TECHNICAL NOTE

TRAINING PROGRAMME

ON WELFARE OF ANIMALS DURING LONG DISTANCE TRANSPORT BY LAND

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Contents

FOREWORD

OIE and its global role on mandate on AW

The World Organisation for Animal Health (OIE) is an intergovernmental organisation with a mandate from its 180 Member Countries to improve animal health and welfare worldwide. According to the World Trade Organisation, the OIE is the reference standard-setting international organisation. It is responsible for ensuring transparency of the animal disease situation worldwide, including diseases transmissible to humans, for the publication of disease prevention and control methods as well as for safeguarding the sanitary safety of world trade in animals and animal products, and ensuring food safety from their production phase.

Due to the close relationship between animal health and animal welfare, the OIE has, at the request of its members, become the international standard-setting organisation for animal welfare. Its international standards, recommendations and guidelines relate to both terrestrial and aquatic animals and are exclusively science-based.

OIE Platform on Animal Welfare in Europe

Many countries in Europe face challenges in the application of OIE intergovernmental standards on animal welfare (section 7 of the OIE Terrestrial Animal Health Code - TAHC), which are still applicable in all 180 OIE Member countries.

To empower Veterinary Services to apply OIE standards, at the request of the OIE regional Commission for Europe, in 2013 the OIE launched a regional Platform on Animal Welfare for Europe (http://rpawe.oie.int). The first Action Plan of the OIE Platform (2014-2016) proposes a series of capacity building activities targeted at Veterinary Services on animal welfare conditions during long-distance transport by land of live farm animals, in compliance with Chapter 7.3 of the OIE TAHC. It is also proposed that long-distance transport activities be fully continued in the second Action Plan of the OIE Platform (2017-2019), currently under development.

Training programme on welfare of animals during long distance transport by land

Based on the successful experience of the OIE Improved Animal Welfare programme initially prepared for Asia on slaughter, the OIE Platform has developed a similar methodology as well as training modules on long distance transport by land and will run Training-the-Trainers Workshops in selected countries of Europe. OIE will closely monitor the 'cascading effects' at national level, to ensure that a wide range of stakeholders – mostly official veterinarians but also private transporters and the academia – become fully aware of the OIE obligations during long distance transport and apply those provisions on a routine basis.

The aim of training programme is to improve welfare of farm animals prior to and during long distance transport in selected eligible member countries by the tailored, training-the-trainers programme developed to support implementation of the OIE animal welfare standards.

The training/learning materials comprise nine PowerPoint presentations with audio-visual materials and accompanying Technical Notes. The Technical Notes document covers presentation topics in more detail providing a framework of knowledge comprising relevant standards and science.

Training materials cover the welfare of the animals mostly in relation to long distance transport, but also could be applied for short distance transport. The materials address the welfare of cattle, sheep, pigs, horses and poultry during transport with focus on animals transported for slaughter.

Acknowledgement:

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1. INTRODUCTION TO ANIMAL WELFARE

Introduction

Animal welfare is widely defined as the physical and mental health and wellbeing of animals, which can be measured by indicators that include behaviour, physiology, longevity, and reproduction.

The term animal welfare can also mean human concern for animal well-being, or a position in a debate on animal ethics, or expressed via standards and regulations.

Concerns for animal welfare are usually based on ethics, awareness that non-human animals are sentient and that consideration should be given to their well-being, especially when they are used by humans. These concerns can include how animals are keep at farm, transported killed for food, and how they are used for scientific research.

In Western culture and philosophy, animal welfare and the use of animals is based on so called "contractarian utilitarianism". Translated to practical language it means animals use by humans is morally justifiable if the overall benefits are larger than losses.

Animal welfare can be defined in various ways, but usually the definition includes three elements: the animal's emotional state, its biological functioning and its ability to show normal patterns of behaviour (Fraser and Duncan, 1997; Mendl, 2001)

Image 1:Animal welfare includes its ability to cope with environment

According to the OIE Terrestrial Code, animal welfare means, "how an animal is coping with the conditions in which it lives. An animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well nourished, safe, able to express innate behaviour, and if it is not suffering from unpleasant states such as pain, fear and distress. Good animal welfare requires disease prevention and veterinary treatment, appropriate shelter, management,

nutrition, humane handling and humane slaughter/killing. Animal welfare refers to the state of the animal; the treatment that an animal receives is covered by other terms such as animal care, animal husbandry, and humane treatment."

In approaching the subject regarding the animal's emotional state, animal welfare involves the subjective feelings of animals, so that welfare will be reduced by negative subjective states such as pain and fear, and can be improved by positive states such as comfort and by environmental enrichment - opportunities to play.

Measures based on biological functioning and on the **animal's ability to cope with the environment** also provide relevant information on welfare. Both failure to cope and difficulty in coping would indicate poor welfare (Broom, 1986).

An animal could run into three different situations regarding the capacity to face difficulties created by the environment.

- The environment is particularly difficult for the animal, which cannot overcome the difficulties. The animal in this situation could die or suffer from diseases.
- The environment is not so difficult and the animal eventually manages to adapt to it. The adaptation was however not easy and involved some cost. These costs are predominantly consequences of the stress. This stress response is similar among different species with range of clinical, behavioural, physiological, and immunological changes.
- The environment is appropriate for the animal so the adaptation process is not difficult for it and there is no biological cost for the animal.

Animal Welfare Concepts

OIE Terrestrial Code chapter 7.1. Introduction to the recommendations for animal welfare describes guiding principles for animal welfare and scientific basis for OIE recommendations and animal welfare assessment.

In the 20th century there were attempts to express animal welfare more precisely in general definitions and concepts, the best known concept, proposed by British Farm Animal Welfare Council (FAWC 1979) covering basic animal needs is concept of "five freedoms":

1. Freedom from Hunger and Thirst - by ready access to fresh water and a diet to maintain full health and vigour.
2. Freedom from Discomfort - by providing an appropriate environment including shelter and a comfortable resting area.
3. Freedom from Pain, Injury or Disease - by prevention or rapid diagnosis and treatment.
4. Freedom to Express Normal Behaviour - by providing sufficient space, proper facilities and company of the animal's own kind.
5. Freedom from Fear and Distress - by ensuring conditions and treatment which avoid mental suffering.

The "five freedom" concept focused on animal's welfare at certain point of its life.

The more recent concept of "life worth living" introduced by British Farm Animal Welfare Council looks at the welfare of an animal during its entire life. 'A life worth living' is a statement about an animal's quality of life, (in an animal life context), during its lifetime, including the manner of its death i.e. the life of chicken broiler in certain production systems taking account all phases of the production chain.

Of particular relevance are the following.: Does the system or practice induce severe negative mental states, frustrate normal behaviour, preclude positive experiences or cause physical debilitation? Does the system fail to meet the physiological and mental needs of the animal?

Examples of a life not worth living are an animal suffering a severe debilitating disease that is untreatable, a severe physical state such as starvation or dehydration, and severe negative mental states, such as chronic, intense pain, fear, or distress. In each case, a good stockman would either treat the animal swiftly or euthanize it promptly and humanely.

The Welfare Quality® project has developed a system to enable overall assessment of welfare, where the different components of welfare to be covered are turned into 4 welfare principles that correspond to the questions:

- Are the animals properly fed and supplied with water?
- Are the animals properly housed?
- Are the animals healthy?
- Does the behaviour of the animals reflect optimized emotional states?

Measures used for animal welfare assessment are divided into resource-based measures, management-based measures animal-based measures. The factors that affect an animal‘s welfare include the physical environment and resources available to the animal (resource-based measures), such as space allocation, housing facilities, bedding material, etc and the management practices of the farm (management-based measures), such as handling, biosecurity etc. Depending on characteristics of animal (breed, sex, age, etc.) the animal will respond to these inputs and the animal‘s responses (outcomes) are assessed using outcomes, animal-based measure (EFSA, 2012; Keeling et al., 2013).Animal-based measures for assessing the welfare of animals during handling and transport may include: vocalisation, number slips and falls during loading and unloading, body condition, sings of heat and cold stress, bruising and injuries, ect.

Animal welfare in transport and the human factor

Transport of farm animals is a critical phase for the welfare of the animals because they are exposed simultaneously to a variety of stressors that may result in high levels of fearfulness and pain, inducing psychological and physical stress, thus compromising their welfare.

A range of clinical, behavioural, physiological and immunological changes have been documented in different animal species by, for example, increases in heart rate, increased adrenal cortical activity, decreased immunity, increased morbidity and mortality due to infectious diseases after transport.

There is an anecdotal saying suggesting that the welfare of animals has nothing to do with animals and that it is solely dependent on humans – more precisely humans dealing with animals and their understanding of the animals. In situations where animals are exclusively in a man-made environment – for example during transport, it is almost self-evident.

The most important prerequisite for the good welfare of animals in transport is to put only animals that are fit for transport on the lorry. If an animal is loaded, it cannot be assumed that its welfare, in the course of transport, will improve, contrary to that it may get much worst. Because of that some of the worst welfare problems occur when old breeding animals are sent to be culled, or animals at the end of their production life that are not usually very fit (dairy cows) are transported. To avoid these problems, the old breeding animals should be sold/marketed when they are still fit to be transported.

Image 2 The most important prerequisite for good welfare of animals in transport is to put only animals that are fit for transport on the lorry Source (World Animal Protection)

Beside of inspection of animals before transport, loading and unloading facilities, stocking density in the vehicle and conditions during journey, one of crucial factors to ensure welfare of animals during transport is quality of driving (style of diving). Careful driving with smooth starts and careful braking will prevent animals from falling. Cockram (Cockram et al., 2004) reported that in 80% of the cases animal lost its balance and posture (and in some cases fell) after of inconsiderate driving such as sharp cornering, sudden braking etc. Unpublished industry data suggest that the difference in injured and dead on arrival animals between the best and the worst drivers can be 100%.

One of the most effective ways to improve welfare of animals in transport is to measure losses. Bruises, injuries, sickness, dead on arrival should be counted and tabulated. This should help to identify drivers and producers who are having high losses (T. Grandin, 2010).

Producers and transporters should receive bonuses or fines depending on the conditions of animals upon arrival as well as upon final conditions few weeks after arrival. In case of transport to slaughter, the quality of transport can be estimated based on the quality of carcass and PSE/DFD meat.

Financial incentives always make a strong case, however they can be easily misused in situations when farmers or businessman tend to pay to hauliers based on the weight of consignment – i.e. more you load more you are paid. This should never be encouraged, just as rewarding people for moving more and more animals on or off a lorry per hour. That can easily lead to abusive handling of animals.

Research from different parts of the world suggests that the “farm of origin” effect also plays significant role in the welfare of animals in transport. Particularly in pigs and poultry but also in beef cattle, the rearing system (intensive, semi intensive, extensive) impacts upon an animal’s general mobility and the strength of its motoric apparatus. On-farm day to day husbandry and management practices impacts animal’s ability to cope with stress during harvesting, loading and transport. According to recent US and Spanish research there were a small proportion of farms that showed significantly higher losses of pigs in transport. Those can be attributed to husbandry, genetics or feeding that have not yet been identified. There are however events way beyond the transport itself that impact on the welfare of animals in transit.

Responsibilities for animal welfare during land transport

Once the decision to transport the animals has been made, the welfare of the animals during their journey is the joint responsibility of all people involved. The individual responsibilities of persons involved are described by OIE standard.

Owners and managers of animals are responsible for: the health of the animals, deciding whether they are fit to travel, complying with veterinary or other certification, responsible for making sure appropriate equipment and veterinary assistance are provided for the species and journey and the presence of an adequate number of animal handlers.

Business agents or buying/selling agents share the responsibility with: owners for ensuring that animals are fit to travel, market owners and managers of facilities at the start and at the end of the journey to ensure facilities for the assembly, loading, transport, unloading and holding of animals and for emergencies are available.

Animal handlers are responsible for: the humane handling and care of the animals, especially during loading and unloading, maintaining a journey log. In the absence of a separate animal handler, the driver is the animal handler

Transport companies and vehicle owners are responsible for planning the journey to ensure the care of the animals: choosing appropriate vehicles, providing properly trained staff for loading and animal care, developing and keeping up-to-date contingency plans for emergencies planning ahead to minimise animal stress during transport, producing a journey plan which includes a loading plan, journey duration and location of resting places

Drivers are responsible for: loading only animals which are fit to travel, correct loading of animals into the vehicle and inspection during the journey, appropriate responses to problems arising during the journey.

Managers of facilities (where animals are held at the start and at the end of the journey and at resting points) are responsible for: providing suitable premises for loading, unloading and securely holding the animals, providing water and feed, providing competent animal handlers to load, unload, drive and hold animals in a way that causes animals minimum stress and injury, minimising the opportunities for disease transmission, providing facilities and equipment for emergencies, including humane killing if needed, providing facilities for washing and disinfecting vehicles after unloading, ensuring facilities allow proper rest times and minimal delay during stops.

Competent authorities are responsible for setting minimum standards for animal welfare, including inspection of animals, certification and record keeping, approval of premises, facilities, containers and vehicles for animal transport, setting standards for the competence of drivers, animal handlers and managers, accreditation and training of drivers, animal handlers and managers, monitoring and evaluating the effectiveness of health and welfare standards, including use of veterinary products.

2. ANIMAL BEHAVIOUR

Introduction

According to the OIE standards (Article 7.3.2.) "Animal handlers should be experienced and competent in handling and moving farm livestock, and understand the behaviour patterns of animals and the underlying principles necessary to carry out their tasks".

Understanding of animal behaviour is fundamental to recognizing signs of stress and pain, and thus handling them efficiently during all stages of transport. In addition, recognizing the needs of animals and their relation with environment is essential to providing them with conditions, resources handling procedures that to safeguard their welfare. Consequently, there will be equilibrium between ethical production and economic profitability.

We usually distinguish animal's behaviour as:

- **Innate behaviour (basic behaviour)–** pre-programmed reactions: an animal is born with the potential to express these types of behaviours, as they do not depend on experience and are species-specific;
- **Learned behaviour –** depends on experiences lived by each animal, originating from individual experiences.

Animals' behaviour is very much influenced by capacity or limitations of their senses. The characteristic of farm animals' **sensual modalities** is different than ours therefore is important to understand animal perception of environment (animal perspective) to improve design of facilities, handling procedures and practises.

Cattle behaviour

Cattle originate from the Auroch (Bos primigenius) which inhabited Europe and large parts of Asia and North Africa. The Auroch are thought to have been domesticated about 9000 years ago. In India a subspecies of the Auroch was domesticated to give rise to cattle with the characteristic hump and dewlap – Bos indicus or zebu type cattle. The hump-less cattle that originated elsewhere are known as Bos taurus.

Bos indicus and *Bos taurus* breeds have adapted to cope with very different environments and have been selected by man for hundreds of years for different characteristics. But with common ancestors most basic behaviours are the same.

Cattle innate behaviour

Cattle are ruminant animals and in extensive conditions graze for approximately 9 hours a day. This period can be influenced by season, grass height, animal category and breed. Cattle's diet in extensive conditions basically consists of grasses. Rumination takes around 75% of time spent grazing (6 - 7 hours), and it is interchanged with regurgitation when the bolus returns to the mouth, is chewed and swallowed again. Daily, cattle ingest between 25 and 80 liters of water, and this volume may vary with environment, animal, diet (the greater the percentage of concentrate ration the more water is ingested).

Social (group) living

Cattle are social animals. This trait is a result of ancestral natural selection for benefits such as predator protection. If cattle are alone, the probability of one of them being attacked by a predator is greater than when it is in a group. Escaping is another advantage of group living as several animals running at the same time are difficult for predators to chase.

Cattle raised extensively (on pasture) tend to form groups of cows and their calves, while bulls gather in small groups separately from female cattle. Cattle tend to synchronize their activities and do things together to some extent; they eat, walk, rest, and sleep together. Cattle can recognize up to 70 other animals in the herd and their position in the social rank.

Image 3: Cattle gathering in group. (Source: Embrapa)

To follow that natural pattern of togetherness cattle should be handled in groups. Segregating one animal from the group is stressful (see Image 4). When cattle are socially isolated this tends to alter their behaviour and reactivity. They are becoming restless, nervous, more agitated or even aggressive.

Image 4: Cattle in isolation. Source: WSPA Steps

Social dominance

Cattle always tend to establish a social order within the group. This hierarchy is established through challenges and fights among animals, with strength and aggressiveness determining dominance order; although, subtle flee-submissive behaviours contribute to the group's social organization. Height, weight, age, gender, temperament and horns are among the factors that also interfere with dominance formation and maintenance.

In free-range, adult herds of cattle there are several parallel hierarchies among adult males, females and juveniles.

The hierarchy tends to be linear and large herds probably break down into a series of smaller hierarchies. There is evidence that dominance hierarchies in young beef steers are formed soon after weaning and that they remain stable even when the groups are moved to other pens.

Once the dominance relationship of any pair of animals is learned, it eliminates the need for further fights. The subordinate animal retreats from the dominant at the slightest threat and physical contact is of minor importance as long as the animals can see each other's posture. With time, social order may change among a few animals in the herd. If a dominant animal suffers some sort of injury that compromises its state, soon it loses social position within the group and a new social order is established.

Mixing unfamiliar cattle results in fights that intend to determine a new hierarchy status among the newly introduced animals (see Image 5). Reinstatement of social organization of new groups may take several days. Therefore, if possible transported groups of cattle must be formed by animals that were raised or lived together (familiar), and mixing of unfamiliar animals must be avoided. Attention to this characteristic can minimize fights and improve welfare of cattle, as fights lead to stress and injuries.

Image 5: Mixing unfamiliar groups promotes fighting among animals Source HSI

Leadership

Leadership is a feature in groups of cattle. The lead animal is the one followed by other animals in the group when moving to seek water, shade, a grazing area or another resource (see Image 6) Normally, leaders are mature female cattle (as current herds are predominantly monogamous during most of the year), though group movement can be initiated by different animals in different circumstances.

Image 6: A group of cattle following the leader: Source WSPA

An illustration to distinguish dominance and leadership is that a lead animal is the one followed by the group to a water trough; while the dominant animal is the one displacing animals already in the trough in order to access and drink water. When cattle are driven, the least dominant animals will be first and last, with the dominant animals in the middle of the herd. Mixing known calm leaders in to a group improves overall handling

Cattle learned behaviour

Cattle have good short- and long-term memories, as they can remember events that happened during rearing and can be conditioned to a handling routine. They learn abilities in the environment where they live and can be trained with rewards. Cattle's response to handling during transport the is directly related to the type of handling they experienced during their lives at the farm.

Cattle that had limited human contact at the farm or that were subjected to aggressive handling tend to show strong fear reaction during handling, loading and unloading. Therefore, it is desirable promote changes in handling practices at the farm, providing more frequent positive human-animal interactions between handlers and cattle, which can lead to better quality of life for the animals and ease handling.

The rearing environment influences cattle behaviour significantly. Animals reared in extensive systems, independently of their breed, tend to be more reactive than those reared in enclosed environments or confined systems. Lack of human contact in the initial rearing phase results in more fearful animals, which at times are also aggressive toward humans. It is better if calves receive special care and positive stimuli from humans immediately after birth and after weaning in so called "imprinting period" as that directly affects their behaviour when adults (evidence of "imprinting times" not yet been fully established).

As the way of animals are cared for during rearing has impact on cattle behaviour, herds from some farms may be more difficult to handle than others, and also cattle from the same breed but from different herds can be more difficult to handle than others.

Cattle have the ability to recognize and distinguish positive from aggressive handlers. For this reason, it is better if only a small number of people carry out more aversive procedures at the farm, while the others are in charge of daily farm duties.

