EVALUATION OF CONTRAST AGENTS FOR BONE, CARTILAGE AND SOFT TISSUE VISUALIZATION IN X-RAY COMPUTED TOMOGRAPHY AND BRIGHTFIELD MICROSCOPY IMAGING.

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In bone imaging X-ray micro-Computed Tomography (micro-CT) is frequently used for 3D visualization and image quantification. However, radiolucent tissues as cartilage and soft tissues are still challenging to image. Therefore contrast agents are applied to enhance image contrast of these tissues. As well, microscopy imaging is the gold standard in histomorphology bone analysis whereby cells and tissues are studied in more detail.
Therefore the goal is to find an easily applicable radiocontrast agent which could be used for correlative imaging.

Contrast agents cadmium iodine (CdI), phosphomolybdic acid (PMA), phosphotungstic acid (PTA), uranyless stain, EM Stain 336™, Hexabrix™, cesium chloride (CsCl) and potassium iodine were applied on rat femoral condyles. A GE NanoTom micro-CT scanner was used to visualize and analyze the tissues. Bone sections were created for histomorphology analysis, imaged using Scanning Electron Microscopy (SEM) and subsequently Energy-dispersive X-ray spectroscopy (EDS) was performed to detected and confirm contrast agent localization.

Micro-CT imaging showed detailed soft tissues, cartilage and bone tissue when CdI, CsCl and PMA were used [figure 1]. Histomorphology analysis displayed the practicality of PMA, CsCl, and Hexabrix in hard tissue microscopy analysis [figure 2]. However, SEM EDX analysis presented CsCl, PMA, and PTA in cartilage and soft tissue.

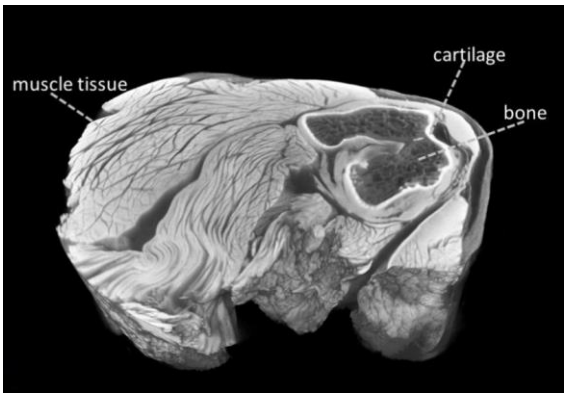

Figure 1: X-ray micro-CT imaging

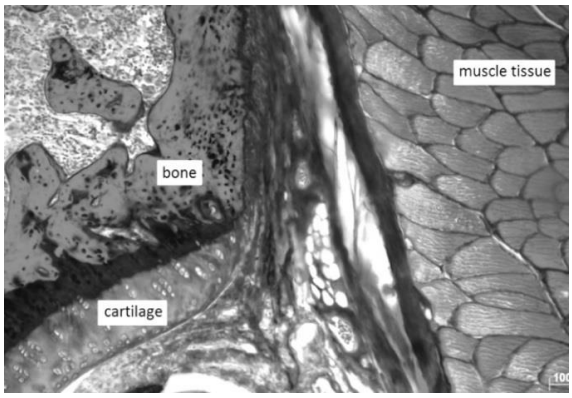

Figure 2: Histomorphology analysis

In conclusion, PMA and CsCl are useful easily applicable contrast agents for correlative imaging whereby 3D visualization and analysis of bone, cartilage and soft tissues in micro-CT imaging is enhanced, and subsequent histomorphology analysis is not influenced.