

**Comments on
Australian Standards and
Guidelines for the Welfare of Animals
Land Transport of Livestock**

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General comments

It is revealing to compare the *Australian Standards and Guidelines for the Welfare of Animals* with the EU Council Regulation (EC) No 1/2005. This Directive not only lays down mandatory standards for the welfare of animals during transport, but also requires that all journeys be fully documented, that documentation be audited by relevant authorities, that drivers have certificates of competence and that vehicles be inspected. To show how serious the EU is about compliance with the Regulation, by 2009 all vehicles transporting animals on long journeys (> 8 hours) must be fitted with navigation systems to trace and verify compliance with travel limits.

In contrast, many important conditions are stated as unenforceable guidelines in the Australian document. In the abridged RIS document it is stated that “... *most state and territory departments advise that there is unlikely to be any significant increase in enforcement costs of the prepared standards relative to the base case.*” In other words, relevant authorities plan to continue with the current *laissez faire* attitude to the enforcement of animal welfare legislation, and transporters can essentially do as they please. It is rather futile to draft welfare standards, no matter how good, when there is no intention or structure to enforce them.

Specific comments – Part A

1. Responsibilities and planning

According to EU Regulation 1/2005, a log must be kept on all long journeys, defined as journeys of 8 hours. Standard SB4.5iii for young calves recognizes the importance of documentation. The intention of a log is to allow non-compliance to be investigated, for example, if maximum time off water has been exceeded, if the driver has fulfilled his/her obligations to correctly load the vehicle according to standard SA5.4 and has inspected the animals as required by standard SA5.11.

Amended standard SA1.2

On any journey reasonably expected to take 8 hours or more, the driver must record:

- i) the source and destination of the animals and the drivers name;
- ii) the number of animals loaded, or the number of birds per crate in the case of poultry;
- iii) the date and time of departure and arrival
- iv) the date and time the animals last had access to feed and water;
- v) the date and time of all inspections, any problems detected and the actions taken.

This document must be retained by the person receiving the animals, and must be available for inspection by relevant authorities, both during and subsequent to the journey.

Many journeys in Australia are long and take place through isolated areas. Therefore careful planning is required to minimize welfare problems. Elements of guidelines

GA1.6, GA1.13 GA1.14 and GA1.16 should become standards to place a legal obligation on the people responsible for animal transport to produce a written plan for the intended journey and contingency plans for any interruption to the intended journey. It should not be necessary to produce a separate plan for each journey. Rather a generic plan for a particular route and species of animal should suffice, especially since contingencies are built into the plan.

New standard

On any journey reasonably expected to take 8 hours or more, people responsible must produce a written plan for the journey, including but not limited to:

- i) the location of rest stops and spells and arrangements made at these locations;
- ii) changes in procedure to minimize effects of adverse weather conditions;
- iii) actions to be taken in case of delays, such as mechanical failures;
- iv) methods to deal with illness and injury, including arrangements for expeditious humane destruction;
- v) emergency contacts.

Drivers must be thoroughly familiar with such plans, and plans must be available for inspection by relevant authorities.

Guideline **GA1.19** should become a standard, since there is no excuse for poorly maintained vehicles and the welfare problems that mechanical breakdown can entail.

New standard

All transport vehicles must be kept in good order and a maintenance logbook or record of servicing must be kept with the vehicle and be available for inspection by relevant authorities.

2. Stock handling competency

On-the-job training may or may not produce people who have expertise in handling livestock, depending on the competence of those doing the training. Bad habits and ignorance can be perpetuated in such a system. While it is not possible at present to demand that all drivers and handlers have certificates of competence, as in the EU, by the time these standards are reviewed, approved training courses must be set up to allow all persons involved to be certified as competent.

Future amendment to SA2.1

SA2.1 ... A person must be allowed to undertake these tasks only if they have a certificate of competence from an approved training course. This certificate may be revoked if the person breaches standards of animal welfare.

While at present certificates are not required for all the elements of competency in livestock transport set out in guideline **GA2.1**, drivers on long distance journeys, especially in isolated areas must be competent in methods of humane destruction. Otherwise sick or injured animals could suffer for long periods of time before a competent person is found.

New standard

All drivers involved in the transport of animals for over 8 hours must carry a well-functioning, penetrating captive bolt stunner with charges appropriate to the species being carried. Drivers must be trained in its use for the humane destruction of sick or injured animals.