As there are genetic differences in temperament, and temperament is heritable cattle with "excitable" genetics (*Bos Indicus*) need to be introduced more gradually to novel experiences than cattle with "calm" genetics

Image 7: Cattle handling at the pasture. Source: Embrapa

Cattle sensory modalities

Cattle rely mainly on senses of vision, olfaction and hearing to assess stimuli, and thus respond to different events such as changes in the environment and threats; for example, when exposed to a sudden noise, cattle's first reaction is avoidance or escape. After assessing the situation, if it is not perceived as dangerous, the animal will lose interest in it.

Vision

Cattle have slit-shaped pupils and weak eye muscles, which inhibits their ability to focus quickly on objects. Cattle can distinguish long wavelength colours (yellow, orange and red) much better than the shorter wavelengths (grey and green). Cattle have good night vision that helps detect movements.

Cattle are dichromate i.e. they have only two of the three main types of neural cells in retina. Dichromatic vision may provide better night vision and aid in detecting motion. Cattle have poor perception of depth and need to lower their head to see clearly. Because of this poor depth perception and lack of definition, cattle will often baulk and refuse to cross a shadow or drain grate (perhaps seeing it as a physical objects) and are best moved through diffuse light.

Binocular vision – Cattle's eyes are located laterally on the head, and only see with both eyes (**binocular vision**) in a narrow area straight ahead (40°–50°), where they have clearer sight and better depth perception (see Image 8). This is the reason cattle turn and lower their heads to see clearly handler or objects in details (see Image 9).

Image 8: Angle of binocular vision in cattle.

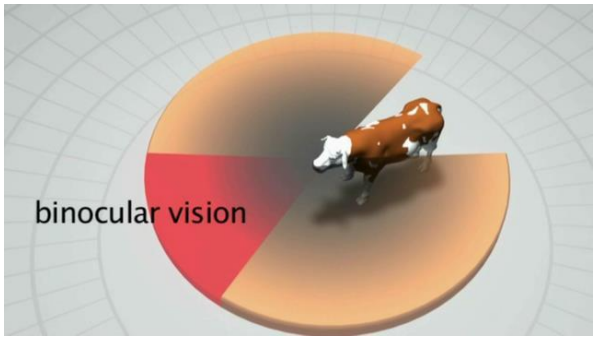
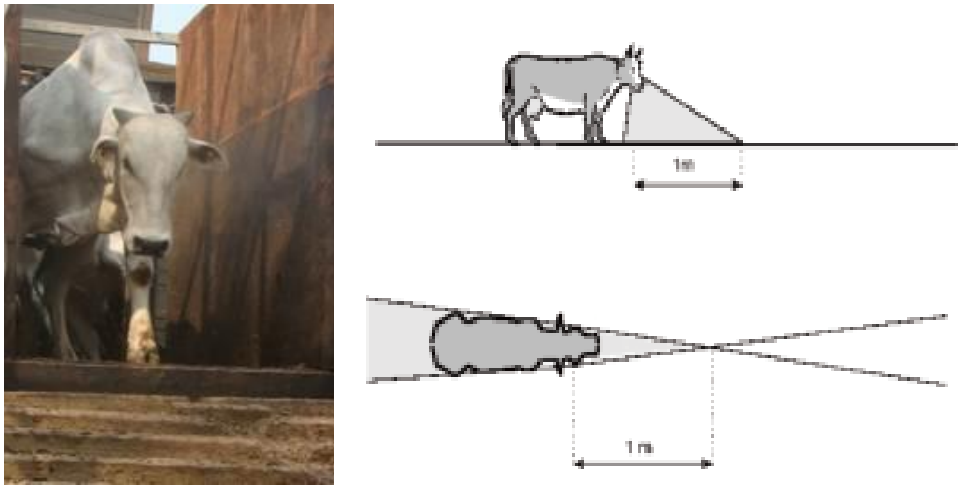


Image 9: Cow dimensioning unlevelled flooring during unloading (binocular vision). Source: WSPA Steps



Monocular vision – Cattle do have with their eyes positioned on the side of the head panoramic vision of 300 - 310° which allows for good predator awareness (Image 10). Despite the wide set of their eyes, however, they do have a blind spot directly behind them.

This panoramic lateral vision, achieved by each eye independently, does not provide depth perception. However, cattle can sense movement even with their heads lowered, while grazing, which helps detect the presence of predators in their natural habitat.

Image 10: Monocular vision in cattle

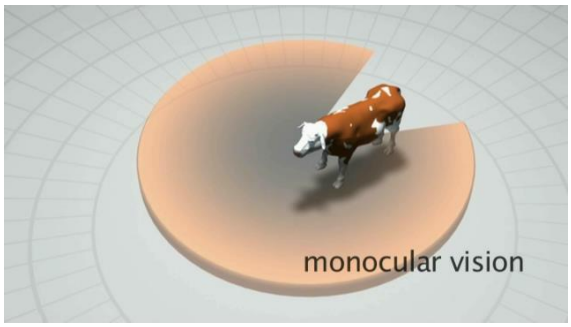
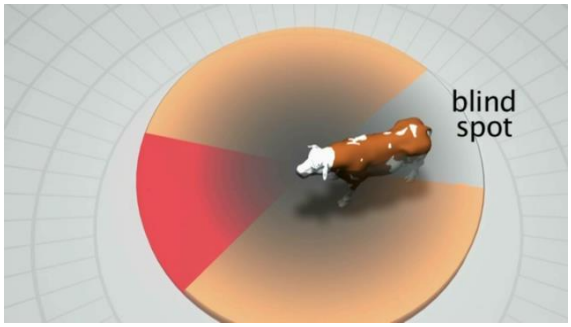


Image 11: Blind spot in cattle.



Blind area – This blind spot is located straight behind cattle's body and a small area in front of their nose, where they cannot see (Image 11). These areas must be avoided to optimize handling, preventing cattle from getting distracted while trying to situate the handler (details described in the Chapter 3. USE OF ANIMAL BEHAVIOUR IN HANDLING).

Image 12: A cow redirecting its visual angle to maintain visual contact. Source: WSPA Steps

Olfaction

Cows identify their calves using smell, although visual and sound recognition become more important as calves grow older. Adult cattle also smell each other during social behaviour.

Communication by olfaction is important for sexual activity of cattle. In addition, olfaction contributes to social hierarchy (dominance) information exchange, where submission pheromones are released from a subordinate to a dominant animal. Cattle exposed to alarming situations tend to group and may release pheromones through urine, saliva or other mechanisms, to warn others about the condition they are exposed to; cattle may become fearful of these signs thus promoting difficult handling.

Image 13: Cattle using olfaction for identification. Source: WSPA Steps

Hearing and communication

Cattle are very sensitive to high frequency sounds when compared to humans. When hearing, cattle move their ears searching for source of noises, positioning them in the same direction as the source of sound, even when not turning their heads directly towards the source. One can determine the direction of cattle's focus by assessing the position of their ears. This characteristic is easily observed during handling, when animals alter ears position between handlers and other cattle in the group frequently.

Image 14: Bull tries to detect a source of sound

Cattle in the process of evolution lived in open fields where they could always see the rest of the group around. That resulted to very limited need to use vocal communication. Limited vocalization within the herd has been important for survival as vocalization would always attract attention from predators.

During handling and transport vocalization among cattle is associated with aversive events, such as prodding.

There are noises that even at the same intensity are more adverse than others; for example, yelling, disturbs cattle more than sounds from banging of metal.

Behaviour, genetics and age

Animal behaviour is determined by the interaction between environments and genetics, with differences among breeds. In general, *Bos taurus Indicus* is more reactive than *Bos taurus taurus.* Likewise, crossbred zebu cattle may be more reactive during handling than pure blood or crossbred European cattle.

However, Brahman or Zebu cattle (*Bos Indicus*) are the most inquisitive and will investigate or follow a person or a dog. A common practice used in Australia to move groups of Brahmans is allowing them to follow a person. The tendency to follow a person is greater in Brahman compared to British or European continental breeds. Nevertheless, some studies found that if Brahmans are handled gently they can become extremely docile. The breeds that are the most reactive had the strongest tendency to approach novel objects. This is only true when the animals voluntarily approach the novel object. During forced movements where the animals are being driven toward a novel object just the opposite is true. The excitable flighty individuals will be most fearful and they will be more likely to freeze or balk.

Most beef cattle handled to slaughter will be under 30 months, most dairy cattle will be at least 5 years and bulls can be even older depending on whether they are raised for beef or used as sires. Nearly all cattle will be coming from highly socialised groups. Older cattle are vastly more experienced but this also means they are more accustomed to a routine. Being loaded onto transport and taken to an unfamiliar mart or lairage is a major change for them and it is little surprise that sometimes they will exhibit antagonistic behaviour.

Social behaviour of young bulls

The most dangerous dairy bull is a bull that has not been properly socialized to his own kind. When a young bull calf becomes mature at age two, he needs to challenge the top bull in the herd. If the bull

calf has been raised alone and has not had the opportunity to interact with other cattle, may fail to develop proper relations with other animals and possibly view people as part of the “herd”. Bull’s need to exert his dominance over the "herd" can result in dangerous attacks on people.

Scientists found that bull calves raised in groups were much less likely to attack people than bull calves raised in individual pens. Bull calves raised on a cow were the least likely to attack. When they are raised with their own kind, they are less likely to attack people. The major causes of bull attacks are mistaken identity or improper behaviour that has been learned. A bull will perform a broadside threat prior to attack. He will stand sideways so the person or other bull can see how big and powerful he is. Sometimes a person can make a bull back off by responding with the human variation of a broadside threat which for people is a frontal stance. Alternatively, the person may just back slowly away from the bull. **NEVER RUN away and do not turn your back on bull.**

Sheep behaviour

Sheep innate behaviour

Social (group) living

Like other animals, sheep react to the situations they are placed in according to instincts that have been developed over thousands of years. While it can be argued that domestication has decreased their instinctive behavior, they still show their instincts in many ways, daily.

The dominance hierarchy of sheep and their natural inclination **to follow a leader** to new pastures were pivotal factors in sheep being one of the first domesticated livestock species. Their only means of survival for thousands years was to run from danger and to band together in large numbers for protection **– to flock.**

Image 15: Sheep on a pasture

Even with domestication, sheep retain these defence mechanisms, they run from perceived danger, and they band together for protection. Exploitation of these instincts is what makes a shepherd dog valuable. Sheep see the dog as a predator, or danger, so they band together for protection and move away from the danger. By controlling the dog, a shepherd controls the flock.

During flocking, sheep have a strong tendency to follow. A leader may sometimes be the first individual to move. Flock behaviour in sheep is generally only exhibited in groups of four or more sheep; fewer sheep may not react as you would expect if they were in a larger group.

Flocking and running away behaviour changes in ewes immediately after they give birth. An ewe, docile and scared of a dog all year long will become extremely aggressive toward a dog right after birth. Sometimes, although not often, the ewe will also be aggressive towards a shepherd.

Because of their instinct to stay close together, sheep will move toward another sheep or a perceived friend. They learn that a farmer can be a friend, particularly if he feeds them. By using this combination of ***instinctive and learned behaviour*** (a) follow the friend, (b) shepherd is a friend, shepherds have controlled sheep movement for centuries. In this case the sheep will follow other sheep that are actually moving to see a friend (the shepherd who feeds them). The secret is to allow the sheep that come to you to actually eat grain. If they are not provided with any feed, they will soon figure out that they are being fooled and will not respond. An unknown handler unloading and handling sheep would be seen as predator.

Interestingly, in regions where sheep have no natural predators, none of the native breeds of sheep exhibit a strong flocking behaviour

Dominance hierarchy and leadership

Sheep establish a dominance hierarchy through fighting, threats and competitiveness. Dominant animals are inclined to be more aggressive with other sheep, and usually feed first at troughs. Horn size is a factor in determining flock hierarchy, especially among rams. Rams with different size horns may be less inclined to fight to establish the dominance order, while rams with similarly sized horns are more inclined to fight. Anecdotal information and observations of leader sheep suggest that leadership ability runs in bloodlines and is equally distributed between males and females.

It is assumed that these are more intelligent animals that have the ability and instinct to lead a flock in difficult conditions. They have an exceptional ability to sense danger. For example, there are many stories in Iceland of leader sheep saving many lives when blizzards threatened shepherds and flocks.

Sheep learned behaviour

Sheep can remember the faces of more than 50 other sheep for up to two years. They can even recognize a familiar human face. The hidden talents of sheep revealed by a study in the journal *Nature* suggest they may be nearly as good as people at distinguishing faces in a crowd.

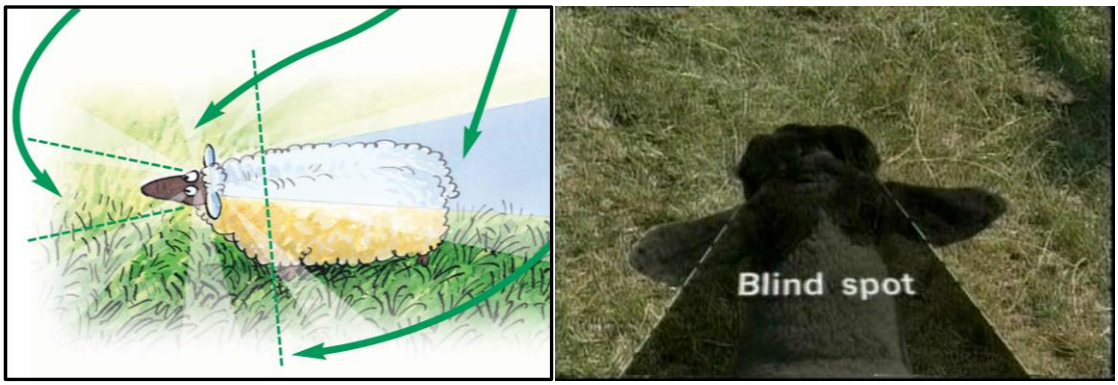
Researchers in Australia have developed a complex maze test to measure intelligence and learning in sheep, similar to those used for rats and mice. Using the maze, researchers have concluded that sheep have excellent spatial memory, and they can retain this information for a six-week period.

Sheep sensory modalities

Vision

Sheep depend heavily on their vision. They have horizontal slit-shaped pupils, and good peripheral vision with visual fields of approximately 270° to 310°. Same as in cattle we recognize **sheep's binocular, monocular vision** as well as **the blind spot** (see Image 16) Many breeds have only short hair on the face with facial wool (if any) confined to the poll and or the area of the mandibular angle. However, they have poor depth perception. They cannot see immediately in front of their noses. Some vertical vision may also have been sacrificed in order to have a wider field of vision. For example, it is doubtful that a sheep would be able to see something in a tree.

Image 16: ***Sheep vision; arrows from left to right*** *1) binocular vision 2) monocular vision 3) blind spot arrow at the bottom of the image, point of balance. Source: Eblex, UK*



Contrary to previous thought, sheep perceive colours, though their colour vision is not as well-developed as it is in humans. Sheep may react with fear to new colours.

Vocalization and hearing

Sheep have excellent hearing. They can direct their ears in the direction of a sound. Sound arrives at each ear at slightly different times, with a small difference in amplitude. Sheep are frightened by high-pitched and loud noises, such as barking dogs or firecrackers

Image 17: Sheep tries to identify source of sound, Source HSA

Olfaction

Sheep have an excellent sense of smell. They are very sensitive to the scent of different predators. Smell helps rams locate ewes in heat and ewes locate their lambs. Sheep also use their sense of smell to locate water and determine subtle or major differences between feeds and pasture.

Pigs behaviour

All behaviours that pigs perform such as walking, looking, feeding, grouping, fighting and fleeing, among many others, contribute to their survival. Several factors may influence behaviours of animals.

Pigs innate behaviour

Pigs are omnivores, naturally feeding on grass, roots and fruits, and altering their diet according to the availability of resources. They have powerful teeth and jaws to chew and can be predators but also prey. Daily, pigs spend an average of 17 hours resting, 5 hours sleeping and only 1 to 3 hours

foraging. Pigs weighing between 50 and 150 kg may drink approximately 5 to 10 litres of water in a day, varying according to the animal, environmental factors and diet. They are sociable animals, and normally live in groups of 2 to 6 sows with close bonding with their litters. Male pigs (boars) have a tendency to live isolated most of the time, but may gather into groups of males at times.

Image 18: Sows with respective litters living in a free-range system (SISCAL)

As gregarious animals, pigs are best handled in groups. When isolated, they alter their behavior and reactivity, becoming more agitated and aggressive, as separation from the group is highly stressful. Handling pigs in small groups is recommended, which provides the handler with more control over the animals.

Naturally, a group of pigs establishes a hierarchy or social organization. The hierarchy is established through fights among animals, and strength determines the dominance order. This explains the fact that mixing unfamiliar pigs results in fights that intend to determine a new hierarchy status among them, and clarification of social organization in the group may take several days.

Pigs learned behaviour

Pigs have good short- and long-term memories, as they can remember events that happened during rearing until. They can be conditioned to a handling routine, learn abilities in the environment where they live and can be easily trained with rewards. Thus, pigs' response to handling is directly related to the type of handling they experienced during their lives at the farm.

Pigs sensory modalities

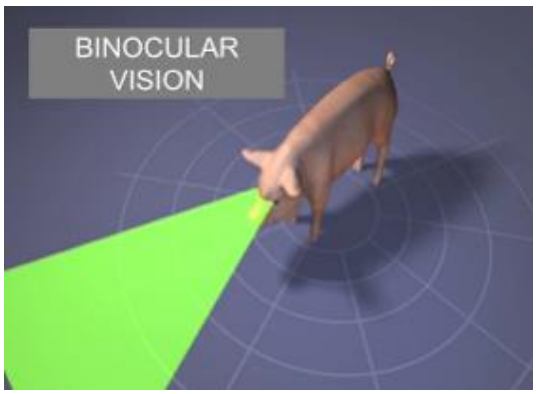
Pigs rely mainly on senses of vision, olfaction and hearing to assess stimuli, and thus respond to changes in the environment and threats; for example, when exposed to a sudden noise, their first reaction is avoidance or escape. After assessing the situation, if it is not perceived as dangerous, the pig will lose interest in it.

Vision

Pigs' eyes are located laterally on the head, and thus have areas of binocular and monocular vision and a blind area. They can see colours well, but have limited depth perception. Pigs also have good night vision that helps detect movements. Uniformity of colours (walls and floor) in areas of high circulation of animals can facilitate handling.

Binocular vision

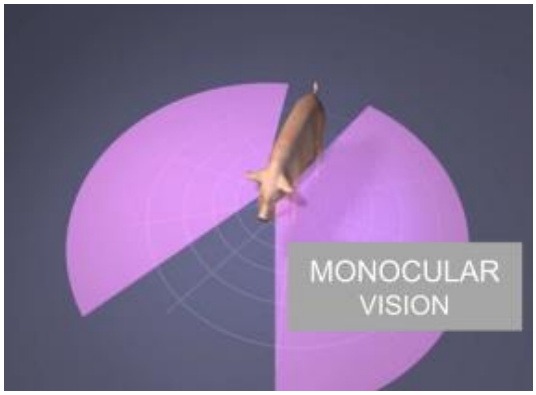
Image 19: Binocular vision



With binocular vision, pigs see with both eyes straight ahead (for a width of 30 - 50°), where they have clear sight and depth perception. For a pig to see something clearly requires the object to be directly in front of its face. This is the reason pigs turn and lower their heads to face the handler, objects or variations in the environment (an unloading ramp, a trailer entrance or a drain in the alley).

Monocular vision

Image 20: Monocular vision



The monocular vision is ample and panoramic, and can reach up to 300° around the pig's body, depending on ear positioning. Thus, pigs can detect movement even with their heads lowered, when nosing or rooting. This lateral vision, achieved by each eye independently, does not provide depth perception, and pigs only see clearly if their heads are facing the object they aim to detect, using binocular vision.

Blind area

Image 21: Blind area

This blind spot is located straight behind the pig's body, where they cannot see or detect movements. Movements in this area must be avoided to optimize handling, preventing pigs from getting distracted while trying to locate the handler (details described in the chapter on handling). A pig also cannot see an object directly in front of their snout.

Olfaction

Smelling is one of the most important senses for pigs, used also for individual recognition and social interaction. Olfaction contributes to hierarchy formation in the group (dominance), for example, release of submission pheromones from a subordinate to a dominant pig.

Pigs exposed to alarming situations tend to group and may release pheromones through urine, saliva and other mechanisms, warning other pigs about the condition they are exposed to; other pigs may become fearful of these signs thus promoting difficult handling.

Image 22: Use of olfaction for environment recognition.

Hearing and communication

The vocal signs are the most important means of communication among pigs. A total of 20 different calls have been identified, following six vocalization patterns easily recognized by humans. Each call has different functions, for example:

Grunts – a series of short grunts given in response to familiar events, for example, when pigs are rooting. A short single grunt is produced when the pig is disturbed;

Alert vocalizations – they are repeated by other pigs that then freeze or flee;

Acute vocalization – given by a scared pig;

Long vocalization – given by an injured or stressed pig. The vocalization duration and intensity reflect the severity of the condition. The higher the intensity, the greater the pain and suffering.

Image 23: Pig identifies source of sound

Horses behaviour and sensory modalities

Equids, including horses, mules and donkeys, are grazers and prey animals. As such their “fight or flight” reaction is prominent, and their senses are developed to rapidly detect changes in their environment. This acute ability to detect movement, often results in equids to be “spooked” easily. Horses have widely spaced eyes, and as a result have a large field of peripheral vision; however, this area is only monocular, so their depth perception is poor. This one-dimensional view is another contributing factor for horses to “overreact” to objects or sounds things behind or beside them. Horses do have some areas of binocular vision (where it sees with both eyes at once) but this area is very small, and includes the area directly in front of them. Horses have two “blind spots” – a small spot directly in front of their nose and directly behind them. These are important characteristics to keep in mind when approaching and moving equine. Equids have a very strong herd instinct and try to stay together in a group, especially when they are frightened. There is a distinct social order within equine herds. Most equids when frightened will flee, but if they are isolated and or cornered, they may strike out with their hooves or teeth.

3. USE OF ANIMAL BEHAVIOUR IN HANDLING

Introduction

Welfare of animals during handling as well as in other procedures depend on three key components: These are: understanding of animals and their behaviour or staff knowledge, environment or design of premises (facilities) and tools that are fit for purpose.

According to OIE Terrestrial Code (Article 7.3.2.) animal handlers should be experienced and competent in handling and moving farm livestock and understand the behaviour patterns of animals and the underlying principles necessary to carry out their tasks.

Good pre-slaughter handling relies upon people having a basic knowledge of the animals they handle, but more importantly an understanding of how their own behaviour can influence the effectiveness of the handling process. Aggressive attitudes can trigger even more aversive reactions from animals and make handling more difficult.

A good handler is also a good observer. Prior to handling, ideally, one should observe the agitation level and temperament of animals, and use this as an indicator of how to approach each group of animals.

Transported animals are coming from variety of rearing systems. These animals tend to have different previous experience. Some animals are easily to handle because they experienced good handling at the farm and learned to respond adequately to handlers. However, some animals can be more difficult to handle which is usually associated with animals' genetics, poor handling or fact that they were reared in free range conditions with seldom interactions with handlers.

Animals and activity levels

In the farm environment an animal's activity or arousal level ranges from sleep at one end, to fight or flight reactions at the other. When handling the animals, the objective is to raise activity levels to the point where they are moving in the right direction at the right speed.

If handlers increase arousal levels significantly, animals become alarmed, fearful and perhaps even aggressive. They are more difficult to direct and therefore control; handling takes longer and stress levels increase. **Awareness is a basic handling principle**, even in situations where animals are in a low state of agitation.

Image 24: Calm handling reduces stress for both animals and handlers. Source: WSPA Steps

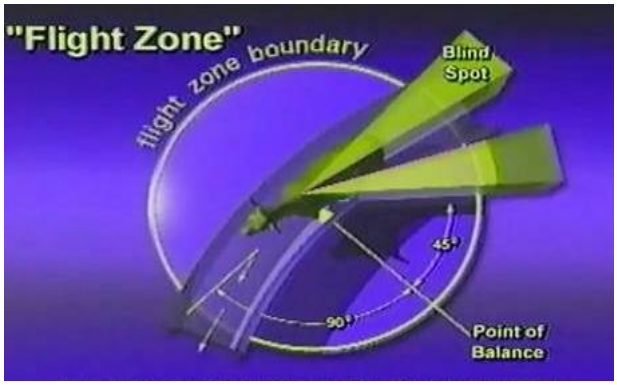
Flight zone and point balance

As described in chapter on behaviour, behavioural features related to handling include the thread avoidance behaviour, the flocking instinct, visual field, social hierarchy, genetics and previous experience

Cattle, sheep and pigs protect an area around themselves, called the "**flight zone**". The flight zone is defined as the distance in which an animal can tolerate the presence of an unfamiliar individual or a threat prior to initiating escape. Whenever the flight zone is invaded, the animal tends to re-establish a safe distance from the threat (see Image 25). But under critical circumstances, when there is not enough space to escape, animals may freeze or fight.

The size of the flight zone is variable and depends on species, breed, previous experience and way of handling.

Image 25: Flight zone and point of balance according to T. Grandin



Point of balance is defined as an imaginary line drawn through the animal's shoulders. The point of balance is used by the handlers to control and direct movement of animal. An animal moves forward if the handler is positioned behind the point of balance. If the handler is positioned front of the point of balance, an animal it will move backwards.

An understanding of the flight zone is essential in handling and controlling animals' movement. In practice following hints are as follows:

- Handler should be positioned outside or on the edge of the flight zone avoiding standing in the animal's blind area;
- To move animal ahead he should step forward - just within the flight zone boundary
- As the animal walks forward, he should walk along remaining inside the animal's flight zone;
- And observe when moving **outside the animal's flight zone** and standing calm **animal also stops**.

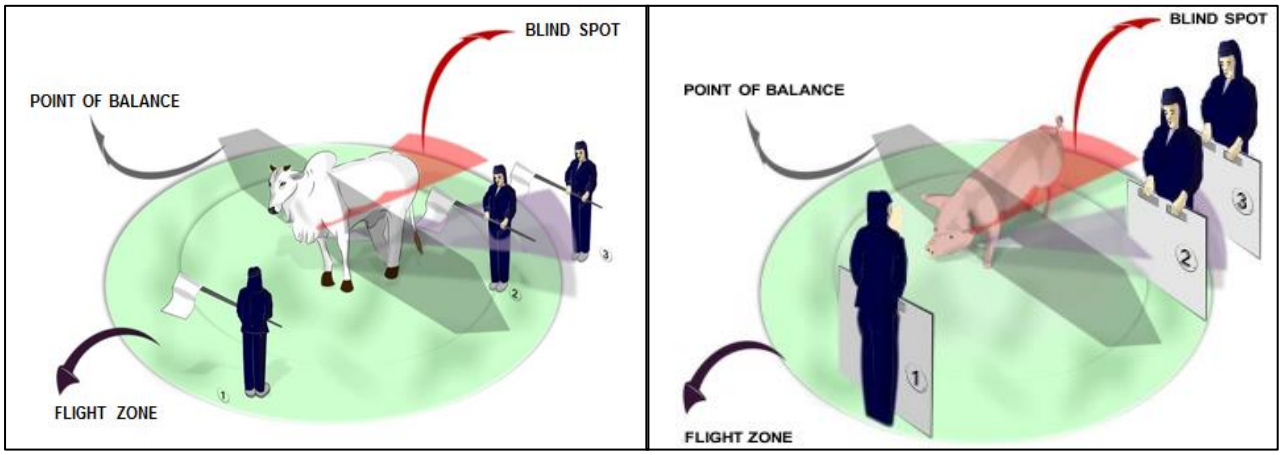
As soon as the handler enters an animal's flight zone, its reaction is to avoid threat and move away. If there is not enough space ahead, the animal will try escape by passing the handler If handler moves too deep and too quickly into the animal's flight zone animal will move faster, and if it has nowhere to go it will turn and attempt to run back past the handler.

Handlers can increase or decrease the size of the flight zone, and to some extent control the response of the animal, by their approach and body posture. Being quiet and calm reduces the size of the flight zone; increasing levels of noise or activity from the handler will increase the size of the flight zone.

The handler will use this point of balance to control movement and direction of cattle guiding them in the desired way. Cattle move back and forward, depending on the handler's position in relation to point of balance:

- If handler is **ahead of the point of balance and inside the flight zone** (position 1), **the animal will move backward**;
- If handler is **behind the point of balance and inside the flight zone** (position 2), **the animal will move forward**;
- If handler is **outside the flight zone** (position 3), **the animal will stop (**See Image 26 below)

Image 26: Handler's positions using the point of balance and flight zone. Source: WSPA Steps



Cattle handling

The flight zone of cattle can vary from 1 m to 50 m. It can be easier observed when cattle are in a penned area. In holding pens, cattle (particularly flighty) form a group and keep a safe distance - flight zone from by passing handlers.

Cattle from extensive farming condition with limited exposition to people and handling, tend to have much larger flight zones than animals which are handled daily. Cattle from smallholdings or backyards exposed to daily contact with owners, dairy cattle or draught animals including buffaloes can have a very little or no flight zone at all.

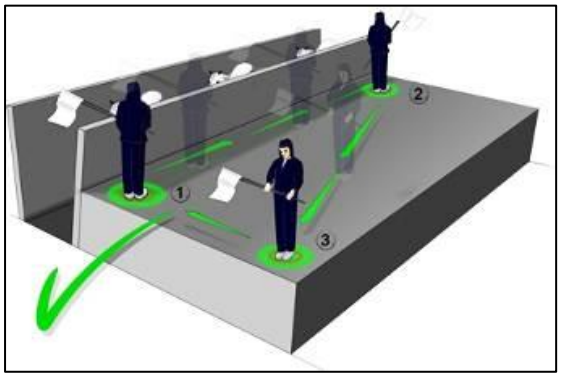
Image 27: Cattle keep themselves in safe distance from a handler (WSPA Steps).

In handling and controlling cattle's movement principles of the flight zone and point of balance as described above applies.

Since cattle are handled in the groups, it is not always possible to enter the flight zone of every animal. However, the handler must be positioned in a way that all cattle in group can see him.

The point of balance principle is widely used in handling cattle in a narrow races or chutes, where cattle movement is limited to forward and backward. In such situation to avoid handlers, cattle always move in opposite direction to moving handlers. The sequence of numbers in the figure below (Image 28) demonstrates handler's positions moving cattle in desired direction.

Image 28: Handler's positions to move cattle in the single file chute. Adapted from T. Grandin (2008)



- The handler enters the flight zone of animals in chute (position 3 to 1) and stand aside in front of the first animal in line (position 1);
- handler than walks from position 1 to position 2 passing the point of balance of each animal from front to back, prompting animals to escape and to move forward;
- When at the end of chute, the handler exits the flight zone (walking from position 1 to position 3)

Same principles are used when getting animals out of holding pens or stockyards.

Occasionally, animals are resistant to exiting the pen. Moving animals in small groups i.e. 2-3 animals often helps to solve the problem. After splitting the group in the holding pen, the handler must walk them to the alley. This approach encourages animals to advance, avoiding returns.

It is always easier to move smaller groups. Handling of cattle must be done in calm manner, without too much noise, rush or sudden movements. Animals must be aware to handler's commands. Excessive agitation may lead to panic and loss of control. Calm and confident these are core qualities of a good handler.

Handling tools

These are tools that aid handling of cattle. When used correctly, they encourage cattle to move in the desired direction. Some groups of cattle may require more persuasion than others to move. Essentially, the level of persuasion must be increased when not achieving a response from the animal, and this is the appropriate moment to use handling aids.

Handling flag (see Image 29) – it encourages movement, directs animals, it can increase the threat and also helps to block cattle's vision. Because the flag is flexible, its movement catches the animals' attention. The flag is perceived by cattle as an extension of a handler's body that enlarges the threat.

The flag should not touch the animal. Ideally flag is adjusted to type of cattle handled. Large flags are used to handle less reactive cattle or larger herds, while small shorter flags are used for flighty cattle.

Image 29: Handling cattle with a flag, Source WSPA

Sound stimuli (noise) – Use of combination of movement and noise in handling is a common practice at farms and most animals respond to it. Associated to sound, handler's movement and position strengthen cattle's response. Importantly continuous constant noise will not alert animals as much as intermittent noise.

Bare hands handling – touching animals back by bare hands helps move less flighty cattle. The intensity of the force applied must be adequate.

Electric prod – It shall be used **ONLY** as a last resort, when all other handling aids failed. It shall be not used on a routine basis to move animals. The use of prod is regulated in many countries and it is always limited only to emergency handling in situations when:

- animals refuses to move, and there are no distractions ahead of it
- on the rear limbs of adult cattle, above the ankle to avoid kicking and risks of accident;

- for a maximum period of one second, with intervals between prod applications.

The electric prod must **NEVER** be used on

- sensitive parts such as the anus, genitals, nose, eyes and udder.
- repeatedly, if the animal does not respond
- to move calves

The use of such devices should be limited to battery-powered goads.

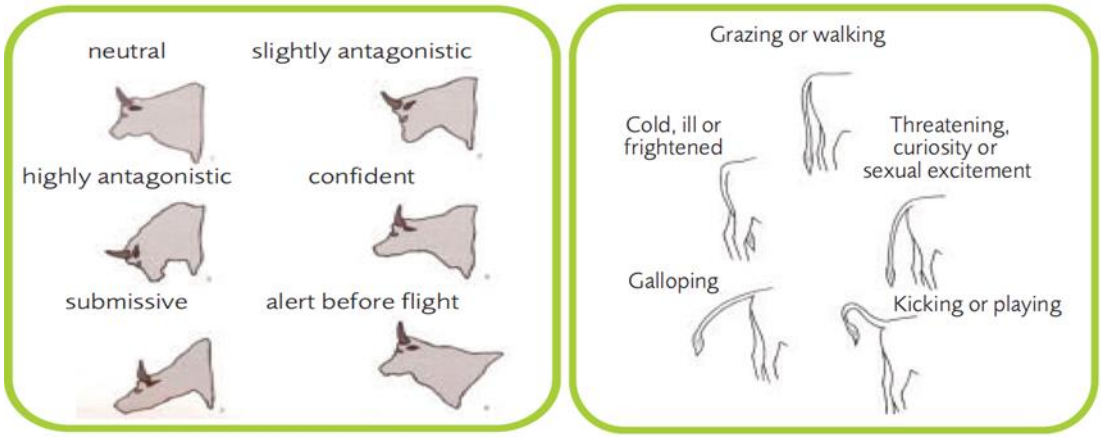
The use of electric prod must be controlled to promote minimum stress and pain to cattle.

Health and safety when handling cattle

Skilled stockman should always recognize the signs and sounds of the cattle they are handling. These signs include body postures, agitation and arousal, head and tail positions, vocalisation. Seriously distressed cattle often vocalize.

Higher risk of in injury occurs when handling: cattle are not handled frequently; cattle isolated and away from their herd mates, cattle with bad past experiences, bulls, cattle in unfamiliar surroundings, some specific breeds, bad tempered or fractious cattle, horned cattle and cows with calves.

Image 30: Positions of head and tail of cattle. Source Health and Safety Authority Ireland



Sheep handling

A thorough understanding of sheep behaviour is the first step towards developing an effective method of handling sheep. Their strong flocking and following behaviour tends to make sheep easy to handle, relative to other livestock species. Conversely, sheep will prove difficult to handle if you force them to act in ways that are not natural for them. When handling sheep, the same basic principles of flight zone and point of balance apply as in handling of cattle.

Image 31: Flight zone of flock of sheep moving in an opposite direction as shepherds. Source: Temple Grandin

Being a prey species, the primary defence mechanism of sheep is to flee from danger when their flight zone is entered. Cornered sheep may charge and butt, or threaten by hoof stamping and adopting an aggressive posture. This is particularly true for ewes with new-born lambs.

Most sheep are flighty animals so it is best to handle them carefully moving on the edge of their flight zone. If the flight zone is penetrated too deeply, they will run away fast.

Sometimes their behaviour can be unpredictable and dangerous. Sheep are not large, but they are quick on their feet. Pile-ups can result in small enclosures, causing injury to the animals, especially the small or weak ones.

Electric prods should not be used in handling sheep and goats of any age.

Catching a sheep

There are situations in which you need to catch an individual sheep. If you do not have a handling system to assist you, you can use gates and panels to make a small catch pen. Once the sheep are in the catch pen, manoeuvre them into a corner and use your arms or a portable gate to form a visual barrier. Always approach sheep calmly and slowly. Cup your hand under the jaw of the sheep you want. Grab the bony part of the jaw, not the throat. Point the sheep's nose upward to stop its forward motion. If you keep the sheep's head up, you will be able to maintain control of it. Sheep have a lot more power when their head is down.

Image 32 Holding a sheep Source HSA

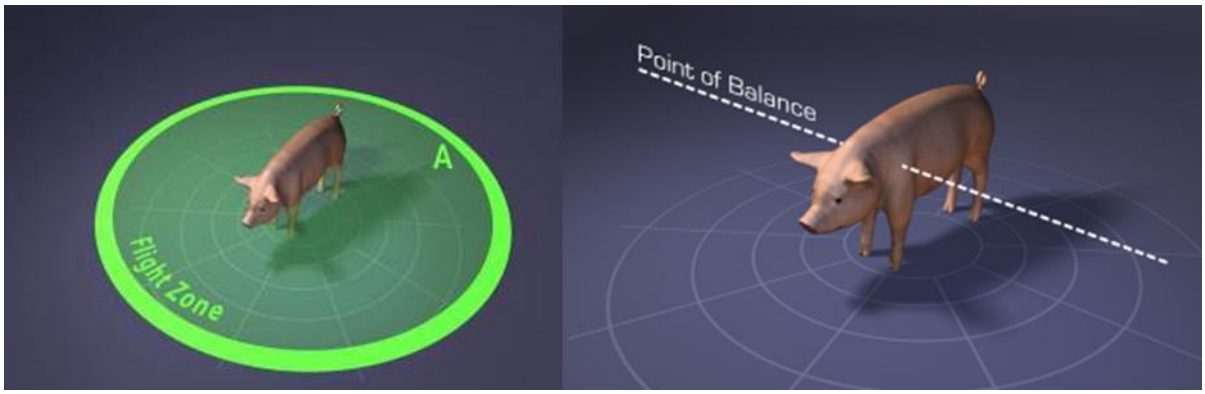
If you cannot get close enough to the sheep to grab it under its jaw, you can reach for its hind leg or rear flank. Reach for the hind leg above the hock, then move your other hand up to control the head as soon as possible. Adult sheep are able to kick strongly, so this method works best for small sheep or young lambs. To catch an adult sheep, it is better to grab the rear flank. You should never catch a sheep by its wool. Not only is it painful to the sheep, but it can cause bruising to the carcass.

Image 33: Catching sheep by its wool is painful and causes bruising. Sources: HSA and Eblex

Pigs handling

Pigs also do have a "flight zone". Whenever the flight zone is invaded, the pig tends to re-establish a safe distance from the threat. But under critical circumstances, when there is not enough space to escape, the pig may freeze or fight. The point of balance is a limit determined at the pig's shoulder (scapula). The handler will use this point of balance to control movement and direction of pigs guiding them in the desired way.

