Final report on the scientific background to the development of an animal welfare monitoring systems for drivers and third parties for transported cattle, pigs, sheep and horses

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The project “Development of EU wide animal transport certification system and renovation of Control Posts in the European Union” foresees a significant improvement of the equipment as well as the management of Control Posts (CPs) located at the cross roads of important flows of animals transported over long journeys in the EU; the development of a quality certification systems for the transporters of animals operating on very long journeys.

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1. INTRODUCTION

Hans Spoolder (Wageningen Livestock Research)

Background
The quality of transport of animals over long distances is very diverse (e.g. EFSA 2011; Nielsen et al., 2011), affecting health and welfare of the animals as well as meat quality and other economically relevant parameters. To improve the welfare of animals during long distance transports the Commission has asked the partners of the ‘Quality Transport and Control Posts’ project to develop a welfare certification system for transporters. The project is broken down in so called Work Packages (WP’s), and this report presents the results of WP2. The project focused on the following species: cattle, sheep, horses (for meat) and pigs.

Objective
The main objective of WP2 was to create a scientific basis for a welfare certification scheme for animal transporters, with emphasis on journeys exceeding 8 hours (‘long journeys’).

The scheme will be referred to in this report as the ‘Welfare Plus scheme’, and its actual development is the objective of the next WP in this project (WP3).

Approach
The following steps were taken in this part of the project, and summaries of the results are presented in the subsequent chapters:
1. The existing literature was investigated and competent authorities and drivers were interviewed regarding the fitness of animals to start a journey (Chapter 2).
2. An investigation was made on how electronically collected transport data should be standardised for welfare assessment and monitoring during transport (Chapter 3).
3. A stakeholder consultation and literature search were performed to list potential animal based welfare parameters to assess welfare during and after long distance transport (Chapter 4).
4. Protocols with indicators or measures, especially animal based, were developed and assessors were trained per species (Chapter 4).
5. The protocols were applied to 50 long journey transports for each species (Chapter 5).
6. In cooperation with stakeholders and experts an analysis was carried out on the welfare parameters, in order to rank the importance of the welfare measures following transport and give overall animal welfare classifications for the journey. This was done through a so called ‘Delphi’ approach (Chapter 6).
7. Finally, this deliverable lists the recommendations and main conclusions which were passed on to the next Work package in which the Welfare Plus scheme is being build (Chapter 7).

This report aims to present an overview of the work and the outcomes of this WP. For detailed results and discussions the underlying Deliverables D2.1 – D2.5 should be consulted.
2. FIT TO TRAVEL

An important requirement for all animal transports is that the animals are fit for the intended journey. The wording in Council Regulation (EC) No 1/2005 suggests that the criteria to consider an animal as fit for travel depend on certain characteristics of the journey, but this is not further specified in legislation. Because it is assumed that long journeys (>8 hours) are more challenging than shorter journeys it was questioned if fitness to travel deserves special attention with regard to long journeys. Perhaps higher standards of fitness should be required. This was investigated with the results of animal based measures scored during assessments after both short and long journeys.

Additional provisions for long journeys
The current legislation gives additional requirements for long journeys compared to shorter animal transports. The compartments with animals should have bedding, and it should be possible to water and feed the animals during transport and stops. Pigs should have access to water continuously. Moreover, a ventilation system should be in place to maintain temperatures with a range of 5 to 30 °C and the truck should be equipped with a temperature monitoring system. Finally, the personnel involved must have had training in animal handling.

Other specific requirements
Contrary to short transports, animals selected for long journeys should be checked by competent authority veterinarians before they can receive a veterinary certificate. Although there are no specific instructions for long journeys, there are some categories of animals for which there are minimum criteria that must be fulfilled. Interviews with competent authority vets indicated they do not experience difficulties when determining fitness for long distance transports. Probably animals with reduced fitness (e.g. sick or injured) are normally not selected for long journeys by farmers. For such animals there usually are alternative destinations more nearby. Practical guidelines for determining fitness such as the one developed for cattle (INTERBEV, 2007; UECBV, 2012) and the one being discussed for pigs (Chevillon, personal comment) are particularly useful for short journeys.

