LabTrak: A Micro-Telemetry Device for Modeling Mice Behavior

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Preclinical animal studies are crucial for evaluating the effects of novel therapeutics on rodent models before testing on humans. Unfortunately, it is difficult to confirm and replicate their conclusions because these studies use qualitative and imprecise observational methods to assess the behavioral responses of mice, leading to over 80% of pre-clinical “successes” to be failures in human trials. LabTrak is an easily implementable IoT solution capable of quantifying rodent behavior and providing researchers real-time feedback on pain and motor function. A 10x10mm PCB equipped with Bluetooth and a triaxial accelerometer was designed, using computational electromagnetics to model and maintain signal integrity while reducing size. A hybrid compression algorithm alternates between lossless and lossy methods, reducing power consumption by enabling fewer Bluetooth transmissions. The final iteration is 86% smaller than leading IoT devices and records data 300 times longer than comparable behavior-tracking solutions at only 3.5% of the cost. The raw acceleration data it gathers is filtered and transformed into features which are mapped to fluctuations in pain and motor levels. 70 mice were fitted with LabTrak during a multi-day study. Buprenorphine and Ketamine were administered to modulate pain and motor function along with positive and negative controls. Among experimental groups, expected outcomes due to variations in dosage correlated strongly ($p<0.05$) with those reported by the model, indicating both accuracy and precision. For researchers studying diseases that lead to chronic pain or motor degeneration, LabTrak provides a robust framework and standard for modeling therapies in mice, enabling rigorous experimental design and optimizing the drug development process.

Awards Won:
Second Award of $2,000
National Institute on Drug Abuse, National Institutes of Health &amp the Friends of NIDA: Second Award of $1,500
China Association for Science and Technology (CAST): Award of $1,200