

Do No Harm - The Art of Reproducible Experimental Surgery in Rodents, and Why it Matters to You

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Surgery in rodents is challenging, and specialized skills, training and experience is required to establish a reliable and reproducible surgical model. In addition to mastering the individual steps of the procedure, knowledge on anatomy and physiology, and a broad understanding of good surgical practice, including asepsis, reduction of trauma, hemostasis, anesthesia, analgesia, and selection of tools and materials is crucial for success. Yet, in preclinical metabolic research, the priority is usually the downstream application of the surgical model, whereby the surgical procedure, being considered a tool required to enable the study, receives less attention. Consequently, proper surgical training is often replaced by a chain of peer training where inexperienced staff learn a surgical procedure from other lab members, who were also once trained by other lab members. This learning strategy is prone to propagation of procedural mistakes and faulty assumptions leading to unnecessary animal suffering, poor surgical outcomes, and, ultimately, unreliable research data.

We know this, because that is how we started more than ten years ago, when we set out to establish a dual-catheter infusion/sampling model for glucose clamp studies in mice. Here we will present our work on refinement of this model and demonstrate how training, optimization, and meticulous attention to detail, leads to improved animal welfare, substantial reductions in animal usage numbers, and more robust and reproducible research data. While our study is founded in metabolic research, our conclusions are generally applicable and will be relevant to anyone using experimental surgery in their research.