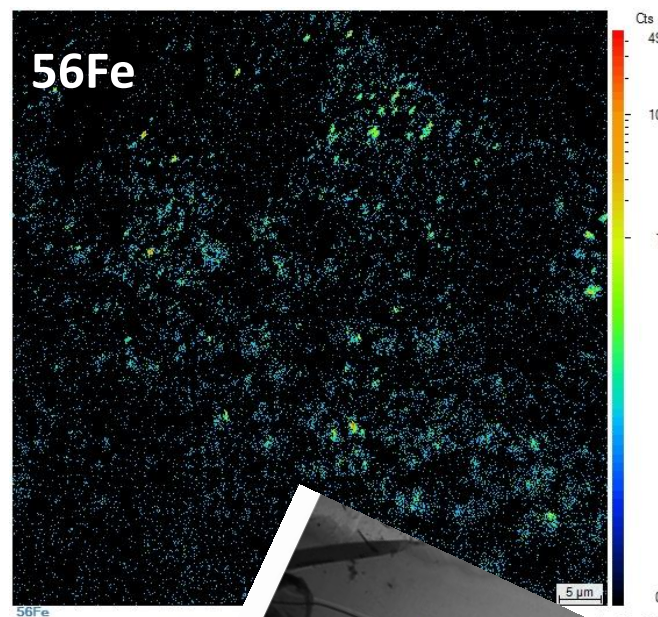
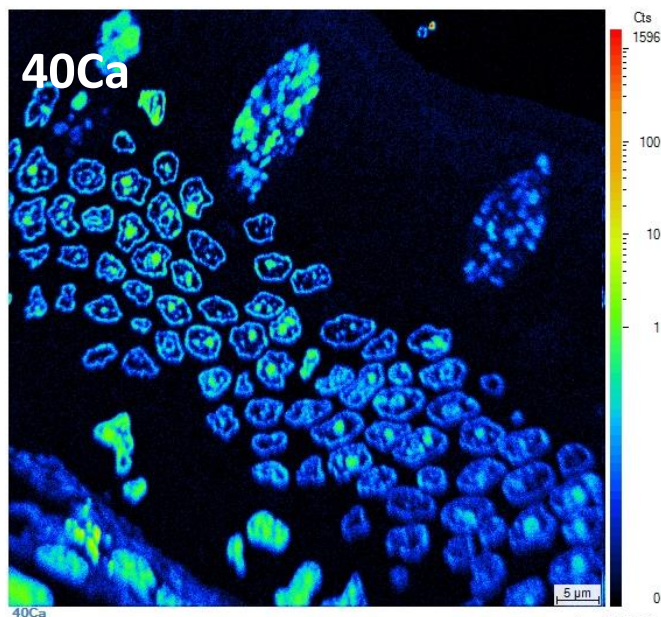
Krka - Knin

exposed site

INTESTINE

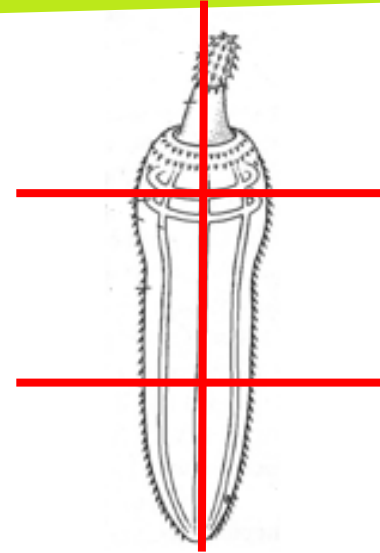
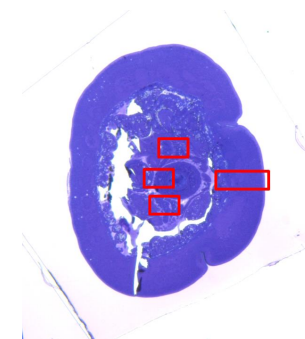
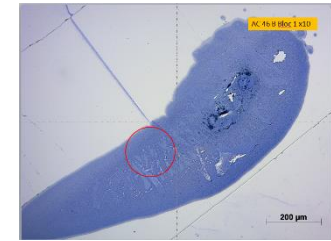
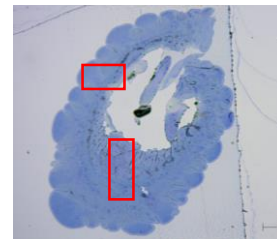
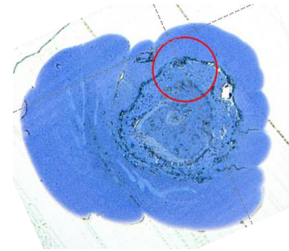
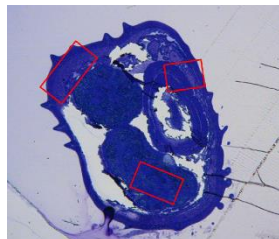
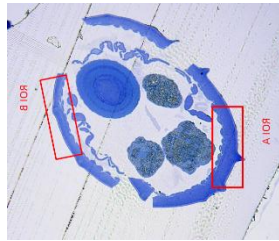


NanoSIMS imaging



NanoSIMS imaging

PLACE		SAMPLES
Krka - Knin	exposed site	INTESTINE
		ACANTHOCEPHALAN
Krka - spring	reference site	INTESTINE
		ACANTHOCEPHALAN