4. Pre-transport selection of livestock

According to standard **SA4.1**, animals must not be transported if they have conditions that are likely to cause increase pain or distress during transport. Therefore, guideline **GA4.5** should be written as a standard, and not apply only to limb bones.

New standard

Livestock with signs of broken bones must be humanely destroyed without delay, unless veterinary advice recommends alternative measures.

5. Loading, transporting and unloading livestock

Standards in this section contain many good points to minimize risks to animal welfare, including the requirement for regular inspections. Suggestions are as follows:

Amended standard SA5.6

... injured animals must not be dragged. Livestock that cannot walk from the vehicle must be destroyed humanely on the vehicle wherever possible. Otherwise they must be humanely lifted off the vehicle for immediate destruction.

In standard **SA5.7**, how would it be possible to legally prove that an electric prodder has been used “excessively”? This is a term open to interpretation, which would effectively prevent any prosecution. Given the options for handling aids listed in guideline **GA5.9**, there is no need to use electric prodders.

New standard

Electric prodders must not be used on any animal.

It does not make sense to require only dogs that ‘habitually’ bite to be muzzled. By that time the dogs are recognized as habitual biters they have already bitten many animals, including some that the owner may not even aware of. ‘Habitual’ is again a term open to interpretation, which can prevent a prosecution.

New standard

All dogs must be muzzled while working with livestock.

Amended standard SA5.12:

Upon identifying a distressed or injured animal at an inspection, the driver must provide or seek assistance without delay.

The current wording of ‘at the first opportunity’ does not rule out the driver having a long lunch before dealing with the distressed animal.

Guidelines **GA5.39** and **GA5.42** should be written as standards to ensure that all animals are included in the time off water limits.

New standards

During spell periods, water must be easily accessible to all livestock, and livestock must be able to drink with normal posture.

At unloading, if the facility is unmanned or out-of-hours arrangements are to be followed, drivers must make sure that unloaded livestock have access to water.

B4 Specific requirements for cattle

The maximum time periods off water, and hence possible travel times, are too long. Mortality increases with increasing journey length in both cattle and calves (Malena *et al.*, 2006, 2007; Cave *et al.*, 2005). After 24 hours of travel cattle are tired and beginning to show signs of dehydration (Warriss *et al.* 1995; Knowles *et al.* 1999). Tarrant *et al.* 1990 note:

“At the end of 24-h journeys, slaughter weight cattle were very tired and were conspicuous in the lairage pens at the abattoir by lying down despite the unfamiliar surroundings and the nearness of strange cattle.”

Another reason for not extending time off food and water beyond 24 hours is the potential for pathogen growth (Hogan *et al.*, 2007):

“Based on the potential for enteropathogen growth and potential for an increase in stress to the animal, it is prudent to ensure that total time off food and/or water does not exceed 24 hours.”

Amended standard SB4.1

Time off water must not exceed the time periods given below:

Cattle over 6 month	24 hours
Calves 1-6 months old	18 hours
Lactating cows with calves at foot	12 hours
Calves 10-30 days old travelling without mothers	12 hours
Cattle in last trimester of pregnancy	12 hours

Journey times for some classes of animals must be limited. Cows carrying calves are likely to find bracing in a moving vehicle more difficult and to become more fatigued than lighter animals. Similarly young calves are likely to become fatigued during transport.

Ruminants store 15-20% of their body water in the rumen, and it has been observed that “... the metabolic effects of depriving animals of feed and water differ little from the effects of depriving them of feed alone” (Knowles, 1998). This observation highlights the importance of feeding all cattle other than unweaned calves immediately prior to transport.

New standard

Cattle must be fed adequate quantities of dry hay or fibre before transport to sustain them for the journey.

There is a dearth of research on the effect of transport on calves of various ages. Young calves have not developed following behaviour and so are more difficult to load. They have also not developed muscular strength and are easily be fatigued in a moving vehicle. The EU Regulation 1/2005 prohibits the transport of calves less than 10 days of age. Calves will lie down in transit if they have sufficient space and a comfortable surface,

which reduces fatigue and risk of injury (Todd *et al.* 2000, Knowles *et al.* 1997). Bedding also protects calves against cold stress.

