Telemetry provides a useful way of acquiring physiological data, while still allowing the animal to display natural behavior. As opposed to an external measuring instrument attached to the animal, an internal transmitter is much less intruding on the freedom of movement of the animal.

The implanted transmitter emits a signal that is detected by a receiver, placed inside or outside the cage. For instance, with a telemetry system of Data Sciences International (DSI), the receiver is connected to a so-called Data Exchange Matrix. This device is able to power and multiplex data from multiple receivers. In this way, measurements such as blood pressure, temperature, bio-potentials (ECG, EMG, EEG) and physical activity can be simultaneously acquired, stored on your computer and analyzed.

Figure 1. A typical set-up of a DSI system.

It is often the combination of physiological data with other data modalities, such as behavioral data and video, that makes research most valuable. That is because physiology can show responses that are not always visible through observable behavior. With The Observer® XT you can take your research to a higher level: it offers flexible integration of your telemetry data with other modalities and the management of these different modalities in one research set-up.

Logged behavior from standard research tests can now be combined with physiological measurements. This enables you to investigate a whole new set of research questions. The Observer XT allows you for instance to automate the scoring of the resident-intruder test. Stereotyped attack or defense reactions from rodents to an intruder can be scored easily and reliably.

The integration with telemetry data will refine your results and strengthen your conclusions, because ambiguous behavior will be less difficult to interpret. Furthermore, the reliability of the physiological data increases as the environment in which they are taken remains undisturbed. Also, these measurements can be acquired in a wider range of settings.

COLLECT YOUR DATA
To start your data acquisition, connect the telemetry equipment to a computer that runs The Observer XT. With a synchronization signal sent out from the Observer computer to your telemetry system, you can automatically synchronize your data sets. If the computers are not directly connected, synchronization can be done later by manually adjusting the start and stop time of your observations.

Figure 2. Overview of data streams in The Observer XT.

With The Observer XT, you can specify all subjects, behaviors (e.g. piloerection, pinning, freezing) and modifiers in a coding scheme before or during observing. Modifiers describe additional features of behavior, such as biting the back or snout of an intruder.
You do not necessarily have to set up a coding scheme first: just add or change elements while observing and perhaps log comments to qualitatively classify your results later. You can code your observations by means of keystrokes or mouse clicks, which are automatically assigned to a timestamp.

To facilitate coding video images, you can play two or more video images simultaneously backward or forward and at multiple speeds. This is especially useful when coding a video of aggressive rodent behavior for example [1], since it can be hard to follow unless viewed in slow-motion. Also, important events that evoke changes in the animal’s physiology can be found back quickly in the dataset by scanning the video images.

After collecting your physiological measurements, you can import the results into The Observer XT, together with any other external data you would like to use. If necessary, synchronize your imported data with your observations and start (additional) coding.

Coding can be refined as many times as you like, without losing previously coded measurements. The coding scheme can also be re-used with subsequent series of data collection.

After coding your observations and importing external data, you can start to investigate the relationship between your logged events and the telemetry data.

SELECT AND ANALYZE YOUR DATA
The Observer XT can provide detailed visualizations of your data that help you to explore the results. Customized charts and statistics are accessible in a few mouse clicks and ample selection options give access to the video images you require.

Specify the relevant parts for analysis by filtering or nesting the appropriate independent variables, subjects, behaviors and modifiers. For example, differentiate between 5-HT1A receptor knockout mice and wild type mice and their level of anxiety in reaction to stressors, in terms of behavioral responses, heart rate, body temperature and general activity [2].

For additional calculations and analysis, The Observer XT also contains the possibility to export data to the spreadsheet or statistics program of your choice or to CD and DVD for backup. Another possibility is to export your behavioral data to Theme™ for structural analysis. Theme can detect complex patterns of events in raw behavioral data, and can quantify the complexity of the behavior as a whole. Where patterns in time-based data are difficult if not impossible to find with standard statistical methods, Theme will discover them [3].

A wide range of presentation options is offered as well, to facilitate communicating your results to others. Select important video fragments and create your own Highlights Video Clip to illustrate your findings.

Feel free to contact us or one of our local representatives for more references, clients lists, or more detailed information about The Observer XT, Theme or physiological data acquisition systems.

References: