



Restrainters in laboratory animal research

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Restraint of laboratory animals is necessary to conduct various procedures. As a potential source of stress, however, the design and fabrication of restraint devices must allow for minimal restraint and be safe for both subject and handler.

It has long been understood that comfortable restraints improve animal welfare, and when used in conjunction with training and acclimation protocols, they can provide for calmer subjects and for the collection of qualitative and quantitative data. Where necessary, the restrainer may be either adapted or custom-made to accommodate specific measurements or procedures.

Cloth and soft restraints

Small animals are prone to stress and require extra care in handling. Mechanical restraints frequently require the involvement of two personnel: one to restrain and one to perform the procedure. The resulting stress and discomfort for the subject can often jeopardize the efficiency of the procedure. The ‘Snuggle Family’ uses the principle of a cocoon rather than a rigid structure for immobilization. The multiple flaps perform two functions: (1) they are adjustable around the subject for effective yet comfortable restraint, and (2) they are positioned or kept open for access depending on the procedure. This allows both restraint and procedure to be carried out by one handler.

The LOMIR ‘Snuggle Family’ is manufactured from flexible yet extremely durable canvas fabric. The fabric is coated with nylon to facilitate laundering for reuse. Wide flaps with Velcro™ fasteners allow for maximum flexibility, ease of use and adjustment for fit between individual subjects. ‘Snuggle’ restraints are available for a number of laboratory animal species including mouse, rat, guinea pig, rabbit, ferret and other small mammals. Designs vary by species, taking into account anatomical features and common restraint techniques for each species. Snuggles for each species are available in a number of sizes based on given weight ranges, and the Velcro™ bands allow for customized fit and adjustment for individual animals. Routinely used for sample collection, dosing and other procedures, these restraints may be further adapted for specialised applications.

Restraint slings

Sling restraints have been in common use in laboratory animal sciences for more than forty years and provide a reliable tool to safely and securely immobilize subjects. Today, a number of designs with species-specific and procedural features may be needed for certain applications.



FIGURE 1 | Portable panepinto sling.

Devices must be of a robust construction, which is essential for secure handling and restraint, using materials easily sanitized with existing cleaning products and equipment normally used in the facility. The design of the restraint must take into consideration the needs and preferences of various laboratory animals. For example, a resting board can be used for dogs while slings for swine need to have sufficient support for the head and neck. Sling designs must include clear access to specific areas of the body required for sampling, dosing or collection of physiological data. A number of restraint slings are described here (Figs. 1–3); other designs are commercially available along with the many in-house models. There are many choices of fabrics used for the fabric support of the restraint system. Fabrics include heavy duty canvas and sail cloth, plastic coated mesh with anti-microbial treatments, mesh materials and moisture wicking fabrics, disposable or limited use slings are made using polyester cotton. The fabric hammock may have padding for comfort and to support weight bearing parts of the body. In addition to openings for the limbs, extra ‘windows’ can be created for external genitalia, elimination of body waste, and for sampling and dosing procedures.

Panepinto-style frames

The Mobile Restraint Unit embodies the most efficient incorporation of all the necessary features (Fig. 2). This device provides humane immobilization for the animal and an efficient and safe working platform for the handler. A choice of two frame lengths and interchangeable fabric sling covers make this device particularly adaptable for multi-species facilities. The device allows convenient access to the subject to allow veterinary investigations,

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FIGURE 2 | Mobile restraint unit, an adaptation of the original panepinto sling.

grooming or laboratory procedures. The height of the frame is adjustable for a comfortable working height. A deep V-shaped opening in the frame permits unimpeded access to the head of the animal. Low support-bearing cross-members allow the animal to be easily introduced into the device without the need for handlers to lift the animal over and above the frame.

Flat-top frames

A flat sling that is stretched taut across the frame is fastened by means of metal snaps to the four sides of the frame (Fig. 3). The sling has leg holes and an opening for the external genitalia. Each hole is edged with a soft cotton jersey fabric. As the sling is taut the animal has only its ventral surface in contact with the material. These frames are made in multi-animal configurations of either two or four animals located side by side. Using fabric covers of the correct size, different species can be studied using the same frames.



FIGURE 3 | Flat-top sling; multiple animals may be restrained at the same time.

Humane, user-friendly, and portable restraint was developed in partnership with Panepinto Associates for micro/mini-pigs, dogs, goats, lambs and other small- and medium-sized animals. Truly portable, this sling was designed to be used in areas where space may be at a premium or for use in remote facilities or in the field. Deep V shaped openings at the front and back allows for unimpeded access to the animal, enabling easy sampling and use of instrumentation. Setting up and dismantling the restraints are both simple processes and require no tools. Clevis pins lock the frame in place in use and, for storage, either fold closed or hang on hooks or use the storage bag. All openings on the sling are trimmed with a cotton jersey fabric for comfort. Velcro straps close over the back to provide quick and secure restraint while maintaining an adjustable fit for individual animals.

Limb restraints

When restraining animals in both sling frames and other devices, protocols may call for the limbs to be secured. Most often, limbs may be secured using strong but soft cords. These restraints have been further refined by the introduction of padded or cushioned cuffs designed to reduce pressure, creating more comfortable restraint and further refining the entire technique.

Custom fabrications

As new techniques are developed in research areas, such as functional imaging, and as the equipment becomes more readily available in biomedical research, we need to consider safe and humane restraint devices to secure animal subjects in correct positions for bio-measurement. Some species can be successfully and reliably trained to remain still while measurements are taken, whereas other species require restraint or need to be secured in a specific position. The nature of imaging equipment presents challenges when designing custom made restraints, especially when the use of metal is prohibited. Materials such as polycarbonate thermoplastics with trade names such as Lexan™, Makrolon™ and Durolon™ are good choices for fabrication. The material is lightweight but extremely strong, available in optically transparent forms and is easily cut, glued and welded. The cloth portions of these restrainers are generally made using a mesh fabric to optimize data collection, and all fasteners are non-metallic. Custom dimensions and fabrication are used to accommodate the range of equipment and measurements to be taken. However, adequate and appropriate training and acclimation is conducted prior to data collection.

Company profile

Lomir is a Canadian designer and manufacturer of high quality, innovative, and durable equipment for international life science or biomedical research facilities. Products include infusion systems, protective jackets, restrainers, handling equipment, environmental enrichment and custom products for use in laboratory animals. Lomir products are designed with the well-being and comfort of the subject in mind and success is founded on respect for integrity and commitment to customer satisfaction.

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