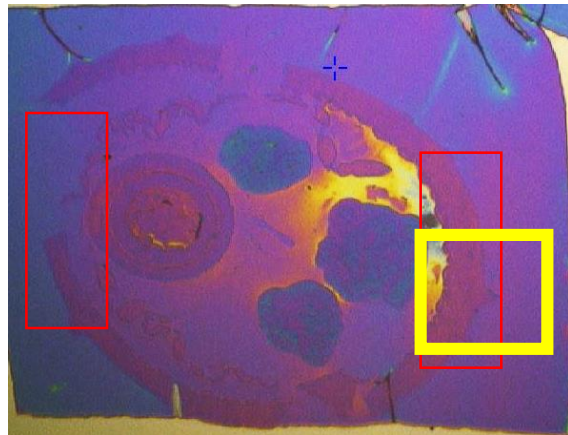
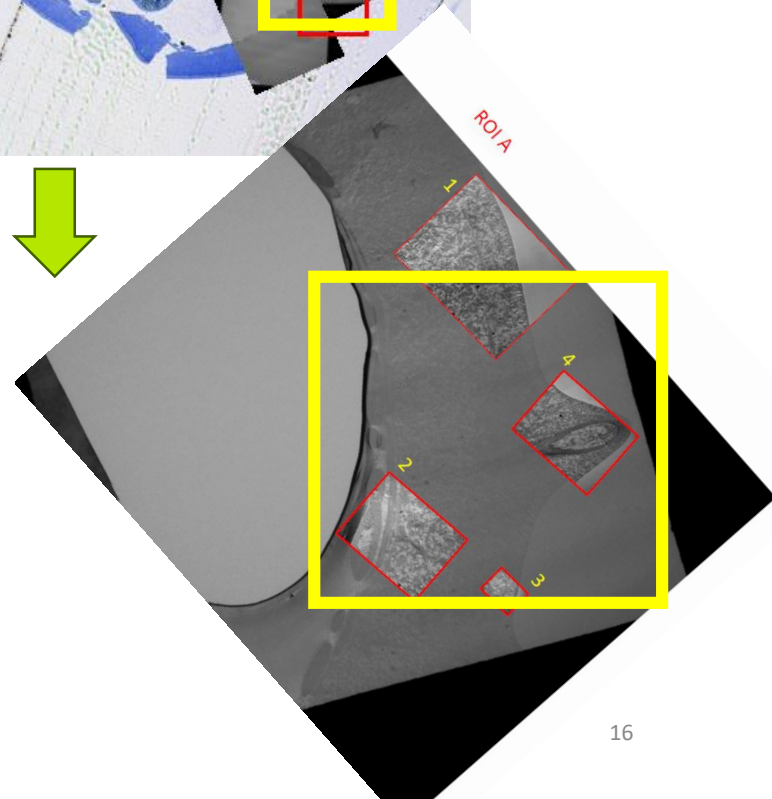
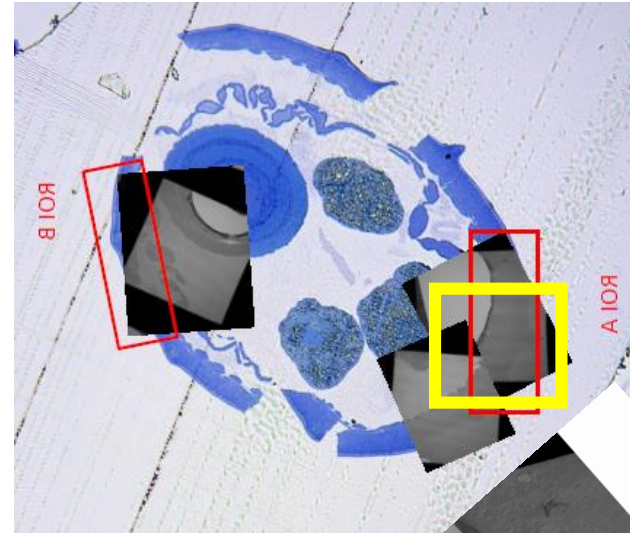
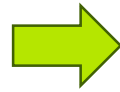
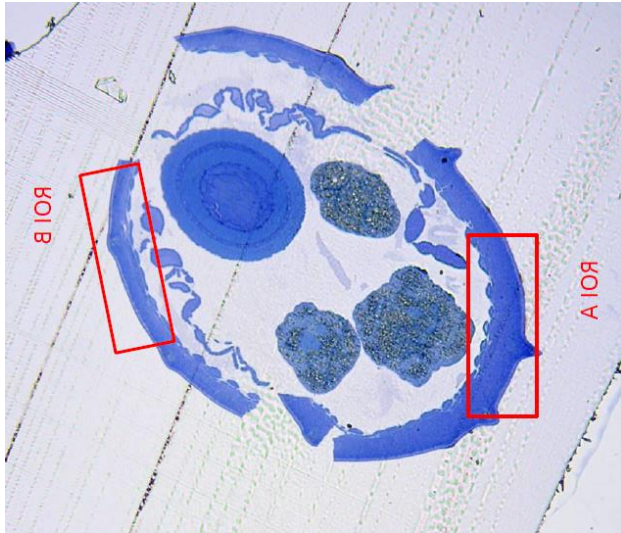


NanoSIMS imaging

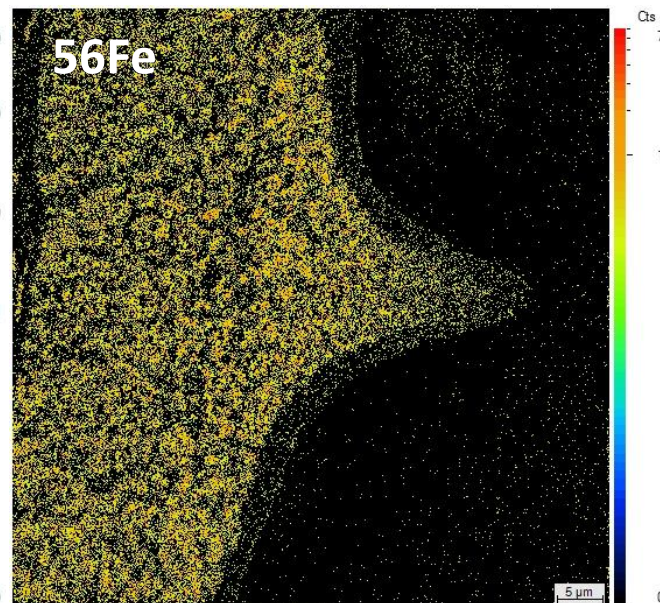
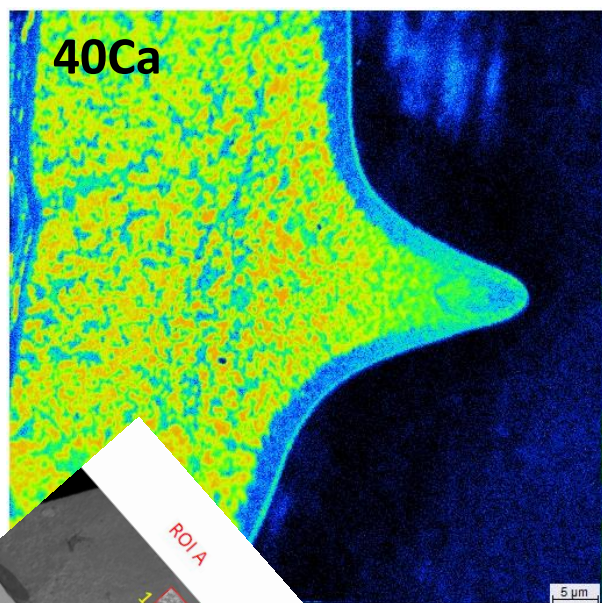
Krka - Knin

