

The logo for Lomir Biomedical Inc. features the word "Lomir" in a white, sans-serif font. The letter "o" is stylized with a white arc that curves over the top of the letter and extends to the right, ending above the "r".

Lomir

BIOMEDICAL INC.

CANADA | USA | EUROPE | LOMIR.COM

Jackets: The Interface Between Animal and Machine

AS PRESENTED BY TERESA WOODGER
AT THE 66TH NATIONAL AALAS
MEETING IN PHOENIX, AZ

HISTORY

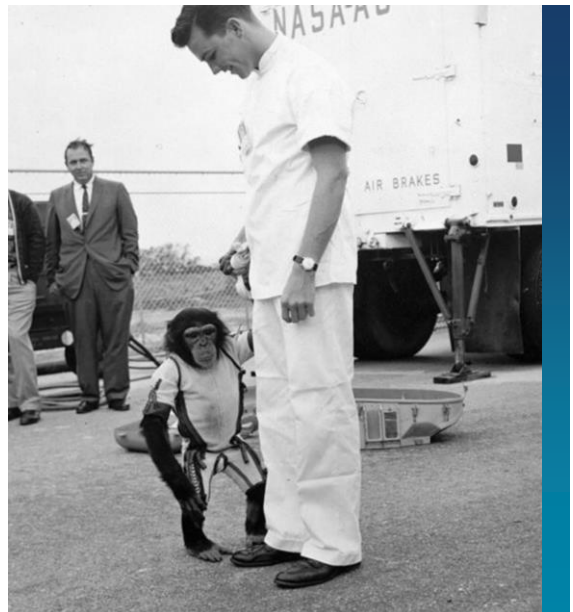
Laboratory animal jackets were first used in the early space missions of the late 1950s and early 1960s. These jackets were custom made full body suits which allowed the subject, in particular chimpanzees to be secured into their capsule like restraint for the journey into space. A comprehensive history of animals in space can be found on the NASA website

<http://history.nasa.gov/animals.html>

Further development and adoption of jacket systems in the laboratory animal field was pioneered by Alice King Chatham who developed the first commercially available jacket and tethering systems for the administration of test materials via continuous intravenous infusion, her 1985 paper discussed the system still in wide spread use today (Chatham A. K. 1985 Jacket-and-swivel-tethering system. Lab. Animal 14:29-33).



Ham's suit was created by Alice King Chatham



HISTORY

Manufacturing techniques and the use of new materials meet the requirements of current research in terms of reliability and the security and well-being of the individual animal species and jacket designs continue to refine the overall model.



SWIVEL TETHERING SYSTEMS

Today the traditional swivel and tethering systems are still in daily use with minor changes from the original design.



Changes are in terms of ease of use, reliability of fabrication.



TODAY'S JACKETS

Today the use of jackets covers many varied research disciplines. In the past few years several factors have combined to enable new technologies to be adopted within the lab animal field. There are now requirements for many lab animal species to be housed in group or social settings with enhanced and enriched environments and that also applies to jacketed animals. The miniaturization of circuits and increased computing power lead to the small light weight devices available for measurement and recording of all types of physiological measurements and their ability to store and transmit real-time data to remote capture systems have contributed to significant refinements in many lab animal studies. Information from these types of devices has also increased knowledge and understanding of various physiological states and confirms objectives of behavioral management programs.

The continued development of behavioral training and management programs now include training and acclimation of individual species to wearing jackets and equipment.



The availability of functional textiles, new materials and fasteners mean jacket designs keep pace with these latest advances and may be adapted for best practices.

CUSTOM PRIMATE JACKET FEATURES



- Padding at chest area
- Padded smooth neck and waist band – caution if using pole and collar system
- “D” rings to secure zippers – group housing and extra security
- Zipper protectors
- Black canvas pocket for pump and bag – black good for photosensitive materials



- Short v neck – essential for pole and collar set-up
- Plastic anchor point on back with tether end plate riveted in place – location can vary as per surgery
- Zipper protector over pocket zipper – need for extra security and group housing



CUSTOM PRIMATE JACKET FEATURES

- Sleeve choices can be important to the acceptance of jacking
- On standard jackets sleeves finish above elbow
- With cynomolgus monkeys a short cap sleeve is often used as it is better accepted
- Long sleeve may be used to protect surgical sites and devices on the forearm
- Velcro bands secure and adjust at neck and waist
- Green strips here allow for bands to be trimmed to optimal length
- Jackets can feature reinforced areas such as upper chest, preventing damage to jackets



APPLICATIONS



- Intravenous infusion – tethered and ambulatory



- Intravenous infusion – tethered and ambulatory



- Dermal or topical applications



- Holding devices in place at specific locations

APPLICATIONS FOR UNDERSHIRTS AND SOFT GARMENTS

Recent advances in textiles have given us undershirts for various species, using spandex and moisture wicking fabrics from sportswear.

