Association of Primate Veterinarians
Guidelines for Jacket Use in Nonhuman Primates

PURPOSE

The Association of Primate Veterinarians (APV) recognizes that jackets may need to be placed on nonhuman primates (NHPs), and accepts that their use may facilitate aspects of biomedical research projects. To ensure appropriate animal welfare, it is essential that each institution ensures that jacket use is justified and that users are adequately trained and familiar with potential complications associated with jacket use. The following general guidelines provide basic information for researchers, animal caregivers, veterinarians, and institutional animal care and use committees (IACUCs) to consider when assessing the use of jackets for NHPs. Professional judgment should guide development of institutional policies and standard operating procedures (SOPs) to reflect specific research uses.

BACKGROUND

Use of jackets ranges from helpful to critical in specific types of research, but regardless of the purpose, putting a jacket on a NHP can be a stressful experience for the animal. Every project in which jacket use is deemed necessary will benefit by habituating the NHP to the jacket prior to study initiation. Jackets offer advantages in projects in which animals have been instrumented with chronic, indwelling catheters for collection of blood samples or constant infusion of test articles. Other uses include protection of implants, fentanyl patches, surgical incisions, and traumatic wounds.

GUIDELINES

Protocol Review

The IACUC should carefully examine each proposal to ensure that jacket use has been described and justified, and that suitable alternatives are not feasible. Each proposal should include a plan to habituate the animal to the jacket and ensure the jacket’s integrity and cleanliness throughout the study (e.g., periodic changes, repairs as needed), and should contain a description of the parameters and schedule for monitoring the comfort and health of a jacketed animal. Finally, the IACUC should determine if wearing a jacket will interfere with social housing or implementation of the institutional environmental enrichment program.

Fitting the Jacket

The manufacturer may be consulted for determination of an appropriate jacket size. Although the jacket sizes are roughly based on animal species, body weight, and length, the fit is best customized to an individual animal with plastic zip ties, additional padding, and other adjustments. Jackets may produce
discomfort, distress, or pain when not fitted properly. The jacket should fit snugly and comfortably around the neck, thorax, abdomen, and armholes, and not restrict the animal’s normal movements or respiratory effort, or cause chafing, which may lead to skin lesions. Stretchable spandex or cotton undershirts may be used to reduce skin chafing from the jacket. Pockets and inserts may be added to customize jackets for a particular study, but the overall weight and size of the jacket must be considered. Sleeveless jackets or protective vests are available and may be cooler and more comfortable if sleeves are not required for a particular study. Many investigators prefer clipping the hair under the jacket. Others believe that clipping may stimulate itching and that hair provides a buffer that reduces abrasions. Ultimately, either approach requires close clinical vigilance combined with jacket adjustments to accommodate growth and weight gain.

**Jacket Habituation**

Many NHPs will habituate to a jacket within a few days. Signs of maladaptation include destruction of the jacket, poor appetite, depressed or aggressive attitude, decreased activity, self-injury, and stereotypic behavior. Field et al. provides evidence that fecal corticosterone levels return to baseline by day 3 after jacketing in rhesus macaques. However, a longer habituation period may be required for long-term studies or for jackets with additional components such as a tether, swivel, or recording device. In addition, there are species differences with respect to jacket tolerance. In the authors’ experience, baboons tend to be highly tolerant, most macaques readily habituate, and African green monkeys often quickly destroy jackets. The limited use of sedatives, tranquilizers, or anxiolytics may be considered to assist with habituation. Animals that fail to habituate to the jacket should not be placed on a study that requires jacket use. Jacket habituation must include all aspects of the restraint system (e.g., a tether/swivel system or other devices that may be attached to the jacket), usually introduced in a stepwise fashion.

**Monitoring Jacket Use**

The jacket and animal must be examined regularly to ensure proper fit and cleanliness, and to ensure that the animal does not sustain injuries from wearing the jacket. The examination frequency is dictated by the duration that an animal wears a jacket and/or the presence of an internal implant with an exteriorized component, but should be at least weekly. Sedation is necessary in most cases to allow a thorough examination of the animal and adjust the jacket as necessary. An ill-fitting jacket is more likely to chafe and can quickly cause significant skin erosions. Minor skin abrasions can often be managed by readjusting the fit of the jacket and providing padding in the affected areas. The most common locations for jacket abrasions are the underarm and shoulder areas, but all areas of the body in contact with the jacket should be closely examined. Severe wounds may not heal without removal of the jacket, and if the jacket cannot be removed, frequent sedation may be necessary for wound cleaning and bandage changes. Jackets should be changed at a minimum of once monthly, or when damaged, or soiled with feces, urine, blood, or exudates. Jackets should be disinfected and laundered after each use.

**Considerations for Long-Term Use of Jackets**

The long-term use of jackets is often required for NHPs instrumented with externalized implants, such as an indwelling catheter protected by a tether. In such cases, a longer acclimation period to all the components of the system may be warranted to allow stabilization of the animals. In particular, there are
physiologic changes consistent with persistent arousal of the sympathetic nervous system that have been documented in response to jacketing, tethering, and catheterization. Adams *et al.* demonstrated an increased heart rate in male cynomolgus macaques in response to tethering. This study did not include females nor was the effect of surgical catheterization assessed separately from the tethering process. Crocket *et al.* found that urinary cortisol increased in both male and female cynomolgus in response to jacketing, tethering, and surgical catheterization. Each condition was assessed separately, and results demonstrated that urinary cortisol quickly returned to baseline following jacketing and tethering in both males and females. However, surgical catheterization was associated with elevated cortisol levels for at least 3 weeks, especially in females.

**Jacket Use for Socially Housed NHPs**

Jacketed NHPs do not need to be routinely exempted from social housing. Each animal and research scenario must be evaluated to determine the impact of social versus individual housing. IACUCs should encourage use of new technologies to allow social housing of jacketed animals (e.g., telemetry signaling in group housed animals). The principal investigator, veterinarian, or IACUC should be familiar with recent publications involving the socialization of jacketed animals, and consider socialization if appropriate. Social housing of jacketed or instrumented NHPs must take into consideration exteriorized components that can be manipulated by a social partner; therefore, one should proceed with caution to make sure that the partner does not damage the jacket or associated components. If this occurs, further changes to the jacketing equipment may be necessary to allow continued social housing or single housing may be elected.

**Endpoints**

a. The experimental endpoint should be clearly defined and include the duration of jacket use.

b. It is difficult to predict *a priori* how an individual animal will react to wearing a jacket. Any maladaptation must prompt veterinary investigation, treatment, and further habituation or removal from the study.

**Record Keeping**

The clinical veterinarian should examine animals and review records regularly to ensure that the health of each jacketed animal is monitored according to parameters outlined in the protocol or SOPs. Any departures should be investigated and treated accordingly. Records must be available for review by clinical veterinarians, IACUC, and regulatory agencies.

**REFERENCES**


