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## Far Red Imaging of Beta-galactosidase Activity for Stem Cell Detection in the Brain

**Category:** Stem Cell Imaging

**Presentation Time:** Saturday, 1:00 p.m. - 2:00 p.m.

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**Background:** Genetic reporter systems based on the enzyme  $\beta$ -galactosidase have been widely used for *in vitro* and *in vivo* reporter applications because of the ease of their *in situ* tissue sample analysis. However, the destructive nature of this approach for gene expression and regulation monitoring severely limits the use of  $\beta$ -galactosidase for *in vivo* applications where repetitive monitoring of the same animal is desirable. As such, several groups have attempted to extend the applicability of this reporter protein to non-destructive and repetitive *in vivo* imaging.

**Aim:** The purpose of this study was to explore the possibilities for imaging of deeply lying  $\beta$ -gal/luciferase expressing cells using optical approaches.

**Methods and Results:** Beta-galactosidase and luciferase expressing C17.2 mouse neural progenitor cells (NPCs) were stereotactically implanted into the parenchyma of the left hemisphere of the BalbC *nu/nu* mouse brain and imaged 10 days after implantation. Following both DDAOG and luciferin i.v. administration fluorescent and bioluminescent signals were detected respectively only from the left hemisphere of the mouse brain. Serial imaging revealed a rapid increase in the fluorescent signal intensity over the right hemisphere of the animal with the highest signal to peak at 10-15 min after substrate administration. Postmortem staining of the brain cross-sections with X-gal confirmed the presence of the  $\beta$ -gal-expressing C17.2 cells in the left hemisphere.

**Conclusion:** Our results indicate that  $\beta$ -galactosidase may be successfully employed for *in vivo* imaging of deeply-lying  $\beta$ -gal-expressing cells not only as a stand-alone fluorescence reporter system, but also multiplexed with bioluminescent reporters, especially when the assessment of more than one molecular event is desirable within a single experimental subject.

