



Module 25

Livestock: Transport and Markets

Lecture Notes

Slide 1:

This lecture was first developed for World Animal Protection by Dr David Main (University of Bristol) in 2003. It was revised by World Animal Protection scientific advisors in 2012 using updates provided by Dr Caroline Hewson.

Slide 2:

In this lecture we will consider the primary welfare issues for animals being transported and sold at markets, and how their welfare can be improved.

Slide 3:

Animals are transported to markets by their owner in order to sell them (a) so they can be slaughtered and provide us with meat, or (b) because other farmers want to take them on, e.g. for breeding or replacement stock, or for fibre or meat production.

Bad conditions during transport and/or at market causes animal suffering and, consequently, economic losses. The main areas of economic loss for the farmer or abattoir are:

- death of the animal because of poor transport conditions, baulking and suffocation
- injuries
- dehydration
- disease of the newly bought stock because of transport and market conditions
- poor meat quality because of chronic stress

It makes economic sense to follow minimum standards of care for animals during transport. The World Organisation for Animal Health (OIE), which represents ~178 countries, has issued detailed standards for the humane transport of a variety of livestock by land and by sea. However, a survey of member countries in 2008 indicated that some members were not aware of these standards.

Slide 4:

Regardless of how animals are transported, the transport itself has several stages. They are:

1. pre-transport handling, e.g. collecting up the animals on the farm, and withholding food and water from them in preparation for travelling
2. loading, the methods of which depends on the facilities at the farm (as well as the vehicle itself) and on the experience and attitude of the people doing the work
3. the journey: once the animals are loaded, their journey begins.

Slide 5:

Typically, livestock are transported by road. Their welfare at this point depends on several factors, such as the distance and duration of the journey, the type of vehicle, the driver's skills and the road surface.

Once they reach their destination the livestock are unloaded. The unloading is affected by the design of the unloading facilities and by handling. Handling may include examining each animal in order to see his or her identification, e.g. by checking brands or ear tags.

Once unloaded, the animals are held in holding pens before sale.

Each of these transport stages could be stressful, meaning that by the time the animals reach their destination they will have been dealing with the cumulative effect of a series of stressors. A few examples are:

- food and water withdrawal
- loading and unloading – goad use, stick marks and bruising, potentially poor ramp design
- prolonged physical effort of maintaining their balance during the trip
- handling by different stockmen
- duration of the live transport
- high stocking densities in the truck – heat stress
- extremes of temperature and humidity
- mixing of unknown animals
- physical exertion
- unfamiliar vibration, noise and environment .

Slide 6:

Each stage of transport creates new and potentially very stressful experiences for livestock.

Later in this lecture we will look at each species in turn. However, some of the issues are common to all species, so we will first go through the main areas of concern. We will adapt the four-point framework of the Welfare Quality® project to guide us.

This framework has been presented in several of the other lectures. Please take a minute to review the four areas.

Slide 7:

We start with area 1, good feeding. Preparing animals for transport often involves withholding food, to prevent diarrhoea, vomiting and travel sickness. Not withholding food increases transport mortality in pigs. However, lack of food for more than 12 hours causes prolonged hunger. Animals sometimes travel hundreds of kilometres to the market, and they may be in transit for two or three days without food. This causes prolonged hunger and thirst, and weakness. Longer fasting increases microbial contamination of intestines in poultry and pigs, which carries health risks.

Dehydration can be a particular problem for poultry and pigs, especially in hot climates or when they are very stressed by transport for other reasons such as overcrowding.

Slide 8:

Moving on to area 2, good housing, there can be a number of problems, as listed on the slide.

When animals are packed too tightly they may become aggressive, and not have enough space to stand or rest comfortably. However, if there are too few animals in a trailer and they are not tethered or supported, they may slide about and fall and injure themselves.

