

The study of elemental distribution in adrenal gland tumors using synchrotron radiation microprobe

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The adrenal glands are the endocrine organs located at the bottom pole of each kidney. Anatomically they are divided into the adrenal cortex (outer part) and the medulla (inner part). Both of them differ each other structurally and functionally. The adrenal gland tumors are often incidentally detected by chance (hence they are named incidentallomas) while diagnostic imaging is used for the reasons other than the endocrine disease indications [1].

Two types of tumor tissue were investigated: adenoma (derived from outer part of adrenal gland) and pheochromocytoma (from the inner part of glands). They were taken intraoperatively from patients with adrenal cortical adenoma and pheochromocytoma. The specimens were cryo-sectioned into 16 μm thick slices. Then they were fixed onto ultralene foil by adhesion force and freeze-dried at $-80\text{ }^\circ\text{C}$. The area of each sample was about 50 square millimetres. The foil was mounted on the plastic ring about 3 cm in diameter.

The previous investigations has shown [2] that studied samples differ biochemically, depends on the region they originate (inner or outer part of adrenal gland) hence it was interesting if there are any differences in elemental distribution between two groups of tumor samples.

The micro-SRXRF measurements were carried out at beamline L (HASYLAB at DESY). The primary photon energy was set to 17 keV by a multilayer monochromator. The beam was focused to the dimension of 15 μm x 15 μm by the use of the polycapillary optics. Emitted X-ray fluorescence spectra were recorded with Vortex SDD detector. The time of single spectrum acquisition was equal to 10 s and the resolution was set to 15 μm .

26 of samples were investigated altogether (15 - adenoma and 11 of pheochromocytoma samples). From each sample two or three regions (average dimension 400 μm x 400 μm) were scanned. The XRF measurements allowed to analyze the elements such as: P, S, Cl, K, Ca, Fe, Cu, Zn, Br and Rb. For the analysis the PyMca application version 4.6.2 was applied. Exemplary distribution maps of selected elements in the pheochromocytoma sample are shown in Fig.1. The statistical analysis are in progress.

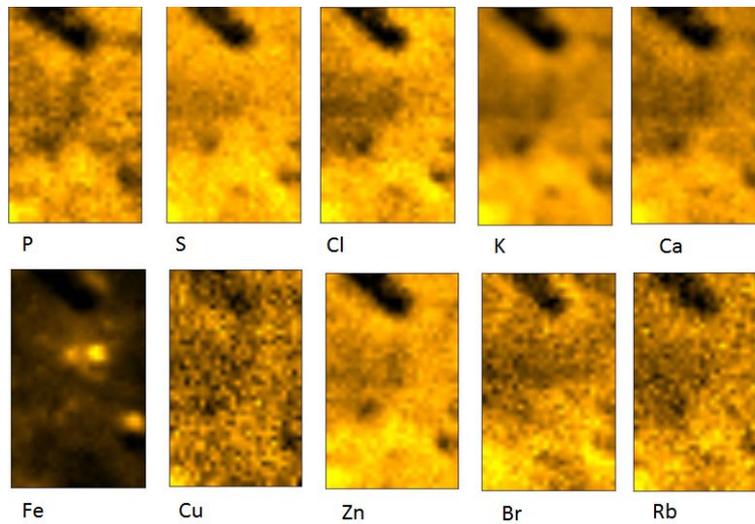


Figure 1: Distribution maps of elements detected in pheochromocytoma sample (the data normalized to the photon flux)

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References

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