



## **Literature review: Welfare of dogs and cats during transportation**

Currently the transportation of animals for commercial purposes is covered by Council Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport and related operations, which requires animals to be transported in a way that will not cause unnecessary suffering. The Regulation sets out general requirements that apply to the transportation type, handler and the journey itself to reduce any negative impacts to welfare during transportation. The current legislation is largely for the protection of livestock animals, however general requirements such as making sure transportation is secure and well ventilated providing sufficient space for the animal, the animal is fit for travel and the animal has access to food and water when needed is also applicable to transporting domestic species such as cats and dogs for commercial purposes. There is very little within the legislation that applies specifically to the transportation of cats and dogs. Current dog- and cat-specific provisions in the Regulation are:

- Dogs and cats of less than eight weeks of age are NOT allowed to be transported unless accompanied by their mother;
- They must be fed at intervals of no more than 24 hours;
- They must have water provided at intervals of no more than eight hours.

### **How can transportation impact welfare?**

The above general and dog- and cat-specific provisions are clearly limited and do not address many of the issues that may result in stress and reduced welfare of dogs during transportation. It is acknowledged within the literature that a change in environment or social status is stressful for most species, and therefore a range of potential stressors have been highlighted that can be sources of fear or distress for animals, including domestic species, during transportation. These include: 'separation from a familiar environment and family/social groups, loading and unloading, overcrowding in confined spaces, unfamiliar and loud noises, vibration, jolting, extremes of temperature and humidity, acceleration and deceleration during movement, long periods of waiting during which there may be no ventilation, alternating with rapid air movement when the vehicle is in motion, gases from faeces/urine/fuels, changes in the biota of bacteria to which animals are exposed and deprivation of feed and water' (Adams, 1994; Wolfensohn, 1997).

### ***Stress***

Research studies have been conducted specifically into the effect of transportation (air, road and rail) on the welfare of dogs, by measuring biological parameters reflective of stress. The majority of these studies suggest that transportation can indeed be a stressful event to some individuals (Leadon and Mullins, 1991; Frank, Gauthier and Bergeron, 2006; Ochi *et al.*, 2013; Radisavljević *et al.*, 2017), and therefore further legislation to decrease the likelihood of stress experienced by individuals and to safeguard their welfare during transportation is needed.



For example, a study by Ochi *et al.*, tested serum alkaline phosphate (ALP) levels in 59 laboratory beagle dogs that were transported between laboratory facilities by both road and air. The dogs were placed in single cages at temperature of 15-25°C, and Serum ALP levels were compared before and after travel. Levels of serum ALP were higher following transportation, showing levels of stress were potentially increased as a result of transportation. There were no significant changes noted in other blood parameters (Ochi *et al.*, 2013). In another study, 40 free-roaming bitches were captured in public areas of Serbia by the veterinary service and transported every other week for 30-45 minutes at a time. Blood samples were collected immediately after travel and 24 hours after travel when housed in a new environment and analysed for biochemical indicators of stress. A greater physiological response was recorded immediately after travel compared with 24 hours after being housed upon arrival, with a gradual decrease in the measured parameters. The authors concluded that the procedures associated with transportation (such as loading, caging during transport, vehicle vibrations, traffic noise and unloading) were more stressful to the dogs than being confined within a cage in a new environment (Radisavljević *et al.*, 2017). Fazio *et al.*, studied the impact of transportation using 20 clinically healthy dogs of various breeds. Ten dogs who had previous experience of traveling and loading/unloading onto a van, were transported in crates large enough for the animal to lie down, and ten dogs were not transported, acting as a control group. Road transportation had a significant effect on the measured biological parameters between the two groups, demonstrating road transportation can be highly stressful and potentially compromise welfare (Fazio *et al.*, 2015).

Other studies have highlighted that transport can be stressful regardless of the journey length, and repeated exposure to transportation may not result in habituation and decrease the stress experienced during transportation. For example, in a recent study, eighteen beagles were divided into 3 groups, and either acted as a control group and not transported, or a study group and were transported for either one or two hours in a transport cage (to which they were previously accustomed to) within a minibuss vehicle on the road. The transportation sessions took place over a 6-week period. Stress parameters (heart rate, saliva and blood samples) were measured one hour before, during and until two hours post travel and behavioural analysis was conducted during transportation. Transported dogs had significantly higher elevations in stress parameters, such as cortisol and heart rate, than dogs not transported, and there was no difference in levels with repeated transportation over the 6 weeks, suggesting transport does not become a less stressful event with short-term repeated exposure. Elevations in stress parameters were also recorded throughout the whole journey for both 1- and 2-hour transportations suggesting that transportation can be stressful regardless of the length of the journey, and individuals may not become habituated to the experience of transportation (Herbel *et al.*, 2020).