Image 34:Pigs' flight zone and point of balance



The size of the flight zone can vary according to species, genetics and prior experiences. As pigs are omnivores and have tusks (teeth), they are prepared to attack and defend themselves against a predator. Thus, their flight zones are smaller when compared to ruminant species such as sheep and cattle. Pigs of docile genetic lines and animals that have undergone positive experiences during rearing at the farm may have an even smaller flight zone.

Since handling is carried out in groups, it is not always possible to enter the flight zone of every pig. However, try to position yourself in a way that pigs can keep visual contact.

Depending on the manner in which handlers approach the animal, they can interfere with the flight zone of an animal and alter the speed of fleeing. If behaving in a calm and silent manner, the handler can reduce the animal's speed of reaction; ascending levels of noise or movement from the handlers will increase the speed.

Handling tools

These are tools and/or handlers' attitudes that help handling of pigs. When correctly used, these resources encourage pigs to move in the desired direction. Some groups of pigs may require more

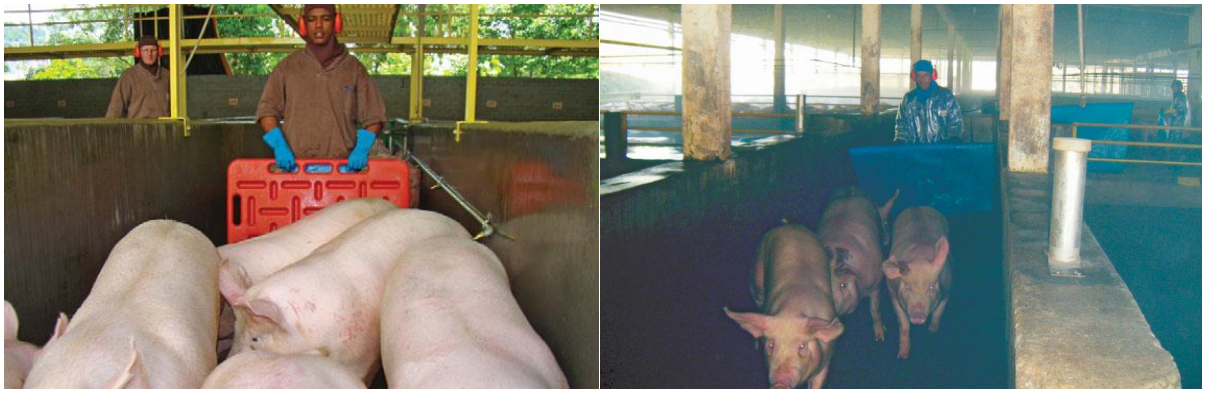
persuasion than others to move. Essentially, the level of persuasion must be increased when not achieving a response from the animal.

Rattle pads, paddle, voice, clapping and compressed air (see Image 35) – these resources assist moving of pigs mainly by the sound they produce and the way they are used. Emission of continuous sound will not produce as much response from the animals as intermittent sound. So continuous and routine use of these resources, particularly the rattle pad, must be avoided especially on animals that are already moving in the desired direction.

Image 35: Use of plastic bottle rattle to assist in handling of pigs, use of paddle to encourage moving, Compressed air as a tool to drive pigs

Handling boards and plastic panels (see Image 36) – their main function is to limit and/or block pigs' vision and encourage them to move forward. Another function of this type of tool is to prevent pigs walking in an undesirable direction.

Image 36: Use of handling board plastic panel to move pigs



Stimulus with own hands – stimulating movement by using physical contact with the pig. The intensity of the force applied and area where the pig is touched must be adequate and controlled.

Image 37: Hand incentive to encourage pig walking

Electric prods – these deliver electrical current to the animal. The use of this method is ONLY acceptable as a last resort and exclusively on pigs that persist in refusing to move. Same rules as in cattle apply to pigs. Use of electric prods is limited only to hindquarters of adult pigs and. The electric prods must **NEVER** be used on sensitive parts such as the anus, genitals, nose, eyes or to move piglets.

Horses handling

The flight zone and point of balance is also important to consider when approaching horses. The size of the flight zone depends on temperament of the horse and its experience with people. An important step when moving equine is to be aware of their body language (CFSPH, 2014).

Equids are easily dominated by humans when handled properly. However, most equine are frighten, by sudden movements and loud noises. Methods of capturing and containing equids will vary depending on their familiarity with humans and way being handled. Animals that are used to human contact will generally be easily haltered, and lead to the necessary location. Handlers should be aware of the animal's surroundings and ensure there is nothing in the movement path that could cause them to startle (CFSPH, 2014).

Observation of animal's body language provide insight and perhaps a warning of animals strike out in fear. When equid lays its ears back, it usually means the animal is angry or feeling threatened. The animal may also swish its tail when it is agitated. When approaching the animal, always make sure it sees you. Avoid the animal's blind spots. Use caution when working around the horse's head, legs, and tail. If it becomes startled or irritated, the horse may move suddenly and injure the handler (CFSPH, 2014).

4. PLANNING AND PREPARATIONS FOR THE JOURNEY (INCLUDING PRE-JOURNEY)

Introduction

When planning a transport of animals it is critical to ensure that amount of time animals spend on a journey is kept to the minimum (Article 7.3.1 OIE Terrestrial Code).
Adequate planning is a key factor affecting the welfare of animals during a journey (Article 7.3.5. OIE Terrestrial Code). Planning and preparation should concern: preparation of animals; nature and duration of the journey; vehicle characteristics; required documentation, space allowance; rest, water and feed; observation of animals, control of disease; emergency response procedures; forecast weather conditions; transfer times and waiting time at frontiers and inspection points.

Thorough planning of any journey in advance is essential. Looking at the journey in advance helps to look at the problems and potential obstacles. For example, in the EU a driver can drive for only 4,5 hours in one log and then he has to take a break. Also animals can be transported for only a certain number of hours before having break, either 9 or 14 hours for young and adult animals respectively. Therefore, logistics of transport (using one or more drivers) has to be planned according to the drivers' welfare or social legislation as well as animal welfare legislation.

Some species of animals has to also be provided with water at certain intervals – usually during short breaks some, such as equines after 8 hours and some such as adult pigs have to have constant access to water along route.

As the volume of water tanks is always limited there is a need to plan stops at the places where water tanks can be re-filled with fresh water. The long distance transport should be planned to accommodate all logistics and breaks - short stops or long ones at the resting points where animals are offloaded and vehicles are being cleaned and disinfected.

Lorries suitable for long distance transportation.

According to Article 7.3.5.4 of OIE Terrestrial Code vehicles and containers used for the transport of animals should be designed, constructed and fitted as appropriate for the species, size and weight of the animals to be transported. A lorries need also be designed with the structures necessary to provide protection from adverse weather conditions, to have adequate ventilation to meet variations in climate and the thermo-regulatory needs of the transported animals and the ventilation system (natural or mechanical) should be effective when the vehicle is stationary, and the airflow should be adjustable.

Type and design of vehicle is an important factor to determine maximum duration of journey. For example, according to EU Regulation (EC) N. 1/2005, long journeys are permitted only if the mean of transport meets additional requirements such us:

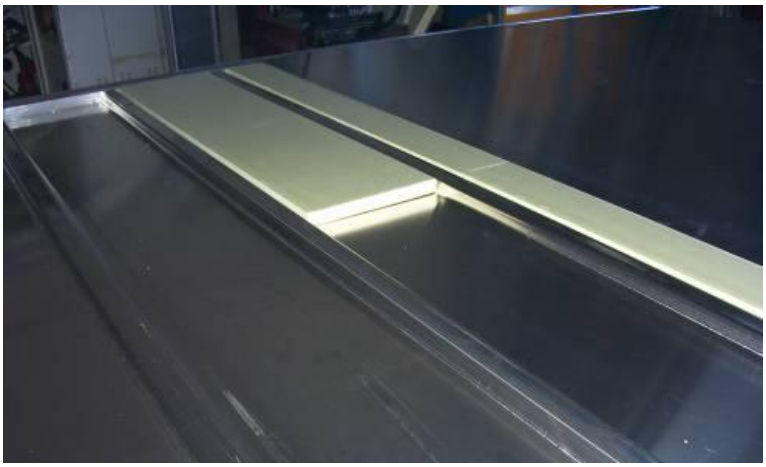
a) roof is of light-colour and insulated to prevent overheating,
b) bedding materials,
c) built in watering system,

d) feeding of animals during transport
e) equipment, partitions to separate compartments or in case of horses separations for individual horses

In order to be able to transport animals all year long, the vehicle must be specifically adapted to the weather conditions to be faced. In Northern regions, especially in wintertime and for some species, insulation of the vehicle and heating are required, in addition to ventilation.

In Southern regions and in summer time, insulation of the vehicle is required. Animal comfort is affected by the internal surfaces to which they are exposed, therefore vehicles should be designed so that floor, walls and roof can be insulated, thus ensuring that animals are not exposed to hot surfaces in summer and cold surfaces in winter. It is recommended to distribute ample bedding, such as straw, when the temperature is below 10°C, as it provides good insulation and helps to keep animals warm and dry.

Image 38: Insulated roof of bright colour - removable bright colour panels on the roof



Planning alongside the documentation (Journey logs)

Article 7.3.6. of OIE Terrestrial Code lists information that should be included in documentation accompanying the consignment: journey travel plan and emergency management plan; date, time and place of loading and unloading; veterinary certification, when required; animal welfare competencies of the driver; animal identification; documentation of the period of rest, and access to feed and water, prior to the journey; stocking density estimates; the journey log - daily record of inspection and important events. The journey log should also include records of morbidity and mortality and any actions taken, climatic conditions, rest stops, travel time and distance, feed and water offered and estimates of consumption, medication provided, and mechanical defects.

For example, for each long distance transport in the EU is accompanied by a set of documents called in EU Regulation 1/2005 a journey log. The journey log (Regulation 1/2005, Annex II) the comprises the following sections:

Section 1 — Planning;
This section requires that drivers look at the all routes he will pass, calculate the distance and average speed on each different type of road. Accommodate all short and long rests (including those at the resting points), fuelling up, potential traffic jams, taking into account some problems and delays then calculate an estimate time of total transport from place of departure to place of destination.
Note that there are sections where contact details of the transport company and the driver are filled in. Places where consignments will stop and animals will be unloaded and rested shall be identified and filled in.

A signed copy of Section 1 (Planning) of the journey log, properly completed except as regards the veterinary certificate numbers, should be received within two working days before the time of departure by the competent authority of the place of departure in a manner defined by such authority.

Within the process of planning it is necessary to send an email or fax to the resting point and book a place for animals – i.e. reserve a place by informing them in advance about time of arrival, species and numbers of animals arriving which are needing space to rest, feedstuff and water. Animals should not be transported without the driver receiving form resting a confirmation of availability of e facilities to accommodate and feed animals at the time of arrival.

Section 2 — Place of departure;
This section contains information on the country of origin, address of the keeper of the animals (place of departure), date and time of first animal loaded, and signature of keeper and veterinarians that they were present at the time of loading and that all animals were observed during loading and were deemed fit for transport.

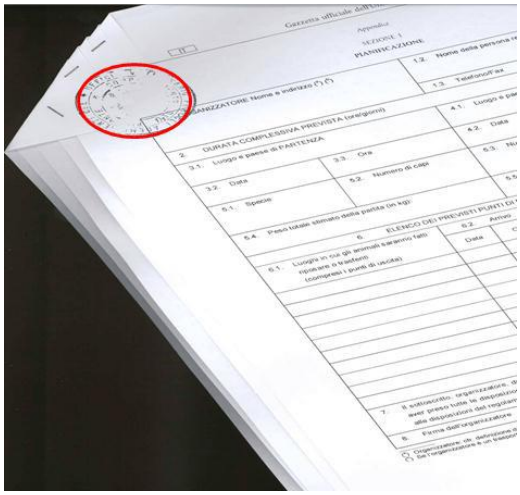
Section 3 — Place of destination;
This part of log comprises sections that require to make checks of the means of transport, driver and transporting company, as well as transport conditions – space allowances. Any irregularities and injured or dead animals are recorded in this part. Again signatures of the next keeper – a person to whom animals are destined and the official veterinarian must sign a log to the effect that they were present at the time of arrival and inspected all animals during unloading from lorry to place of destination.

Section 4 — Declaration by transporter;
In this part the driver fills in any places of official control – borders or resting points where animals were unloaded and rested – times of arrivals and departures, so they can be compared with Section 1 – Planning. He also has to record any changes in the itinerary and provide explanations of any changes in the itinerary if they occurred.

Section 5 — Specimen anomaly report.
Where any anomalies or accidents occurred during the transport i.e. injuries,

All 5 parts of the Journey log have to be fastened together and stamped.

Image 39: *Stamped and fastened Journey log*



According to OIE Terrestrial Code (Article 7.3.6.) animals should not be loaded until the documentation required at that point is complete.

Preparation of animals

When organising a livestock transport, an adequate preparation of the animals is critical. Proper treatment of the animals before journey will improve their ability to withstand the transport, improving their physical state upon arrival. An adequate pre-treatment of the animals includes:

• Proper feeding and watering: food restriction is important for some animal species (e.g. pigs) both to reduce the extent of motion sickness and for food hygiene purposes. Adequate watering is very relevant before transport, for cattle in particular, especially if subjected to a long journey. When animals are to be provided with a novel diet or method of water provision during transport, an adequate period of adaptation should be planned.

• Health check: prior to loading, animal shall be checked in order to ensure that no animal is unfit for the given travel (e.g. injured animals, animals not able to ambulate unaided, very young animals). Special care should be taken in the case of long journeys.

• Proper grouping: the mixing of unfamiliar animals should be avoided as much as possible, in order to reduce aggression episodes resulting in injuries, that can be even serious particularly if males are in the group. If mixing is necessary (i.e. at animal collection sites), precautions should be taken in order to mix animals just once, without further modifying group compositions later on. Also, grouping of horned and dehorned animals should be avoided, except if they were raised together.

• Appropriate handling: adequately trained handlers should adapt management procedures to the animal species-specific behaviour (e.g. using gregarious behaviour in sheep), to help reduce stress caused by unfamiliar environment and situation. Less distress and fear in animals also results in a more smooth management, therefore reducing the risk of injuries as well as of time wasting for stockmanship. Animals that are herded together into groups as they are loaded to lorries and exposed to frequent presence of handlers, do react better to handling during loading.

Pigs:

Pigs have to be fasted prior transport. Warriss (Warriss, 1994) recommended that pigs' last feed should be arranged for between 4 and 12 h before loading. The elevation of the cortisol levels either during short or long periods of fasting can be due to the occurrence of travel sickness when pigs are transported on a full stomach or can also be caused by the increasing demand for energy supply. In pigs, fat mobilization, as the main source of energy, starts after about 16 h of fasting. Currently, a maximal feed withdrawal of 16-24 h before slaughter is recommended. After this time, animals should be fed with moderate amounts of food (Velarde, 2008)(source: EFSA, 2009).

Image 40: Image xyz Pigs have to be fasted prior loading to avoid motion sickness and vomiting during journey.

Cattle:

Grandin (Temple Grandin, 2010) stated that loading physically fit, healthy animals on the vehicle is the single most important factor to maintain an adequate level of welfare during transport. Therefore selection of animals for transport is a major factor in assuring animal welfare during transport.

Mixing unfamiliar cattle from different social groups before or during transport can induce a significant risk of threatening and fighting behaviour (Kenny and Tarrant, 1987; Warriss, 1990)(source: EFSA, 2009).

Mounier et al. (Mounier et al., 2006) studied the influence of transfer conditions and previous handling in relation to the decline of meat pH determined by an increase of stress. Their results suggested that social aspects, like the presence of bulls from the same finishing group, can limit stress and improve the pH decline. Additionally, they observed that events and management before transport also affected pH decline. Cattle are calmer if they are accustomed to handling. (Source: EFSA, 2009).

Before transport cattle should be well rested and fed with sufficient good quality feed, which should be withdrawn about 8 hours before loading. In bulls, mixing of social groups plays a roll due to fighting behaviour and social rank order. For long transportation of cattle, habituation of animals to feeding during transport in accordance to their home feeding regime, as well as rumen physiology is important because unaccustomed feed can induce lower acceptance resulting in lower feed intake (Marahrens et al., 2003)(source: EFSA, 2009).

Sheep:

It is very important to thoroughly evaluate the clinical conditions of the animals prior to travel (fitness to travel): the level of risk can be reduced by selecting animals that are best fit to travel; in particular animals at a late pregnancy status, or just after delivering, or very young lambs, should

never be transported, whereas wounded or unfit to travel animals should be transported only under exceptional circumstances (Source: EFSA, 2009).
Advanced exposure to handling the animals before transport could reduce the negative effects of the transport itself. Rodway et al in 1993 observed that the level of beta-endorphins is significantly lower if the animals are regularly handled for two weeks before transport compared to control animals that were not handled at all before transport.
Some genetic characteristics could have an influence on the level of stress during transport. For example, autochthonous breeds are generally more stress resistant compared to highly selected breeds (Hall et al., 1998a; Romeyer and Bouissou, 1992; Torres-Hernandez and Hohenboken, 1979). In general, extensively kept animals are more prone to stress than intensively kept ones m(Le Neindre et al., 1996; Markowitz et al., 1998). Animals from different farms kept in the same pen or vehicle show agitation and agonistic behaviour (Pearson and Kilgour, 1980). (Source: EFSA, 2009).

Horses:

There are some differences between horses and other farm animals and so the transport conditions should be adapted to this species.
Horses that travel with incomplete or no partitions can have aggressive behaviour that leads to fights; this can happen with unfamiliar groups of horses or aggressive horses, especially considering that a substantial number of the equines transported long distances for slaughter are entire males.
Some reports say that the effort of a horse during transport can be compared with that of a walk of the horse that would last all the journey time, because they constantly have to adjust to the movements of the vehicle (Doherty et al., 1997). The increased heart rate and electro-myographic activity (Giovagnoli et al., 2002) seem to be influenced by emotional and physical stress, determined by road conditions and driving style. (Source: EFSA, 2009).

Lorry inspection and other preparations

All means of transport shall protect the animals from bad weather, extreme temperatures and adverse climatic changes. All road vehicles used for long journey animal transports in the EU have to be equipped with temperature monitoring and recording systems. Sensors are designed to record effective temperature inside the compartments where animals are accommodated. Temperature alarm system should be tested as well.

Prior loading drivers have to check whether the on-board watering system is working, and check the volume of the water in water tanks. Feedstuff and bedding in sufficient amount should be stored and available for supply in normal circumstances and also in case of emergencies.
Prior to the transport, it is advisable to check the relevant route weather forecasts and adjust both passive and forced ventilation systems as well as amount of bedding to the upcoming weather conditions.
In severe weather conditions such as extreme heat the transport time may be changed to early morning or late evening. In conditions like severe winds it is better to postpone transport.

It is also important to check traffic conditions or traffic forecast if possible and available – to avoid road closures and severe traffic jams. For the welfare of the animals it is better not to carry out the transport at the specific time if that involves being stuck for several hours in a traffic jam. It is important to remember that stationary lorry can be a heat stress trap for animals.

Image 41: Lorry is inspected so that after loading there is appropriate space for all animals

Preparation for contingencies

During long distance transport animals are in the direct physical responsibility of the driver(s) and/or attendant.

Therefore, it is extremely important that all possible precautions are taken to avoid any complications, as well as plans on what to do if complications occur (contingency plans).

A variety of emergency situations may occur, including livestock health, lorry or lorry engine failure or driver itself issues.

- Traffic accidents
- Injured sick or dead animals
- Technical failures (engine, ventilation system, watering system)
- Unwell or ill driver.