The surface underfoot is important, both during loading and transport. If it is slippery, and the animals have to walk around sharp bends to get to the trailer, they may slip and injure themselves. Also, they may need a ramp to walk up into the vehicle. If the ramp is not at the right angle, and if it has cleats that are too close or too far apart, the animal's foot may slip and they may fall and injure themselves.

Heat stress is common when fatteners with a relatively fast metabolism (generating lot of heat in stressful situations) are transported in high stocking densities, even in mild climates. The risk of heat stress is increased with higher humidity. In the case of broiler transport, the difference between outside temperature and temperature inside the lorry is 9–12°C.

Cold stress in transport is not often seen, and it is related to specific climatic conditions. Animals at the end of their production cycle (such as laying hens) and young animals such as piglets are more prone to suffer cold stress in inappropriate transport conditions.

Journey times and distances are very important factors for animals' overall stress levels and comfort. They are related to the design of the vehicle and the road surface, e.g. a vehicle that does not have shock absorbers and is travelling on a rough road will mean a very uncomfortable ride for the animals.

Slide 9:

Transport can cause animals to suffer various problems in the broad area of health.

The first problem is pain if the handler prods the animal with an electric goad or hits the animal with a stick. Typically, handlers do this because the design of the handling facility or the vehicle frightens the animal and makes him or her reluctant to move. Other reasons may include habit on the part of the handler, and lameness or other pre-existing problems in the animal which makes it hard for them to make their way forward.

Muscle or leg weakness occurs when animals have grown rapidly with large muscle mass but an immature skeletal system, e.g. pigs, broilers. Most of the animals kept in confinement have very weak legs, spending almost their whole lives in pens or tethered, standing or lying. When moved to the vehicles they have difficulty walking, and this is not often understood by handlers. Keeping their balance during transport is also problematic to them. Animals may suffer bruising if they fall down in the vehicle due to fatigue and muscle weakness.

Many laying hens have osteoporosis at the end of lay, and if they are handled roughly during transport their wings and legs may break, causing pain. Pigs can also suffer from motion sickness and nausea.

Young animals are especially at risk of disease because the cortisol and sympatho-adrenal responses to the stress of transport reduce their immunity, while being mixed with strange animals at the market increases their exposure to pathogens.

Similarly, the stress of transport may make animals of all ages more likely to shed verotoxigenic *Escherichia coli* (*E.coli* 0157), which can cause fatal diarrhoea and toxæmia in both animals and people.

Slide 10:

A lack of appropriate handling by humans during loading and unloading can contribute greatly to animals' stress.

When people are not trained, and when the handling facilities make animals move slowly or stop from fear, the handler may beat the animal, twist the animal's tail, shout at them, etc. This makes the animals even more fearful and greatly increases his or her stress.

Some animals may also be scared of other animals, particularly when there is mixing of animals en route or on arrival at the market.

Excessive aggression may also occur when unknown animals, i.e. young males, are mixed during transport, especially if there is overcrowding.

Slide 11:

You now have an overview of the stages of transport and the variety of animal welfare problems that can arise.

You can see that there are many welfare challenges in transporting animals, because there are so many elements that can cause them stress in a relatively short space of time.

Note that all the causes of stress during handling and transport can also have significant negative impacts on meat quality and cause pale, soft, exudative meat, which results from the metabolic changes of stress and an acid pH in the muscle at slaughter. The resulting meat is worth less. Knowing all this, we shall now focus on how to improve the welfare of animals during transport.

Because many of the solutions are general to all species, we will look at the general principles of improvement first. Then we shall look at some of the most common livestock species.

Slide 12:

The following principles apply to improving the welfare of any species of livestock, including all the ones we have just mentioned.

First, you can improve welfare inputs. Welfare inputs are the resources available to the animal. In the case of transport we are talking about the stockperson who prepares them for transport and loads them onto the vehicle, and the design of the handling facilities, e.g. the chute leading to the truck.

The design of the vehicle is very important. So is the driver. Related to both of these inputs are the road conditions and weather that the driver has to deal with.