Assessment results
Numerous assessments carried out after long journeys for pigs, cattle, horses and sheep revealed that the vast majority of animals were fit after travel. Because it is not likely that these animals had recovered during the journey, it can be assumed they were fit at loading. In contrast, transports of culled dairy cows and sows in the Netherlands showed that regularly these animals were not wholly fit both before and after travel (for instance lameness). Despite these observations, they were considered fit for travel. Moreover, it was experienced that the total duration of transport from farm to slaughterhouse for these categories of animals can be more than 8 hours, but despite this these transports are not registered nor treated as long journeys. This is because they do not cross the border and are not registered in TRACES. For the comparison of fit to travel for long and short journeys it must be mentioned that the transporters involved in the research cooperated voluntarily, therefore our observations may not be representative for all long transports.

Conclusions
Based on the limited number of voluntarily participating transports to assess the level of fitness after travel it can be concluded that for long journeys the fitness of animals is ensured sufficiently under the current regulations and a strict interpretation of fitness to travel, but the fitness for travel of animals selected for shorter journeys needs to be better investigated.
3. HANDLING GPS AND SENSOR DATA

Michael Marahrens (FLI)

Introduction
A central improvement of the Council Regulation (EC) No 1/2005 compared to the Council Directives 91/628 and 95/29 is the requirement for electronic data to verify the transport organisation and the physical environment of animals during long transports. In the existing legislation the compulsory use of a ‘global positioning system’ (GPS) or ‘satellite navigation system’ (SNS) to track the route of the vehicle is specifically requested, with recording of open/close status of the loading door. It also requires temperature sensors in every approved means for long transports, combined with an alarm system. With these electronic systems it should be monitored that every long transport of animals is performed within the legally based limits of transport duration and temperature thresholds.

Assessment results
One aim of WP2 was to match the electronic data of long transports with the animal based measures, after completion of the journey. With this combination the results of animal based assessments could be supported by data on the physical environment, transport durations, transport break duration, etc. Although system providers were willing to discuss the technology they can provide, the retrieval and collection of real data appeared problematic. Transport companies have been reluctant to share information, and seemed generally unable to provide them in an interpretable format. These problems are related to the fact that providers of data collection systems use their own data formats. This makes it problematic for transporters to present electronic data in a uniform way to e.g. competent authorities. Consequently, for the same reason it was not possible in this WP to actually link the electronic data to other measures collected on arrival or to obtain a printed output from SNS. This was addressed during the Advisory Board meeting in Bologna (February 05, 2013) and it was agreed to use a different approach to harmonize the data formats and data flow.

Round table for system providers
During the Advisory Board meeting it was decided to perform a ‘round table’ with the main European system providers of SNS, after sending out a questionnaire to investigate the harmonization of the data collection performance and also the transmitting data formats. During two meetings: Amsterdam (June 18th) and Copenhagen (October 24-25 2013), all legal based data were included: geopositions, temperatures, and loading door status on a regular and also event orientated common time basis.

Standard management of satellite navigation system data
The European main system providers involved agreed to follow a common protocol in the future to present data of animal transports, including minimum requirements for the following areas:

Data format: All legally based data will be provided in XML format, the basis is the XML schema [XSD] used in the European Dear-Trace project. The data will relate to the positions of trucks in a format allowing simple visualization on common applications (e.g. ‘google maps’).

Time intervals: The data format will allow the storing of ‘unique identifier of a journey (JID)’, TRACES numbers, number of injured animals, etc., as required by Council Regulation (EC) No 1/2005. This information must be included manually, the inserting is performed either by the driver or the organizer using the Cabin User Interface (CUI) or using internet access. In particular the start and end point of the journey must be included. The collection of SNS-
data, temperature data, and status of loading door(s) takes place at least every 15 minutes (the maximum time interval). Additionally, asynchronous events will be stored as change of status, e.g. related to loading doors opening or closing, reaching temperature thresholds (alarms at +5 °C and +30 °C) and every malfunctioning of the system. There will be no real time data transmission.