It is important to make sure that for each of the situations there is a list of actions procedures and contact details available: Each driver should have:

a) Emergency contact sheet listing . telephone numbers for:
    - Police/Firefighters/Emergency services,
    - Transport company/dispatchers
    - Country veterinary service / competent authorities
    - Slaughterhouse/processing plant
    - Insurance company

b) Emergency warning devices (i.e. flares, emergency triangles).
c) Disposable camera and accident information sheet.
d) Company emergency policy sheet
e) Fire extinguisher and first aid kit.

Sick, injured or dead animals

A driver or an animal handler finding sick, injured or dead animals should act in accordance with a predetermined emergency response plan. Sick or injured animals should be segregated. When killing of an animal(s) is necessary, it should be carried out as quickly as possible and assistance should be sought from a veterinarian or other person(s) competent in humane killing procedures. Recommendations for specific species are described in Chapter 7.6. OIE Terrestrial Code.

Technical (engine problem) problem

In all events when transport is disrupted and animals are loaded on the stationary lorry, the primary concern should for the welfare of the animals. If the engine has malfunctioned, it is again animals that should take a priority. A stationary lorry with no air circulation means a high risk of the animals overheating on the closed trailer. If the lorry/engine is broken, first question to consider is how to get the animals as quick as possible to continue the journey. That may involve moving them to a replacement lorry rather than repairing the broken engine before continuing with the animals still on board.

Traffic accidents /example

In the event of an accident, if the driver is not injured and able to do so, the following steps should be:

- To call the one of the emergency numbers if the accident occurred on a public roadway and advise the operator of:
- the location of the accident,
- details of animals on-board;
- the status of any loose animals;
- any known hazards.
- set out emergency warning devices within 10 minutes of the accident.
- To phone the company/dispatcher/veterinary service and inform them about the circumstances
- In any circumstances speaking to press must be avoided.
- Under no circumstances should animals are let off the trailer until a containment vehicle or suitable containment area is available.
- Driver should have skills/equipment to humanely kill injured animals or have emergency numbers to services available and equipped to do so.

Loose animals in traffic accidents

These animals can be dangerous. Public safety must always take priority over anything else. If an animal is a threat to the public, it must be placed in a containment area or euthanized if necessary as soon as it can safely be done.

Animals must not be chased on foot or in a car or truck. They must not be yelled at, and horns or sirens must not be used. This will only make the animal more frightened. If they become cornered and feel threatened, they will attack until they are able to flee.

If animals are standing calmly in one place or grazing, they should not be approached. Everyone should be kept away from them until a plan is established and a containment area can be created or found.

Image 42: Loose animals in traffic accidents

Refusals of entry (and completion of journey) from by official authorities at destination /importing country

The welfare of the animals should be the first consideration in the event of a refusal to allow the completion of the journey.

According Article 7.3.11 of OIE Terrestrial Code, if the animals have been refused import, the Competent Authority of the importing country should make available suitable isolation facilities to allow the unloading of animals from a vehicle and their secure holding, without posing a risk to the health of national herd or flock, pending resolution of the situation. In this situation, the priorities should be:
a) the Competent Authority of the importing country should provide urgently in writing the reasons for the refusal;
b) in the event of a refusal for animal health reasons, the Competent Authority of the importing country should
provide urgent access to a veterinarian to assess the health status of the animals with regard to the concerns of the importing country, and the necessary facilities and approvals to expedite the required diagnostic testing;
c) the Competent Authority of the importing country should provide access to allow continued assessment of the health and other aspects of the welfare of the animals;
d) if the matter cannot be promptly resolved, the Competent Authorities of the exporting and importing countries should call on the World Organisation for Animal Health (OIE) to mediate.

In the event that a Competent Authority requires the animals to remain on the vehicle, the priorities should be:
a) to allow provisioning of the vehicle with water and feed as necessary;
b) to provide urgently in writing the reasons for the refusal;
c) to provide urgent access to an independent veterinarian(s) to assess the health status of the animals, and the necessary facilities and approvals to expedite the required diagnostic testing in the event of a refusal for animal health reasons;
d) to provide access to allow continued assessment of the health and other aspects of the welfare of the animals, and the necessary actions to deal with any animal issues which arise.

The World Organisation for Animal Health (OIE) should utilise its informal procedure for dispute mediation to identify a mutually agreed solution which will address animal health and any other welfare issues in a timely manner.

Natural disasters (such as, flooding, fire, earthquake)

Central Government and civil defence typically play the lead role in preparing for and responding to disasters. Veterinary Services will play a leadership role in advising the authorities on animal health, welfare and veterinary public health in disaster situations. The roles and responsibilities of the Veterinary Services should be clearly laid out. To provide a framework that veterinary professionals can use to develop processes and procedures for managing the veterinary sector's actions to reduce the adverse consequences of disasters OIE developed "Guidelines on disaster management and risk reduction in relation to animal health and welfare and veterinary public health"

5. LOADING AND TRANSPORT (RED MEAT SPECIES)

Fitness to travel

The most important factor for good welfare of animals in transport is to only load on the lorry animals that are fit for transport. According to Article 7.3.7.3 of OIE Terrestrial Code, before loading each animal should be inspected by veterinarian or competent animal handler to assess fitness for transport, and animals found unfit to travel should not be loaded onto a vehicle.

Animals that are unfit for transport include:

- sick, injured, weak, disabled or fatigued;
- unable to stand unaided and bear weight on each leg;
- blind in both eyes;
- cannot be moved without causing them additional suffering;
- new-born with an unhealed navel;
- pregnant animals which would be in the final 10% of their gestation period at the planned time of unloading;
- females travelling without young which have given birth within the previous 48 hours;
- if body condition would result in poor welfare because of the expected climatic conditions.

Assessment of fitness to travel also needs address a certain category of animals that may require special conditions (design of facilities and vehicles, and the length of the journey) and additional attention during transport. Those categories include: large or obese individuals, very young or old animals; excitable or aggressive animals, females in late pregnancy or heavy lactation, dam and offspring, animals with a history of exposure to stressors or pathogenic agents prior to transport; animals with unhealed wounds from recent surgical procedures such as dehorning.

Loading

Many studies have shown that loading and unloading are the most stressful part of animal transport (Hall and Bradshaw, 1998). The physiological changes indicative of stress occurs at loading and last for the first few hours of transport. Then, the stress response can gradually decline, depending on driving quality and other factors, as the animals become accustomed to transport (Broom et al., 1996; Knowles et al., 1995). The large effect that loading may have on the welfare of the animals results from a combination of several stressors such as forced physical exercise, novelty of being moved into unknown surroundings, proximity to humans etc. (source: Broom, 2008)

A thorough knowledge of animal behaviour and the presence of appropriate facilities are important for good welfare during handling and loading.

Pigs

Most authors agree that loading and unloading are the most stressful processes during transport in pigs. Stephens and Rader (Stephens and Rader, 1982) compared handling to transportation and they found that handling caused more disturbances than the trip itself. (Source: EFSA, 2009).

Cattle

To evaluate stress during loading and unloading Maria et al. (Maria et al., 2004) developed a scoring system which assesses time and behavioural events of the unloading/loading process. The results indicated that loading was more stressful than unloading and that higher scores implied significantly higher levels of stress. This scoring system evaluates events that can adversely affect the welfare of

the animals for e.g. falls, balks, reversals, aggressive bouts, mounts, jumps, slips, eliminations, vocalisation and use of electric prods.

To avoid negative effects as referred to by Maria et al. (2004) floor surface and ramp design are fundamental. For an optimal loading of cattle on the means of transport, the ramp slope is of great importance. (Source: EFSA, 2009).

Small ruminants

Generally, the first animal of a group has the tendency to hesitate when entering a darker zone. Small ruminants have a strong social instinct with lateral vision therefore they tend to walk side by side. Therefore, wider loading ramps is preferable to a narrow one, with a slope between 15° and 20° (Fraser and Broom, 1990)(Source: EFSA, 2009).

Loading facilities

The facilities for loading such as the collecting area, races and loading ramps should be designed and constructed to take into account the needs and abilities of the animals with regard to dimensions, slopes, surfaces, flooring, etc. There are important differences between species in their response to handling and loading, which should be taken into account when choosing appropriate loading procedures (see chapter 3. USE OF ANIMAL BEHAVIOUR IN HANDLING). Despite these differences between and within species, several general recommendations can be made.

The lorry must be well parked not allowing gaps between the load compartment loading/unloading ramp, which can disrupt movement animals or causing injuries to animals.

The slope of ramp is an important aspect when loading or unloading animals. As animals prefer to walk slightly uphill rather than downhill, floors should be flat or slope upwards. On the other hand, however, ramps should not be too steep (Grandin, 2007a), and should not exceed 20°.

For cattle, different studies have led to a consensus that ramp slopes should not be steeper than 20% (11°). For concrete ramps, stair steps should have a 10 cm rise and a 30 cm (Grandin, 2007a) to 50 cm tread (Lapworth, 1990). Steps between loading ramp and floor should not be higher than 15 cm. Side protections of ramps should be solid and at least 150 cm high (von Holleben et al., 2003).

Non-slip flooring and good drainage preventing pooling of water is important. Gently curved races without sharp corners, with lateral full side walls facilitate the movement of the animals.

Facilities should provide uniformly even light levels directly over approaches to sorting pens, chutes and loading ramps, with brighter light levels inside vehicles to minimise animals baulking.

Space allowances.

Optimal stocking density for animals during transport has been a subject for debate in recent years. OIE Terrestrial Code gives general recommendation to determine space allowances and for specific space allowance calculations recommends using the figures given in a relevant national or international document. As an example minimum required space allowances listed the EU Council Regulation (EC) 1/2005 are presented below in the document.

It is important that required space depends not only on the animal size and weight but also on their physiological condition, on the meteorological conditions and on the likely journey time.

Cattle

According to OIE standards the recommended space should allow the animal to stand in a natural position or alternatively to lie down. According to Knowles et al., (1999), cattle prefer to stand in a perpendicular position during long transports although it was also shown that cattle lie down if they have enough space to do so. It is often recognized that the number of cattle which lie down increases with extended journey times because of fatigue. Warriss et al. (1995) observed that during 15 hours of transport no cattle laid down. Knowles et al. (1999) noted that most cattle preferred to lie down after 24 hours of transport and Marahrens et al. (2003) noted that only 20% of bulls laid down during a 29 hours journey. Contrarily Honkavaara, (1993) reported that stocked cattle laid down 2-3 hours after the beginning of transport, thus indicating that cattle may prefer lying down if there is enough space. Overloading increases the risk of bruising (Tarrant, 1990). (Source: EFSA, 2009)

Minimum space requirements for different cattle categories specified by Council Regulation (EC) 1/2005 are listed in Table 1 below.

Table 1 Minimum space requirements for different cattle categories specified by Council Regulation (EC) 1/2005

Category	Approximate weight (in kg)	Area in m²/animal
Small calves	50	0,30 to 0,40
Medium sized calves	110	0,40 to 0,70
Heavy calves	200	0,70 to 0,95
Medium sized cattle	325	0,95 to 1,30
Heavy cattle	550	1,30 to 1,60
Very heavy cattle	> 700	> 1,60

Apart from stocking density, cattle behaviour is also influenced by the height of the compartment and external factors like ventilation. To provide adequate airflows the overhead space should be at least 20 cm above the highest part of the tallest animal carried, when standing in any normal position (SCAHAW, 2002). In order to prevent bruising due to mounting behaviour of bulls, any mounting behaviour device should not be >20cm above withers (von Holleben et al., 2003).(Source: EFSA, 2009)

Sheep and goat

To define an optimum value for stocking density during animal transport, many variables should be considered such as the breed, the body weight, the ventilation system, and the presence/absence of wool (Knowles et al., 1998). In Regulation (EC) No 1/2005 provides minimum requirements taking into account the species (ovine and caprine) and body weight (above or less than 55kg.), physiological state (pregnant or not pregnant) and the presence/absence of wool (see Table 2). Also a very low stocking density could have potential adverse effects during transport: during vehicle movements animals continuously try to find their balance in order to stand still (Hall et al., 1998b), 1998) and the increase of density could reduce the slipping accidents and losses of balance (Cockram et al., 1996). Abrupt accelerations and decelerations could cause further stress to the animals because they fall more frequently (Hall et al., 1998b).

Table 2 Minimum space requirements for different categories of small ruminants specified by Council Regulation (EC) 1/2005

Category	Weight in kg	Area in m²/animal
Shorn sheep and lambs of 26 kg and over	< 55	0,20 to 0,30
	> 55	> 0,30
Unshorn sheep	< 55	0,30 to 0,40
	> 55	> 0,40
Heavily pregnant ewes	< 55	0,40 to 0,50
	> 55	> 0,50
Goats	< 35	0,20 to 0,30
	35 to 55	0,30 to 0,40
	> 55	0,40 to 0,75
Heavily pregnant goats	< 55	0,40 to 0,50
	> 55	> 0,50

Pigs

Optimal stocking density for pigs during transport requires that all pigs should as a minimum be able to stand and lie down naturally. EU Council Regulation (EC) No 1/2005 recommended a stocking density of 0.42 m_2 per 100 kg pig. The value of 0.42 m_2 per 100 kg pig was suggested by Lambooy et al. (1985), as a suitable compromise between welfare, meat quality and transport economy for long distance transports (Source: EFSA, 2009)

Some authors stated that more space during transport allows pigs to lie down and rest more quickly with better welfare outcomes (Lambooy and Engel, 1991; Warriss et al., 1998). On the other hand, other authors concluded that pigs do not tend to lie down during short distance transports and a fairly high stocking density that allows pigs to support one another during transport will reduce the risk of injury (Gade and Christensen, 1998). The currently prescribed loading density of 0.42 m_2/pig seems optimal because pigs can lie down or stand up in their natural position to feed and drink successively. Hence, the increase in floor area per pig in the truck of 20 to 40%, did not result in an improvement in terms of observed feed consumption, loss of live weight, carcass yields and parameters of meat quality and carcass appearance (Chevillon et al., 2003). However, Ritter et al., (2007) suggested that transport floor space had a major effect on transport losses and that these losses (incidence of pigs dead on arrival, of total non-ambulatory pigs and of fatigued pigs) were minimized at a floor space of 0.462 and 0. 520m_2/pig or greater compared with to 0.437 and lower. Gispert et al., (2000) evaluated the effect of two different stocking densities and observed higher lactate concentrations in the stocking density of <0.40 m_2/100 kg pig compared with >0.40 m_2/100 kg pig which indicated that pigs arrived more exhausted at the exsanguinations point when they were transported at higher stocking densities. (Source: EFSA, 2009)

Horses

Lots of studies have been made to standardize the space allowance in horse transport, and to determine how the density influences the welfare of transported animals. The space allowance concerns other factors: the ability of the animals to thermo-regulate effectively, ambient conditions,

particularly environmental temperatures and whether the animals should be allowed to stand up after accidental falls. Horses are social animals but they have a flight or fight instinct. It is safer and less stressful for them to travel in individual compartments. In contrast, cattle and sheep, when scared, will herd together for safety. When stocking densities increase, horses may not be able to adopt balancing strategies because the high density does not allow them any freedom to change their behaviour. Some farmers believe that fairly high stocking densities allow horses to support one another during transport but all researches demonstrated that this is completely untrue; higher densities increase the number of falls and injuries during transport and the injuries are more severe (Collins et al., 2000; Iacono et al., 2007; Stull, 1999). Tarrant and Grandin (1993) stated that when animals went down in a high stocking density, they were trapped on the floor by the remaining animals 'closing over' and occupying the available standing space. The high-density horses also have a difficult time finding a position or place for their neck and head (indispensable to maintaining balance). Some horses adopted a strategy of keeping their heads below leg level while most horses kept their heads relatively high and occasionally positioned their heads on or over the backs of other horses.

Table 3 Minimum space requirements for different horses' categories specified by Council Regulation (EC) 1/2005

Adult horses	1,75 m² (0,7 × 2,5 m)
Young horses (6 — 24 months) (for journeys of up to 48 hours)	1,2 m² (0,6 × 2 m)
Young horses (6 — 24 months) (for journeys over 48 hours)	2,4 m² (1,2 × 2 m)
Ponies (under 144 cm)	1 m² (0,6 × 1,8 m)
Foals (0 — 6 months)	1,4 m² (1 × 1,4 m)

According to EU Regulation 1/2005 for long journeys horses and ponies must be transported in individual stalls, except that a mare may travel with her foal. Unbroken horses and ponies must not be transported on long journeys

Vehicle microclimate, thermoregulation, cold and heat stress

Micro-climate on vehicles is composed of factors such as air temperature and humidity, air velocity, air quality, ventilation and insulation of the surrounding walls, floor, and roof. Micro climate on a vehicle can significantly influence welfare and health of the transported animals, if not in an appropriate range. Particularly, overheating in summer and too low temperatures in winter can lead to deaths and suffering of the animals from heat or cold stress. The environmental temperature experienced by the animal depends on interactions within and between environment and animal related parameters. In addition, large regional differences in climate exist in Europe.

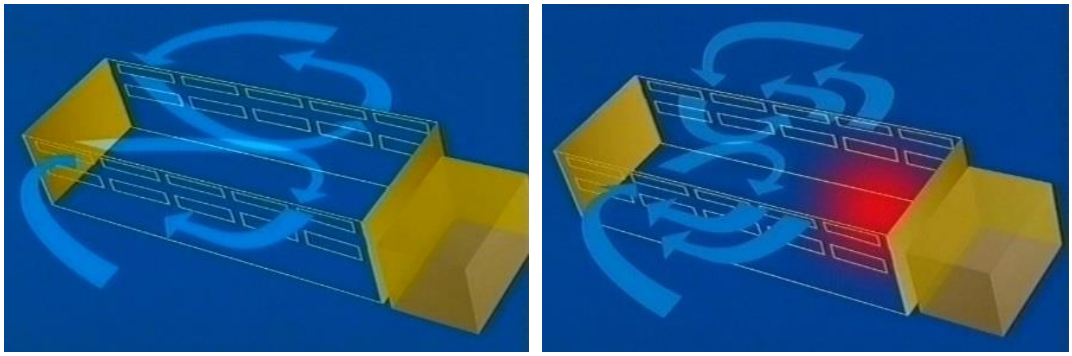
Ventilation

Vehicle ventilation systems to ensure the thermal comfort of animals are essential because during journeys wide ranges of differ ring weather conditions are common. Where changes in geographical surroundings occur, ventilation systems should help containing temperatures within a thermometric zone.

Ventilation systems are either free (passive) or forced systems. Free ventilation systems are common in vehicles used for short (less than 8 hours) journeys

Different air pressures within and outside vehicles drive passive ventilation into and within the vehicle. A central feature is the tendency for air to move in the same direction as the motion of the vehicle. That means air enters at the rear and move forward over animals and exiting towards the front. As air passes the lorry it has cooling effect on animals and at the same time it is getting warmer leading to development of the hot spot which is located immediately behind the cab on the lower deck (see Image 43).

Image 43: Air flow in within vehicle and location of hot spot (source HSA)



Forced ventilations systems are a requirement for long journey vehicles. According to the Council Regulation (EC) No 1/2005, the minimum air flow rate of fans should not be lower than 60m3/h per 100 kg live weight.

Image 44: Forced ventilation system with temperatures sensors

Principles of animals' thermoregulation

Cattle, sheep, pigs are homeothermic and sustain body temperature within specific limits independently of variation in the ambient temperature. Nonetheless, heat needs to be continuously exchanged with the environment in order to regulate and maintain this body temperature, and this exchange is efficient only when the ambient temperature is within the thermoneutral limits.

The control of body temperature is achieved through several mechanisms, the majority being triggered by thermoregulatory centres located in the hypothalamus, skin thermo-receptors and

deep tissues. When an animal's body temperature alters and is detected by the hypothalamus centres, mechanisms are triggered to sustain a normal body temperature near to 39°C. For efficient thermoregulation, the amount of heat produced by the pig must be equal to total heat lost to ambient conditions.