The animal's genetics and experience are also important welfare inputs. We will consider those by species later on.

Incentives and penalties may cause the stockperson to try to improve his or her animals' welfare. This can include economic premiums or penalties, and bans on transporting animals or imprisonment, depending on the law. Typically, economic penalties can be imposed by the abattoir or the retailer whom the abattoir may supply – the abattoir may pay a premium for carcasses without signs of injury, or may penalise the farmer if carcasses are bruised.

Auditing simple, quantifiable traits (e.g. the number of animals who fall when getting off the truck) provides data to help farmers, hauliers and abattoir workers see how changing their behaviour can bring about improvements. The level of that concern may in turn depend on many factors, such as average income level, public awareness and culture. For example, countries may have laws about farming, but no money to provide inspectors to enforce the law. Module 5 on legislation explores this in more detail.

Finally, as vets in practice you can always advise and help farmers to improve their welfare inputs.

You will find that some farmers and stockpeople may be unwilling to follow your advice. There may be many reasons for this, some of them related to human factors such as temperament and communication. Research on this is only just beginning, and will need to be done in each country, since cultural and other factors concerned will vary.

However, many farmers will be open to your advice. They will want to use incentives and to observe the law to ensure their animals have good welfare.

Slide 13:

On-farm, the stockperson can improve the wellbeing of animals in transport by preparing them well.

This may include training a 'lead animal' for social species such as sheep or goats. The lead animal learns that walking through a chute and onto a vehicle does not cause any harm, and he or she can be placed at the front of a group of animals who need to be transported, to lead them onto the vehicle.

Other preparation includes ensuring calves, especially newborns, receive enough colostrum so that they are less susceptible to disease if they are transported in the first weeks of life, and also vaccinating animals as appropriate, e.g. respiratory vaccines for calves and beef animals.

Cattle who have been on green pasture tend to have very wet faeces which can make the walkways and vehicle slippery. Feeding the cattle hay for two days before shipping can help to reduce this.

The stockperson's handling of animals can make loading them much less stressful.

Habituating animals to the presence of handlers among them is very important, e.g. every day, the stockperson should walk calmly through each pen of pigs or cattle, so that they are used to him/ her touching them, and to moving away from him or her without stampeding.

The animal's flight zone is his or her 'personal space': it is the area around an animal where he or she can see the handler and not feel so frightened that they run away. Livestock who are used to human handling may allow the handler to come right up to them. However, extensively reared animals may try to run away if the handler is closer than 50 metres from them. This is important when it comes to moving animals onto the vehicle.

Prodding animals with electric goads or beating them causes fear and is aversive. It can also cause bruising and it should not be necessary to use either, except in very rare cases. Using a trained 'lead animal' can minimise the need to prod or beat animals.

The stockperson should also be aware of prohibited practices such as the dragging of any animal onto a vehicle, or dropping or throwing them off the vehicle.

Slide 14:

When you load animals onto a vehicle (or unload them into a pen, or for slaughter) the handling facilities should minimise fear. A good design requires knowledge of the animals' sight, hearing, group behaviour and normal fear reactions. We will look at this more in Module 30, on human–animal interactions. Important examples are:

- moving animals down gently curved walkways, rather than straight ones or those with corners
- having solid sides to the walkway, so that there are no shafts of bright light falling onto the ground, because the contrast between light and shadow makes cattle, sheep and pigs baulk. This is a special problem if the animals are raised in very dark conditions on the farm, and are not used to natural light.

The flooring of the handling facilities that animals pass through on their way to the vehicle is also very important. It should be non-slip, especially because some livestock may already have sore feet from their housing, and some meat animals have weak muscles or joints, as discussed in the modules on livestock. If the floors are slippery, these animals may not be able to keep their balance and may easily slip and injure themselves. Also, when animals defecate or urinate, this makes the ground slippery.