exposed site

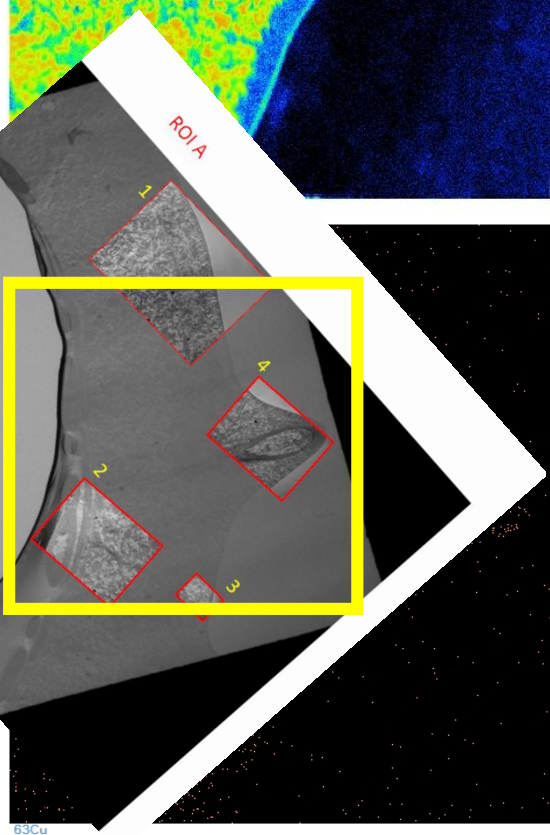
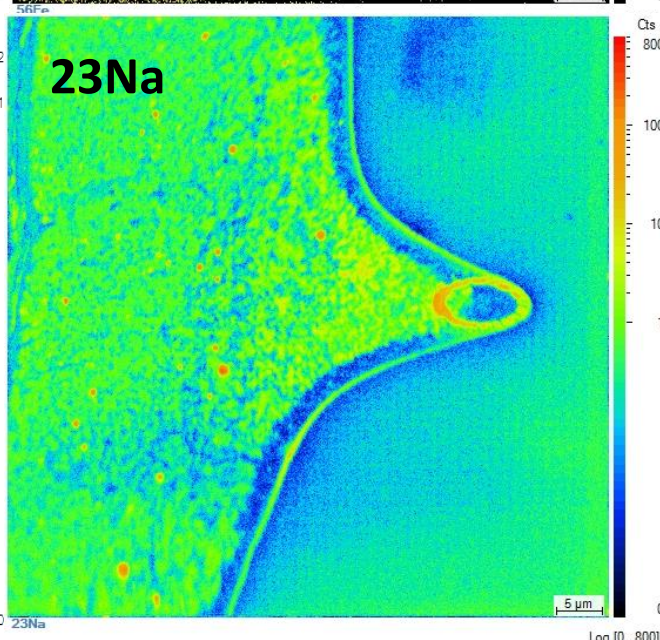
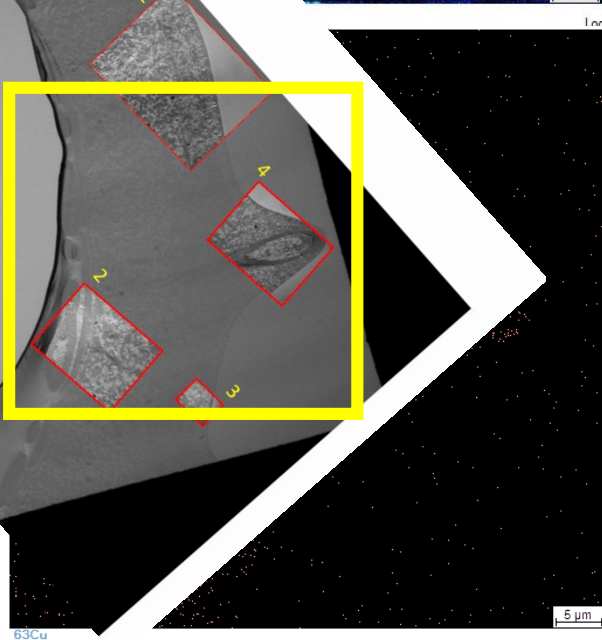
ACANTHOCEPHALAN



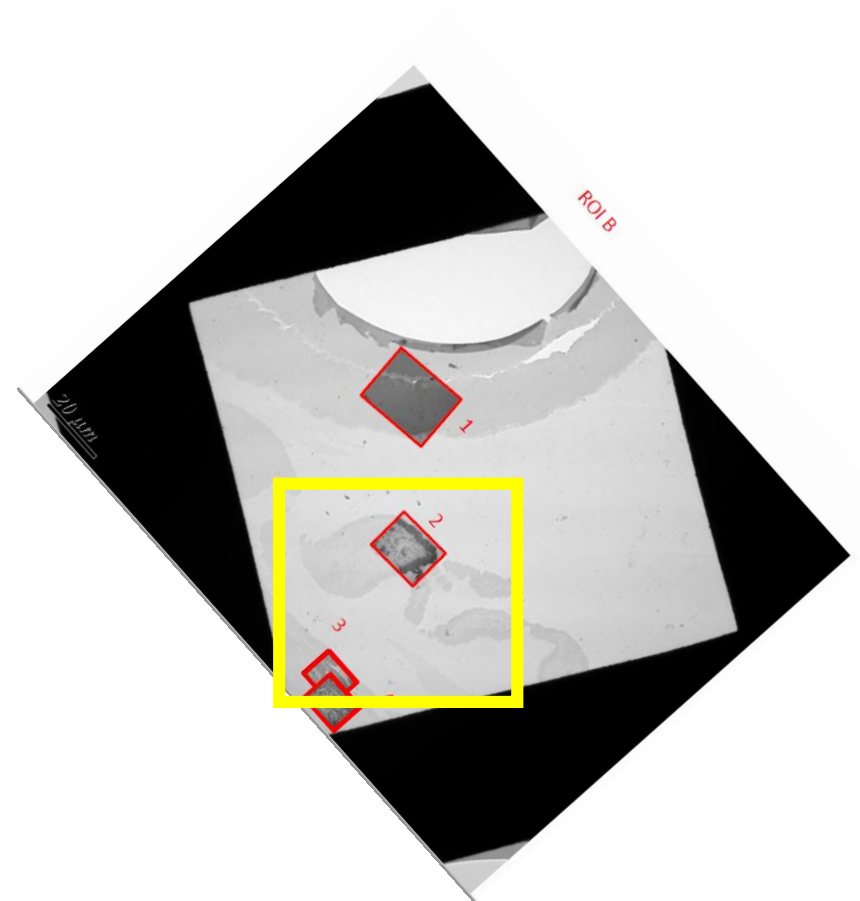
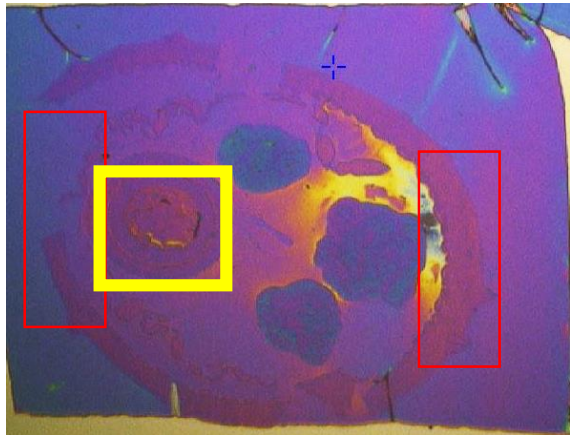
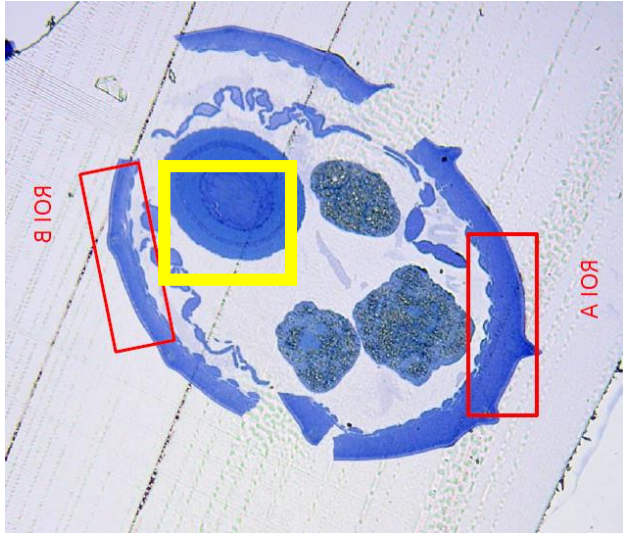
NanoSIMS imaging