When ambient temperature decreases, an animal's temperature may be out of the thermal comfort zone; thus, the body triggers mechanisms to generate heat. With increasing ambient temperature, these mechanisms are triggered to lose heat. Under these conditions, both physiological and behavioural alterations may occur as the animal seeks to maximize heat exchange efficiency.

The homeostatic system promotes thermal balance by regulating the body temperature within tolerable limits for perfect physiological functioning. There are four mechanisms through which animal can exchange heat with the environment, as follows:

Radiation - this mechanism allows for heat exchange (loss or gain) through electromagnetic waves and occurs when the animals passes heat to a cooler environment or absorbs radiation in the form of a wave. Examples of radiation sources that can promote heat production are: sun, light bulb and fire.

Conduction - Heat exchange occurs by direct contact of an animal's body with ground, water or other surfaces. In order to lose heat through conduction, the animal seeks to maximize contact of the body surface with cooler surfaces.

Convection - This is the transferring of heat resulting from air movement over the skin or blood circulation surfaces, transporting heat from internal tissues via the body surface of the animal

Evaporation - this is the conversion from liquid to gas (vapor) state. Control of respiratory evaporative heat loss (by panting, fast breathing) is one of the most important mechanisms for animals exposed to high temperatures to lose heat. Sweating is another way of losing heat; in farm animals this mechanism is limited since they have a reduced number of sweat glands, which are inefficient.

Heat exchange by radiation, conduction and convection depends on temperature differences between the pig and its environment. In contrast, evaporation is not only related to variation of temperature, but is also greatly influenced by relative air humidity surrounding the pigs.

Each method for heat exchange varies considerably according to:

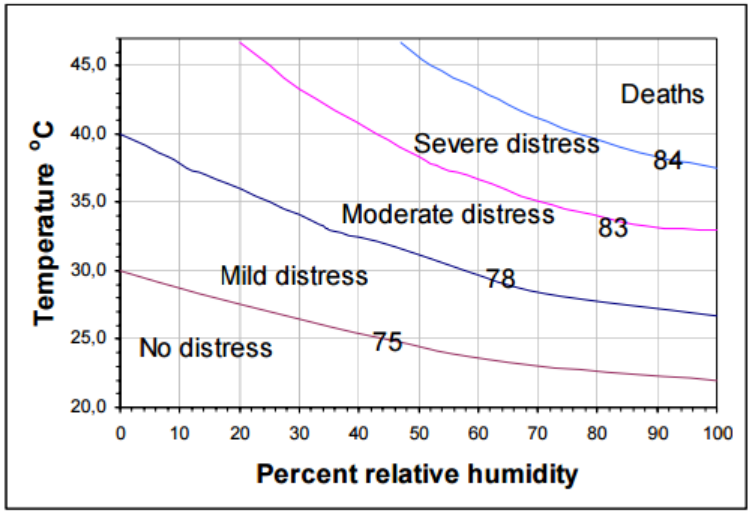
- Climate factors (temperature, relative air speed and humidity);
- Climate conditions (seasonal variations and period of the day);
- Facility features (ventilation, flooring type, solar incidence);
- Factors intrinsic to the pig (age, sex, genetics, skin colour);
- Stocking density (truck or pen).

The range of ambient temperature where the animal maintains body temperature constant with minimal thermoregulatory effort is called 'thermal comfort'. The thermoneutral zone defines the range of temperatures for thermal comfort of an animal and its limits are known as ambient lower

critical temperature (LCT) and upper critical temperature (UCT); An animal needs to gain or lose heat to keep their body temperature constant above and below these limits.

In a cold environment, the lower critical temperature is that at which the organism triggers thermoregulatory mechanisms to increase heat production and retain body heat, thus compensating for heat loss to the environment. In a hot environment, the upper critical temperature is that at which the pig activates mechanisms to lose heat when production is greater than the losses. Within this range, mechanisms such as fast breathing and peripheral blood vessel dilation assist in the process of dissipating heat.

Image 45 Relationship between temperature and relative humidity with THI-zones of heat stress levels in cattle (modified after Armstrong, 1994)(EFSA, 2004)



Heat stress

Pigs and poultry have great difficulty in losing heat and may therefore suffer heat stress at ambient temperatures close to the upper limit of their thermoneutral zone and at high humidity.

If the animal body temperature rises above the average value considered normal this leads to heat stress or hyperthermia. A body temperature reaching 4° C above normal can lead to an animal's death. In circumstances of heat stress, the animal alters its behaviour to increase heat loss. A pig will seeking cooler surfaces and air flow, spreading in the pen and increasing water intake. If these exchange mechanisms are not sufficient, the condition is aggravated and the pigs start losing heat by panting. However, during transport the possibilities to behavioural responses are limited.

Heat stress may result from poor ventilation, excessive duration of stops during the journey, with lack of forced ventilation in the vehicle, inadequate design of the vehicle and an overly high stocking density.

Cold stress

If core body temperature falls, the animals become hypothermic. A fall of 7-8°C is undesirable but can often be followed by complete recovery. Animals conserve body heat or increase their body temperature by: shivering, pilo-erection (raising of the hair/coat), huddling, postural changes.

Animals are less likely to suffer cold stress during transport. The risk of cold stress is increased with cold environmental conditions (low temperatures, air movement, high humidity), very young or shorn animals, or by having very few animals on the vehicle. Providing deep straw bedding will help to protect animals.

6. UNLOADING AND RESTING AND THE RESTING POINTS (RED MEAT SPECIES)

Feeding watering and resting of animals

Introduction

According to relevant standards the journey means the entire transport operation, from the place of departure to the place of destination, including any unloading, accommodation and loading occurring at intermediate points of the journey.

During transport, animals are usually deprived of food and water exposed to strange environments, vibrations, smells – exhaust from cars, changing weather conditions and strange noises.

Food and water deprivation are a limiting factor. Food deprivation, if it is sufficiently prolonged or severe, can lead to debilitation, loss of body condition, immune-suppression and disease. Consequently, prolonged hunger may result in inadequate biological functioning and it is likely to be an unpleasant emotional state (Kyriazakis and Savory, 1997; Webster, 1995)

For example, pigs are fasted to reduce gut content during the pre-slaughter period and to prevent the release and spread of bacteria. Fasting before slaughter, within reasonable limits, is beneficial for the welfare of pigs as it prevents vomiting and hyperthermia. However, a prolonged fasting period causes hunger, aggressiveness (Warriss, 1994), weakness, lethargy and sensitivity to cold (Gregory, 1998). Cattle have a greater ability to withstand the rigours of transport and especially the disruption in their normal intake of food if they have been appropriately fed before loading.

Thirst also reduces food intake. During long transports, thirst can occur if animals are given water of poor quality or dirty, when access to water is difficult, or the supply system is not properly designed and constructed.

Thirst can also occur when the animals are not used to the water devices. The ability to cope with dehydration varies between species and upon age (Gregory, 1998). Suckling animals are particularly susceptible to dehydration because they have not learned how to drink from a trough and therefore fail to drink the water provided.

Feeding and watering regimes in long distance transports

Both OIE standards and EU regulation require animals in long distance transport to be rested watered and fed at regular intervals. As an example of in transport times EU Regulation 1/2005 requirements are presented in Table 4.

Table 4 : Transport times

TYPE OF ANIMALS	TRANSPORT REGIME
PIGS	24 HOURS TRANSPORT ON A LORRY WITH CONTINUOUS ACCESS TO WATER
DOMESTIC EQUIDE	24 HOURS, MUST BE GIVEN LIQUID AND IF NECESSARY FED EVERY EIGHT HOURS
GOAT SHEEP CATTLE	14 HOURS OF TRAVEL, REST PERIOD AT LEAST 1 HOUR TO BE GIVEN LIQUID AND IF NECESSARY FED, AFTER THIS MAY BE TRANSPORTED
UNWEANED CALVES, LAMBS, KIDS, FOALS, PIGLETS	9 HOURS OF TRANSPORT, REST PERIOD OF AT LEAST 1 HOUR TO BE GIVEN LIQUID AND IF NECESSARY FED
AFTER THE JOURNEY TIMES ABOVE ANIMALS MUST BE UNLOADED, FED AND WATERED AND BE RESTED FOR AT LEAST 24 HOURS.	
IN THE INTERESTS OF THE ANIMALS, THE ABOVE SPECIFIED JOURNEY TIMES MAY BE EXTENDED BY TWO HOURS, TAKING ACCOUNT IN PARTICULAR OF PROXIMITY TO THE PLACE OF DESTINATION.	
POULTRY AND RABBITS CAN BE TRANSPORTED FOR UP TO 12 HOURS (NOT TAKING INTO ACCOUNT LOADING AND UNLOADING TIMES)	

Pigs

Long distance transport of pigs is still very common. Proportion of pigs long distance transport n pigs within the EU is about 35 % of all pig transports. That includes piglets, slaughter pigs and breeding pigs. During long distance transport, any deficiencies in transport conditions are likely to have more serious consequences than in shorter national journeys (Warriss, 1998)(source EFSA, 2009).

In the EU, after 24 h (with continuous access to water), pigs must be unloaded, allowed to rest for 24 h and provided with food before continuing the journey (1/2005/EC). Becker et al., (1989) suggested that because of feed and water deprivation pigs tend to eat more when rested. Chevillon et al. (2003) reported that pigs eat from 2 to 5 times more when the truck stops than when the means of transport is in motion, which can be detrimental for further journey. (source EFSA, 2009).
Furthermore, feeding and watering pigs on the truck may avoid the stress of unloading and mixing in the staging point compartments (Chevillon et al., 2003)

Image 46: Water tanks on the lorry for water supply of pigs (adapted from BTSF)

Cattle

Cattle as ruminants with a large volume of liquid in the rumen can withstand long distance transport without feed and water in better condition than mono-gastric animals. In the US and Canada transports of cattle for 24 – 30 hours without food and water are not uncommon.

Effects of dehydration are measured by an increase of albumin, total plasma protein and osmolality which was quickly rectified by access to water. Based on these observations Warriss et al. (1995) concluded that cattle transport up to 15 hours under good conditions is acceptable from an animal welfare viewpoint.
Knowles et al., (1999) investigated the physiological and behavioural effects of different journey periods from 14 up to 31 hours. The majority of measured variables changed during the journeys and some progressively with the length of the journey. However, the change between 15 and 31 hours was not extreme and the major effect was observed in the first 15 hours. Behaviour measurements showed an increase number of cattle lying down after 24 hours probably due to fatigue (Knowles et al., 1999)(source EFSA, 2009).

In transports within the EU, cattle are rested on the lorry provided with water and fed if necessary. The duration of feed and water supply is important for a sufficient intake particularly for ruminants. One hour rest after 14 hours of transport seems to be insufficient for adequate water intake (Knowles et al., 1999). Marahrens et al., (2003) recommended a minimum feeding interval of up to 3 hours for long journeys. Furthermore, the access to feed and watering cups is affected by the stocking density. For instance Knowles et al., (1999) observed that at a stocking density of 0,27m_2/100 kg, 42% of cattle during a one hour resting period did not drink although water was offered to them and that animals on double deck lorries often drank significantly less than those on single deck lorries. Drinking facilities for cattle should have an open water expanse with a minimum of 3 cm water depth and minimum flow rate of 3 litres per minute (source EFSA, 2009).

Water and feed should be provided to animals after 14 hours during resting periods.

Image 47: Automatic drinkers on the lorry

Image 48: Portable feeding - on the lorry (source BTSF)

Small ruminants

Small ruminants are frequently transported for long distances: every year in the EU, more than more than half a million of small ruminants are imported to EU. Most of sheep and goats are transported by road.

Even so, the welfare of small ruminants during transport has been relatively less studied when compared to other species. Ovine species do not show their discomfort and pain with vocalization because of a natural tendency of “silent suffering” (Buchenauer, 1994)(source: EFSA, 2009).

When describing the consequences of deprivation of food and water during long transport in small ruminants, many researchers agree that in sheep after 24 h of transport, an 8 h rest is sufficient to have a complete recovery (Knowles et al., 1995); a shorter resting period would be insufficient (Parrott et al., 1998). It has also been demonstrated that after a 24 h transport, it takes at least the same number of hours to regain the pre-journey values in terms of body weight (source: EFSA, 2009).

One of the main concerns of commercial operators is the loss of weight during animal transport. Warriss et al., (1990) observed that sheep transported for 3-6 hours have a post slaughtering carcase weight 1-7% lighter than animals that have not been transported at all.

Some farmers have the habit of fasting animals before slaughtering them i.e. to have the minimum live weight to pay while processors interest is the minimum possible quantity of gut contents for disposal. It is important to remember that in general small ruminants under stressing conditions tend to cease feeding, but after 12 h of travelling time their priority starts to again be feeding and drinking (source: EFSA, 2009).

Image 49: On lorry drinking system for sheep and pigs (source BTSF)

Horses

Providing slaughter horses with access to water on board trucks appears to be a useful method to reduce dehydration or to delay its onset. The duration of access to water depends on density and can be longer in penned horses because of dominant horses and agonistic behaviours; in some studies, highly motivated horses were blocked from drinking by more aggressive horses. So, the on-board watering system should be constructed in a way that all the horses are able to drink, providing adequate manoeuvring space or, if mobile, placing troughs on both sides of the truck (Gibbs and Friend, 2000)(source: EFSA, 2009).

Reece et al., (2000) stated that serum sodium, chloride and protein concentrations dramatically increased after 24 h of transport, indicating that even healthy horses suffered severe dehydration and fatigue if transported for more than 24 h. According to the study of Friend (2000) transport for more than 28 h even with periodic access to water will likely be harmful due to increasing fatigue. (source: EFSA, 2009).

In fact, Council Regulation (EC) No 1/2005 requires that horses have to be unloaded, fed and allowed to rest for 24 hours at control posts whenever the duration of transport exceeds 24 hours.

Image 50: Portable removable drinkers used to water large animals – cattle and horses

Unloading

On the arrival at destination/resting point unloading of animals should be carried out without delay. In circumstances where waiting is unavoidable, the loaded vehicle should be parked in a shaded and well-ventilated place to minimize of heat stress while waiting for unloading.

Many studies have shown that loading and unloading are the most stressful part of animal transport

All transport vehicles should be equipped with ramps of sufficient size to ensure a safe loading/unloading

See chapter 5. LOADING AND TRANSPORT (RED MEAT SPECIES)5 for more details on the design of loading and unloading facilities

Pigs

Most authors agree that loading and unloading are the most stressful processes during transport in pigs. Stephens and Rader, (1982) compared handling to transportation and they found that handling caused more disturbances than the trip itself.

Bradshaw et al., (1996) suggested that, because loading and unloading is a very stressful period, and the animals become travel sick, unloading the pigs during a long distance journey in order to rest them and allow them food and water (and subsequently re-loading them back onto the vehicles with full stomachs), may be the worst possible course of action.

Chevillon et al., (2003) performed two transport runs lasting 36 hours (20 hours transport - 9 hours rest stop - 7 hours transport) to study if it would be desirable to unload pigs at the control post and observed that the heart rate records of unloaded pigs showed peaks due to stress and (or) effort during unloading and reloading operations. In addition, whether or not the pigs were unloaded at the control post had a small effect on the feed and water consumption, on the weight loss or carcass yields. Finally, analysis of behaviour failed to show better levels of rest and feeding in unloaded pigs. (source: EFSA, 2009).

Cattle

The study results indicated that loading was more stressful than unloading (Maria et al., 2004).

Small ruminants

Generally, the first animal of a group has the tendency to hesitate when entering a darker zone Small ruminants are generally reluctant to step out on the unloading ramp. Small ruminants tend to walk side by side; a wider loading ramp is preferable to a narrow one, with a slope between 15° and 20° (Fraser and Broom, 1990). Particular attention should be given to the unloading procedure, which is more traumatic than the loading. In general, the destination place should be lightened and brighter than from where they are unloading.

Horses

The most frequent transports of Equids (for slaughter) are from Baltic states and Romania to Italy. Some slaughter horses are tethered in stalls where they are fattened prior transport and slaughter. Therefore, they have no muscle development or condition and are unused to exercise. For all these reasons, horses are 16.5 times more likely to be injured during transport than cattle (Stefancic and Martin, 2005).

Horses tend to be more fatigued in transports than cattle because, unlike cattle they do not tend to lie down during transport and constantly need to adjust to the movements of the vehicle.

Friend, (2000) established that horses transported at medium and low-density showed a slight increase in activity after 55 minutes of on-board truck rest, hinting that one-hour stops may give horses a meaningful rest. The loading/unloading activities are very stressful and resting on the truck could be a good solution but additional research is needed. (source: EFSA, 2009).

Resting points

OIE Terrestrial Code define **resting point** as a place where the journey is interrupted to rest, feed or water the animals; the animals may remain in the vehicle/vessel or container, or be unloaded for these purposes.

Resting points must ensure that the bio-security criteria are applied correctly, in order to protect animals which are hosted by the facility. Every resting point must be located, designed, constructed and operated so as to ensure sufficient bio-security, thus preventing the spreading of infectious diseases to other holdings.

Resting points must be used exclusively to:

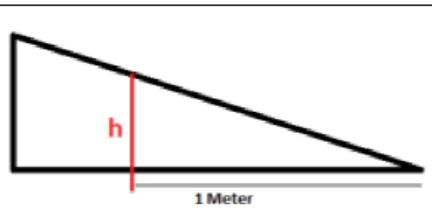
- Receive animals and provide space to rest
- Feed and water them
- Provide protection against adverse climatic conditions

They are not used for the purchase and sale of the animals concerned. Animals may be housed at the CP only if their health status is certified.

Before hosting animals, the premises that will house them must be cleaned and disinfected within 24 hours following the departure of all animals previously held, and must remain clear of animals until the cleansing and disinfection operations are completed to the satisfaction of the official veterinarian. It shall be completely cleared of all animals for a period of 24 hours (sanitary breaks) before the arrival of a new consignment.

Loading and unloading are stressful situations for transported animals, due to the rapid changes of their close environment. Unloading equipment must be designed and operated way to prevent injuries and suffering, to minimize excitement and distress.

Non-slipping flooring and proper lightning is also required. To prevent slipping, specific maximum gradient slopes are imposed according to the categories of animals.

	Slope	Maximum height **h**	
Pigs	≤ 20°	36 cm	
Calves	≤ 20°	36 cm	
Horses	≤ 20°	36 cm	
Sheep	≤ 26°34'	50 cm	
Other cattle	≤ 26°34'	50 cm	
All species	> 10°	17,6 cm	Foot battens necessary

The quality of handling operations when loading, unloading and moving the animals into the resting point has a major impact on the welfare of transported animals. For this reason, it is recommended to use only low stress handling techniques described in the chapter on handling in this handbook. Assembly and holding areas should be designed way to allow animals to remain in social groups and to rest without risk of mixing groups.

Housing

Housing should be constructed with walls and roofs that should provide adequate protection to animals from adverse weather conditions. Temperature and ventilation have a direct influence on animal health.

Minimum and maximum recommended temperatures for housing at the resting points are in Table 5.

Table 5: Minimum and maximum recommended temperatures for housing at the resting points

Animal categories	Minimum temperature	Maximum temperature
Piglets < 15 kg	+20°C	+35°C
Growing-finishing 16 to 110 kg	+15°C	+30°C
Pigs above 160 kg	+10°C	+28°C
Ewes	+6°C	+ 26°C
Lambs	+14°C	+21°C
Calves before weaning	+5°C	+25°C
Cattle ≤ 400 kg	Difference with outside temperature : no more than 3 to 6°C Comfort from -5°C to +25°C	
Cattle >400 kg and Cows		

If outside temperature is above 30 °C, water must be sprayed on the alley, without making the floor slippery, and if necessary water is to be sprayed on pigs as well. Cattle and sheep are less sensitive to heat, but ventilation (natural or mechanical) may be necessary above 30°C. If inside temperature is lower than 5°C, it is necessary that the bedding be correctly made with straw. A heating device can be used as well, if needed, especially for small piglets.