Data flow: The minimum requirement is that the events in the journey log can be understood and interpreted. Data from SNS, collected according to this protocol (and in the format defined in the protocol as well), will be provided to competent authority on request within 30 days after a journey is finished (as required for the journey log by Council Regulation (EC) No 1/2005. Possible implementations are to send data by email, or to send an URL of system provider web-apps. During an inspection ‘on the spot’, data (in the XML format of the protocol) of the journey will be available within 30 minutes at least (sending data by email or extract data from OBU via USB connection). The availability of data during inspection depends on the availability of an internet connection, which should therefore be present.

Management tool for transport organisations or drivers
Another result from the project is the idea to develop a kind of a computerised management tool for risk based long transport organisation and planning. By developing this software tool, transporters will be able to work with own data (SNS and temperatures) and experiences (loading densities, day time driving, emergency cases, etc.) from former long transports to plan further transports in a risk based way. During the round table meetings the system providers of SNS discussed how to include this management tool into their system software, and it was agreed that this would require further research. Perhaps the development of a management tool for risk based transport planning is a topic for a future R+D project.

Requirements for a Welfare Plus certification scheme
It was agreed during the Advisory board meeting at Bologna (February 05, 2013) that to be included in a Welfare Plus scheme the transporters/organisations should provide information collected during the journey regarding:
• how they manage the access to the system (Truck-Trailer/Semitrailer)
• how they present data on management of transport durations and resting periods (including reachability of Control Posts, ferries, …)
• how they monitor temperature data (including alarms)
• how they add additional data to the system (e.g. journey log informations like journey identifier = TRACES etc.)
• how they present the legally required data to the competent authorities during spot checks (on the road) or after completion of the transport.

In addition, transporters or organisations should present how the data coming from the SNS system can be used for own quality management and transport planning, including how they fulfil the social requirements for drivers.
4. DEVELOPMENT OF ASSESSMENT MEASURES

Cecilia Pedernera and Antonio Velarde (IRTA)

Analysis of reports by the Food and Veterinary Office (FVO) of the European Commission shows that many Member States are failing to enforce Council Regulation (EC) No 1/2005 on the protection of animals during transport which, if enforced, would lead to substantial animal welfare improvements. The use of agreed protocols to investigate animal welfare following long journeys maybe a useful tool in this regard. The protocols may also be used to distinguish instances in which the welfare of the animals exceeds the minimum acceptable level, and attains sufficient levels to comply with a Welfare Plus certification system. Thirdly, they can be used by the transporters as a self-assessment management tool to identify welfare problems or risks, and to monitor improvements. Finally, the protocols can be used for research purposes.

In WP2 four protocols were developed to assess welfare after long journeys of animals arriving to Control Posts, slaughterhouses or assembly centres. The protocols were developed for cattle, pigs, sheep and horses, and were based on the four principles and 12 criteria of the Welfare Quality® project. They included animal based measures (ABMs) which are recorded by looking at the animal, resource based measures (RBM) regarding the environment in which the animals are kept and management based measures (MBMs) regarding how the animals are handled. The aim of a protocol was to provide a structured way for the assessment of animal welfare, for further use in a certification system. The protocols were developed in steps, firstly performing an initial selection of suitable measures, then testing these measures for feasibility & repeatability and finally adjusting the measures and preparing a final protocol.

First of all, a literature review and stakeholder consultation were carried out to find out the relevant measures to be considered during long transport based on a risk evaluation. There are four main stages during transport, where the welfare might be compromised: at loading, the transport itself, unloading and the arrival to a new environment. All of these were addressed on arrival after the long journey, and combined ABMs together with handling, resource, truck and transport information.

Table 4.1 Summary of the structure of the protocols

<table>
<thead>
<tr>
<th>Assessments</th>
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<td>At arrival</td>
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<td>General characteristics of the transport</td>
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<td>Truck characteristics</td>
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<td>Unloading</td>
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<td>Conditions during unloading</td>
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<td>ABMs</td>
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<td>Animal handling</td>
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<td>Resting pens</td>
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<td>ABMs</td>
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<td>Additional information</td>
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<td>Drivers checklist fitness to travel</td>
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The selected measures were tested in the field and a first assessment was made on the appropriate way to describe the measure and the way to obtain it. The horse protocol was tested on two trucks, allowing a total of 36 horses being unloaded at a slaughterhouse. Since horses are individually unloaded, the scoring system was primarily based on individual scorings. But as some of the horses are unloaded very fast, and most of the observations were performed in early morning darkness, the scoring of light to mild injuries, mild sweating spots, irregular movement other than severe lameness, appeared not to be feasible. Since the way horses are haltered during transport can cause discomfort, during this testing phase the feasibility of scoring the rope length and halter quality was tested and proved feasible.
Scoring the consistency of manure appeared difficult when horses were standing in the stalls and straw was moved during the unloading phase.

For sheep, while testing the protocol, it was realised that some measures could not be assessed at individual level (e.g. slipping) due to the large amount of animals unloaded in a row and to the speed of the unloading. Then, to obtain a higher repeatability of this measure, it was decided to record the occurrence of behavioural events at group level (e.g. no animal slips/at least one animal slips in the group). A group (hereafter ‘flock’) was considered as all the animals in each compartment of the truck being unloaded together. Flock size might then differ depending on the age/weight of animals unloaded and on truck characteristics.

Regarding cattle protocol, some differences appeared in relation to the unloading of the different categories of cattle. For example as the steers or broutards are unloaded very fast (they normally go out of the truck running), it was decided to assess less measures during unloading and keep the others for the assessment in the resting pens, where animals could be better observed than during unloading. The assessment of ABMs regarding health at the resting pens was difficult in the case of calves because they are normally housed in big groups, making individual scoring difficult. However, as the measures investigated were looking for extreme situations, it was assumed that those animals were spotted anyway.

In the case of pigs, due to the speed of unloading and the light conditions, assessing ABMs was difficult sometimes. However, the repeatability among observers increased after training.

All the measures where then tested for feasibility during the assessment of 50 commercial transports per species on animals arriving to Control Posts, slaughterhouses or assembly centres. Before testing the feasibility of the final protocols on the field, all the people involved in the assessments were trained in order to assure repeatability between observers. Training sessions consisted of presentations of the measures and the methodology to record them. Photos, videos and golden standards were used to illustrate the information and to test repeatability. After a theoretical session, all training courses included a practical session. In total four assessors were trained for the cattle protocol, three for the pigs protocol, six for the sheep protocol and eight for the horse one.

The results from the assessments are presented by species in the next Chapter (Chapter 5). Most of the ABMs showed to be feasible but as different categories of animals were assessed for each species, further research is still needed to test the protocol in specific conditions per animal category. Prolonged thirst, for example, is one of the main risks for animals being transported over long journeys, but suitable ABMs were not included in the protocol, due to lack of feasibility, and only RBMs were then used for this purpose. As these also proved not to be reliable (e.g. because they require the driver to testify on his own actions), further studies will be needed to define feasible and reliable measures to assess the level of hydration of the animals on arrival. It should be noted in general, that the information depended on communication with drivers was not always easy to access. This was mainly due to the driver’s availability, their willingness to collaborate and also due to linguistic barriers (despite the fact that all driver questions were translated into predominant languages of transporters).
5. TRANSPORT ASSESSMENT
5.1 Cattle

Béatrice Mounaix (Institut de l’Elevage)

Animal categories
In cattle, it was necessary to distinguish between five categories of animals to take into account differences in the behaviour during unloading. They were small calves (around 50 kg), medium sized calves (around 110 kg), heavy calves (so called ‘broutards’, of approximately 200 kg) and heifers and young bulls (of 500 kg). Due to the number of animals in a truck, assessments of small calves in pens were carried out on part of the animals only, but the sampling size varied according to the transport.

