Micro Computed Tomography (µCT)

Preclinical Micro Computed Tomography (µCT) scanners utilize an x-ray source and a flat-panel detector mounted on a rotating gantry on opposite sides of the animal to acquire projections from many different angles.

The projections measure x-ray attenuation through the tissue caused by different local electron-densities. A reconstruction software is used to compute volume data (slices) based on the acquired raw data and the resulting pixel intensities strongly correlate with the density.

Different trajectories, e.g. circular or helical, can be used and some devices can zoom in to focus on smaller specimens. The voltage of the x-ray source can be varied, e.g. from 30kV for small samples such as a mouse heart or 70kV for a larger rat. Dual energy scans are possible to unmix materials, e.g. water, calcium and iodine.

Gating techniques can be used to reduce breathing motion or differentiate cardiac cycles. µCT devices can perform whole body scans in minutes and are often used as anatomical reference information for other modalities, e.g. PET, SPECT or FMT.

Many different µCT contrast agents available, e.g. to enhance blood or the liver. Important image parameters from the user perspective are noise, duration, x-ray dose and resolution and in this study group, we are working on ways to assess these parameters in a reproducible way.
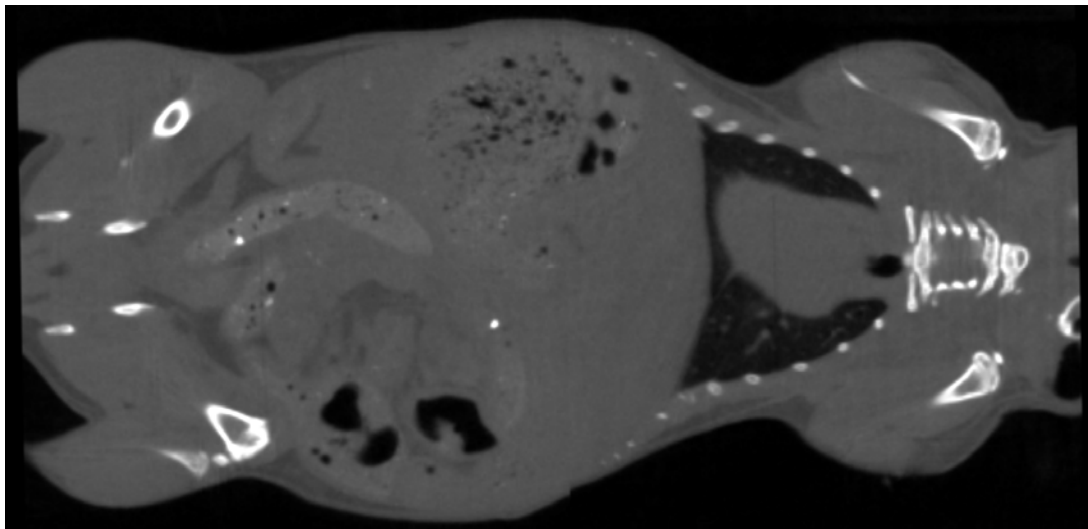

Figure 1: Coronal µCT slice through a mouse, showing bright signal in bone and dark signals in air and lung tissue. Texture appears in the stomach and gut while liver, heart and muscles appear homogenous. Fat is slightly darker than other soft tissues but blood vessels can hardly be seen without a contrast agent.