An integrated system for video and telemetric recording: measuring behavioural and physiological parameters

Elena Moscardo[1], Chiara Rostello[2], Eric Rieux[3], and Reinko Roelofs[4]
[1] *Safety Pharmacology Group, Dept. Safety Assessment, and* [2]*Animal Model Investigator Support Group, Laboratory Animal Science, GlaxoSmithKline R&D Centre, Verona, Italy, elena.2.moscardo@gsk.com and chiara.b.rostello@gsk.com*
[3]*Eric Rieux, Data Science International, St. Paul, USA, erieux@datasci.com*
[4]*Reinko Roelofs, Noldus Information Technology, Wageningen, The Netherlands, R.Roelofs@noldus.nl*

Physiology gives insight into phenomena that are hard to see, such as sleep changes, seizure electrical activity and memory processes; therefore it is often the combination of physiology and behaviour that makes research most interesting and valuable. The aim of our research activities in the last two years was the setting up and assessment of a new Video-Telemetry system to be applied in pre-clinical research. In particular, our objective was to find an integrated equipment to properly analyze the relationship between electrical brain activity and behaviour in rodents, in order to powerfully assess specific activities of the central nervous system (i.e., seizure, sleep and memory) and their phenotypical-behavioural manifestations. Radio-telemetry is a technology of radio-signals recording from chronically implanted transmitters in freely moving animals widely used to investigate physiological parameters, while still allowing the animal to display natural behaviour and therefore the combination of telemetry and video recording was selected for setting-up our Video-Telemetry system. This integrated system should reduce the number of animals used, improve the data quality by maximizing the amount of information gained from each experimental animal and reduce animal stress and discomfort.

In our laboratory was installed and technically verified for its proper functionality a complete telemetric (by Data Science International) and video (by Noldus Information Technology) system for 8 rats singly housed in PhenoTyper cages, see Figure 1. The selected equipment (hardware and software) allows the simultaneous and continuous recording of physiological parameters (e.g., EEG, EMG, Temperature) and of video images for up to 24-48 hours or longer periods (few days).

The telemetric waveforms recorded with the DQ ART system (DQ ART Gold 4.1, DSI) are then analysed using dedicated software (e.g., Sleep-Sign by Kissei America, Neuroscore by DSI) and the perfectly synchronized video images are shown simultaneously on the screen for helping the researcher during the waveforms analysis. The system also allows using videos for a more detailed analysis of the behaviour, using dedicated software (i.e., The Observer XT and Ethovision XT by Noldus) and the perfectly synchronized telemetric traces are shown simultaneously on the screen for helping the researcher during the behavioural analysis. The analysis of the 24 hours video files with Ethovision XT consists in an initial automatic score of standard behaviours and general activity and then, in the identification of specific episodes based on behaviour. This automatically recorded data can reduce the workload and increase the accuracy of behavioural scoring. A following more detailed manual analysis of the videos is conducted with The Observer XT, that can synchronize multiple behavioural video episodes scored with Ethovision XT with the physiological telemetric data. Male CD™ rats, approximately 7-8 weeks old, were selected for the surgical instrumentation with a telemetric transmitter (type TL10M3-F50-EEE, DSI) implanted intra the peritoneum. The two leads for electroencephalography were placed one on the dura for cortical EEG recording and one deep to the dentate gyrus for the hippocampal EEG recording; the third couple of leads was secured to the neck muscle for the EMG recording [1].

With the common aim to do better science we would share with you our experience on investigating and assessing the potentialities of this integrated DSI and Noldus system to be used for combining and synchronizing the physiological parameters and behavioural patterns.

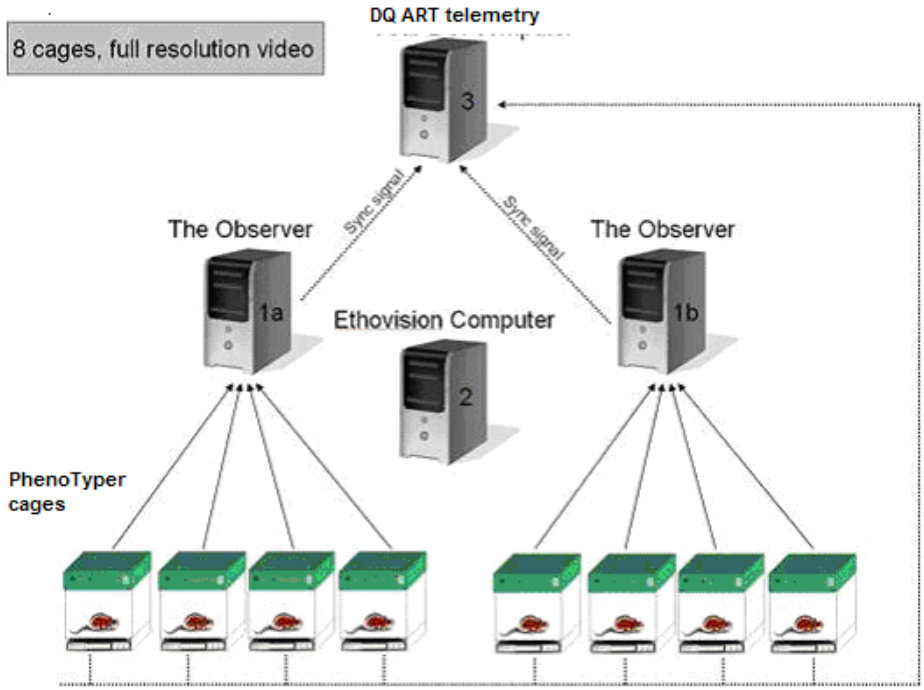

Figure 1. *The integrated Video-Telemetry system*

- 2x The Observer XT with External data and multiple video modules and multi MPEG-4 encoder

- 1x EthoVision XT software with multiple body point module

- 8x PhenoTyper cages for rat with top camera unit

- 1x Data Quest ART Gold 4.1

- 2x synchronizations signals C12V analogue to digital converters

References

1. Williams P.A., White A.M., Ferraro D.J., Clark S., Taley K. and Dudek F.E. (2006). The use of radiotelemetry to evaluate electrographic seizures in rats with kainite-induced epilepsy. *Journal of Neuroscience Methods*, **155** 39-48, 2006.