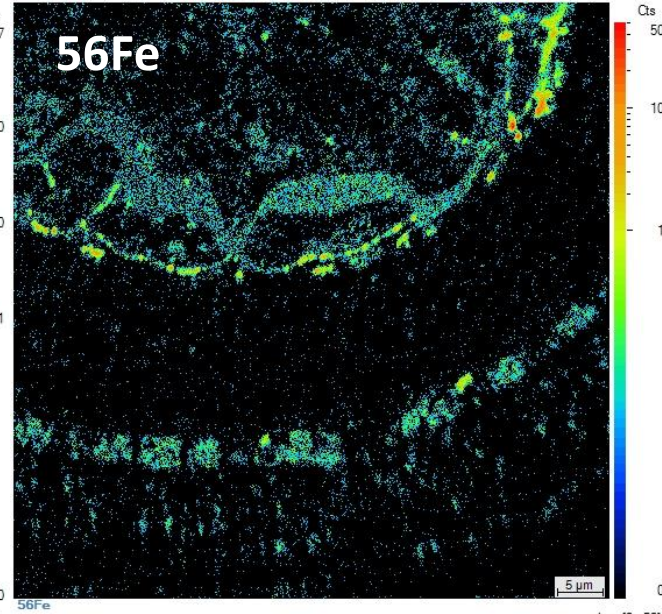
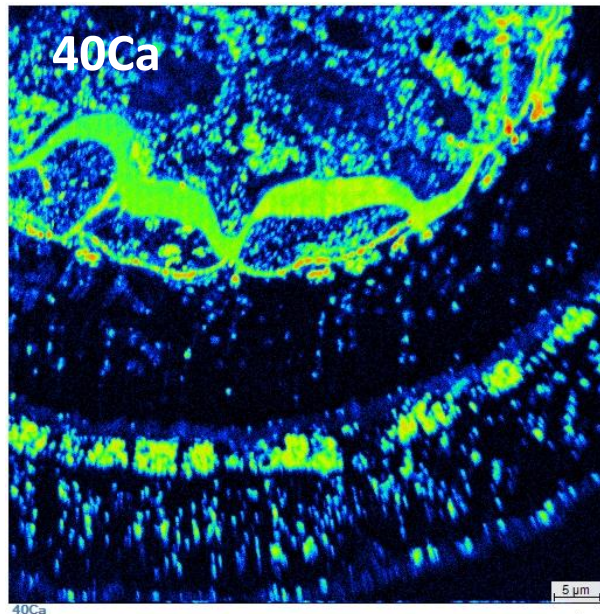
65x65 μm
512x512 pixels
10 ms/pixel
6 planes
accumulated



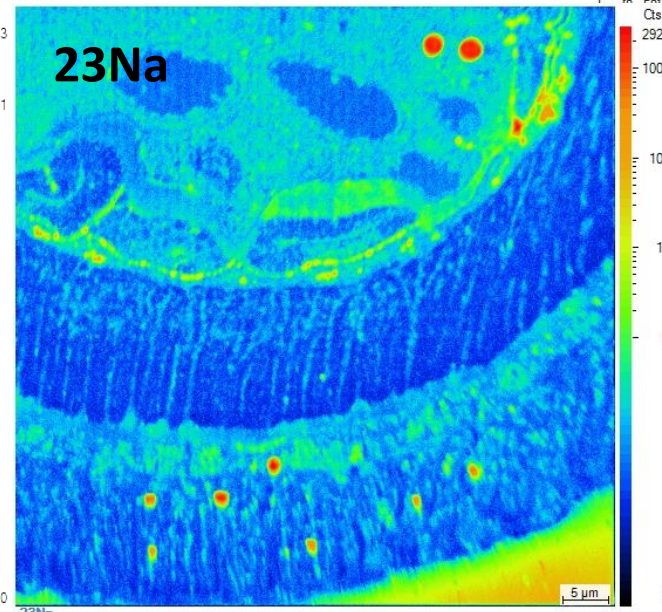
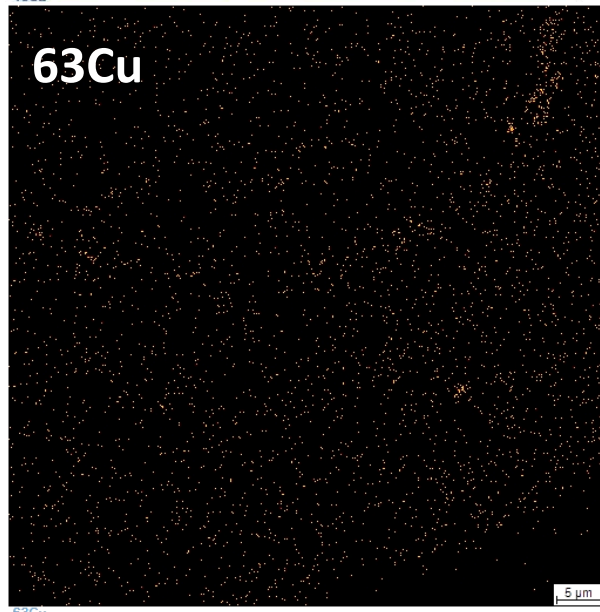
NanoSIMS imaging