Image 51: Animals at the resting points (source Srefano Messori)

Space allowances

All animals in resting points should be able to lie down comfortably at the same time. The space allowances are usually calculated to allow animals lay in a lateral recumbence (on a side) as animals spend 24 hours resting. The recommended space allowances for resting points are in a Table 6 below.

If there are not enough pens in the resting point compared to pens on the lorry the rule is not mix more than 2 pens of the truck. Observe behaviour, and isolate injured or stressed animals if necessary.

Table 6 The recommended space allowances for resting points

	Animal categories	(m^2/head)
Pigs	<10 kg	0.13
	10 kg >< 20 kg	0.20
	20 kg >< 30 kg	0.26
	30 kg >< 50 kg	0.37
	50 kg >< 85 kg	0.53
	85 kg >< 110 kg	0.63
	> 110 kg	0.96
	Sows[1] (200 kg LW)	1.22
	Gilts[2] (110 kg LW)	0.63
	Boars[3] (200 kg LW)	1.22
Sheep	Ewes	1
	Lambs	0,5
Cattle	Small calves (50 kg LW)	0.43
	Medium sized calves (110 kg LW)	0.73
	Heavy calves (200 kg LW)	1.10
	Medium sized cattle (325 kg LW)	1.52
	Heavy cattle (550 kg LW)	2.16
	Very heavy cattle (> 700 kg LW)	> 2.544

Flooring, bedding and additional measures

The floor material must be non-slippery, cleanable, and sufficiently drained (i.e. kept free from urine and water). It must be adapted to animal species. If concrete slatted floor is used for pigs, part of it should be not slated. This dedicated space must be sufficient to allow the animals to rest together at the same time and the floor material must be solid or covered with a mat.

For cattle, sufficient bedding should be provided: between 8 to 12 kg of clean straw for adult cattle, between 2 to 3 kg of clean straw for calves. Straw must be dry, good quality and must be renewed between each truck load. Straw can added associated to wood chips to improve liquid absorption. For sheep, straw bedding should be provided in the pens, 0.5kg/head for ewes, between 0.20 and 0.25 kg/head for lambs.

Feeding and watering

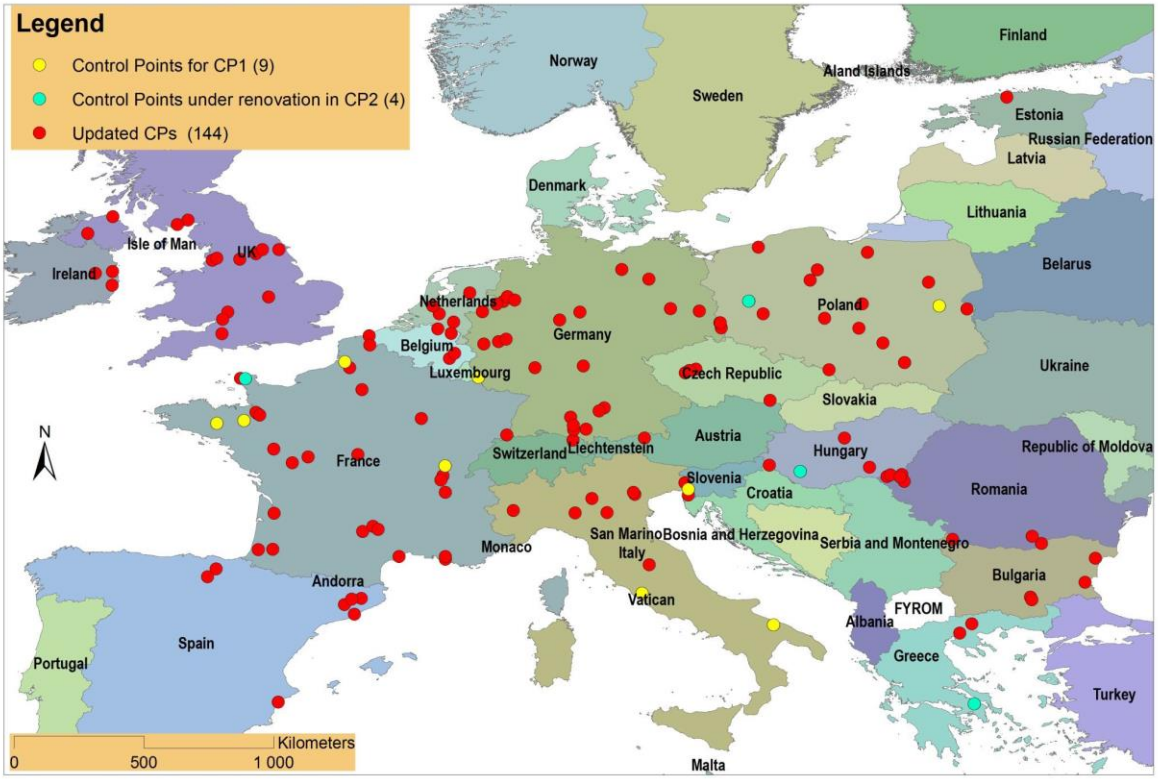
The feeding and watering of animals shall be carried out in such a way as to ensure that every animal accommodated can have sufficient clean water and appropriate feed to satisfy its bodily needs during its stay and for the expected duration of its journey to the next feeding point. The recommended quantities of feedstuff are indicated in the Table 7 below.

Table 7. Recommended quantities of feedstuff

Animal categories	Feed(kg/head/24h)
	Concentrate feed
Piglets < 15 kg	0.35
Weaners 16 to 50 kg	0.75
Growers 51 to 110 kg	1.00
Fatteners 111 to 160 kg	1.25
Sows, boars	1.50
	Hay
Ewes	3 kg
Lambs	1 to 2 kg
	Milk replacer
Calves before weaning	2 l/12 h
	Hay
Cattle ≤ 400 kg	7 kg
Cattle > 400 kg	15 kg

All animals should have free access to fresh drinking water, delivered *ad libitum*. Young calves should not be watered with cold water, especially in winter, as it may cause diarrhoea. Rather it is recommended that they are provided with warm water (about 30°C) or electrolytes to meet their water needs without compromising the health of calves.

Image 52: Map of resting points within the EU (source BTSF)



7. LOADING, TRANSPORT AND UNLOADING OF POULTRY

Introduction

All poultry species and major breeds employed in the main intensive production systems are transported at least twice during their lifetimes over distances that may range from a few kilometres to journeys with durations of many hours. Most journeys are by road e.g. from hatchery to production site or from farm to processing plant. All modes of transport involve the placement of birds or chicks in to transport containers which are subsequently loaded on to vehicles, to their intermediate or final destinations.

All the procedures and practices involved in transportation and the micro-environments prevailing in containers and vehicles may impose varying degrees of stress upon the birds, which will result in compromise of their welfare status, health and productive efficiency, depending on the level of stress imposed.

There are certain specifications that somehow limit distance over which birds are being transported. Because broiler chickens are genetically selected for rapid growth (in 42 days) they do so with rather fast metabolism. Therefore, they can produce lot of heat in a relatively short period. As they are transported in containers and crates where they cannot be fed or watered, this significantly reduces time over which birds van be transported.

They do not have sweat glands and a large proportion of their thermoregulation is routed via evaporation (loss of heat with moisture via breathing or panting). Food withdrawal, prior transport, also limits the duration of transport significantly.

The transport of birds is defined as a period starting with placing first bird into transporting crate until the period when last crate is offloaded from the lorry. That often includes parking lorry in 'laiarge' premises.

Fasting of birds

The truly limiting factor for transport of chicken broilers is fasting. Feed should be withheld before the birds are slaughtered, to allow the gut to empty. This should help to reduce the likelihood of gut contents leaking or spilling on to the carcass, but on the down-side it will assist the establishment of *Salmonella* within the caeca (Moran and Bilgili, 1990). A *fasting time* of 16 hours will reduce the overall burden of gut contents in broilers (Papa, 1991).

The period of feed deprivation should not lead to unnecessary loss of carcass weight. When broilers are fasted their liver glycogen levels can be depleted within 6 hours (Warriss et al., 1988) and from that time onwards they are likely to lose carcass weight. By 24 hours there may be as much as 10% loss in live weight and a 6% loss of carcass weight. The overall optimum fasting period that allows adequate gut emptying without excessive loss of carcass weight is 10 -12 hours. Fasting birds for 12 hours or longer can also adversely affect tenderness (Scholtyssek *et al*., 1977).

The longer catching takes, the greater is the risk for stress, dehydration and death of birds in the barn, especially for those already in the trays, or for the first trays loaded onto the truck, which are going to be the last ones unloaded at the plant.

Duration of transport

That is determined on an ad hoc basis depending on number of animals transported (capacity of a lorry), and time of lairing which should not be longer than 2 hours. The capacity of a standard single lorry is 7000 chickens. The lorry with trailer can transport up to 14 000 chicken. Birds are harvested (caught) and placed in the lorries by catching team of 4-5 catchers each catching 1000 – 1500 birds in an hour and placing birds into the drawers/containers. Extra time is added to allow for placing the modules/containers with birds onto lorry. Therefore depending upon whether the birds are

transported by single lorry or a lorry with a trailer, catching - harvesting can last from 2 to 4 hours. Usually feed is withdrawn from birds at least 2 hours prior transport while lairaging (on the lorries) lasts up to 2 hours. Taking into account that the optimum total fasting period is 12 hours, deducting the time taken to catch and loading (2 hours for a single lorry) feed withdrawal prior catching 4 hours, and time of lairaging (2 hours) the real time of lorry moving would be 4 hours or about 300 km. That might be extended if period of fasting is 16 h. Transport of broiler chicken for 8 hours would be seldom within Europe. The best practice is not to build farms further than 2 hours from processing plans. The largest UK, Chinese and Brazilian companies keep 90 % of their broiler chicken on moving lorries for maximum of hour and half (personal communication with Moy Park, Brazil Foods and SSK).

Harvesting of chicken / loading

Broiler chicken are usually caught and placed into containers/drawers fitted into modules by specially trained teams of catchers (Image 53).

Birds can be caught in several ways and the method can be determined based on instruction norms, and standard procedures of industry's quality control, or by client demand. **It is very important that practices safeguarding animal welfare are prioritised**

Image 53 Transporting module for poultry

Dorsal catching

This is the least stressful method and recommended for reducing lesions, as long as birds are lifted and loaded properly inside the drawers. Nonetheless, it is a slow method as birds are lifted and placed individually inside trays and thus requires a trained team with sufficient number of catchers.

Both legs catching

Birds are caught from the floor and carried by both legs in inverted position, with a maximum of three birds in each hand. It is a faster method compared to dorsal catching and requires a smaller number of people; however, birds are inverted and suspended by the legs, which is more stressful and there is a higher risk for lesions and mortality than dorsal catching.

Mechanical catching

Some countries within the EU as well as United States use catching machines to lift birds from the floor and lead them into containers without physical contact with catchers. This method is not widely used because of its cost, required barn adaptations, hygiene complexity and concern with bio-security as dead and injured birds are sometimes harvested as well.

Following groups of birds must not be put into containers and transported:

- Weak and/or not alert
  These birds might not run away from you when approached. They might have their heads on the litter and their feathers fluffed up.
- Birds having skin on head or neck dark red or very pale
  Compared to other birds in the flock, these birds will have discoloured faces. They might also show other symptoms.
- Swollen head and/or neck
  The face or head will be puffy and eyes might be swollen shut. These birds might also have wounds on their heads.
- Bloody and prolapsed vents
  The area under the tail will have exposed red tissue that appears to stick out. There can also be blood in the area. Prolapsed vents are painful and hens can bleed out and die if the prolapsed is pecked or stepped on.
- Dislocated, broken and/or exposed bones
  These injuries are painful. Wings might droop on the ground and legs might stick out at odd angles. Legs might also be discoloured with bruises.
- Wet birds in cool and cold weather

Recommended stocking densities

The stocking densities or number of birds per drawer may vary according to weather conditions. Usually in mild weather conditions (16 – 20 ºC) area of 160 cm^2 per kg of live weight is provided to broiler chicken. That corresponds with about 63 kg of birds per m^2
When outside temperature is around 24 ºC or recommended stocking density is 54 kg per m^2.

Poultry other than day-old chicks: weight in kg	**Area in cm^2 per kg**
< 1,6	180 — 200
1,6 to < 3	160
3 to < 5	115
> 5	105

The load i.e 63 kg m^2 is then re- calculated to number of birds of certain known (average) weight per m^2 or area of drawer/container i.e there would be 21 birds with average weight of 3 kg placed to m^2 of area of container in mild weather conditions.

Heat / cold stress

Normal body temperature for broilers is 41º C and as homoeothermic, they can regulate internal temperature even with variation in the ambient temperature. Alterations in body temperature trigger homeostatic mechanisms in the bird's body to prevent development of hypothermia or hyperthermia.

Under high temperature conditions, these mechanisms are activated to lose heat. In these situations, physiological changes take place and likely behavioural changes will occur, when the bird seeks to maximize heat exchange efficiency.

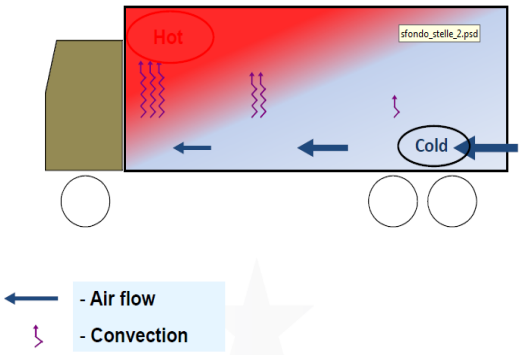
The internal thermal micro-environment in the poultry transport containers is the product of the inlet air temperature and humidity, airflow rate and the heat and moisture production of the birds (Kettlewell et al., 2001)(source: EFSA, 2009).

The passive ventilation regimes of most commercial broiler transport vehicles result in a heterogeneous distribution of airflow within the bio-load.

Different air pressures within and outside commercial broiler vehicles drive passive ventilation into and within the vehicle. A central feature is the tendency for air to move in the same direction as the motion of the vehicle. That means air enters at the rear and move forward over the birds and exiting towards the front. As air passes the lorry it has cooling effect on birds and same time it is getting warmer. Therefore, at exit it has a very limited cooling effect. On the top of that, it is not passing all areas of lorry equally.

This accounts for the distribution of temperatures and humidity in the lorry differently and creation of the "thermal core" – the area of the lorry with high temperature and cold zone. Therefore, in some situations it is possible to have birds suffering heat stress and cold stress within the same lorry (Image 54).

Image 54: thermal core and cold area within the lorry



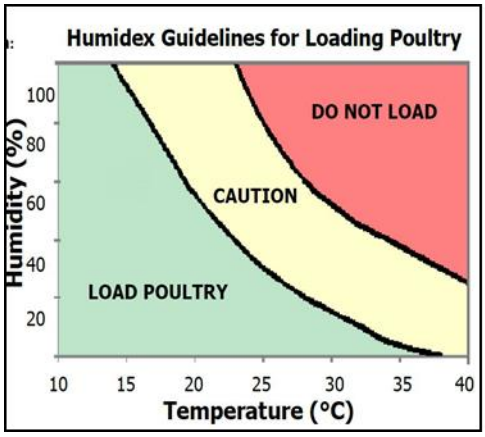
When vehicles are stationary there is no external force driving the ventilation, thus heat and moisture removal is then dependent upon free convection (a less effective way) of heat exchange of heat from containers to outside area.

Heat stress would increase even on open or semi-open vehicles, particularly when stationary in hot and humid weather conditions. Drivers have to understand that particularly in situations such as slow traffic, traffic disruption or traffic jams, when a lorry is not moving or moving slowly, the risk of heat stress increases significantly with the time lorry is “locked” in a traffic jam.

In order to eliminate risks of uneven distribution of heat and humidity within the lorry as well as risk of heat stress in a slow traffic, some countries have recently started to work on a design of closed lorries with fully controlled and even micro-climate (temperature and humidity) within the closed load.

For transport exploiting passive ventilation there are set up guidelines of optimum temperature and humidity for loading and transporting of poultry – Please see Image 55

Image 55: Recommended microclimate for loading and transport of poultry



Humidex = "Feels Like" Temperature

Humidity	Temperature 20 C	25 C	30 C	35 C
50%	22	28	36	45
60%	24	30	38	46
70%	25	32	41	49
75%	26	33	42	50
80%	26	33	43	52
85%	27	34	44	53

Lairaging and unloading of poultry

Birds must be kept in the holding facilities for the minimum amount of time needed. The time broilers are kept in a holding area – lairage depends from slaughter throughput i,e time needed to all load passes through slaughtering line.

The good practice is to organise logistics of supply of birds arriving to the slaughterhouse in a way that no birds have to be kept in a lairage for periods longer than 2 hours. Birds that wait for long periods in the truck can suffer dehydration, as they do not have access to water.
It is important to be attentive to the fact that monitoring of the holding time is not enough since one should also observe the environmental variables in the facilities i.e temperature and humidity within the a stationary lorry in a lairage area.
• On the arrival at the slaughterhouse, birds must be designated to cool and well ventilated areas while waiting for slaughter;
• The holding area must provide a calm and comfortable environment so that birds can rest and recover from transport related physical stress;
• Lighting in the holding area must be dimmed to allow birds to remain calm while waiting for slaughter;
• Fans or exhausters are used to maintain appropriate levels of temperature and relative air humidity to prevent heat stress (Image 56)

Image 56:Poutry lairage ventilation

8. TRAINING OF DRIVERS - THEORY, PRACTICE LEGISLATION, EXAMINATION

Introduction

According to OIE international standards people responsible for animals during journeys should be competent in accordance with their responsibilities: The assessment of the competence of animal hauliers should at a minimum address knowledge, and ability to apply that knowledge, in the following areas:

a) Understanding of country's legal requirements – and international requirements when transporting animals out of the country – to the EU
b) Understanding of all responsibilities of the animal transporter
c) Understanding how to realistically plan the journey, and carry out planning of journeys with feeding, watering and resting breaks as well as maximum driving periods as applied to drivers; contingency planning
d) Suitability of the vehicle and equipment
e) Assessment of fitness to travel; if fitness to travel is in doubt request assessment by veterinarian
f) Animal behaviour, general signs of *disease*, and indicators of poor *animal welfare* such as stress, pain and fatigue, and their alleviation;
g) Handling animals in transit and associated activities, such as assembling, *loading* and *unloading*;
h) Maintaining a *journey* log and post journey requirements

It is necessary to make sure that these areas of concern are well addressed in training programmes and reviewed in an examination. To illustrate development of the training programme we will model development of the training programme based on the above selected areas of concerns. Obviously, the trainings of drivers should reflect local legislation and standards.

Based on these areas of concerns assessment criteria are developed and against each assessment criterion, assessment content is developed.

Assessment criteria versus content/ examples

The example of assessment criteria and content based on the existing EU legislation is presented in ANNEX I

Practical training/examination

Drivers should obviously prove their practical skills too It is highly recommended that drivers pass practical training / exams in low stress handling, fitness to travel – clinical assessment, as well as in actual driving or driving styles.

That involves testing the driver in in handling the vehicle in a safe and controlled manner, with due care for animals transported and other road users including:

- clear indication of intended manoeuvre and smooth use of controls (pulling away/gear change)
- avoidance jerky movements
- manoeuvring vehicle in a safe and controlled manner

9. ANIMAL WELFARE IN TRANSPORT AND MEAT QUALITY

Introduction

The pre-slaughter transport and handling of animals designated for human consumption is directly associated with the quality of meat offered to consumer. A lack of commitment to welfare and care for animals during this stage can lead to production of low quality meat and significant losses of the commercial value of carcasses.

