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Trace elements concentration and diabetes mellitus duration in crystalline lens of dogs: μ EDXRF applications

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Diabetic mellitus (DM) is one of the major causes of increased sight loss. Cataract, considered the most important complication of DM, is a reversible cause of visual impairment that can affect dogs at all ages [1]. WHO has considerate the diabetes mellitus an important risk factors to cataract formation. Several elements are responsible for many activities in the body. Furthermore, an association between levels of some trace elements in the formation process of cataract has already been observed [2].

The aim of this study is to evaluate the trace elements content in samples of cataractous lenses in diabetic dogs and compare the results with the corresponding healthy ones. The lenses were collected by cataract surgery at Ophthalmology Surgery of Faculty of Veterinary Medicine of University of Sao Paulo-Brazil. Afterward the samples were immediately stored in a freezer at -40 °C. The samples were lyophilized and subsequently they were prepared for Energy dispersive X-ray fluorescence (EDXRF) measurements. Energy dispersive X-ray fluorescence (EDXRF 720, Shimadzu, Japan) was used to quantify Fe, Cu, and Zn. The EDXRF consists of an X-ray tube equipped with a changeable secondary target, normally of rhodium. The characteristic radiations emitted by the elements in the sample were detected by a Si (Li) detector. Experimental parameters were obtained by calibration, using standard reference materials 1577b. The X-ray generator was operated at 50kV and 100 mA and a typical acquisition time of 100 s was used. Data about the patient were collected such as breed, gender and age, blood glucose levels and progression of disease (diabetes mellitus duration). The samples were shared in two groups of diabetic duration and blood glucose levels. The Fe levels were increased in dogs with higher blood glucose levels and shorter duration of diabetes. Our results suggest that levels of Fe may facilitate caractogenesis in diabetic patients. Dogs are susceptible to cataract formation, despite the regulation blood glucose with insulin therapy. Iron participates of free radicals formation that results into the hydroxyl radical and promotes oxidation of biological molecules. In conclusion, trace elements changes can be an additional parameter to enlarge the cataract formation in diabetic dogs.

References

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