Finally, in a study looking at both physiological and behavioural parameters of dogs being transported (by road) in travel kennels for 1 hour, it was found that transportation was associated with a significant increase in cortisol measurements. Dogs were recorded spending most of their time sitting up during transportation which is potentially another display of



discomfort and stress. Stress behaviours such as lip licking, vocalisation, panting and drooling were commonly displayed during transportation (Frank, Gauthier and Bergeron, 2006).

Other studies examining owner-reported transport induced stress highlight similar behavioural signs such as panting, vomiting, restlessness and vocalisations. As discussed above, there are a number of stressors related to transporting dogs resulting in stress and anxiety, which could be related to the vehicle itself, the journey (such as strange noises, balance changes, extreme confinement and climatic stress) or the destination of the journey (e.g. negative anticipation of something such as a trip to the vets) (Santurtun and Phillips, 2015). In a survey of dog owners completed for 155 dogs, 23% of owners reported their dog was restless when travelling. Just under half the dogs in the survey were reported to have had travel related behavioural changes. Of the dogs that showed these behavioural changes 50% of owners provided them with a form of comfort during travel, e.g. blanket/toys, whereas only 28% of owners with dogs not exhibiting behaviours (but may still be experiencing stress) provided a form of comfort (Cannas *et al.*, 2010). In another survey answered by 1031 dog owners about use of transportation, 24% of owners surveyed reported that their dog had some sort of negative reaction or travel related problem to car transportation. In particular, dogs not exposed to transportation and thus socialised to the experience when puppies were more likely to exhibit problems. Common behaviours recorded by owners that are highly indicative that the individual dog was experiencing stress or a negative welfare state include restlessness, hypersalivation, vomiting and panting (Mariti *et al.*, 2012). Travel stress is often overlooked as a minor problem during travelling; however studies demonstrate that in dogs it can be a common occurrence, and has the potential to significantly affect the dog's welfare and therefore, measures to reduce the impact of stress during transportation need further research and implementation.

### ***Health***

Motion sickness and transport stress have been recorded in many animal species including dogs. The motion associated with transportation can affect the welfare of the animal through induction of motion sickness and/or travel stress, fear and anxiety. Behaviours indicative of stress and motion sickness specifically in dogs include licking of lips, swallowing, panting and vomiting (Frank, Gauthier and Bergeron, 2006; Santurtun and Phillips, 2015). Another potential health implication associated with transportation is risk of immunological stress, with one study showing transportation (to the vets) was capable of affecting immunological parameters (and thus the immune system and overall health) of dogs. Greater impact on the measured parameters was observed following transportation compared to longer-term hospitalisation at the vets (DeClue *et al.*, 2020).

The results from the above studies prove dogs can indeed find travel stressful with the potential of negatively affecting both health and welfare. Elements of transportation from loading/unloading, noises, motion, and confinement are all factors that can be stressors and should be taken into consideration when protecting welfare during transportation.



## **Welfare needs during transportation**

For transportation to take place, animals need to be fit to travel (defined as absence of injury, pain, disease). The transportation itself should also be carried out in a way that minimises fear and stress and optimises emotional state as much as is possible. Key factors that should be accounted for include the provision of a suitable environment (i.e. temperature, housing/restraint, whether they are housed with/in close proximity to other individuals), food, water, rest, the opportunity to recuperate following travel and ability to exhibit normal behaviours (Marahrens *et al.*, 2011).

Sedation of animals before transportation is not recommended, and only to be used under veterinary supervision if it is considered in the best interest of the animal's welfare. Research studying use of sedatives have found sedation to not be effective method of reducing stress and can have damaging health implications. In a study by Bergeron *et al.*, dogs were transported by road, followed by air transport and either sedated with acepromazine or non-sedated. The heart rate results in this study suggest that both road and air transport are stressful for dogs, particularly for animals who are not used to travel regardless of sedation (Bergeron *et al.*, 2002). Sedation with acepromazine, at the dosage used, did not significantly affect the stress reaction during air transport. However, overall, this study indicates it may not be beneficial to sedate animals during transportation, although this is variable down to an individual level.

### ***Restraint***

Whilst being transported, it is important animals are safely restrained, however, this should be done in a way to provide necessary comfort at the same time as preventing unnecessary suffering and or injury. Under the Highway Code in the UK, dogs and other animals are required to be suitably restrained so as not to pose a threat to themselves or others in the vehicle. Distraction to the driver caused by animals not restrained appropriately on board the transport, can result in injury or fatalities. Recent research has shown that in the UK the most used restraint by dog owners was a cage/crate, followed by harnesses tethered to the seat belt or buckle, in the back seat or boot of the car. However, there are many concerns over the welfare implications and safety of such devices due to them being unregulated, and thus not having to meet any minimum safety standards before being used to transport animals (Hazel *et al.*, 2019).