Slide 15:

It is critical to use a good ramp when animals are being loaded onto the vehicle.

Some vehicles have a ramp as part of their tailgate. If the vehicle does not have a ramp, the driver should provide one. The lack of a ramp appears to be a big problem for the welfare of animals in low-income countries, as stockpeople may throw the animals off the vehicle when they are unloading them, causing a lot of distress.

To overcome this, the farmer could build a stationary ramp on the farm using concrete or wood. The ramp should be located in the yard where the vehicle could park beside it, and the animals could climb onto it smoothly from the chute or pens.

Alternatively, the farmer could buy a portable ramp, or make one with the help of local craftspeople.

Any ramp must be non-slip. That is, it must have concrete steps built into it. The steps should be no higher than 10 cm for cattle, or 8 cm for pigs, and they should be at least 30 cm deep.

Portable ramps should have bars of steel or wood placed across them horizontally. The bars should be 5 cm × 5 cm for cattle and 2.5 cm × 2.5 cm for pigs. The space between the bars should be just enough for hooves to fit between the bars – no closer or further apart. You can see from this that you will need slightly different designs of ramp for different species.

The angle of the ramp against the vehicle is important for each species. Cattle and pigs should have a very gentle slope of no more than 20 degrees. Sheep can tolerate steeper ramps.

Slide 16:

The vehicle itself should:

- have a strong, non-slip floor
- have a means of removing urine and faeces, e.g. absorbent litter or drainage
- have sufficient space and head room so that the animals can stand upright in their natural postures
- have adequate ventilation
- be easy to clean
- be escape-proof
- have no sharp edges or protrusions likely to cause injury.

Light is also important, because animals are usually afraid to enter dark places.

Slide 17:

The driver plays a very important role in the welfare of animals during transport. He or she has many responsibilities, and needs training to meet them all. Training programmes for drivers in many parts of Europe and the Americas have been shown to greatly improve the welfare of livestock. This slide and the next list the driver's main responsibilities.

Note the second main point, which is understanding the species being transported. You will see that journey times and rest stops are mentioned. How these are managed can seriously affect animal welfare. For example, a badly managed rest stop may be worse for animal welfare than if the journey was undertaken without a stop. Similarly, a long drive in a purpose-built vehicle and on smooth roads is less stressful than a much shorter journey in a badly designed vehicle and on bumpy, dirt roads.

The journey time and the need for rest stops may also depend on the environmental temperature and the nature of the vehicle and the roads. Some countries have regulations on journey times and rest stops, but not necessarily on vehicle design or driver training. When there is no good protective legislation, keeping journey times as short as possible is very important.

Drivers must also know how to recognise signs of stress and ill-health in the species, and be aware of the restrictions on transporting injured animals. They must also have contingency plans for injury or stress among the animals en route, including euthanasia plans.

Slide 18:

During the journey, the driver should be aware of the effect of the local weather and climate, and be able to adjust ventilation accordingly. He or she should also know how to clean and disinfect the vehicle between loads of animals.

Slide 19:

Long-distance transport (e.g. between continents) poses particular risks to animal welfare, because the journey times are so long.

This can be made worse if the species is not adapted to the climate or handling conditions at the destination – e.g. live cattle or sheep from a mild temperate zone and who are not used to handling being shipped to a hot, dry climate.

Transport can also become prolonged if there are many dealers and middlemen who buy stock and sell them on to farmers or abattoirs via markets.

Ideally, we should remove the need to transport livestock over long distances.

This would include:

- educating consumers
- encouraging retailers to source animal products locally
- building more abattoirs and markets locally, and auditing them.

Note that in the past small regional abattoirs or markets may not have had high standards of animal welfare, food safety, etc., and may have been closed down for this reason. This means much longer journeys to take animals to better – but more distant – abattoirs and markets.

Overall, livestock may not benefit from the removal of the badly run but local facilities. A better solution could be auditing the conditions of those markets and abattoirs, and educating the personnel, so as to raise standards there.

