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Evaluation of matrix effects on Formalin Fixed Paraffin Embedded tissue samples using µ-EDXRF

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Every time an intervention is performed, the total (biopsy) or a portion (surgery) of normal and tumor tissue is retrieved and processed as Formalin Fixed Paraffin Embedded (FFPE) blocks for the diagnosis and after they are stored for safekeeping. These FFPE blocks contain precious information regarding the elemental composition of normal/tumor tissue that is not harvested because there is no suitable analytical tool for elemental analysis of these samples. In what regards EDXRF, paraffin embedding process alters the sample's matrix permanently, hindering the application of common quantitative approaches based of Certified Reference Materials (CRMs).

In this work we have analyzed 12 sets of mirrored tissue samples, processed as pellets or after FFPE, in order to develop calibration curves and parametrize the influence of paraffin in the intensity of elemental peaks in the EDXRF spectrum.
Measurements were performed using Bruker M4 Tornado EDXRF system with Rh anode X-Ray tube. Calibration curves for S, Ca, Fe, Cu and Zn were obtained with and without correcting the intensities for the Rh Ka Compton to Rayleigh ratio. A 13th set of samples was used for validation, comparison of the intensity obtained in the FFPE tissue block and as pellet (true value).

Results show that using both uncorrected and corrected approaches the obtained intensities present a bias towards the true value lower than 13%. On the other hand, precision of the method is still too low, so there is a need to increase sample size and reduce the uncertainty of the method.

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