NanoSIMS imaging



65x65 μm
512x512 pixels
10 ms/pixel
6 planes
accumulated

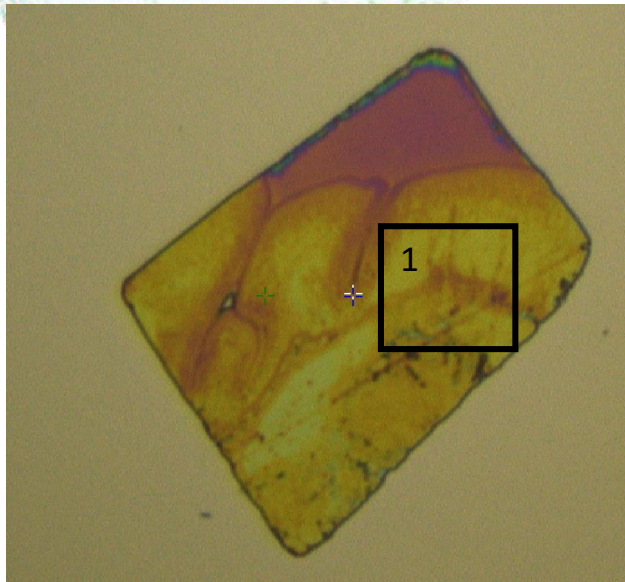
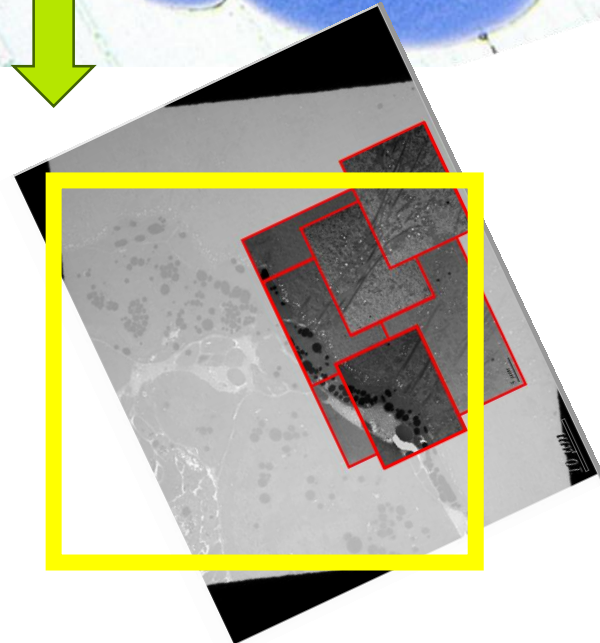
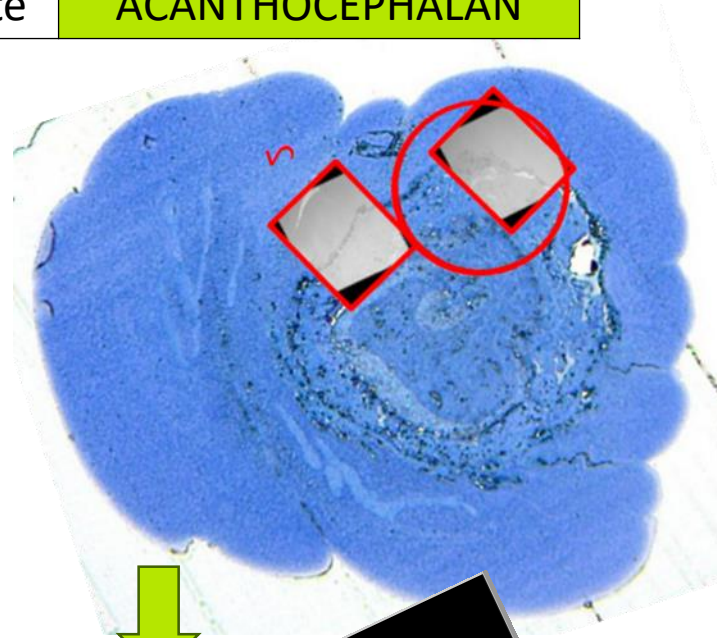
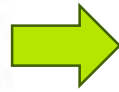
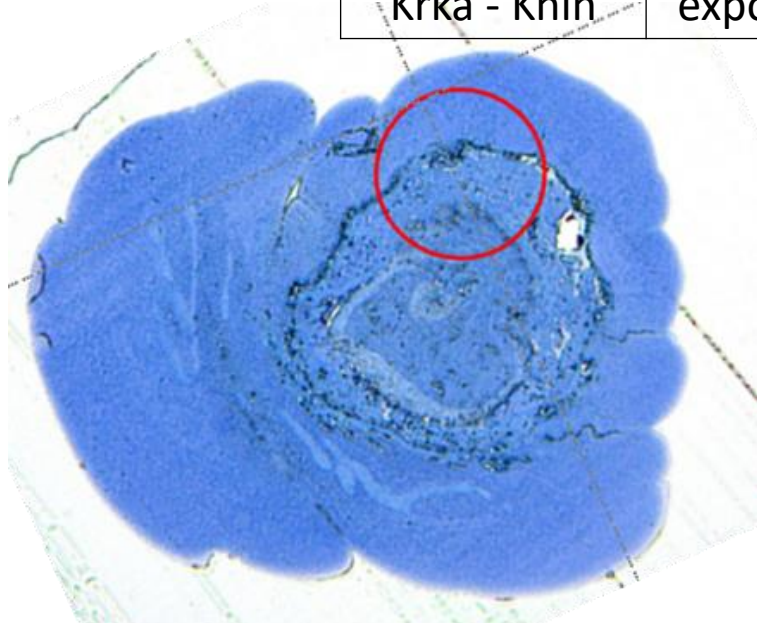


Log [0...3]

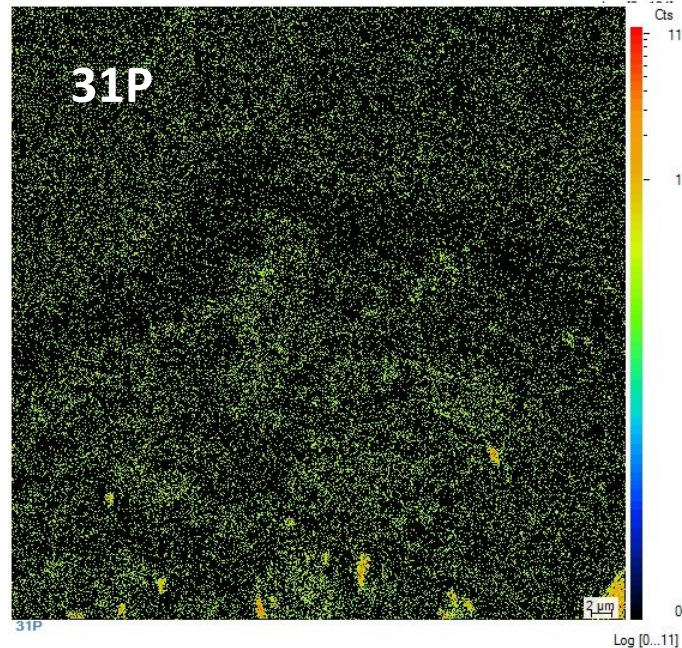
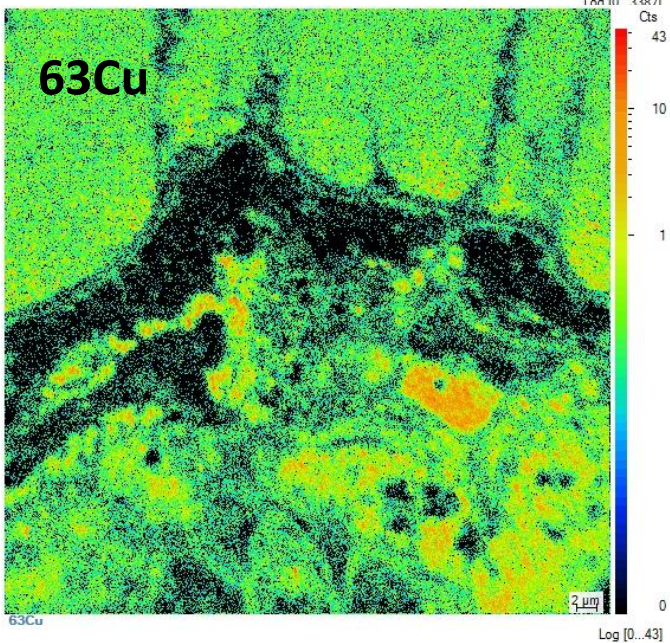
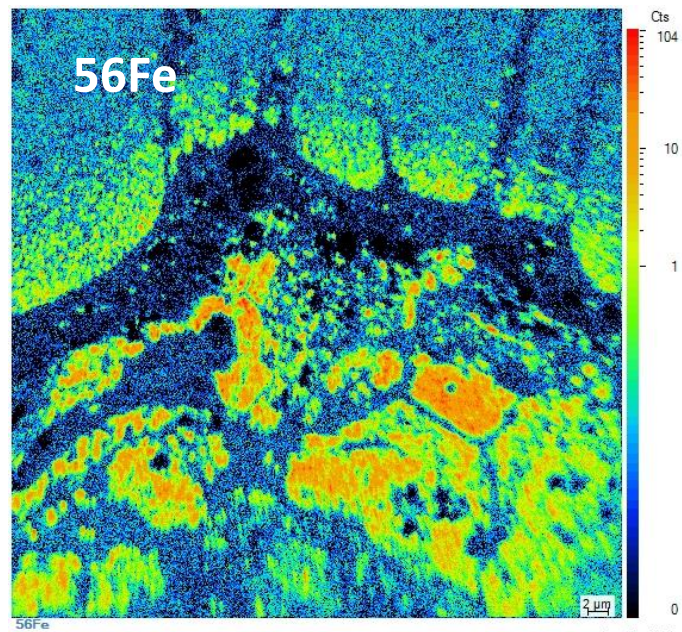
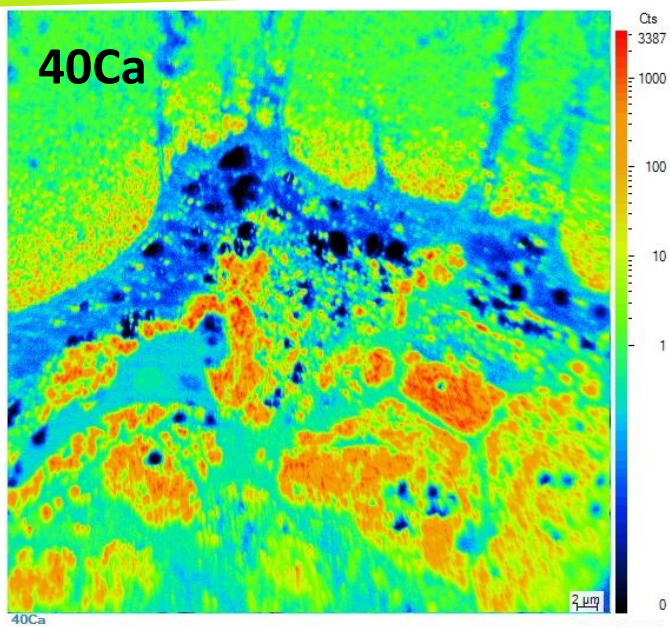
Log [0...2923]