- Worn under mesh jacket to secure and support ECG leads; respiration bands etc for telemetry
- Worn on their own to secure devices
- Worn on their own to protect dermal application sites



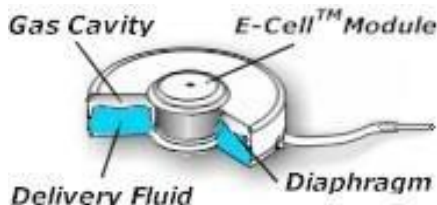
APPLICATIONS

AMBULATORY INFUSION

Ambulatory infusion describes the system where the animal carries a portable infusion pump and the fluid delivery bags or cassettes in pockets located on a jacket, catheters pass through the underside of the pockets to the surgical implantation site. Primary use of the ambulatory model is in the larger lab animal species but set-ups are also available for rodents where the animal has a jacket and a pouch to secure a small pump (<http://www.medecell.com/index.html>). For the larger species this allows for group housing, jacket designs feature pockets the correct size for the equipment and have protectors for zippers and fasteners minimizing the potential for interference and damage from group mates, protecting both the surgical sites and the equipment. A huge advantage of ambulatory infusion is that the animals are freely moving and able to exhibit species natural behaviors. The latest pumps have further refined the model by utilizing remote monitoring and recording of dose delivery, ease of use for calculating dose volumes and pre-set alarms stop the pumps, prevent unwanted bolus doses in the event of blockages and can send notifications via text and email. The transmission of data using Bluetooth, Wi-Fi and other systems maintain data from individual animals on separate frequencies and should be on secure systems, validation of software to recognized standards to ensure the integrity of the data (<http://www.orchestainfusion.com>).



More information can be found at Orchesta Infusion - www.orchestainfusion.com



Primary use of the ambulatory model is in the larger lab animal species but set-ups are also available for rodents where the animal has a jacket and a pouch to secure a small pump. An example is the battery powered Infu-Disk pump by Med-e-Cell Inc. At the heart of the pump is the E-Cell™ which produces a continuous flow of gas. The gas, separated from the fluid by the diaphragm, displaces the fluid volume. Rodent jackets and pouches may also be used to secure other devices, such as catheters, during transport.

APPLICATIONS

EXTERNAL TELEMETRY



The development of external telemetry systems allow for cardiovascular and other physiological parameters to be recorded in conscious freely moving animals. External telemetry systems avoid in the main the requirement for surgery reducing the number of procedures and the associated anesthesia and analgesia. International regulations for drug development and pre-clinical research include comprehensive safety assessment of cardiovascular parameters as part of the safety pharmacology requirements. For these systems the animal wears a tightly fitting spandex undershirt to secure ECG leads and respiration bands in place and the outer jacket includes a pocket to hold the telemetry device, all of the leads and connections are under the jacket and protected from interference. Real-time data is transmitted using Blue Tooth or Wi-Fi and powerful computing systems analyze that data. Having freely moving trained animals that are trained to their jacket systems combined with the precision of the telemetry devices allow for even very subtle changes in parameters to be highlighted. The regulatory requirements and oversight of the same mean that the system must be robust, reliable and consistently reproducible. Some research now includes safety pharmacology evaluation during repeat dose toxicology studies increasing the data gained from individual animals and reducing the need for separate studies. Further information on telemetry systems and applications can be found at these manufacturers' web-sites: - Data Sciences (<https://www.datasci.com>) and EMKA Technologies (<http://www.emka.fr>). Other systems are also available.