Slide 20:

Now we will move on to how incentives and penalties can help improve the welfare of animals during transport.

Specific welfare audits are best based on measurements of the animals themselves (welfare outputs) rather than relying on measures such as vehicle design and journey time. To obtain animal-centred measures, you should ideally watch 100 animals and calculate these percentages:

- the percentage of lame animals leaving the farm, and then the percentage who are lame on arriving at abattoir
- percentage of thin animals
- percentage of dirty animals leaving the farm and then the percentage who are dirty on arriving at abattoir
- percentage of animals with sores, bruises or lesions
- percentage of animals who are dead on arrival, or die before slaughter takes place
- percentage of animals with disease or injuries
- percentage of birds with broken wings and broken legs.

Producers, drivers and abattoir personnel could be penalised for causing bruising and the other welfare problems above, to incentivise improving their handling and transport of animals.

Slide 21:

Legislation to prohibit and penalise certain types of handling may also be helpful, but requires robust reinforcement.

Conversely, private audits conducted on behalf of other retailers may be immediately effective. Big retailers such as supermarkets and restaurants have helped to raise the standards of animal welfare at abattoirs in countries across Europe, Asia and the Americas. For example, the list of prohibited practices listed on the slide can be used to help to protect animal welfare during transport in countries where farmers cannot afford to use specially designed vehicles, but could at least provide ramps so that the animals can move easily on and off the vehicles without being dragged, dropped or thrown.

Slide 22:

Note that all countries should adopt the minimum standards of the World Organisation for Animal Health (OIE) as their norm for the welfare of animals in transit.

The OIE specifies nine groups of animals that are not fit to be transported. These are listed on the next few slides.

Slide 23:

The first four groups of animals that the OIE specifies as unfit to be transported are listed here.

Slide 24:

The last five groups of animals that the OIE specifies as unfit to be transported are listed here.

Slide 25:

In addition to groups of animals who should not be transported, the OIE makes note of animals who are at higher risk of welfare problems during transport, and who therefore need special handling or monitoring (listed on this slide).

A sub-group of particular concern is *culled animals*. These are typically production animals who are 'spent' and are no longer producing enough. They may be emaciated or weak; examples are high-producing dairy cows, sows or buffaloes, and laying hens. The condition means that they are likely to fall down and be trampled. Thorough assessment should be in place when deciding if cull animals are fit for transport.

In parts of the US and probably in other countries too, culled animals tend to be transported for longer distances than healthy, younger animals. The reasons for this are not clear, but may be because some abattoirs may pay slightly more money for the cull animals. If farmers sold

their cull stock before they became emaciated and 'spent', the culled animals would have higher financial value at slaughter which could help to improve their handling and shorten their journey times. Farmers could achieve this by fattening their old breeding stock instead of continuing to breed them until they are very thin or emaciated. In the US and other countries, educating farmers about this has been successful for animal welfare.

Slide 26:

Now that you have seen that the solutions apply to all species, we shall look at some of the most common livestock species: poultry, cattle and pigs.

Slide 27:

The principal welfare problems for transported poultry are injury, pain and distress during removal from houses, and heat stress in meat birds and cold stress in end-of-lay hens, as discussed earlier.

The removal of poultry from large, heavily stocked poultry houses is often done very quickly and without due care. The staff are often paid for the number of birds they collect rather than for the time they take. As they are being paid 'piece rates', the incentive is to do the job as quickly as possible. Meat chickens may be carried upside down by the legs, and staff may carry three or four birds like this in each hand. Carrying the birds like this exacerbates leg pain, which they are often already suffering due to high growth rates (heavy bodies supported by weak legs).

Rapidly removing end-of-lay hens from cages or from tight spaces between perches causes bone fractures, as these birds are often suffering from osteoporosis due to high egg production. Moreover, many laying hens who are kept in perchery systems have keel-bone fractures. Rough handling of those birds at end of lay would make their pain worse.

