AbstractID: 9171 Title: Application of computed radiography in small animal imaging: X-ray contrast agents

Purpose: X-ray contrast agents play an important role in small animal imaging studies, e.g. tracking tumor growth without sacrificing animals. This multiphase study evaluates the performance of a computed radiography (CR) system for detecting iodinated contrast agent in tumors, using x-ray exposures at energies below the iodine K-edge.

Methods and Materials: The CR system is characterized by measuring MTF and NPS. Polychromatic x-ray spectra are modeled for different available kVps, and the mean energy for each kVp is determined. Contrast from a theoretical model is calculated for a range of mean x-ray energies.

A microtitration multi-well plate filled with mixtures of contrast agent and water is imaged to study the contrast sensitivity of the CR system. Each row contains a specified concentration, while each column represents a fixed volume (or corresponding thickness). CR images are acquired and the contrast of each well is measured and compared to a theoretical model. Next, a special PMMA phantom is designed to compare the measured CR contrast to contrast measured using a micro-CT, as a reference. Finally, several mice with implanted tumors are injected with different volumes of contrast agent and imaged by CR.

Results: Initial results show measured contrast is consistent with the theoretical model. A Chi-Square goodness-of-fitness test as a function of x-ray energy indicates the best fit between measured and theoretical contrasts is consistent with the mean energy estimates from the polychromatic beam model. A few tumor vessels are visible on mouse images.

Conclusions: Wide dynamic range, fast throughput, low radiation level and low cost are the potential advantages of CR imaging. Further studies are in progress to monitor the progression of tumors. CR imaging potentially offers a complementary procedure for small animal studies using micro-CT when acquiring the complete three-dimensional data is not necessary or time-efficient.