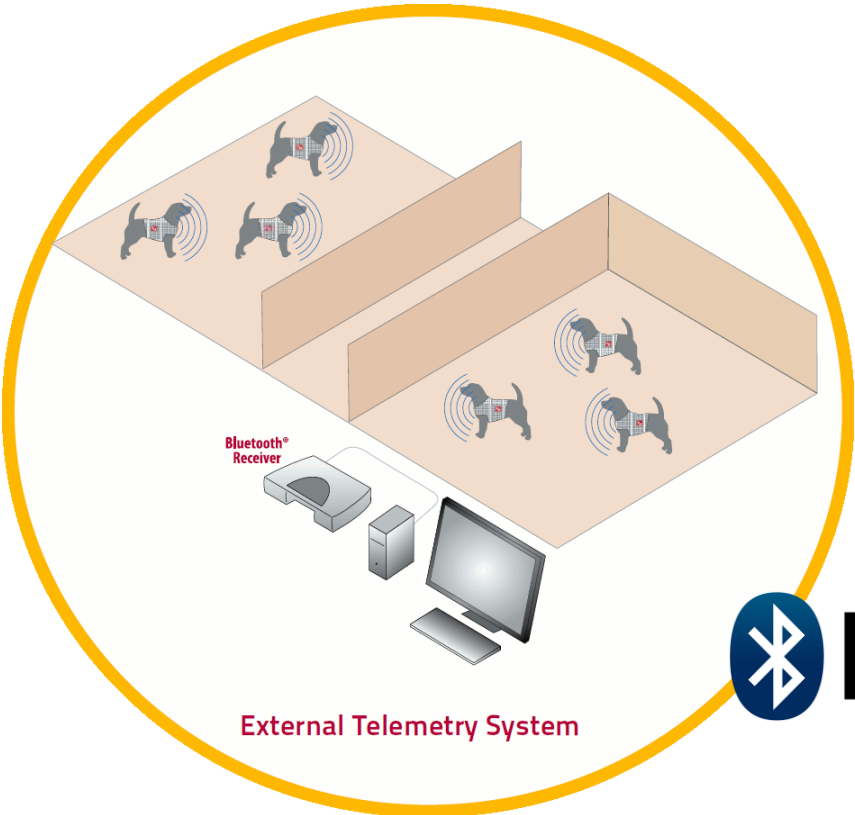
Further information on telemetry systems and applications can be found at these manufacturers web-sites:

- Data Sciences - www.datasci.com
- EMKA Technologies - www.emka.fr

**Other systems are also available*

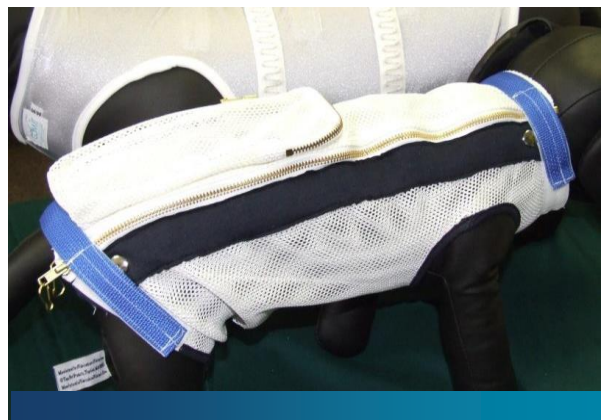
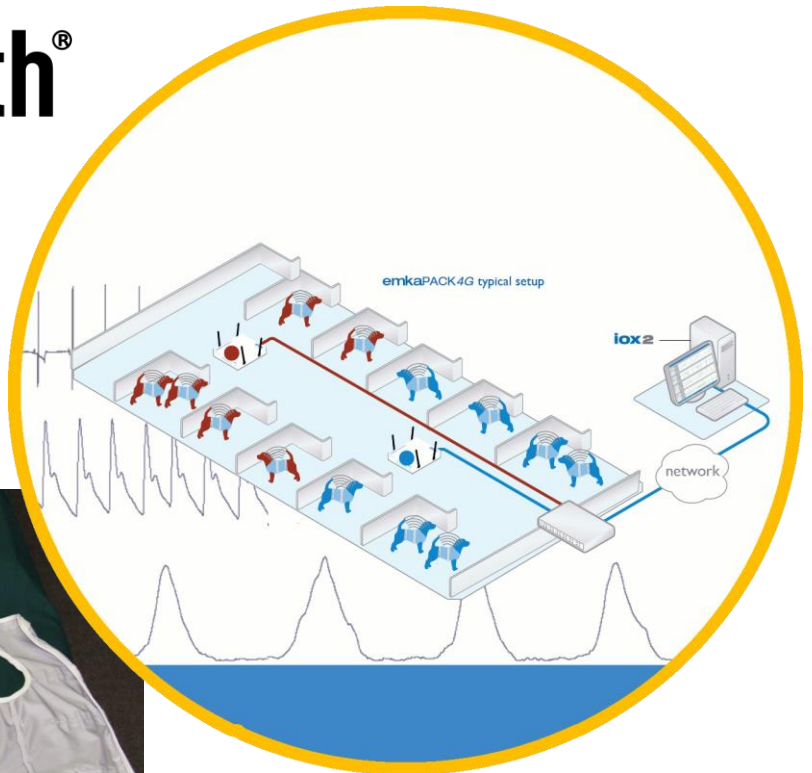
APPLICATIONS

