Clinical vs. Preclinical Ultrasound: Why Frequency Matters

Introduction

In ultrasound research, resolution matters, especially when working in small animal models. Whether you're studying cardiovascular function in mice, monitoring tumor progression, or evaluating therapeutic efficacy, the tools you use can significantly influence the quality and reproducibility of your data. Yet many labs still rely on clinical ultrasound systems, devices designed for humans, to image small animal models.

While this may seem convenient, using clinical systems for preclinical applications introduces limitations that can compromise your results. Here's why dedicated preclinical ultrasound systems are the right choice.

Clinical Ultrasound Lacks the Resolution Small Animals Require

Clinical ultrasound is designed for imaging humans, not small animals with organs and vessels only millimeters, or even microns, wide. These systems typically operate between 2–15 MHz, which is far too low to resolve fine anatomical structures in mice or rats.

Preclinical ultrasound systems, on the other hand, operate at 15–50 MHz, enabling:

- High-resolution micro-anatomical imaging
- Precise visualization of vessels, valves, and soft tissues
- Improved ability to quantify subtle physiological changes

Without this resolution, many preclinical findings risk being missing or inaccurate.

Hemodynamic Measurements in Small Animals Are Not Accurate with Clinical Systems

Rodents have vastly different cardiovascular profiles compared to humans, with heart rates reaching 400–600 bpm. Clinical systems simply aren't built to capture this level of rapid motion or subtle hemodynamic fluctuations.

Preclinical systems offer:
- Higher frame rates
- Optimized Doppler settings for small animals
- Specialized workflows for rodent cardiology

This ensures accurate assessment of cardiac function, perfusion, and dynamic physiology.

Animal Handling and Imaging Positioning Are Not Compatible

Preclinical imaging requires specialized animal staging:

- Temperature-controlled platforms
- Integrated anesthesia and physiological monitoring
- Fixation designed for stable, repeatable positioning

Clinical probes and tables are not designed for small rodents, making it harder to maintain stability, control motion, or achieve consistent imaging planes.

Clinical Ultrasound Is Not Actually Cost-Effective

At first glance, using an existing clinical system seems budget-friendly. However, the hidden costs include:

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- Low-quality imaging leading to inconclusive results
- More repeated scans
- More animals needed
- Difficulty publishing due to insufficient imaging clarity

Preclinical ultrasound systems are specifically engineered to deliver the kind of data reviewers, collaborators, and funding agencies expect.

The Better Choice: Purpose-Built Preclinical Ultrasound

A dedicated small-animal ultrasound system, like the Prospect T2 Ultrasound System, offers:

- High-frequency, high-resolution imaging
- Real-time hemodynamic monitoring

- Compact, researcher-friendly design
- Cost-effective performance for labs & imaging cores

These systems help researchers generate more reliable, reproducible, and publication-ready data.

Final Thoughts

Using clinical ultrasound for preclinical studies is not just a limitation, it poses a risk to data quality. With the increasing demand for precision, reproducibility, and translational relevance, preclinical researchers need tools tailored to their models.

Purpose-built preclinical ultrasound systems empower scientists to image with accuracy, confidence, and efficiency, ultimately elevating the impact of their research.

If you have any questions on which method best meets your research needs, feel free to contact us to discuss your model. We have many resources available, from scientist webinars to journal citations, to help point you in the right direction.

To see the our ultrasound system, please visit our website (www.scintica.com) or feel free to reach out to us via email at info@scintica.com or by phone at +1 519 914 5495 and we would be glad to assist you.

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