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Trace elements concentration in normal and pathological tissues of pituitary gland

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Keywords: pituitary gland, SRIXE, trace elements

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Pituitary gland is a small pea-shaped organ located at the base of the brain. It is under control of the central nervous system via its morphological and functional link to the hypothalamus. The pituitary is often referred as "master organ" since it releases hormones regulating activities of other endocrine glands.

Pituitary disorders most commonly result from the growth of benign tumors and they can produce a wide spectrum of clinical symptoms [1]. These symptoms are effects of over- / underproduction of particular hormones or they result from compression of the tumor on optic nerve or on other cranial nerves. Diagnosis of pituitary disease may be extremely difficult since it is often confused with other disorders [2].

The characterization of trace element species in solid biomatrix like pituitary gland is necessary to understand their complex functions and interactions. μ-SRIXE with simultaneous multielemental detection is capable to address these challenges and hence plays a fundamental role as a nuclear reference analytical technique. For the study we used 10 μm-thick histological sections of human pituitary glands. Experiments were performed at beamline L of DORIS III light source at DESY, Hasylab. Energy was set to 15 keV and use of polycapillary enabled detection of broad range of elements (P, S, Cl, K, Ca, Cr, Mn, Fe, Cu, Zn, As) in a very good spatial resolution (15 μm).

Various structures of normal gland and pituitary microadenomas were analyzed showing accumulation or depletion of certain trace and essential elements. Examples of Fe and Cr concentration distributions are presented in Figure 1.

Our results indicate that intracellular metabolism is most likely to be different in healthy and affected tissues. Furthermore, they can shed light on molecular pattern of the pathogenesis of the diseases.

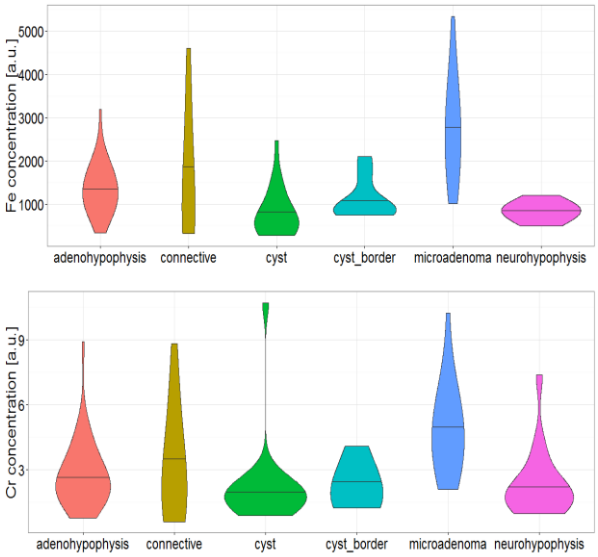

Figure 1. Violin plots for Fe (top) and Cr (bottom) concentration distribution in pituitary tissue specimens.

Acknowledgments: This work was partially supported by NUS Core Support C-380-003-003-00 and the European Community under the Contract RII3-CT-2004-506008 (IA-SFS) (HASYLAB project No II-20052050 EC)

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