

Quick Tips

Rodent Depilation for Optical Imaging



Should investigators remove hair from - or depilate - mouse or rat research models prior to in vivo optical imaging of fluorescence or bioluminescence reporters?

To shave, or not to shave... that is the question.

For optical imaging, a nude, albino mouse is about as optically “clear” of an animal model as one can get - due to the lack of hair and skin pigmentation. Next best are albino strains that lack pigment but have hair. Light transmission suffers progressively as you move through darkening skin pigmentation and coat colors such as yellow, agouti, brown... with the toughest models to capture light transmission from, the darkly pigmented, black-coated strains like c57/B6.

From this, we can establish that nude mice, followed by albino, white-furred mice have better light transmission through their skin due to the lack of epidermal pigment, than that of pigmented agouti, brown or black-furred models, hair removed or not.

Why Depilate?

For optical reporter imaging studies, depilation can be quite useful to increase the visibility of your optical reporter. When first characterizing a model in a pilot or at the start of a study, or if looking for low level signal such as metastases or off-target reporter binding, depilation is strongly recommended.

Removing hair physically removes a barrier to light transmission, which increases reporter light intensity while reducing scattering and absorption, regardless of whether the animal model has pigmentation or not. This in turn increases detection sensitivity to your reporter signal by effectively making your reporter brighter, and more easily detected by the CCD camera.

Shaving by electric trimmer, or depilation by chemical application such as Nair, have both been shown to have low to no impact on animal well-being when done correctly, compassionately, and according to instructions. That said, be sure to discuss these options and procedures with your resident Vet or Vet Tech to ensure local compliance.

Long story short: Overall brighter reporter signal is why one would depilate a research model prior to optical imaging.

Additional Considerations:

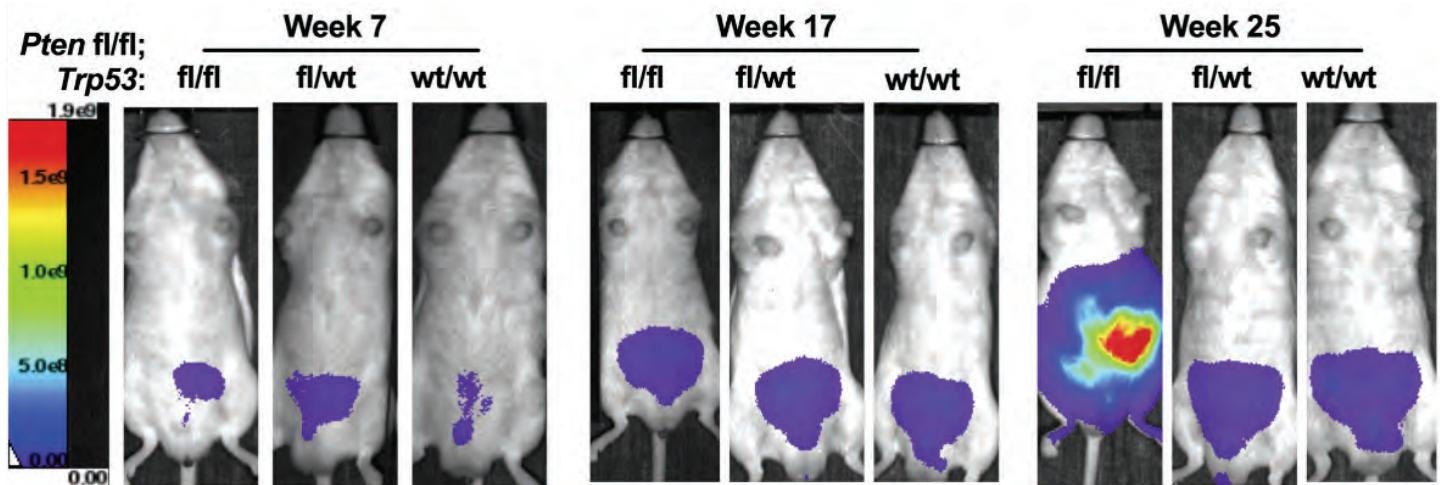
1. Inflammation at the site immediately after hair removal can slightly obscure signal due to increased subcutaneous blood flow as part of the inflammatory response. This response can be minimized partially with good technique, and partially by waiting 24hr or so for the inflammation to reduce.
2. Repeated insult to the dermis, either mechanically or chemically induced, can lead to micro-scarring, which may decrease light transmission over time. Careful application of either technique will reduce this concern.
3. If the disease of focus is manifested in the skin, or incisions or wounds are part of the study, depilation may increase the severity of the disease, or slow wound healing. Here, depilation may have to be avoided, and optimization by mouse strain, if possible, might be best.
4. If using an inflammatory probe, the acute inflammatory response to depilation can alter a probe's normal biodistribution.
5. If your signal is very bright, one simply may not need to remove hair. Published examples are available. However, recognize that intensity may be different than if hair removal had occurred, as the reporter signal collected will be dimmer than signal captured without hair remaining the reporter light path. In this case, remember that consistency is needed. As long as one path (removed or not) is chosen through the course of the study then quantitative data remains comparable over time.