DSI EXTERNAL TELEMETRY SYSTEM



APPLICATIONS

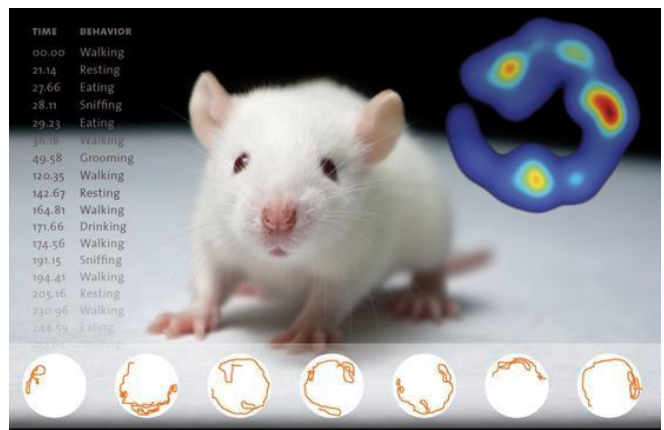
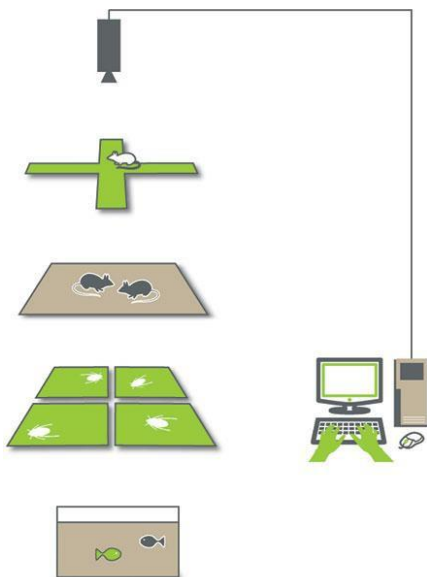
EMKA EXTERNAL TELEMETRY SYSTEM



APPLICATIONS

BEHAVIORAL OBSERVATIONS

- Behavioral observations have become more common in lab animal research with the development of a number of systems designed to monitor and record all types of motion and movement. These systems also enable the data to be quantifiable and reproducible.
- There is often a need for remote monitoring to reduce outside influence on behaviors.
- These varied applications require some of the most innovative jacket designs such as different colored jackets so a video tracking system (i.e. EthioVision XT) can separate the activity of individual animals in a group setting. This scenario necessitates a fabric with a matt finish and distinct colors to allow the software to distinguish the wavelengths of the color and therefore separates data for individual animals.



APPLICATIONS

BEHAVIORAL OBSERVATIONS

- Another application includes the use of motion trackers and features a matt black jacket or suit with reflective markers at given points on the body. These can be used for motion tracking, gait analysis, posture and behavioral measurements and other applications are imagined for the future.



THE FUTURE

- As wearable technology becomes more available one can expect jacket systems to incorporate monitoring capabilities into their manufacture and could include electrodes, LED sensors amongst others. The combination of jacket design and using the latest technologies provides us with refined capabilities and opens doors to very precise investigations in lab animals.





DESIGN. INTEGRITY. RELIABILITY.

**For more information, or to order please visit
us online at www.lomir.com or call 1-877-425-3604**

Lomir Biomedical Inc.

95 Huot, Notre-Dame-de-l'Île-Perrot, QC
Canada J7W 1M3
Tel: 514-425-3604
Toll Free: 1-877-425-3604
Fax: 514-425-3605
Email: info@lomir.com

Lomir Biomedical Inc.

C/O Agenda Life Sciences
UK PO Box 24 Hull
HU128YK, UK
Tel: 03456 44 55 45
Email: info@lomir.com

Lomir Inc.

PO Box 778
Malone, NY
USA 12953
Tel: 518-483-7697
Toll Free: 1-877-425-3604
Email: info@lomir.com