NanoSIMS imaging

Krka - Knin exposed site ACANTHOCEPHALAN



NanoSIMS imaging

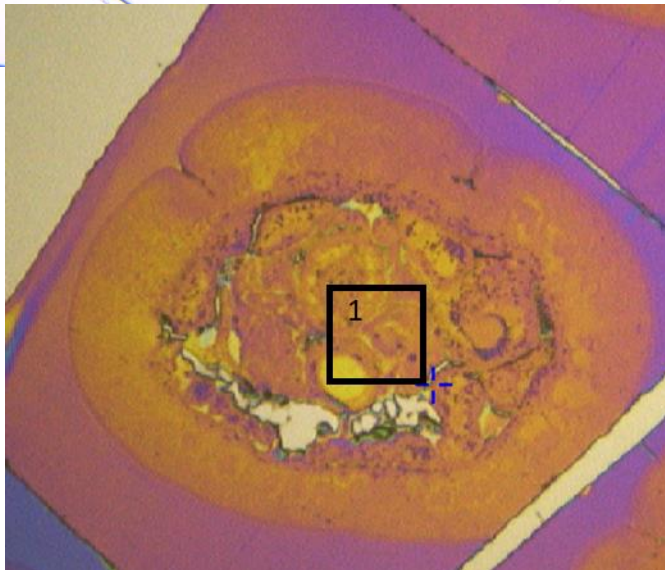
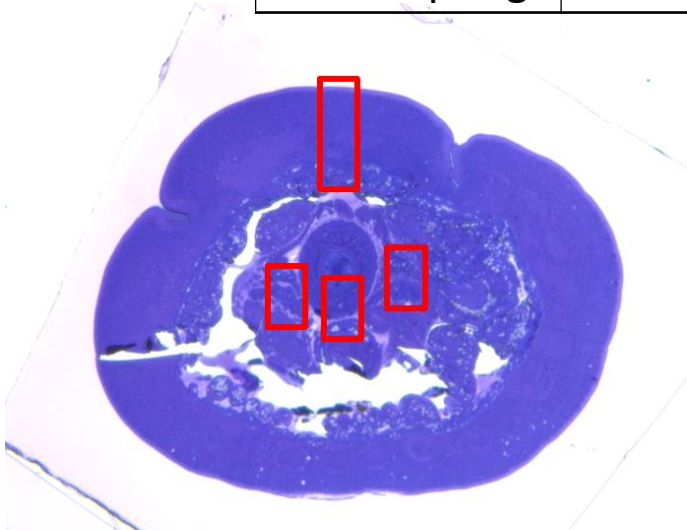


