17th International Mouse Genome Conference

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PLENARY PRESENTATION

TUESDAY 11 NOVEMBER
14:45 – 15:15 HRS

IMAGING FOR MOUSE PHENOTYPING

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Modern medical imaging holds great potential for phenotyping of mice. Magnetic resonance (MR) imaging at high magnetic fields provides excellent three-dimensional anatomical maps (60 μm ^{3} isotropic resolution) in mice. Ultrasound (US) at 20–55 MHz provides real-time imaging with 30–100 μm resolution which is suitable for cardiac structural and hemodynamic flow. X-ray computed tomography (CT) does not scale well to the size of a mouse but is ideal for bone development and highly contrasted vascular architecture at 20-μm resolution. For small samples (< 1 cm), an optical analogue of CT designated optical projection tomography (OPT) has been developed by James Sharpe (HGU, Edinburgh) which can use the wide spectrum of optical chromophores to give 3D spatial maps of gene expression in the embryo or excised organs.

Several examples of the use of imaging for mouse phenotyping will be presented:

1. a heritable ENU mutant with very high aortic velocity detected using Doppler US is shown to have an aortic dissection by MR.

2. an average mouse brain 3D atlas demonstrates that individual anatomical variation is confined to a few hundred microns, making genetic outliers easy to identify.

3. vascular trees for kidney from an inbred strain of mice look “similar” in appearance but are not registerable, raising fundamental questions about what we mean by “anatomical equivalence.”