Amended standard SB4.5

Calves between 10 and 30 days travelling without mothers must:

- i) be protected from cold and heat
- ii) be prepared and transported to ensure not more than 12 hours since the last feed
- iii) have an auditable and accessible record that identified the date and time that the calves were last fed, unless the journey is between rearing properties and is less than 6 hours duration
- iv) have enough room to all lie down
- v) be provided with thick bedding

Calves born prematurely must reach the same level of maturity as normal calves before they are transported. Cave *et al.* (2005) found higher mortality among calves transported in October than in August, in spite of more adverse weather in August. The most likely reason was that more late season calves, possibly induced calves, were included in the later shipments, and these calves were weaker and more likely to die during transport than normal calves. Therefore guideline **GB4.5** should become a standard:

New standard

Calves born earlier than a normal pregnancy term (including induced calves) must be at an equivalent stage of fitness when transported, compared with normal, full-term calves.

Small calves are at risk of dehydration during transport, and this risk is increased if they are scouring. According to general standards **SA4.1**, animals must not be loaded if they have conditions that will cause increased distress during travel.

New standard

Scouring calves must not be loaded until the scouring has been controlled.

B9 Specific requirements for pigs

Pigs need special consideration during transport because they suffer from motion sickness and may retch or vomit (Warriss, 1998). Large pigs are susceptible to heat stress and small pigs to cold stress, which must be taken into consideration in the standards.

Journey times specified in standards **SB9.1** and **SB 9.2** are too long. Pigs were very tired, hungry and thirsty after a journey of 24 hours. A journey of 8-16 hours was considered acceptable (Brown *et al.*, 1999). In the EU Regulation 1/2005, a journey may be extended from the maximum of 8 hours up to 24 hours only if pigs have continuous access to water. A journey of 48 hours, during which food is withheld, is far too long.

Amended standards SB9.1 and SB9.2

Time off water for pigs must not exceed 16 hours or 12 hours for weaners. A journey may be extended to 24 hours, but all pigs must have continuous access to water on the vehicle.

General Standard **SA4.1** states that animals fit for transport should be free from conditions that are likely to cause increased pain or distress during transport. If a sow were to farrow during transport, this would certainly have an adverse effect on the welfare of sow and piglets. Guideline **GB9.2** should be a standard.

New standard

Sows about to farrow or more than 80 days pregnant must not be transported, unless it is over a short distance to improve the welfare of the animals, and they have sufficient space and comfortable bedding on which to lie down.

During lactation the sow should not be deprived of food and water, but food and water have to be withheld for several hours before transport to prevent vomiting. Piglets are in greater danger of being injured (trodden on, squashed) by the sow during transport, so conditions of **SA4.1** are not satisfied. The EU Regulation 1/2005 does not allow piglets under 3 weeks of age to be transported. Guideline **GB9.3** should be a standard.

New standard

Lactating sows with piglets must not be transported unless it is over a short distance to improve the welfare of the animals, they have sufficient space and comfortable bedding on which to lie down, and piglets are protected from injury by the sow.

Pigs will lie down during transport, provided that there is sufficient space and the surface is comfortable (Warriss, 1998; Brown *et al.*, 1999). Lying down reduces fatigue and muscle glycogen depletion, while high stocking density increases mortality (Warriss, 1998). The suggested space allowances in guideline **GB9.6** are inadequate to allow all pigs to lie down at the same time. The 0.35m² per 100 kg pig is similar to the low space

allowance of 0.31 m² used by Warriss (1998), in which physiological signs of fatigue appeared after only a 3 hour journey. Warriss (1998) proposes a space allowance of at least 0.4m² per 100 kg pig and the EU Directive requires a minimum of 0.425m² per 100 kg pig.

New standard

All pigs must be provided with a space allowance sufficient for all of them to be able to lie down at the same time.

New standard

All pigs must be provided with a comfortable substrate to encourage them to lie down during the journey.

A high stocking density increases the risk of hyperthermia because pigs are less able to dissipate body heat when they are closely packed. Warriss (1998) and the EU Directive recommends a 20% increase in space allowance at high ambient temperatures.

New standard

Effective action must be taken to minimise heat and cold stress, as well as sunburn and windburn. Stocking density must be reduced by 20% when the ambient temperature exceeds 30° C to minimise heat stress.

B10 Specific requirements for poultry

Major welfare problems for poultry during transport are injuries sustained during loading into crates and thermal stress. Standards must include procedures to address these problems.

