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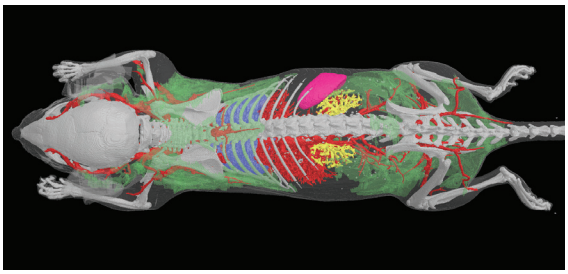
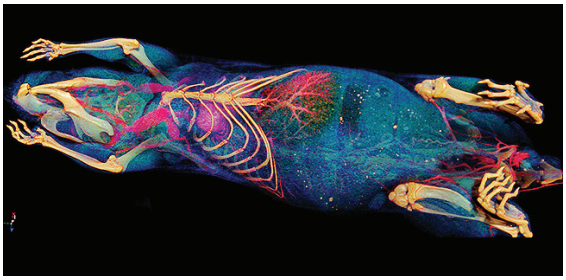
Seminario

MicroCT imaging: 3D solutions for lifescience research, in-vivo and ex-vivo



Full-body scans segmenting visceral fat and/or subcutaneous fat in mice in 3D



Mouse scan with contrast agent injection

Madrid

30 Enero 2015

9:30 h - 12:00 h

Fundación Jiménez Díaz

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MicroCT imaging is a **nondestructive 3D imaging** method in its second decade of widespread use in the scientific community. It is a universal imaging method dependent only on the x-ray attenuation properties of a sample (determined by elemental atomic numbers) and thus equally applicable in lifescience and material science. Within the life sciences, the early focus of application was bone biology due to the ideal attenuation and contrast of mineralised tissue. However an increasing number of applications for microCT are now being developed outside of the bone field also. With in-vivo **imaging of the live animal**, this includes **soft tissue** fields such as **adipose tissue, cancer, lung, cardiovascular, liver, kidney, spleen, gastrointestinal tract and others**.

In-vivo microCT can be part of a “multi-modality” solution in which images from radiation-based molecular imaging techniques (PET, SPECT, optical) using photon-emitting bio-labels are co-registered with microCT images to add extra dimensions of data to the 3D image. **MicroCT imaging of moving organs** – the **lungs and heart** – necessitate synchronisation (“gating”) solutions in which 4-dimensional data – three spatial dimensions plus time – allow animated and functional study of the breathing and cardiac cycles. In post-mortem “ex vivo” imaging the range of biological fields is wider still, extending to zoology and botany, food material, synthetic biomaterials, dentistry and others. For soft tissue microCT imaging, contrast agents are often needed.

This is equivalent to staining in microscope histology. Non-mineralised tissues generally lack the significant differences in the absorption of x-rays that is the basis of CT image contrast; however such contrast can be artificially added by treating a sample with a staining chemical that (a) selectively attaches to certain tissues or biological structures and (b) contains a heavy (high-Z) element that confers high x-ray attenuation.

Examples will be presented, both for in-vivo and ex-vivo microCT imaging, of the imaging process itself and the analysis of the 3D image data which provides quantitative measured end-points to biological experimental research.