Field assessments
Fifty transports of cattle travelling over long journeys were assessed in France and Spain between June 2012 and May 2013. Forty-one transports were assessed by the French Institut de l’Elevage (IE), and nine transports were assessed by the Spanish Institut de Recerca i Tecnologia Agroalimentàries (IRTA). Depending on the transport, welfare assessments were carried out either at a Control Post (intermediate destination) or when arriving at the final destination (slaughterhouse or fattening farm). Per animal category different numbers of trucks were assessed: 17 trucks transported small calves, 5 for medium sized calves, 6 for broutards, 20 transported heifers and 2 had young bulls. They were transported by 2 or 3 deck semi-trailer or trailer trucks. All the inspected trucks were authorized for transport over long journeys, according to Council Regulation (EC) No 1/2005. Assessments were often performed on transports arriving at night times at the Control Post, within a very short unloading time, and in the absence of Competent Authorities. Therefore, it was not always possible to check for the presence and the quality of the compulsory equipment, especially temperature recorders, navigation systems and drinkers.

![Country of origin](image1)

The average transport time before the assessment varied between 16 hours (for small calves) to 34 hours in broutards. The corresponding average distance between the place of departure and the place where the assessments were carried out varied from 992 km (in small calves) to 1367 km (in heifers).

A total of 4811 small calves were assessed at unloading, only part of them being assessed in the pens. In other categories, a total of 1574 cattle was assessed both at unloading and in the pens. The average number of animals by truck was 284 in small calves (199 to 350), 83 in medium sized calves (80 to 89), 58 in broutards (55 to 64), 36 in heifers (22 to 58) and 41 (40 to 42) in young bulls. The unloading procedure took on average 30 minutes for small calves, 9 minutes for heifers, broutards and bulls and 13 minutes for medium sized calves.

Animal Based Measures
No animal was found dead in the truck, but 3 small calves (less than 0.1% of all small calves) died during unloading or in the resting pen shortly after the unloading, and 2 of them were also scored as exhausted. No cattle were unable to move without assistance. One bull showed fresh wounds on legs and lameness at unloading, and 3 calves showed severe lameness). Slipping varied according to the animal category, from 5.6% in small calves to 10% in broutards. Falling was only observed in 1.8% of small calves and 1.3% of young bulls. Reluctance to move was also rare, from 0% in broutards and young bulls to 5.5% in medium sized calves. No too thin animals were observed, except in medium sized calves (10%, but this could be up to 50% of animals in one truck). Dirty animals were mostly observed among medium sized calves (21.8% of animals) and in the two trucks with young bulls (60%, young bulls freshly loaded from pasture). The proportion of shivering, panting or sweating animals was low (< 1% on average) in all categories, as well as animals with diarrhoea (<5%).

Resource Based Measures
As requested by Council Regulation (EC) No 1/2005, all truck ramps were covered with anti-slip flooring material, with foot battens (except in one case due to a change of truck in emergency), but the ramp coverage with straw was correct in only 65% of medium sized calve transports, and in less than 35% of other cattle transports. The ramp slope complied with the relevant regulation for all categories and in all transports (except 4 transports of small calves), and no sharp edges or damaged area or poor drained area were observed on the ramp flooring. The light was adequate for both the animal orientation and for the handlers. Slipping areas were observed on the ramp in 40% of medium sized calve transports and in 16.7% of broutard transports. Gaps were observed between the ramp and the floor, in 65% of small calve transports and in 83% of broutard transports, and blocking zones (mainly shadows and dead ends) were present in 66.7% of small calve transports, and not observed in other categories of cattle. In all transports, for all categories of cattle, deck height was considered as adequate to allow for natural head posture, and the bedding in the truck (mainly straw) was sufficient, except in medium sized calves where 4 out of 5 transports appeared to have no bedding or insufficient quantity of bedding.

