

Guidelines for Establishing a Cancer Tumor Mouse Model for In Vivo Bioluminescence and Fluorescence Imaging



Creating a cancer tumor mouse model for in vivo bioluminescence imaging (BLI) or fluorescence imaging (FLI) is a complex process that requires careful planning and attention to various factors. Here are some key considerations when establishing such a model:

1 **Cancer Cell Line or Tumor Model Choice:**

- Select an appropriate cancer cell line or tumor model that closely mimics the type of cancer you want to study. Consider factors like cell line genetic background, metastatic potential and whether the cell culture is suspended or adherent.

2 **Inoculation Route:**

- Decide on the most relevant inoculation route for the tumor cells. Common routes include subcutaneous, orthotopic (tumor implanted in the organ where it naturally occurs), and intravenous injection. Choose the route that best reflects the clinical scenario you are studying.

3 **Cell Line Modification:**

- If using BLI, you will need to genetically modify the cancer cells to express luciferase or another bioluminescent marker. For FLI, you may use cells expressing a fluorescent marker. Ensure that the modification doesn't affect the cell line's behavior or growth.

4 **Bioluminescent or Fluorescent Reporter Gene Selection:**

- Select the reporter gene (e.g., luciferase, GFP, or RFP) based on your specific research requirements. Ensure that the selected reporter gene is compatible with the chosen cell line and imaging equipment.

5 **Mouse Strain and Genetic Background:**

- Choose the mouse strain that is most relevant to your study. Consider factors like immune response, background genetics, and susceptibility to tumor growth. Immunocompromised mice are often used to prevent rejection of human cancer cells.

6 **Ethical Considerations:**

- Ensure that your animal research complies with ethical guidelines and is conducted with the necessary approvals and permits. Address ethical concerns such as animal welfare, humane treatment, and adherence to institutional or national regulations.

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7 Tumor Growth Monitoring:

- Regularly monitor tumor growth and progression. BLI and FLI imaging should be performed at consistent time points to track changes in tumor size and location.

8 Experimental Controls:

- Include appropriate control groups, such as mice injected with non-luminescent or non-fluorescent cells, to validate the imaging results and rule out false positives.

9 Bioluminescent Substrate or Fluorophore Choice:

- Select the appropriate bioluminescent substrate (for BLI) or fluorophore (for FLI) that provides the best signal-to-noise ratio. Optimize the imaging conditions for maximum sensitivity.

10 Imaging Protocols:

- Develop standardized imaging protocols for your experiments, including anesthesia, handling, and positioning of the animals. Minimize stress to the mice during imaging.

11 Data Analysis and Quantification:

- Develop robust data analysis and quantification methods to accurately assess tumor growth, progression, and treatment responses.

12 Statistical Analysis:

- Plan your statistical analysis approach to appropriately interpret imaging data and assess the significance of observed changes.

13 Data Interpretation:

- Interpret the imaging data in the context of your research goals. Consider how the results align with your research questions and hypotheses.

14 Ethical Considerations:

- Ensure that your research adheres to ethical guidelines and is conducted with the necessary approvals and permits, addressing concerns such as animal welfare, humane treatment, and compliance with institutional or national regulations.

Overall, careful planning, adherence to ethical standards, and proper technical execution are essential when establishing a cancer tumor mouse model for in vivo BLI or FLI imaging. These models can provide valuable insights into tumor growth, treatment responses, and disease mechanisms in a live animal context.