As previously highlighted, restraint/confinement can be a stressor to dogs during transportation, and therefore consideration should be given to the most appropriate restraint and its location within the vehicle. One study compared plasma adrenocorticotrophic hormone, cortisol, lactate and non-esterified fatty acid concentrations in 12 greyhounds following transportation in either their current wooden kennel housing (similar to the size of greyhound racing starting traps) or in wider Perspex kennels, stowed either in the belly hold or in the main cargo hold of the aircraft. Increased kennel size did not have an effect on level of stress response, but there was a significantly greater stress response depending on where in the



plane the dogs were kept, with dogs in the in the 'belly hold' of the aircraft showing markedly increased stress. This highlights that location within the vehicle can have an impact on the stress experienced by individuals. Another significant finding was the variation in individual stress responses between the dogs, which highlights that time should be allowed to ensure specific needs are met based on the individual (Leadon and Mullins, 1991).

Working dogs spend large amounts of time being transported in vehicles and therefore their physical comfort and safety are important factors that should be considered when choosing transportation options. Having a cage inappropriately sized can have welfare and health (such as musculoskeletal issues) implications, especially where large periods of time are spent in cages. A recent study investigated the effect of cage size on behaviour and physiology of working dogs, based on using 4 different cage sizes during 30-minute transportation sessions. Findings showed that cage size affected body position (sitting versus laying down), with larger cages allowing the dog to turn around more. Whilst this could suggest that the dogs were more unsettled, more lying down behaviour was also observed alongside the turning around suggesting the greater movement allowed the opportunity to find comfortable resting positions. The authors initially hypothesised that smaller cages may be safer due to less movement, sliding and hitting the walls of the cage, however, no significant difference between cage sizes was found for safety variables, and in fact balance loss was more common in small cages. The findings suggest the largest cage size appears to be the best cage size for transport as it appeared to be the most comfortable without compromising safety. The authors suggest that if it is not feasible to have a cage filling the boot or back of the car, then a cage 'proportional to the size of the dog' should be the favoured size (Skånberg *et al.*, 2018).

With the unexpected change to environment such as restraint during transportation proving stressful to some dogs, recommendations to minimise stress for cats and dogs being transported include introduction to transportation cages/crates prior to transportation to help acclimatise animals to using such space. Leaving the crates for animals to explore at their own will can help animals familiarise themselves with the space, and potentially reduce stress when introduced to it again during transport. If animals are to be loaded and unloaded using a lead and/or harness, these should also be introduced prior to use during transportation, to create a familiar process (Overall and Dyer, 2005). With evidence suggesting certain elements of transportation being particularly stressful to animals, further research is needed to determine what are the best options for travel that optimise welfare, and improved regulation is needed to ensure that any equipment used meets a minimum welfare and safety standard.

### ***Temperature and humidity***

Another important consideration when transporting animals is the climatic environment, they are being transported in. Incorrect temperature and humidity of the vehicle used for transportation has previously been suggested as a potential stressor to animals.

The canine thermoneutral zone (temperature range where body temperature can be maintained, where energy is not expended for heat production or loss) is between 20 – 30°C



(Jordan *et al.*, 2016; Carter *et al.*, 2020). For animals housed for scientific purposes, it is recommended that temperatures are kept between 15 and 24°C (UK Home Office, 2014), and thus a similar range could be expected for transportation vehicles with dogs on board. However, appropriate interior conditions should be considered on individual basis due to different needs due to differences in breed, fur type, activity levels and body condition and size.

Research has shown that incorrect temperature during transportation is a significant risk for heat-related illnesses, most commonly heat exhaustion/heatstroke (Carter *et al.*, 2020; Hall, Carter and O'Neill, 2020). Vehicles used for transporting dogs that lack air movement can limit temperature regulation, and temperatures can thus vary greatly and rapidly. In a study that continuously logged vehicle temperatures throughout the year, (NB vehicles most frequently kept in an unshaded car park and had no restrictions to use of aircon/ heaters), large variations in internal vehicular temperatures were observed. Temperatures within the vehicle exceeded 25°C (maximum suggested ambient temperature for housing dogs 24°C (Home Office, 2014)) in every month of the year, with the highest car temperature recorded in June (54.5°C) and the lowest in February (-7.4°C). This study demonstrates the potential for thermal stress associated with transporting dogs within cars even in mild climates (Carter *et al.*, 2020). Research has also shown that risk of heat related illness is significantly greater in older, brachycephalic, obese, and high energy dogs (Hall, Carter and O'Neill, 2020), which should be taken in to account when transporting individuals.