Management Based Measures
The handling was appropriate for all categories of cattle except for small calves where inappropriate handling was observed in 6 transports, mainly shouting and slapping animals, and pulling them in some cases. In this category, 17.6% of transports were scored as very bad (negative of all measures) and 14.2% were scored as good (positive for all measures).

Conclusions
The protocol that was developed and tested in the project to assess cattle welfare during the unloading phase proved to be feasible. The variability in parameter outcomes after long journey travels was low because of the overall good welfare conditions of these transports in our assessments. However, when welfare conditions were lower, for instance poor unloading facilities, the animal based parameters were sensitive enough to measure the impact on the animal welfare (slipping, falling, and reluctance to move).
5.2 Pigs
Patrick Chevillon (IFIP) and Michael Marahrens (FLI)

Background on pig transport over long journeys
Live pig transport over long journey (more than 8 hours) in Europe can be observed for two main activities: the transport of breeding pigs with high sanitary status to be preserved during transport (breeding sows, boars and piglets) and the transport of pigs, sows and boars for slaughter. Due to the lack of regular statistics the flow of pigs on long transports more than 8 hours is estimated to be 32% of live pigs in Europe.

Pig protocol peculiarities
Pigs are transported in large groups and unloaded in a very short time in the majority of cases (with the exception of future boars and sows which can be transported individually or in familiar small groups). The assessment needs to be performed by well trained assessors (to secure high observer concordance) at the unloading area and in the destination pens.

Field assessment
A total number of 51 pig transports were evaluated. Twenty-six assessment were carried out by IFIP assessors at two pigs slaughterhouses in the South of France (October - November 2012) and twenty-five by FLI at two slaughterhouses in Germany (December 2012 - March 2013). In Germany 9 out of 25 transportations were transports of sows/boars.

All vehicles evaluated were authorised for transport over long journeys, according to Council Regulation (EC) No 1/2005. In France the majority of vehicles were coming from the North-West of France (23 trucks) and the others from Spain (3 trucks). In Germany the vehicles were coming from northern or southern parts of Germany (20 trucks) or from France (5 trucks).

On average, the overall distance travelled between the place of departure and the place of assessment was 651 km. The average duration of assessed transports was 12 h 45 min, ranging from a minimum of 7 h to a maximum of 24 h 45 min.

The total number of pigs assessed in France was 4926 fattening pigs (110 to 120 kg of average live weight), with an average of 189 animals per truck. The total number of pigs unloaded and assessed in Germany was 2655 (same average live weight) and 763 sows/boars (205 kg of average live weight), with an average of 166 (fattening pigs) and 85 (sows/boars) animals by truck. The average time for unloading was 28 min in France and 20 min in Germany for both fattening pigs and sows/boars.

Animal Based Measures
On arrival, 0.09% of pigs transported were dead or not ambulatory at arrival in this study. Slipping was recorded in 3.8% and falling in 5.5% of the animals. Falling was seen in 2.2% of the fattening pigs and 2.1% of sows and boars in Germany.
Animals with low body condition at arrival (Low BCS) were not observed in fattening pigs in the 2 countries. In Germany a low BCS was seen in 11 sows/boars out of 763 (1.4%). 0.15% of pigs were lame or unable to walk at arrival and 0.1% (sows/boars only) in Germany. Animals with hampered respiratory problems at arrival were observed with 0.5%. Concerning the cleanliness on arrival, the percentage of pigs in score 1 was 26% and 12.6% in score 2. This last point can be related to the quantity of sawdust used for the transport and the weather conditions. The percentages of animals with wound score 1 and 2 were 8.8% and 3.7% respectively. We have seen 0.08% of the pigs with a rectal prolapse. We observed other limited problems in the resting pens at the abattoir after unloading (0.3% pumping animals and 0.12% of animals with liquid manure).