Slide 28:

There are several different types of poultry transporter, including:

- those carrying loose crates
- those carrying modules with several drawers. In some modular crate systems, the birds are unloaded at the processing plant simply by tipping the crates, with the birds falling up to two metres onto a conveyor belt
- 'side-loaders' – fixed crates in which birds are directly loaded onto the lorry.

Informal transport is also used, in which the birds are crowded into containers which are not designed for them: there is not enough room and the birds are shaken about because the container does not protect them from bumps in the road. Birds may also be hung upside down on the outside of the vehicle. This causes them physical discomfort and fear.

Slide 29:

To help improve the welfare of poultry during transport, broilers and group-housed laying hens could be collected by a mechanised system where rotating 'fingers' are driven slowly through the barn, gently moving the birds towards a conveyor belt which takes them to crates which are then put on the vehicle. The benefits and disadvantages of this system are still being reviewed through research

When birds are collected by hand, some experts recommend always picking them up by both legs, never by one leg. In some systems in Asia and Latin America, birds are collected individually with both hands.

The genetics of broiler growth and egg production may help to produce birds with stronger musculoskeletal systems, which would also help to prevent pain and injury during transport.

Training all animal handlers and drivers in correct handling, and paying them appropriately would help to reduce injuries due to rushed and careless handling.

The particular problems posed by long journey times and the hunger associated with them could be reduced on large poultry farms by having a slaughter plant on the farm. Improving the design of carrying crates, appropriate stocking density and better ventilation on the vehicle can all help.

Slide 30:

Audits are a very important way to help to help improve the welfare of poultry during transport, especially if the handler or farmer is penalised for producing a high percentage of injured birds or is paid a premium for a low percentage of injured birds.

The slide shows five types of injury that can be audited, including birds who die en route before being slaughtered. The percentage at which a penalty is paid may have to depend on the prevailing conditions at other plants, but ultimately only very low percentages of injuries should be permitted. For example, not more than 1 per cent of birds should have broken or dislocated wings. However, some plants in Brazil have a very low rate of only 0.25 per cent of birds who have broken or dislocated wings. This is probably true in other countries, and it proves the benefit to birds of having trained handlers who may also be paid a premium for low injury rates.

Slide 31:

We move on now to common welfare problems suffered by pigs during transport. Again, long journey times can cause hunger, thirst and dehydration. This needs careful monitoring as it is relatively difficult for pigs to maintain hydration, and they can easily become hot due to stress and crowding.

Many pigs either lie, sit or lean on others during transportation; however, if they are unable to do so, pigs from intensively stocked livestock buildings may have weak legs due to lack of exercise and can easily fall during transport. Those animals may then be trampled by the others, and die.

As we have noted before, rough roads and badly designed vehicles can cause jarring and discomfort during the journey.

Slide 32:

Pigs may suffer pain and injury during loading and unloading due to the use of goads to move them: pigs frightened of dark places are difficult to drive forward, which increases the use of goads or sticks by the handlers, causing further pain and fear. Bruising is another adverse outcome of transport in pigs if journey times are long and vehicles are crowded.

Slippery floors cause pain if pigs fall, especially if they already have sore feet from being kept in pens with slatted floors, as these are associated with foot injuries and pain.

The ramp angle and the spacing of the cleats (bars) on the ramp are important, so that pigs can easily walk on to the vehicle.

Pigs are very prone to motion sickness, which can cause them to vomit, retch, etc. Motion sickness can be minimised by withholding food for up to 16 hours before the anticipated slaughter.

If pigs are overcrowded, and especially if journeys are long, they are prone to fighting and injuries. Mixing stock from different pens also causes fighting and injury and should be avoided.

Slide 33:

Pigs can suffer fear during loading and unloading. This can occur if the farmer has not made a point of walking through the pens each day to accustom the pigs to a human presence. Fear is made worse when a goad is used.