Summary:

Overall, use of a small electric trimmer or Nair are often the safest and most convenient routes to use for depilation. With a bit of practice, either method may be used, preferably about 24hrs prior to optical imaging. While there are instances where hair removal may not be appropriate or even needed, depilation will typically allow for greater bioluminescence and fluorescence reporter light transmission and intensity by way of removing hair from the light path between reporter light expression within the body of the animal model and the CCD camera.

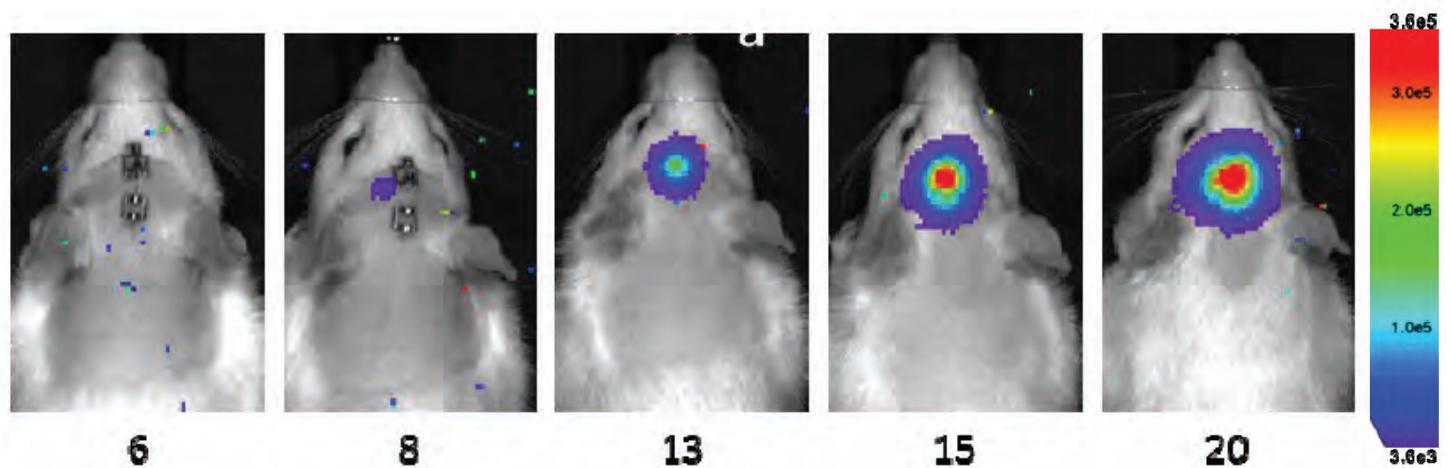
Example of bioluminescence signal captured without hair depilation



<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0232807>

Serial bioluminescence imaging (BLI) of mice with loss of *Pten* and wildtype *Trp53* (WT;wt/wt), heterozygous (HET;wt/fl), or homozygous (DKO;fl/fl) deletion of *Trp53*

Example of bioluminescence signal captured with hair depilation:



BLI Imaging of luc-C6 glioma growth in a rat over 20 days (68R2).

<https://doi.org/10.1117/12.2213867>

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