

# Trends in telemetry monitoring: more data and improved animal welfare

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Implantable telemetry has become the gold standard to obtain physiological data from unstressed, free-moving animal models. A wide range of vital parameters such as Heart Rate, Blood Pressure, EEG, ECG, EMG, Temperature, Motor Activity, etc. can be monitored in animals ranging from small mice of 17 grams, to rats and similar size rodents and other larger animal models (dogs, primates, pigs, etc.).

In addition to physiological data, a number of environmental and behavioral data can be simultaneously collected: room conditions such as lighting and temperature, and events such as running wheel, drinking, and feeding activity. External stimuli (light, noise, air jet, etc.) can also be recorded together with the physiological data. And last but not least, valuable video data can be acquired together with the physiological data in order to give a “full picture” of the animals to the investigator.

This presentation will include a short review of telemetry systems, and present three recent technical improvements enhancing animal welfare and social behavior: large animals housed in pair or groups in larger cages with a Telemetry Repeater; pair housed rats in Central Nervous System studies; External telemetry systems for large animal models in Toxicology studies.

## Large animals housed in pair or groups in larger cages with a Telemetry Repeater

The Multi-frequency Telemetry Repeater allows studies to be conducted in a group housed environment and/or when there is a need to have telemetry transmitted over longer ranges. The Repeater system allows for greater flexibility in cage setup and housing designs as receiver placement and cage size is less of a concern versus using the standard DSI telemetry receivers.

The Repeater is a device that functions as a signal relay between a DSI Physiotel® transmitter and a Repeater Receiver for large animal and primate telemetry applications. In short, the Repeater receives a signal from an implanted transmitter and retransmits that signal at a different frequency to a Repeater Receiver. The Repeater transmits up to distances of 10 meters.

The repeater is also ideal for toxicology studies. Reduce surgical risk in dogs, primates and other species by using a small animal transmitter in conjunction with the telemetry repeater. When used together, chronic high quality blood pressure and ECG signals can be obtained with a minimally invasive procedure.

## Pair housed rats in Central Nervous System studies

The 4ET transmitter was designed primarily for studies involving the Central Nervous System (CNS) in rats and other similarly sized species. It has the ability to monitor up to 4 biopotential channels including any combination of electroencephalogram (EEG), electromyogram (EMG), and electrocardiogram (ECG), along with temperature and locomotor activity. These parameters allow the assessment of sleep architecture, seizure activity, behavior, and other neurological disorders. CNS assessment is particularly challenging in animal models and it is important to maintain a comfortable and controlled environment. The 4ET transmitter allows monitoring of freely-moving animals in their home cage. In addition, it is DSI's first transmitter that allows pair housing to promote more natural, social conditions. Many CNS studies require long-term monitoring, such as those involving aging and cognition. The battery component of the 4ET (telemetry module) can be replaced in-vivo through a minor surgical procedure to prolong the use of the animal. The 4ET transmitter brings improved animal welfare and new research opportunities to the CNS field.

## External telemetry systems for large animal models in Toxicology studies

The Jacketed External Telemetry (JET™) Platform is specially designed to work in conjunction with the Ponemah® software for use in toxicology and safety pharmacology laboratories running large animal studies. JET may be used to collect stress-free high fidelity ECG's, respiration, temperature, and activity waveforms from freely moving animals. Up to 36 devices may be used in the same room without interference and no possibility of crosstalk through a specially designed implementation of Bluetooth®. Furthermore, the system is optimized for portability as there is a minimum amount of supporting hardware and it requires no technical expertise to setup. Each device includes an environmentally-friendly removable rechargeable battery to minimize ongoing replacement costs. The final results are hours to days of high quality data obtained quickly and easily and without the time needed for surgery and recovery

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## References

1. El Amrani Francine, Eric Martel, Pascal Champeroux, Serge Richard, Eric Rieux and Dan Singer (2007). Evaluation of multi-frequency repeaters for record of cardiovascular parameters in group housed dogs. *Journal of Pharmacological and Toxicological Methods*, **56(2)**. September-October 2007, Page e21 doi:10.1016/j.vascn.2007.02.043