Other causes of fear may be a steep ramp or a very dark vehicle. Lots of natural light can also cause fear or caution in pigs who have been reared in dark buildings.

You already know from our earlier summary that correcting these problems during transport requires attention to handling and to the design of the vehicle and ramp, as well as journey times.

Auditing welfare-based measures can also help, e.g. the percentage of bruised carcasses and the percentage of animals on whom the goad was used. As with poultry, the use of financial incentives or penalties can also help to raise welfare standards for transported pigs.

Slide 34:

Handling and design concerns will affect the welfare area of good housing, e.g. housing comfort, levels of pain, and animals' behaviour. One study of 560 cattle and buffalo at markets in Bangladesh indicated that ~60 per cent of buffalo had infected or injured noses from use of the nose rope and ~50 per cent of cattle had tail injuries (Alam et al., 2010).

Additionally, extensively reared cattle can find loading and unloading very stressful, if facilities are not designed to keep them moving steadily forward in a curved line without human intrusion into their flight zone. Lead animals may be helpful in this situation.

Cattle are less likely than pigs to sit or lie during transport – they will only do so when exhausted.

Slide 35:

Again, correcting these problems involves educating stockpeople with regard to ramps, flight distance, lead animals, etc., so that bovines will move easily and more confidently onto vehicles.

Journey times are also important, as long journeys at high stocking densities can be associated with high levels of bruising. Incentives, penalties and audits can all help here.

Slide 36:

The principal causes of poor welfare for sheep and goats include the following.

- Dehydration: this is a danger if sheep are given a break for feeding and watering – the sheep may typically eat first, but not naturally drink for several hours, by which time they have to get back on the vehicle and continue the journey.
- Heat stress can be a problem in certain climates, or if sheep from temperate climates are shipped to countries with very hot climates.
- Overstocking on vehicles presents problems with comfort, as animals cannot lie down.
- Legally required space allowances are difficult to set for sheep as the space required varies greatly – for example, for shorn or pregnant animals.
- Pain from bruising may occur if there is no proper ramp. Also, goats and sheep may easily experience fear during loading and unloading where dogs are used.

Training of personnel, auditing and careful stocking and monitoring of animals en route are ideal ways to correct these problems. In addition, loading and unloading can be made easier by the use of ramps and lead animals, who will calmly lead a group of sheep or goats on or off the vehicle.

Slide 37:

Rabbits are frequently subject to long journeys as there are relatively few abattoirs with facilities for rabbit slaughter. Rabbits are transported in crates or containers that are not equipped to provide food or water during transport or while awaiting slaughter in the holding pens. Stress, coupled with the lack of food, puts them at high risk of digestive upsets with overgrowth of the organisms in their hind gut, and possible gut pain and toxæmia.

Horses may be transported for very long periods in countries where there are few abattoirs for horses: in North America, journey times may be 48 hours or more, especially if the driver has to collect horses from several different farms en route.

During transport, horses are prone to hunger, thirst, injury from falling, and exhaustion or injury from being tied up so that they cannot lie down. They may be strangulated by the tie. Being thrown off the vehicle is also a risk during unloading in countries where very weak equids are transported and no ramps are available.

For all these species, correcting transport-related welfare problems involves the principles we discussed earlier with regard to vehicle design, rest stops on long journeys, appropriate handling, etc. Injuries in horses may be reduced by providing individual stalls or boxes and using only single-decked vehicles for horse transport.

Slide 38:

We shall now move on to briefly review the welfare problems of animals at markets and how to improve the welfare of animals there.

Slide 39:

Note that there are two kinds of market:

- *dry markets*, where live animals are sold on, either for slaughter at the abattoir or for life on a new farm; the picture on the left shows a dry cattle market in the Philippines
- *wet markets*, where live animals are sold directly to consumers. The consumer chooses the animal he or she wants to eat and then either the vendor slaughters the animal, or the new owner takes the animal home and kills him/her themselves. The picture on the right shows ducks at a wet market in Taiwan, held in stacked cages.

