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FIELD STUDIES: ANIMAL IMMOBILIZATION

Immobilization, in the context of animal ethics, is the forced restriction of movement of all or part of an animal's body, either by physical or chemical means. It is used to impose management of some kind, for human and/or animal benefit. Immobilization is a common practice in many animal management procedures. Here we'll examine the impact of immobilization on animal welfare, outline the ethics of use in different situations, and consider ways of improving standards in these areas.

Physical immobilization methods usually involve traps to restrain the whole animal (e.g., pitfall traps, cage traps, box traps, crush cages, plastic tubes, restraint boards, restraint chairs), or part of the animal (e.g., snares, leg-hold traps, chutes, head-holding devices) or just use of direct handling restraints.

Chemical immobilization is achieved using drugs, which have a range of intended effects, from those which produce

a widespread muscular paralysis while the animal is fully conscious, to those which produce unconsciousness with anesthesia (lack of sensation, e.g., of pain).

Immobilization Is a Welfare Issue

Immobilization of an undomesticated or anxious animal may cause considerable stress. When animals are immobilized, they may undergo some or all of a series of acute stressors including pursuit, restraint, pain, fear and anxiety, all of which are capable of inducing harmful responses and pathological changes. Repeated stressors, such as are imposed on some laboratory and wild animals, are likely to result in very poor welfare outcomes.

Animals in physical traps experience stress similar to that of being caught by a predator, but their struggle to escape may continue until released from the trap. Traps may be remote from the human who set them, and a trapped animal may be left unattended for long periods. Physical injury is also a risk. For example, steel-jaw leg-hold traps, widely condemned as inhumane, cause high levels of fractures and tissue necrosis in target and nontarget species. A good account of capture and physical restraint techniques for zoo and wild animals is given by Todd Shury (2007), and a general veterinary account by Sheldon et al. (2006).

With chemical immobilization there are different welfare issues. Immobilizing drugs have the potential to disturb normal regulatory systems, particularly respiratory and thermoregulation, which in turn can lead to negative outcomes such as respiratory depression, overheating (hyperthermia), lowered blood pH (acidosis), and oxygen deficit (hypoxemia). These in turn can lead to neurological or

myocardial problems and multi-organ failure. A chase by ground or air to dart an animal can lead to extreme muscular activity and hyperthermia, as well as a potentially fatal outcome, capture myopathy syndrome, which can lead to death in minutes to weeks after the inciting event. Drugs may behave differently in combination, and in individual animals, depending on their physiological status. Dosages often have to be estimated for animals of unknown weight, and where drugs are remotely delivered by unpredictable darts to a moving target animal, delivery of the correct dosage is very difficult to control. These scenarios would present a nightmare for a human anesthetist, as would the resulting morbidity and mortality rates, but both can be routine in situations where wild or untamed animals are immobilized.

While these stressor situations are much less common under controlled conditions, for example, in the immobilization of laboratory or companion animals, there are welfare issues for each animal being immobilized.

Immobilization Is Also an Ethical Issue

Perhaps the majority of us think of animal immobilization in the context of veterinary procedures conducted on companion animals, exhibit or zoo animals, or valuable sports animals, for example horses. Here, under controlled circumstances and with primary emphasis on the welfare of the animal, immobilization standards are usually high and improved technologies rapidly adopted.

Ethical concerns around the immobilization of farm animals are very different, with the prime concern being the economics of production. Cattle, sheep

and pigs are routinely immobilized for management procedures such as castration, dehorning and Caesarian section. Immobilization techniques range from humane to highly unethical and stressful techniques such as electro-immobilization (EI). Many immobilization procedures for mutilation, such as castration, tail docking, beak trimming, teeth-clipping etc., are carried out on young animals using physical restraint without anesthesia. All evidence shows that these cause unnecessary pain and distress. The organization Compassion in World Farming gives more information at www.ciwf.org.

The sheer numbers of immobilizations undertaken prior to slaughter, primarily for the meat and byproducts industries, outweigh those in all other categories combined. In 2005, in the United States alone, 10 billion land animals were immobilized and then slaughtered for the food/byproducts industry (U.S. Department of Agriculture, 2006). Welfare standards for chickens and turkeys, which comprise more than 95 percent of all animals slaughtered in the United States each year, are the poorest. They are unprotected by existing legislation in either the United States or Britain. Electric immobilization is the standard method of preparation for slaughter, and causes a wide range of animal welfare, economic, and worker-safety problems. More information can be obtained from People for the Ethical Treatment of Animals at <http://www.peta.org>. Temple Grandin, a professor at Colorado State University, has done much work to improve the standards of immobilization for other meat animals (<http://www.grandin.com/references/humane.slaughter.html>) although, as she has pointed out, standards that are applied still depend to a large extent

on the personal ethics of the slaughterhouse manager rather than legislation. In particular, the use of religious slaughter, involving immobilization by physical restraint of the animal prior to blood-letting, has also been the subject of much ethical debate. VIVA, the Vegetarians International Voice for Animals has published an online account of this controversy (http://www.viva.org.uk/campaigns/ritual_slaughter/goingforthekill01.htm), and the UK government agency DEFRA has online information relating to their stance on this issue <http://www.defra.gov.uk/animalh/welfare/farmed/slaughter.htm#religiouslaughter>.

Laboratory animals are routinely immobilized for various procedures in research. Just over 3.2 million scientific procedures on laboratory animals were started in the UK in 2007, the majority of which entail some restraint or immobilization. Around 39 percent of all procedures used some form of anesthesia (UK Government Home Office, 2007). When laboratory animals are subject to repeated immobilization, they begin to learn the preparatory stimuli, which entails increased stress. This is particularly serious in highly intelligent animals such as primates, who respond badly to repeated physical immobilization. Many researchers now question the validity of data gathered using stressful techniques, because they undoubtedly affect the normal physiology and behavior of the animal (Baldwin, 2007), and their emotional welfare (Bekoff, 2007).

Wildlife researchers may need to immobilize wild animals to mark them for later identification, to provide veterinary treatment, or to relocate them from dangerous or overpopulated areas. Marking may involve mutilation, such as ear-notching, digit or tooth removal, etc.,

tagging and banding, or external or internal radio-transmitter attachment. In the last 20 years, the immobilization of wild animals for the fitting of tags and markers has increased dramatically, to the point where this is the starting point for many monitoring studies.

Wildlife immobilization increasingly employs chemical means. The immobilization of large or potentially dangerous wild animals may pose huge challenges, with risks for both operators and target animals. Drug choices and combinations must be of proven safety for each species and calculated for the weight, age, physiological and reproductive status, body condition, and presence of young or companions with the target animal. If the onset of anesthesia effect is slow, this increases the risk of physical injury such as lacerations, limb injuries, head trauma, etc. It isn't surprising that capture- and immobilization-related mortalities in wild animals are more frequent and more serious than in domestic animals. Arnemo & Caulkett (2007) detail useful precautions which can be taken to help reduce the effects of stressors.

Evidence for the negative effects of immobilization for marking is beginning to emerge in several areas of wildlife research (Murray & Fuller, 2000). It is no longer the case that survival of a wild animal through the process of immobilization implies the safety of that procedure. Longer-term views of capture and handling are beginning to reveal problems. Cattet et al. (2008) showed negative effects of immobilization on ranging behavior and body condition in grizzly and black bears in Canada, and similar effects have been suggested for polar bears (Dyck et al., 2007). Immobilization may also negatively impact the fertility of target species. Alibhai & Jewell (2001)

reported a negative effect of repeated immobilization for radio-collar fitting and maintenance on the fertility of female black rhinoceros. While these findings and others often give rise to heated debate among wildlife researchers, most domestic animal veterinarians would not expect their patients to sustain a pregnancy, or perhaps even survive, under similar circumstances. Some authorities (e.g., the government of New South Wales, Australia) have now begun to issue ethical guidelines for wildlife research: <http://www.agric.nsw.gov.au/reader/wildlife-research/arrp-radio-tracking.htm>

The physical trapping of animals for research or killing is an area in which the quality of immobilization is of ethical and welfare importance. A good account of trapping and marking terrestrial vertebrates for research is given by Roger Powell and Gilbert Proulx (2003). Some of the more responsible hunting and trapping authorities issue ethical guidelines, for example, in the United States, by the Pennsylvania Game Commission: <http://www.pgc.state.pa.us/pgc/cwp/view.asp?a=514&q=168724>.

First, the need for immobilization can be reduced. Many of the conditions described above are consumer-driven, and could be avoided if demand was reduced. In wildlife research, the ethics of some practices requiring prior immobilization, e.g., radio-telemetry, can be questioned when there is a high failure rate of collars and/or transmitters (Alibhai & Jewell, 2001), and an accepted, but also poorly documented, potential for injury (see illustration). Training laboratory animals can avoid the need for immobilization in some circumstances; nonhuman primates can be trained to present themselves for routine blood-sampling without restraint (Reinhardt, 1995).

Second, current techniques can be replaced with those which provide better welfare. The UK National Centre for the Replacement, Refinement and Reduction of animal in research (NC3RS), (<http://www.nc3rs.org.uk/news.asp?id=924>) has begun this process. Better husbandry and management conditions in farming, and the adoption of noninvasive techniques for wildlife monitoring, including camera-trapping and biometric techniques such as footprint identification (Alibhai et al., 2008) and coat-pattern identification (Burghardt et al., 2008), can be considered.

Third, research can be prioritized into reduction or replacement. The Dr. Hadwen Trust for the replacement of animals in medical research does excellent work in this field: (<http://www.drhadwentrust.org.uk/>).

Lastly, standards of immobilization can be regulated by developing and monitoring protocols and legislation as a foundation for change. Much unnecessary stress in immobilization is imposed by economic time constraints on the competitiveness of commercial practitioners. Legislation and consumer-awareness campaigns could greatly improve conditions for animals undergoing the stressful process of immobilization.

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