Heat stress during transportation has also been reported by studies looking at deaths of working dogs such as police dogs, where heat exhaustion related to time spent within vehicles is a contributing factor to working dog deaths (Barberi, Gibbs and Schally, 2019). Similarly hyperthermic responses have also been recorded in dogs during air transportation, with notable welfare and health concerns as a result of exposure to unsuitably high temperatures during transportation (Hanneman *et al.*, 1977).

Many organisations and welfare groups have regular campaigns against dogs being left unattended in vehicles and thus potentially exposed to unsuitable temperatures (Dogs Trust, 2020). However, the risk to dogs (or cats) is not limited to just being left unattended in a hot or cold vehicle, with a recent study demonstrating vehicular confinement when both travelling and left unattended was one of the most common reasons for heat-related illness in a veterinary cohort of dogs (Hall, Carter and O'Neill, 2020). Older vehicles may not be equipped with suitable temperature regulating devices such as air conditioning or heating and contain minimal ventilation. Commercial vehicles such as trucks and vans also have separate compartments to the body where the driver and passengers of the vehicle sit in which animals are likely to be contained. These compartments may lack temperature regulation controls and ventilation, potentially exposing animals contained in the back of the van to a prolonged unfavourable environment during transportation. There are also risks to dogs transported in purpose-built vehicles should the vehicle suffer faults or damage resulting in loss of power to the temperature regulation and ventilation systems or if the vehicle is stationary in traffic or while queuing in full sun (Carter *et al.*, 2020).



## **Conclusion**

In conclusion, the current legislation that exists to protect the welfare of domestic species such as dogs and cats during transportation requires additional provisions to optimise the welfare of these animals. Current literature shows that transportation can result in exposure to multiple stressors (such as isolation and confinement, noises, motion, smells, extreme temperatures, limited ventilation, unloading and loading) which can have negative welfare and health implications, which tighter legislation and regulations may help to alleviate. An important consideration is the need to provide a suitable environment during transportation, such as the correct temperature and restraints, to ensure safety and comfort during transportation.



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## **Appendix**

### **Greyhound Board of Great Britain - Rules of Racing 2017**

#### **TRANSPORTATION**

The Greyhound Board of Great Britain has a set of rules/requirements regarding the transportation of greyhound dogs used for racing, in order to improve the welfare of the dogs when transported. These could be of use as guidelines for future policy/legislation changes regarding transportation of dogs:

General Conditions: During any transport by road the driver must be conscious of the fact that he or she is transporting sentient animals and has a duty of care to ensure that the standard of driving and care is commensurate with their comfort (i.e. drive sensibly). Keepers of Greyhounds should ensure that drivers have been trained and shown themselves to be competent in the care of the dogs.

The expected journey time from Trainer's Kennels to the attached Racecourse for Racing should be less than 8 hours.

Greyhounds should not be loaded for transport for at least 15-30 minutes after Racing or trialling to allow them to cool.

Planning: Habituation is vital to reduce transport stress. This should be achieved before 14 weeks of age if possible so that the Greyhound is used to being transported. It will also help to introduce a sapling to the wider world at the same age and well before initial Trials at about 11 months of age.

The conditions provided should partly be related to the length of the journey. All journeys should be properly planned and this should include planning in the event that the expected journey time is exceeded as well as locations of stops for watering, feeding or emptying.

No segment of a journey should exceed 24 hours and there must be a 12 hour rest period before any subsequent journey. If any part of the journey includes a sea passage this must be included in the journey time

If greyhounds are transported in the back of a car, a dog guard should be used and all greyhounds should be muzzled. Government has not specified a limit to the number of greyhounds that can be carried loose in a car but trainers/drivers are responsible for ensuring that the greyhounds are not subjected to any unnecessary stress or suffering. Whilst it will therefore still be acceptable for small numbers of greyhounds to be carried sensibly and where practical in an estate car without the need for travel cages, it is not likely that larger numbers of greyhounds can be transported safely if loose in either a van or car. It is recommended that a maximum of two greyhounds be transported loose in the back of a



vehicle. If more than two greyhounds are to be transported it is recommended that each greyhound be held in a separate travel cage built to the specifications detailed in Appendix II, sub-section 17.

If it is necessary to move a litter of puppies before weaning they should travel together. If they travel with their dam this should be in a double cage.