Slide 40

Livestock markets have been a traditional forum for buying and selling animals in many countries over the centuries. Auctions at markets have been a very effective system for small producers to buy and sell stock. However, in many countries most large farms have contracts with meat-processing plants and all poultry and pigs from these farms go directly to the meat processor; for these large producers, markets are no longer necessary.

Online markets also help to reduce transport and handling. Photographs and descriptions of the animals are given; the animals are then transported to their final destination without needing the middle stage of actually being present at the market.

However, for smaller producers, live markets are still an important means of selling their stock in most countries. Also, there may be dealers and middlemen who buy from those markets before selling animals on to a farmer in a distant area.

Markets can create welfare problems by:

- doubling the number of times animals are loaded and unloaded and the amount of stress caused by doing so
- increasing journey times, especially if there are relatively few markets, so vendors and potential purchasers have to travel long distances to attend
- mixing animals in holding pens, with animals from other farms whom they have never encountered before. This can cause aggression, fear, injury and the transmission of disease.

Additional problems are caused when animals are not sold. They then have to be transported back home and then re-transported to the same or other markets.

Also, dealers may present animals at several markets, or transport them on for sale to more distant markets to get a higher price for them. This can greatly increase the risk of animals contracting respiratory and enteric diseases en route.

Slide 41:

However, note that local markets and collection centres may not be bad for animal welfare, as they provide a local place where farmers can take their animals directly, meaning they do not have to travel a long distance.

Also, farmers do not have to hire a lorry that will go from farm to farm, picking up animals to take to a distant market. This minimises the period for which each animal will travel. Therefore, for some animals, well-managed local markets and collection centres can be a welfare advantage.

Slide 42:

To help improve the welfare of animals at markets:

- pens should have maximum stocking densities which are clearly marked on them (preferably allowing enough space so that all penned animals may lie down together)
- have sufficient pens compared to the market's throughput of animals, preventing the need to mix animals
- raised loading/unloading bays with non-slip ramps and floors should be provided
- ready access to veterinary treatment and means for humane euthanasia or killing of animals should be provided
- shelter from hot sun and extreme wind, wet or cold should be provided.

Slide 43

Other features of markets that promote animal welfare include:

- no sharp edges or protrusions in the pens
- good airflow and ventilation, appropriate to the species
- isolation pens, for sick animals
- milking equipment
- good lighting, to allow thorough inspection of animals
- sufficient personnel who are trained and proficient in animal care and handling
- vehicle cleaning and disinfection facilities.

Slide 44:

Wet markets typically might be local, but many lack proper management and animal welfare regulations. Welfare concerns include:

- the conditions of transport to market
- the conditions of transport home with the consumer
- holding conditions at the market
- slaughter conditions at the market (if personnel are not properly trained), or when the owner slaughters his or her newly purchased animal at home

The picture shows a lorry being loaded with ducks. They will be taken to a wet market in Taiwan to be sold and slaughtered. The ramp is very steep and one duck has fallen off and died.

Slide 45:

This lecture can only give you a broad overview of the problems involved with transporting livestock, and general approaches to solving them.

We have not discussed many specific measurements, as these depend on local conditions and existing standards or legislation. However, you can find more guidance in the texts cited in the reference list, and in the sections of the OIE *Terrestrial Animal Health Code* covering transport by sea and land.

To summarise, the primary welfare problems for farm animals during transport include facilities that are not adapted to the behaviour of the animals, and rough handling, resulting in injuries and distress to the animals.

Vehicle design and journey times are also a big concern, as is the mixing of animals en route to the destination.

Solutions include:

- education and training
- auditing and providing financial incentives and penalties to handlers, drivers and farmers
- limiting journey times and eliminating sales to middlemen or dealers
- improving vehicle design and the design of facilities.