NanoSIMS imaging

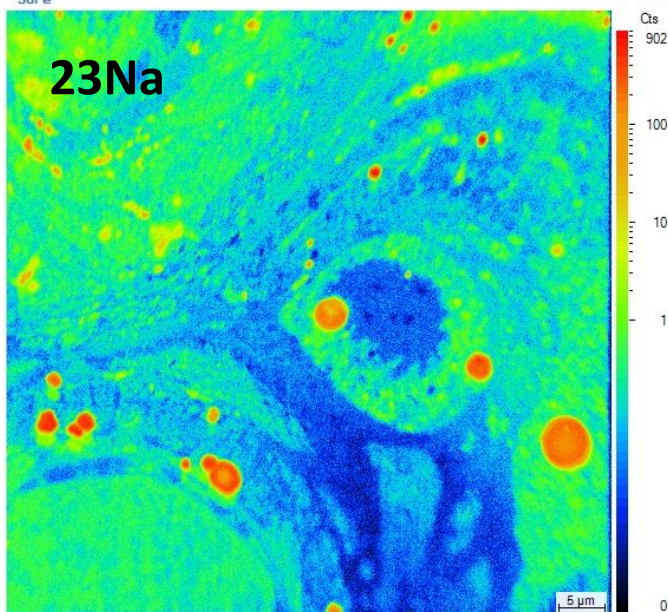
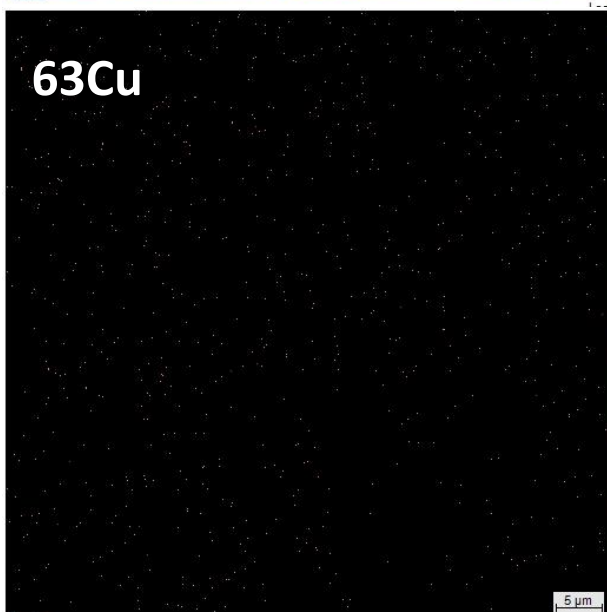
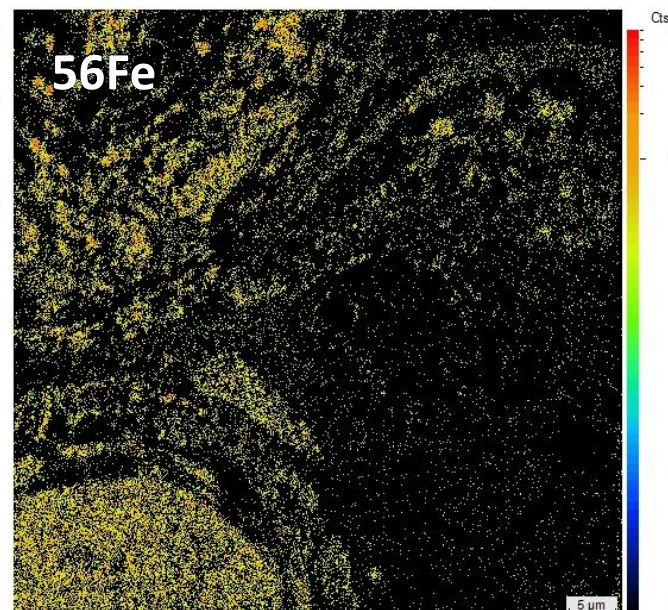
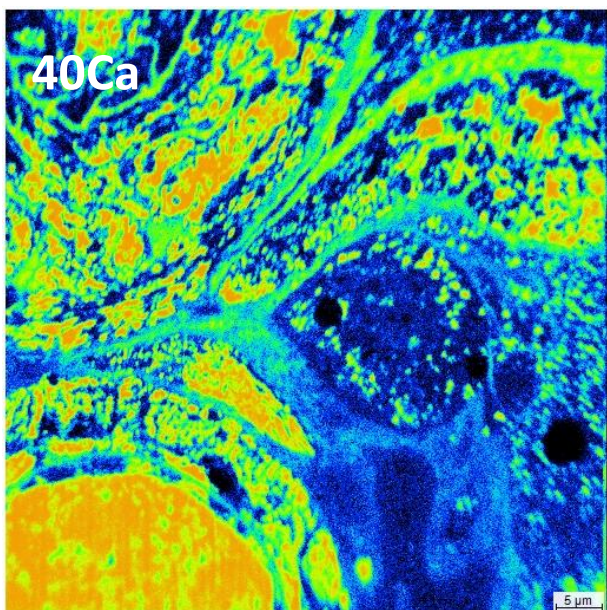
Krka - spring

reference site

ACANTHOCEPHALAN



NanoSIMS imaging

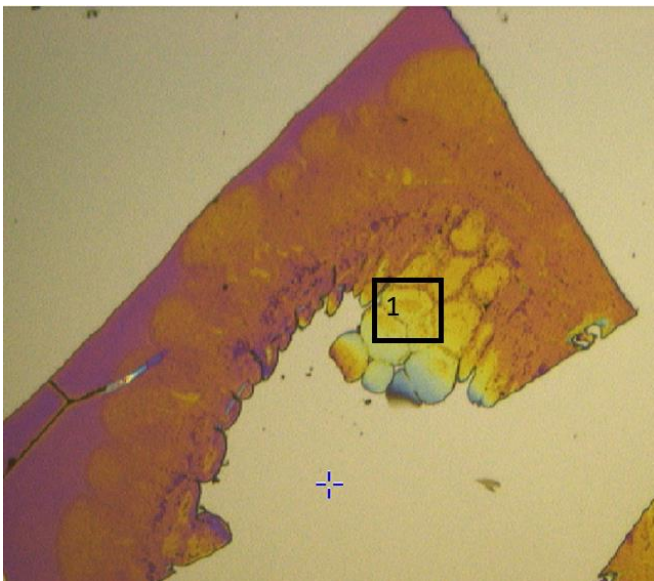
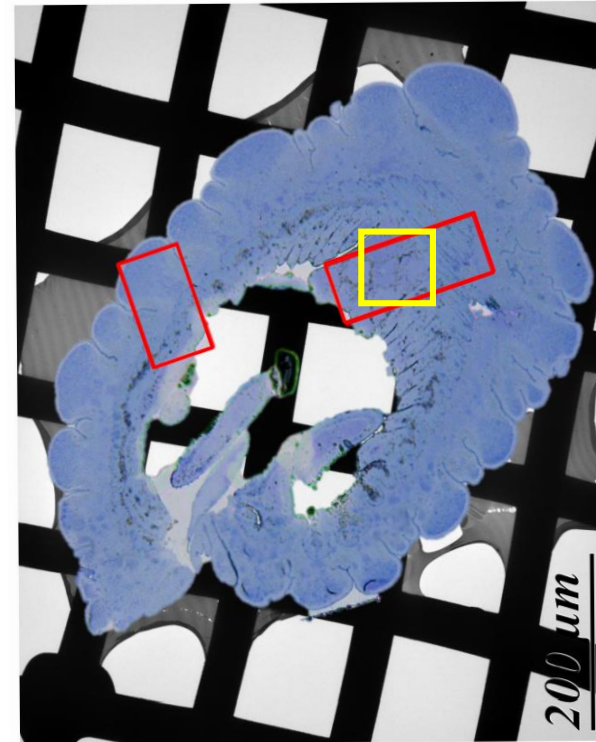
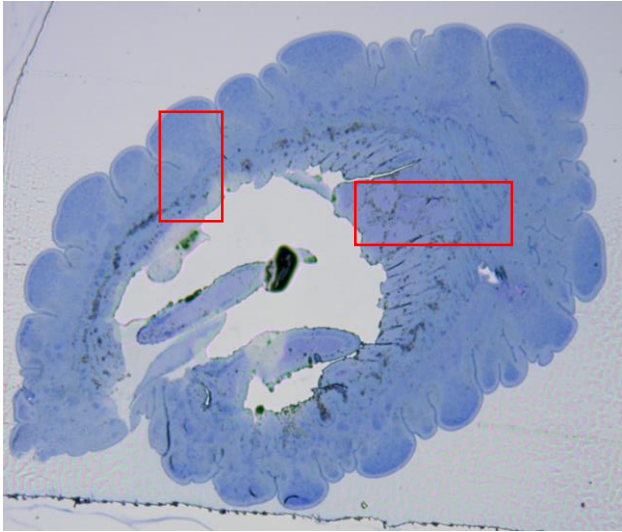