When travel cages are used cages should be designed, constructed, maintained and operated so as to avoid injury and suffering and to ensure the safety of greyhounds. All such cages should be securely bolted to the transport vehicle. All cages should be built of an impervious, mesh material for maximum ventilation and include a carpeted or cushioned non-slip floor surface. Cages must be kept clean, regularly disinfected and in good condition.

Government legislation requires that: "sufficient floor area and height is provided for the animals, appropriate for their size and intended journey". Also, "sufficient space shall be provided inside the animal's compartment and at each of its levels to ensure that there is adequate ventilation above the animals when they are in a naturally standing position, without on any account hindering their natural movement".

As an absolute minimum, cages must have the following dimensions: 35.56cm/14in width, 101.6cm/40in length, 76.2cm/30in height. Trainers should note that these are only MINIMUM sizes; larger greyhounds require larger cages. Trainers are responsible for ensuring that their travel cages are suitable for the greyhounds being transported. Larger cage sizes still are required for journeys longer than 8 hours. Each transport vehicle should also include a cage of minimum width 76.2cm/30in, or 2 cages with a removable separator, to allow secure and comfortable transport of a particularly large or slightly injured greyhound.

For travel by air, IATA rules on cage sizes must be followed. The current IATA Live Animals Regulations are obtainable from The Stationery Office, Tel: 020 7838 8400. 14-4 GBGB Rules of Racing as at 10.02.17 14-4

Vehicle: The vehicle temperature should be maintained between 10°C and 26°C at all times during transport. When the driver is not in the same space as the Greyhounds a remote monitoring device must display the temperature in the Greyhound cabin and be visible from the driver's seat. If the temperature rises above 26°C it is important that dogs are regularly examined for signs of distress and removed from the vehicle to cool down if necessary. Temperature must be monitored and records kept.

Dogs keep themselves cool by evaporating water from their tongues by panting. In conditions of high temperature and high humidity this becomes ineffective and the dog will consequently suffer from heat stroke. It is therefore important that both temperature and humidity are controlled. Consequently wetting a dog to cool it may be counter-productive.



As a rough guide, if there is condensation inside a vehicle it is an indication that the humidity is too high and ventilation must be increased to prevent it.

The vehicle should be designed to provide a minimum of 12 air changes per hour at all times during transport. Cages in vehicles must have at least 40% of the wall area open to allow adequate air flow. This is best provided by a rustproof (stainless) steel mesh door and back to the cage as well as additional open areas on its sides to allow ventilation through the cage.

Maintenance of temperature control and ventilation must be possible when the vehicle is stationary. This is best provided by full air conditioning. There must be a procedure for the provision of ventilation in an emergency; this may be as simple as opening all vehicle doors.

All vehicles carrying dogs must be equipped with a functioning and regularly serviced fire extinguisher. It may be advisable to provide an indication on the outside of the vehicle that live animals are being carried to alert the emergency services.

Care during the journey: For any journey over 4 hours adequate rest stops for watering, feeding and emptying must be included. Water must be provided every 4 hours or frequently enough to prevent dehydration. Emptying must be provided every 8 hours and food every 24 hours.

Greyhounds should have free access to water until loaded for a journey. No food should be given for 2 hours before travelling and an opportunity to empty should be provided immediately before loading.

Slightly ill or injured greyhounds can only be considered to be fit, and therefore able to be transported, in limited circumstances. This would include transport to a nearby veterinary surgery for diagnosis or treatment, or on short journeys where transport would not cause the animal additional suffering. Slightly ill or injured greyhounds are unlikely to be considered fit for any long journeys.

Where there is any doubt over the fitness of an animal, a veterinary surgeon must be consulted before transporting the animal.

Sedatives shall not be used on animals to be transported unless strictly necessary to ensure the welfare of the animals and shall only be used under veterinary supervision.

Vehicles should be driven sensibly and carefully to minimise discomfort to greyhounds



## **The Scientific Working Group on Dog and Orthogonal detector Guidelines (SWGDOG)**

Guidelines for best practice in transporting dogs from the US based SWGDOG:

### Transport

3.5.1 Air Transport should be in compliance with local, state, federal or air carrier regulations. (Reference [www.iata.org](http://www.iata.org))

3.5.2 Any vehicle/vessel utilized to transport working dogs should provide a secure and temperate environment which is suitable to the general health and well being of the animal. Recommendations include;

- Sufficient air exchange to suit conditions
- Protection from environmental extremes
- A secured container with non-slip flooring
- Provide sufficient space to allow each dog to turn about freely, to stand, sit and lie in a comfortable, normal position
- Containers should prohibit animals from making contact with each other and the general public.