Injuries during loading occur frequently in caged end of lay hens due to the fact that they have osteoporosis. Under commercial destocking practices, 24% of birds have broken bones, with an average of 0.35 breaks per hen. This figure can be reduced to 5% when individual hens are removed by both legs (Gregory and Wilkins 1989 Gregory *et al.*, 1993). Breaks are distributed evenly around the body, not only in legs and wings, but also hips and the keel due to dragging across the cage (Gregory and Wilkins, 1989). Knowles and Broom (1990) comment:

“The conditions of housing, handling, transport and slaughter to which most hens are subjected result in such poor welfare that most people would find the current situation unacceptable.”

The same researchers also note that legislation is required to address these problems:

“... because of the low value of spent hens in particular, economic reasons alone are unlikely to bring about an improvement in transportation methods.”

Guideline **GB10.25** must be incorporated as a standard:

New standard

When removed from cages, end-of-lay hens must be held either firmly around the body or by both legs, not by a single leg, which could cause injuries. A breast support slide must be used for end-of lay hens.

Broiler chickens also suffer injuries as a result of catching and loading. 27% of broiler chickens arriving dead (DOA) have dislocated femurs and possibly die as a result of haemorrhaging (Nicol and Saville-Weeks, 1993). 35% of all DOAs are due to catching and transport injuries (Bayliss and Hinton, 1990). The observation that mortalities increase with increasing distance is probably due to the fact that more injured birds die during longer journeys (Whiting *et al.*, 1997; Voslarova *et al.* 2007). Nicol and Saville-Weeks (1993) conclude:

“... the physical injury which occurs during manual catching and loading is a severe welfare problem, and there is a need for development of more humane methods.”

Current catching methods injure birds. The number of birds allowed to be caught at a time in guidelines **GB10.23** and **GB10.24** contribute to this problem.

New standard

For meat chickens weighing less than 2 kg, no more than 4 birds must be carried in each hand. For meat chickens weighing more than 2 kg, no more than 3 birds must be carried in each hand.

Birds must have access to food prior to loading. Guideline **GB10.5** must be stated as a standard to avoid the temptation to withhold food, especially from low value birds such as end of lay hens.

New standard

Poultry, excluding chicks, must have access to food within the 12 hours before assembly for transport.

Temperature is acknowledged as the other major stressor and cause of death during transport (eg Bayliss and Hinton, 1990). Numbers of chickens which are dead on arrival increase as the temperature increases above 18° C (Warriss *et al.*, 2005, Whiting *et al.*, 2007. In fact the number of DOAs was 6.6 times higher when the temperature was above 23 as opposed to below 17 (Warriss *et al.*, 2005). Although the percentage of DOAs is generally low, it represents tens of thousands of birds that suffer and die during transport (Metheringham and Hubrecht, 1996). In addition, birds that do not die are exposed to same stressors. It is therefore completely unacceptable that there are no standards regarding the thermal conditions under which poultry are transported.

Heat loss in poultry occurs by radiation from body surfaces when they are warmer than the surrounding air, and by evaporative cooling from the respiratory system through panting (Nicol and Scott, 1990). Both methods are difficult within crates because only a small body surface area is exposed in crowded conditions, limiting radiative heat loss, and the surrounding air becomes increasingly humid, especially in the core of the load, limiting evaporative heat loss (Nicol and Saville-Weeks, 1993; Warriss *et al.*, 2005). Ambient temperature and humidity are not an accurate guide as to the conditions chickens are experiencing. Temperature is measured in the shade and not in a vehicle on a bitumen road, and humidity in the load is increased by the chickens themselves. Ventilation in stacked containers is inherently poor, as noted by Warriss *et al.*, 2005:

“...because of the confined and poorly ventilated environment in the transport containers, and the presence of wet faecal material and moisture in the air exhaled by the birds, humidity levels within the containers, and therefore experienced by the birds, were probably high relative to outside values.”

The risk of heat stress in stacks of crated poultry is therefore very high. On the other hand, feathers provide good insulation against cold. However, rain or road spray in exposed crates can wet birds, reducing insulation of feathers. Under cold, windy conditions birds can suffer hypothermia (Hunter *et al.*, 1997), especially if they are poorly feathered cage hens (Knowles and Broom, 1990). Guideline **GB10.13** must be incorporated as a standard:

New standard

Suitable covers that enable sufficient natural ventilation must be used to protect birds in containers from wind, rain and road spray in cold conditions.