NanoSIMS imaging

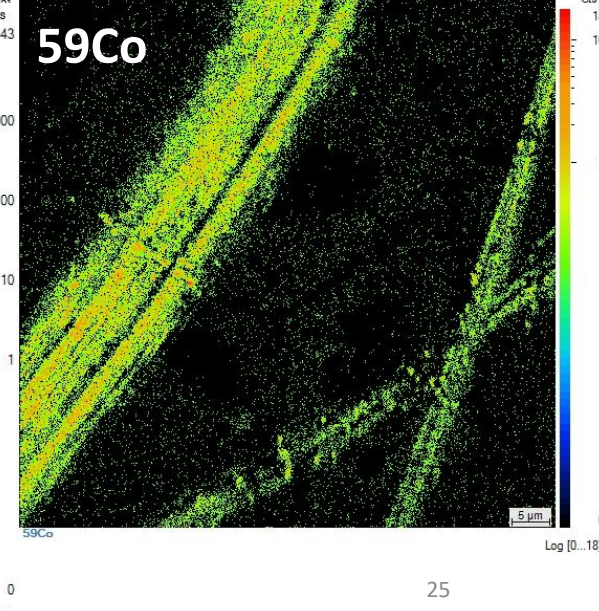
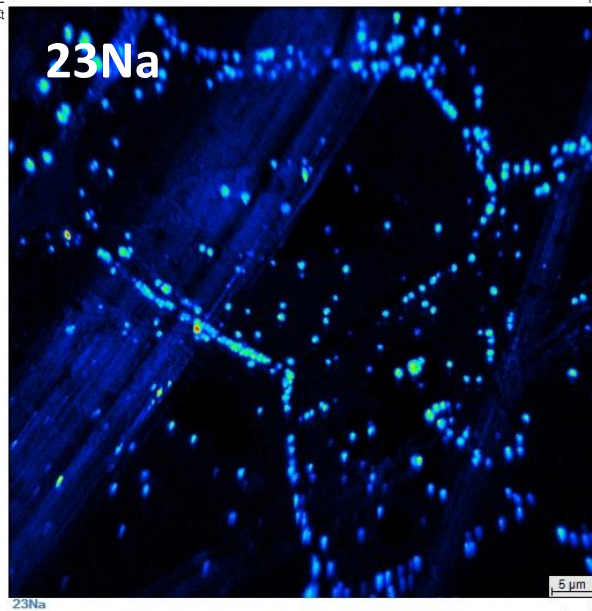
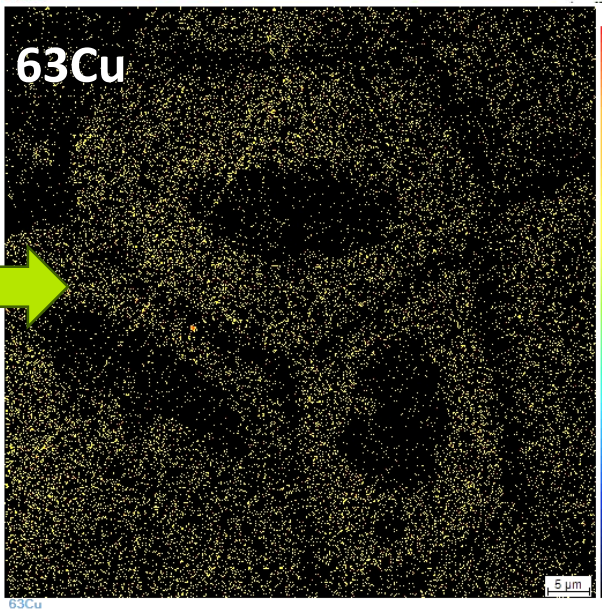
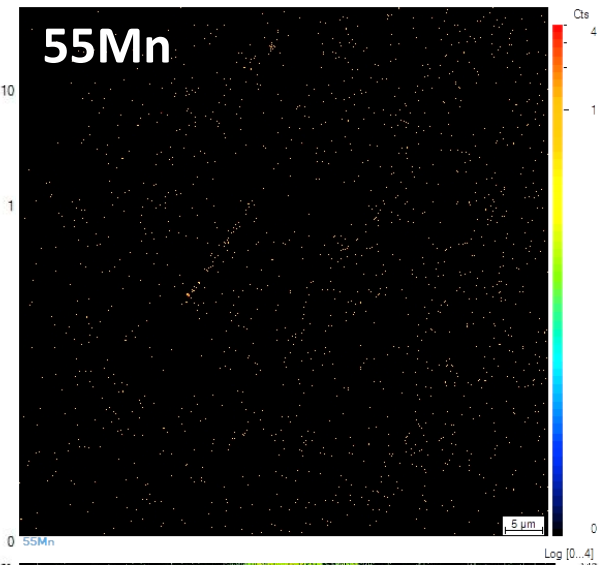
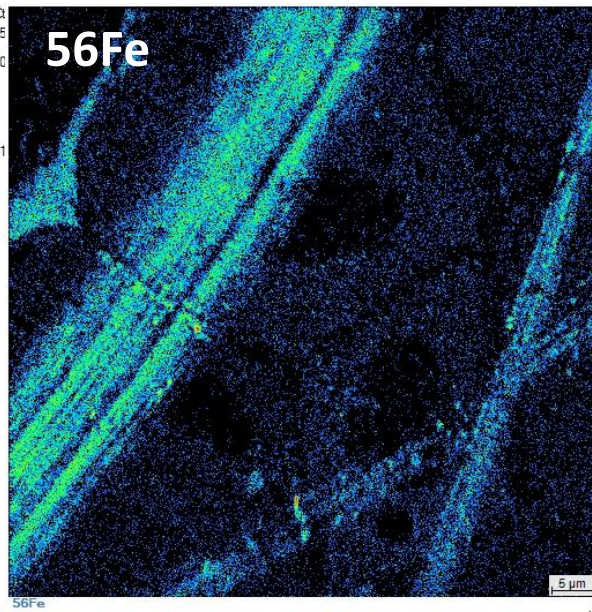
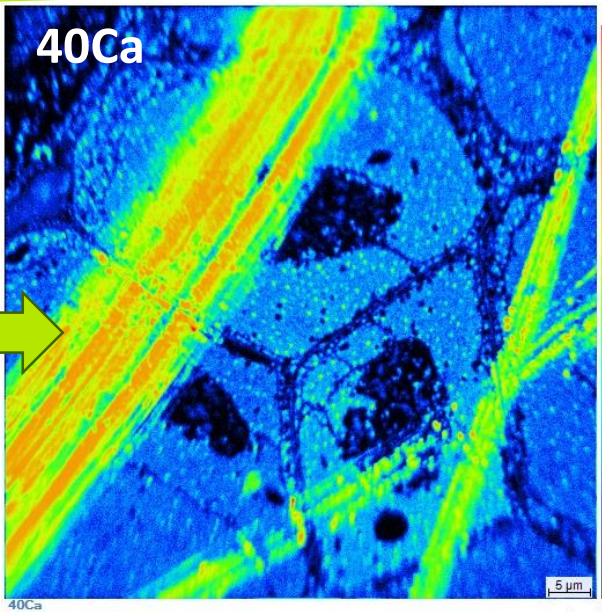
Krka - spring

reference site

ACANTHOCEPHALAN



NanoSIMS imaging



Conclusions

- Intestine:
 - High metal accumulation in the nuclei of enterocyte cells and goblet cells
 - Ca, Cu, Fe, Na, Co and Mg observed.
 - Very few counts of Zn, Rb, Sr, Ba:
 - Iron sometimes not present in goblet cells:
- Acanthocephalan:
 - High metal accumulation, some elements show higher counts than intestine samples which correlate with higher concentrations.
 - Ca, Cu, Fe, Na, Co and P observed.
 - Very few counts of Mn:
 - Copper is sometimes not found in the tissues.
 - Na is observed sometimes in the form of hotspots.

**Thank you
for your attention**