Stress is the main indicator to assess the welfare of animals continuously exposed to stressful conditions, such as handling and transport to which they respond through a combination of biochemical, physiological and behavioural events. These reactions help them to reduce or eliminate adverse aspects of handling and the environment, as an attempt to regain body balance. During exposure to these factors, the body may undergo the following changes:

- **Alert reaction (alarm)** – the body prepares itself for a "fight or flight" reaction by activation of the sympathetic nervous system, that triggers the adrenal gland to secrete hormones such as corticosteroid, adrenaline and noradrenalin. These hormones increase heart and respiratory frequency rate, blood glucose concentration, vasodilatation, dilation of pupils and defecation, among other mediated effects;

- **Adaptation or resistance** – after a certain period of exposure to a stressful stimulus and release of more hormones (cortisol, adrenaline and noradrenalin), animals may recover from the alertness reaction and adapt to the new condition;

- **Exhaustion** – if the stressful stimuli are too intense and persist in the environment animals may not adapt to the new condition and the coping mechanisms start failing, depleting energy reserves. Excessive stress (distress) and suffering are outcomes from this condition and may lead to death of the animal.

Transport is considered stressful for farm animals because their normal routine of feeding and drinking and resting is altered, they are exposed to novel environments, sometimes mixed with unfamiliar animals, closely confined and subjected to noise and vibration and possibly extreme temperatures (Warriss, 2004).

Transport is a source of both acute and chronic stress. Short journeys can produce distress because of a cumulative effect of consecutive stressors derived from loading, short transport and unloading, without time for recovery. During long journeys, acute and chronic stressors can act together to exhaust the animals' ability to cope with stress. There is a direct relationship between transport time and the possibility of increased biological cost during transportation (Grandin, 2007b) which will produce carcass damage or low-quality meat (Gregory, 1998).

Meat Quality

Inappropriate pre-slaughter transport and pre-slaughter handling can negatively influence meat quality due to physiological alterations in the muscle metabolism that the meat producing animals may undergo.

The concept of **quality** is generally related to intrinsic aspects of the meat, such as appearance, palatability, yield, nutritional composition and food safety. However, there are changes happening in

this concept, and some authors already include in quality other aspects that include animal welfare. So ethical quality may refer to conditions which animals undergo during raising, from birth to slaughter. Other important aspects are related to sustainability of production systems and involve social, economic and environmental aspects.

Quality attributes as described by Paul D. Warriss, (2000):

- **Composition and yield** – amount of marketable product, percentage of lean meat and fat thickness, carcass conformation;
- **Appearance and technological properties** – colour, water-holding capacity, texture, streaks of fat within the muscle (marbling), and muscle physical-chemical composition;
- **Palatability –** tenderness, succulence, flavour and odour;
- **Product integrity** – nutritional quality, chemical, physical and biological safety;
- **Ethical quality – all procedures related to the welfare of pigs from birth to slaughter.**

Factors that may influence meat quality

Specific factors may influence meat quality, interfering with water-holding capacity, colour and pH, resulting in a significant economic impact in relation to carcass yield and quality of meat derived products. Therefore, the importance of each factor must be taken into consideration to achieve satisfactory economic results, meet market demands and reduce losses due to defects in meat quality.

- **Animal** factors **–** refer to individual characteristics of animals (genetic, reactivity, age, sex), that may influence stress susceptibility and meat quality. Among the genetic factors pigs, important genes affecting meat quality are the Halothane Gene (hal gene) and the Rendement Napole (RN^-) Gene or “acid meat gene”;
- **Ambient** conditions **–** raising system, thermal comfort, density, and farm and slaughterhouse facilities;
- **Transport** conditions – duration, thermal comfort, density.
- **Nutrition** – physical condition, feed composition and quality, water availability and quality;
- **Health –** absence of diseases and injuries, and feed safety during processing and storage;
- **Handling** – affects the way animals react during raising at the farm, transport, and the pre-slaughter stage. This is particularly important at the pre-slaughter stage when pigs are exposed to many stressful variables such as: fasting, changing environment, loading, transport, unloading, group mixing, handling and restraint;
- **Stunning and *post mortem* variables** – stunning methods and bleeding directly affect animal welfare and meat quality and are ethically important. *Post mortem* variables (cooling speed, electrical stimulation, maturation and storage type) also influence meat quality, and are associated with the technological aspects of processing.

Post mortem muscle metabolism and meat quality

Drastic changes happen to the muscle when an animal is slaughtered. Blood flow ceases, oxygen and components rich in energy (glucose) do not reach the cells and cellular metabolic products are not

removed. Thus, the muscle may use other energy sources in the absence of oxygen, for example glycogen. This is converted to lactic acid, which is responsible for pH dropping.

The glycogen to lactic acid conversion rate is an important factor in the metabolic processes and can directly affect water-holding capacity and final meat colour. However, muscle glycogen reserves in each animal may be exhausted during transport and other pre-slaughter stages as a consequence of many factors:

- Fasting associated with intense exercise (e.g. moving up and down ramps, keeping balance during transport);
- Long transport and lairage periods;
- Inadequate space allowance and insufficient resting time;
- Fighting (e.g. due to group mixing);
- Aggressive handling;
- Agitation due to lack of familiarity with handlers;
- Genetic lines susceptible to stress.

Meat pH curve

The final meat pH is established throughout different periods at *post mortem*, depending on the species, muscle type and level of stress that the animal was subjected to during pre-slaughter handling. The drop in meat pH is important to:

- Delay bad micro flora proliferation;
- Help determine flavour and odour;
- Promote meat tenderness, as some enzymes are dependent on acid pH to play a role in maturation.

Pigs and poultry have a more rapid drop in pH (affected by *post mortem* glycolysis rate) when compared to cattle and sheep (Table 8)

Table 8 ***Variations in pH drop in several muscle types and animal species***

Species	Muscle type	Time (hours) to reach pH 5,5 – 5,7
Pigs	*Longissimus do*	6
	Adductor	8
Poultry	*Pectoralis*	1.5
Cattle	*Longissimus dorsi*	18
	Adductor	22
	Sternomandibular	25
Sheep	*Longissimus dorsi*	16

Source: Jensen *et al*. (2004)

The occurrence of meat defects such as DFD is directly related to the speed at which the pH drops in the muscle are associated with temperature. In some species such as beef, DFD is more prevalent, while in other species such as pigs and poultry, other meat defects PSE is more common.
The final pH in pork meat is normally in the range 5.5 – 5.8 (dropping from 7.0 – 7.2), which is reached within approximately 6 to 8 hours *post mortem*.

Meat defects

DFD meat

Meat with the DFD defect, standing for dark, firm, and dry, is a consequence of inadequate *ante mortem* handling, which determines muscle glycogen utilization, contributing to an elevated final pH (reduced production of lactic acid due to low glycogen reserve).

This condition is observed in animals subjected to a long duration of stress (chronic stress), and is generally related to handling at the farm, mixing, fights, inadequate conditions during transport but also in the holding area at the slaughterhouse.

Image: Pork loin sample (Longissimus dorsi) with DFD

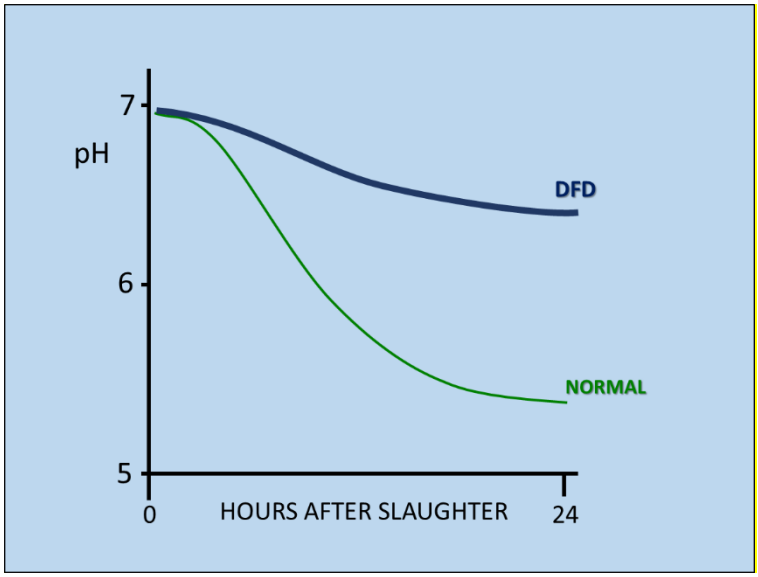
For DFD, the elevated final meat pH (around 6.0) reduces growth of good microflora i.e. lactobacilli and favors proliferation of putrescent microorganisms responsible for depreciating the product, as well as changes to physical, biochemical and organoleptic properties of the meat, resulting in:

- High water-holding capacity (WHC) in the muscle fibers, promoting a dry appearance on the surface;
- Firm texture;
- Dark coloration;
- Short conservation period (shelf-life);
- Meat improper for elaboration of industrialized products (fermented product).

To reduce the incidence of DFD meat, it is necessary to **minimize stressful factors during pre-slaughter handling**. Thus, the following are recommended:

- Move animals in small groups, in a calm manner, from the farm, during transport and all the way to the holding pens at the slaughterhouse;
- Load and unload pigs calmly, do not use an electric prod;
- Keep a short interval between transport and lairage, with adequate pen space allowance;
- Avoid mixing unfamiliar animals during transport and at holding;
- Promote thermal comfort, avoiding heat and cold stress.

Image 57 Post mortem *pH curve for normal and DFD pork meat Source: adapted from Gregory (1998)*



Injuries and bruises

During loading and unloading, transport injuries and bruising occur commonly in all animal species (Grandin, 1990). These defects occur by forceful contacts in passageways, in compartments and in containers, through fighting between animals

Considerable financial losses are incurred by the livestock industry as a result of carcass bruising (Grandin, 2007b). Observations and studies indicate that a very high percentage of the bruising results from rough treatment during transport to the slaughter plant and during unloading or loading of livestock.

Cattle that were handled roughly had greatly elevated bruising compared with cattle that were handled gently. The skill of the driver and the quality of the road appear to be more important than the distance travelled. Stocking density is an important consideration, and high stocking density was associated in cattle with a twice time or greater increase in carcass bruising in both short and long distance road transport (Grandin and Gallo, 2007)

Also mixing groups of unfamiliar animals result in increased injures e.g. skin blemish in pigs. Skin blemish is a serious commercial problem in pork production. The skin blemish score reflects the amount of fighting in which pigs have indulged pre-slaughter (Barton-Gade et al., 1996). It was observed that 63% of 5484 carcasses from pigs in the EU had incurred some damage; with about 10% of carcasses was this moderate to severe.

Live weight loss

The loss of live weight and carcass yield during transportation of animals is of both welfare and economic concern. Most of the live weight losses during transportation may be attributed to the effect of withdrawal of feed and water; the gut contents can account for 12–25%of the animal's live weight. Animals lose live weight as a consequence of excretion, evaporation and respiratory exchange (Grandin and Gallo, 2007).

Sheep lose live weight in an approximately linear manner with increasing durations of transport from 6 to 30 h (about 8% loss of live weight after 24 h) (Knowles et al., 1998, 1995; Parrott et al., 1998). The rate of live weight loss over this period is very similar to that of sheep that have not been transported but do not have access to feed or water. However, after sheep had been transported for 72 h, there was a greater live weight loss than in non-transported sheep without access to feed and water (Horton et al., 1996).

The live weight losses during pig of 1–2 days transport, in general are 40–60 g/kg, and losses increase during hot weather conditions. Piglets may lose close to 7% of their body weight after transported up to 24 h (Lambooij, 2007)

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ANNEX I

Training of Drivers - syllabus

Assessment criterion 1: Legal requirements covering animal health and welfare during transportation.

Assessment content: (Theoretical classroom training/exercise)

When animals unfit for transport may be transported

- receive first aid treatment as soon as possible, be given appropriate veterinary treatment, undergo emergency slaughter without suffering if necessary

The animal welfare principles in transport

- animals are transported without delay
- person in charge of transport who is responsible for the animals regularly inspects animals and takes action necessary to safeguard their welfare
- precautions against very high and/or very low temperatures taken

Accommodation requirements of animals during transport

- animals shall have adequate space to stand in their natural position/lie down
- partitions required to protect from transport motion
- containers constructed to protect the animals against weather (as appropriate to species)
- sufficient lighting to allow the inspection and care of animals must be allowed
- ventilation and airspace as required for the species
- containers shall be easy to clean, escape proof and constructed to ensure safety during transport (as appropriate to species)

Who to approach for advice and guidance:

- police, private veterinarians, the competent authority

Assessment criterion 2 Responsibilities in animal transports

Assessment content: (Theoretical classroom training/exercise)

The people responsible for the welfare of animals during transport

- the keeper, the transporter, driver or attendant accompanying the animal, the organiser,

Which enforcement authorities have powers to inspect animals, documentation and vehicles before, during and after the journey?

- local inspectors, Veterinarians, Police

The powers of the enforcement authorities

- to safeguard welfare of animals and prevent contravention of the law
- to inspect animals, documentation and vehicles
- to prevent a journey from starting or continuing

The authorisation requirements for transporters and when authorisation is necessary

- all journeys over 50 km require a transporter authorisation issued by.....which lasts for a maximum of XY years
- short journey authorisation permits journeys of over 50 km and up to and including 8 hours issued by.....which lasts for a maximum of XY years
- long journey transporter authorisation which covers all journeys, including those of 8 hours or more issued by.....which lasts for a maximum of XY years

Assessment criterion 3 How to effectively plan and implement the transportation of animals

Assessment content: (Theoretical classroom training/exercise)
The requirements for timing a journey

- journey plan and timing for the collection and delivery of animals
- journey log/ plan – timings and distances, time taken to load and unload, to comply with maximum permitted travelling times from animals point of view
- calculation of distances maximum speeds, maximum driving times with 1 and 2 drivers from drivers point of view.

Planning of journeys from animal welfare point of view

- feed and water requirements before the start and during the journey appropriate to species
- rest requirements appropriate to duration of journey and species
- vehicle requirements and approval by the competent authority for specific species and categories of animals
- appropriate documentation and health certificates accompanying the animals

Preparation for contingency plans (on long journeys):

- accidents, breakdowns, animal-related problems, knowledge of who to contact for assistance
- when to seek help, and from whom, when problems occur during a journey
    - organiser of transport, (delays, changing weather or road conditions)
    - person at place of destination (delays and sick or injured animals)
    - police (breakdowns on highway, needing assistance to continue in the journey)
    - veterinarians (animals that become sick or injured)

The documentation requirements when planning and undertaking journeys

- knowledge of use equipment recording journey details and submits journey records to competent authority when required to do so.
- an animal transport certificate or equivalent journey logging documentation.
- animal transport documentation requires:
    - details of animal ownership
    - date and time first animal loaded and last animal unloaded
    - date and time of departure
    - estimated duration of journey
    - health status of animals
    - time(s) and place(s) where rest stops undertaken, including if the animals were offered liquid and/or fed
- The transporter retains equivalent documentation for 6 months as well as records of any deviations from the journey log/plan for completion at the end of the journey

Assessment criterion 4 State the vehicle requirements for transporting animals
Assessment content: Carry out vehicle inspection
The suitability of the animal transport vehicle - practical exercise within a vehicle

- appropriate roof
- signage to indicate that live animals are on board
- dividers/partitions are movable/adjustable
- anti-slip floors
- ramps with side protection

- means of access to animals within the lorries
- sufficient light for inspection
- adequate and functioning passive and forced ventilations
- functional means to feed and water animals as required
- when necessary adequate means to monitor temperature within the animal compartments

The vehicle condition should be checked to ensure that it allows for humane transport of animals:

- anti-slip floors control, adequate ventilation and control, adequate viewing lights, natural and artificial, suitable partitions, correct ramps designed for the type of stock to be loaded and a shallow angle as possible/ containers meet the requirements of the regulation, hydraulic lift (if appropriate), adequate head space, no sharp projections, no large gaps, strong enough to carry stock, adjustable for weather conditions

Temperature/ humidity within the transport vehicle/container.

- describe heat and cold stress, heat and cold spots on the lorry, air movement patterns (in moving and stationary vehicle or container or holding area)
- natural and passive ventilation, ventilation systems and their operation, parking the vehicle at right angles to the wind will aid ventilation

Assessment criterion 5 Fitness to travel

Assessment content:

How to check animals for fitness to travel

- undertake basic clinical examination of animals (skin, eyes, mouth, nose, ano-genital area, feet, joints, ears, respiration and heart rate, behaviour) , their ability to stand and walk towards lorry without assistance
- identify sick and injured animals
- identify animals not fit to travel, leave behind

How to care for unfit or injured animals during transportation

- regular inspections / Identification of problem
- call for appropriate assistance / take appropriate action
- separate from other animals and arrange aid as soon as possible (and if necessary undergo/ arrange emergency humane slaughter)

The requirements for transporting unfit animals

- conditions under which unfit animals may be transported:
    - if slightly ill or injured
    - under veterinary supervision

Assessment criterion 6 Understanding of animal behaviour, identification the causes and signs of stress in animals

Assessment content:

Animal behaviour; instinctive and learned behaviour, sensory modalities

The causes of stress in animals – stressors in general

- poor handling, sudden stimuli, unfamiliar, unpredictable and intense events ,fear, fatigue, pain,

Stress and distress, ability to cope with distress – caused by several stressors over a long period

- state of health, past experiences, age, animal's breed/ temperament

Stressors in transport:

- loading, extreme heat and humidity, journey duration, overloading, slippery wet floors, dust, vibrations, noise, unloading

Signs of stress:

- aggressive or abnormally timid behaviour, vocalisation, nervousness, high mobility, excessive urination and defecation, freezing, abnormal postures, shallow breathing, teeth grinding, excessive licking,

Signs of cold and heat stress and dehydration

The actions to be taken to reduce stress

- making sure animals are fit for the journey, rest stops, providing water and food to avoid dehydration, separation of animals of different sizes/familiarity, appropriate stocking densities – adjustments according to climatic conditions, additional adjustments to young, old or sick animals,

Assessment criterion 7 Principles of low stress handling, loading and unloading, correct stocking densities.

Assessment content:

Low stress handling principles and considerations when loading and unloading animals:

- sensory modalities, flight zone and point of balance of the animals, lighting in lorry and loading/ unloading areas, handling aids (appropriate to species). electric goads (including restrictions) prohibited methods (e.g. pointed sticks)

The space allowances for animals being transported

- recognition of correct stocking densities - overload and under-stocking (observation of the lorry)
- placing animals in correct sized pens/crates for transport.
- adequate space to stand in natural position and room to lie down where necessary and as described in the legislation
- recognise the effects of overcrowding and under stocking

The segregation requirements of animals being transported

- separation of animals into appropriate size groups prior loading by ; species, size, gender, conditions (e.g. pregnant), horned or not, temperament, family/social group,

Assessment criterion 8 Journey and post-journey requirements

Assessment content

The requirements of the holding area / resting point prior loading and unloading

- sufficient space, food and water, timing, correct temperature, effective ventilation

The requirements for cleaning the vehicle and checking its condition

- driver and /or attendant must ensure cleanliness of vehicle after each journey or as soon as is practical after the journey and before animals are loaded on to the vehicle again (at least within the following 24 hours).
- keep the vehicle clean by the use of appropriate cleaning and disinfecting agents

Identify journey and post-journey requirements

- the documentation and reporting procedures post-journey

- the journey log (transport certificate) is completed and returned to competent authority
- copies of the documentation must be retained by the transporter and the keeper at the place of destination for XY years so that checks can be made at a later date