Heat and humidity are not evenly distributed through the load of poultry because of pockets which are poorly ventilated (Hunter *et al.*, 1997). These differences must be considered when determining the potential for heat stress. Guideline **GB10.14** must be amended and incorporated as a standard:

New standard

The air temperature in all parts of a load of live poultry (excluding chicks) must not exceed 30° C when the vehicle is in motion. If this condition cannot be met, poultry must not be transported.

Ventilation through the chicken crates depends on the vehicle being in motion. Guidelines **GB10.15** and **GB10.16** must be amended and incorporated as a standard:

New standard

If the ambient temperature exceeds 30° C, vehicles transporting poultry must not be left stationary. Under these conditions, birds being loaded or awaiting unloading for slaughter must be shaded and air circulated around the crates by fans. Birds must not remain in crates for more than 2 hours after arrival.

High stocking density in crates increases the death rate (Whiting *et al.*, 2007). Risks under crowded conditions included suffocation, injury and heat stress. In hot conditions fewer birds must be loaded per crate to allow greater heat loss. Guidelines **GB10.9** and **GB10.10** must be incorporated as a standard:

New standard

All birds in crates must be able to sit on the floor at the same time. The stocking density in crates must be adjusted to minimise negative welfare impacts of hot and cold conditions.

B11 Specific requirements for sheep

The standard **SB11.1** allows for a maximum of 48 hours off water for adult sheep, and hence allows long journeys. After 24 hours of travel, sheep show signs of dehydration as the maximum ambient temperature approaches 30° C (Knowles et al, 1996). Clearly temperatures in Australia are often higher than 30° C. After 24 hours of travel sheep are also fatigued and are still lying down after a spell of 24 hours (Knowles et al, 1998). Muscular effort is required to brace on a moving truck, and as animals become more fatigued they are more likely to fall over and injure or bruise themselves. Time off water should follow the EU Regulation 1/2005:

Amended standard SB11.1

Time off water must not exceed the time periods given below:

Sheep over 4 months	28 hours
Lambs under 4 months old	24 hours
Pregnant ewes, excluding the last 2 weeks	24 hours

Guideline **GB11.7** seems to suggest that the 48 hour limit can be extended, which is unacceptable. The time off water limits must not be exceeded, less at the end of the maximum periods animals are within 2 hours of their destination

Ruminants store 15-20% of their body water in the rumen, and it has been observed that “... the metabolic effects of depriving animals of feed and water differ little from the effects of depriving them of feed alone” (Knowles, 1998). This observation highlights the importance of feeding sheep immediately prior to transport, so guideline GB11.3 should be a standard.

New standard

Sheep must be fed adequate quantities of dry hay or fibre before transport to sustain them for the journey.

Guideline **GB11.2** essentially allows the transport of animals that have profuse diarrhoea, disease, wounds, abscesses, flystrike or pizzle rot, since no action can be taken if such animals are loaded. This is contrary to general standard **SA4.1** which states that animals fit for transport should be free from conditions that are likely to cause increased pain or distress during transport.

New standard

Unfit animals must not be loaded but must either be treated or humanely destroyed without delay, unless they are being transported short distances for veterinary treatment or better facilities.

There are no standards referring to weather conditions. Guideline **GB11.11** should be included in a standard.

New standard

Effective action must be taken to minimize heat stress in all sheep and to minimize cold stress in lambs and newly shorn sheep. Stocking densities must be reduced in hot weather to allow sheep to effectively lose heat.

References

- Bayliss, P & Hinton, M (1990). Transportation of broilers with special reference to mortality rates. *Applied Animal Behaviour Science*, **28**: 93-118
- Brown, S, Knowles, T, Edwards, J & Warriss, P (1999). Behavioural and physiological responses of pigs to being transported for up to 24 hours followed by six hours recovery in lairage. *Veterinary Record*, **145**: 421-426
- Cave, J, Callinan, A & Woonton, W (2005). Mortalities in bobby calves associated with long distance transport. *Australian Veterinary Journal*, **83**: 82-84
- EU Council Regulation (EC) No 1/2005, 22 December 2004, at <http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2005:003:SOM:EN:HTML>
- Gregory, N & Wilkins, J (1989). Broken bones in domestic fowl: handling and processing damage in end-of-lay battery hens. *British Poultry Science*, **30**: 555-562
- Gregory, N, Wilkins, J, Alvey, D & Tucker, S (1993). Effect of catching method and light intensity on the prevalence of broken bones and on the ease of handling of end of lay hens. *Veterinary Record*, **132**: 127-129
- Hogan, J, Petherick, J & Phillips, C (2007). The physiological and metabolic impacts on sheep and cattle of feed and water deprivation before and during transport. *Nutrition Research Reviews*, **20**: 17-28
- Hunter, R, Mitchell, M & Matheu, C (1997). Distribution of 'dead on arrivals' within the bioload on commercial broiler transporters: correlation with climatic conditions and ventilation regime. *British Poultry Science*, **38**: S7-S9
- Knowles, T & Broom D (1990). The handling and transport of broilers and spent hens. *Applied Animal Behaviour Science*, **28**: 75-91
- Knowles, T (1998). A review of the road transport of slaughter sheep. *Veterinary Record*, **143**: 212-219
- Knowles, T, Brown, S, Edwards, J, Phillips, A & Warriss, P (1999). Effect on young calves of a one-hour feeding stop during a 19-hour road journey. *Veterinary Record*, **144**: 687-692
- Knowles, T, Warriss, P, Brown, S & Edwards, J (1998). Effects of stocking density on lambs being transported by road. *Veterinary Record*, **142**: 503-509
- Knowles, T, Warriss, P, Brown, S & Edwards, J (1999). Effects on cattle of transportation by road for up to 31 hours. *Veterinary Record*, **145**: 575-582
- Knowles, T, Warriss, P, Brown, S, Brown, S, Edwards, J, Perry, A, Watkins, P & Phillips, A (1996). Effects of feeding, watering and resting intervals on lambs transported by road and ferry to France. *Veterinary Record*, **139**: 335-339
- Knowles, T, Warriss, P, Brown, S, Edwards, J, Watkins, P & Phillips, A (1997). Effects on calves less than one month old of feeding or not feeding them during road transport of up to 24 hours. *Veterinary Record*, **140**: 116-124
- Malena, M, Voslarova, E, Kozak, A, Belobradek, P, Bedanova, I, Steinhauser, L, & Vecerek, V (2007). Comparison of mortality rates in different categories of pigs

- and cattle during transport for slaughter. *Acta Veterinaria Brno*, **76**; S101-S108
- Malena, M, Voslarova, E, Tomanova, P, Lepkova, R, Bedanova, I, & Vecerek, V (2006). Influence of travel distance and the season upon transport-induced mortality in fattened cattle. *Acta Veterinaria Brno*, **75**; 619-624
- Metheringham, J & Hubrecht, R (1996). Poultry in transit – a cause for concern? *British Veterinary Journal*, **152**: 247-250
- Nicol, C & Saville-Weeks, C (1993). Poultry handling and transport, in T. Grandin (ed) *Livestock Handling and Transport*, CAB International: Wallingford
- Nicol, C & Scott, G (1990). Pre-slaughter handling and transport of broiler chickens. *Applied Animal Behaviour Science*, **28**: 57-73
- Tarrant, P (1990). Transportation of cattle by road. *Applied Animal Behaviour Science*, **28**: 153-170
- Todd, S, Mellor, D, Stafford, K, Gregory, N, Bruce, R & Ward, R (2000). Effect of food withdrawal and transport on 5- to 10-day-old calves. *Research in Veterinary Science*, **68**: 125-134
- Voslarova, E, Janackova, B, Rubesova, L, Kozak, A, Bedanova, I, Steinhauser, L, & Vecerek, V (2007). Mortality rates in poultry species and categories during transport for slaughter. *Acta Veterinaria Brno*, **76**; S101-S108
- Warriss, P (1998). Choosing appropriate space allowances for slaughter pigs transported by road: a review. *Veterinary Record*, **142**: 449-454
- Warriss, P, Pagazartundua, A & Brown, S (2005). Relationship between maximum daily temperature and mortality of broiler chickens during transport and lairage. *British Poultry Science*, **46**: 647-651
- Whiting, T, Drain, M & Rasali, D (2007). Warm weather transport of broiler chickens in Manitoba. II. Truck management factors associated with death loss in transit to slaughter. *Canadian Veterinary Journal*, **48**: 148-154