Resource Based Measures
The trucks assessed were semi-trailers and truck + trailer combinations with a total surface of 85 to 105 m² on 2 or 3 decks. Most of the ramps used had metal anti-slip floor (96%) and a few rubber mat (4%), so there was anti-slip floor used in every case. Holes, sharp edges were recorded rarely and in single cases. None of the ramps were covered with sawdust before unloading in France and Germany. The lateral ramps were correctly used and efficient. Gaps and steps were still present: between the lorry floor and the ramp (57%), between the ramp and the floor at unloading area (76%). In the majority of cases there were some blocking zones at unloading in relation with small or big steps, and with the slope of the ramp. The light was correct in the majority of cases. The average loading density of pigs in the lorries observed was 220 kg/m². Drinkers were available but sometimes not used (indicated by empty tanks) in winter. About the GPS and temperature equipment they are mostly present but the transporter did not use it or did not know how to manage this equipment in France (it was considered a ‘black box’). In Germany the observers were not allowed to have access to GPS and temperature data.

Management Based Measures
Appropriate handling in accordance with CE regulation was recorded on most transports of pigs (81%). We recorded 6% of transport personnel shouting too much, 14% slapping or hitting animals.

Conclusions
In general the protocol developed for the assessment of pig welfare after completing the long transport appears feasible to observe variations in associated animal based parameters and criteria. The pigs were evaluated to be in satisfactory welfare condition in general, nevertheless the most relevant problem related to animal welfare was the mortality during transport (0.094%). The mortality level is perhaps a little bit above the percentage observed for short transports in the two respective countries. The fitness of pigs at farm level is beneath the consideration of allowed loading density an essential premise to perform a good transport from animal welfare point of view. The relative high incidences of wounds appear to be in relation to mixing of the animals before transport. Another main problem observed in this study is the dirtiness of pigs on arrival, which can be seen in relation with the quantity of sawdust used at loading. Also, relatively high incidences of slipping and falling pigs indicate steps and blocking zones (between the lorry floor and the ramp), uncovered ramps (not enough sawdust) and in several cases unappropriated behaviour of handlers. The watering is not used during all the transport in winter or fresh periods.
5.3 Horses
Stefano Messori (IZSAM) and Kathalijne Visser (WUR)

Background on horse transport over long journeys
The transport of live horses over long distances is of important economic value, especially for Italy, due to the insufficient national production and to the strong market demand for live horses as opposed to carcases (Marlin et al., 2011). In 2012, more than 64,000 horses were transported towards Italy, mainly for slaughtering purposes (Italian Ministry of Health annual report, 2013).

Horse protocol peculiarities
Unlike other species, horses are individually penned during transport and unloaded one by one. This allows for individual assessment of most welfare parameters, compared to assessment in percentages of group of animals which is the case in other species.

Field assessments
Fifty-one welfare assessments of horses travelling over long distances to Italy were carried out from November 2012 to March 2013. Twenty-five evaluations were carried out by Centro Ricerche Produzioni Animali (CRPA) and twenty-six by the Istituto Zooprofilattico Sperimentale dell’Abruzzo e del Molise (IZSAM). The assessments took place either at a Control Post (intermediate destination) or at slaughterhouses (final destination). All horses were transported for slaughtering purpose. All the inspected vehicles were authorised for transport over long distances, according to Council Regulation (EC) No 1/2005. Most of the vehicles were coming from Poland (n=44), followed by France (n=3), Spain (n=3) and Austria (n=1).

On average, the overall travelled distance between the place of origin and the place of assessment was 1379 km. The average duration of transport was 24h, ranging from a minimum of 12.3h to a maximum of 62.3h (a case of a truck that got stuck in a snowstorm).

The total number of animals unloaded was 926, with an average of 18 animals per truck. Since the access to animal passports was not always guaranteed, the estimation of animal age (according to Council Regulation (EC) No 1/2005) was possible only for 424 horses. Among them, the majority was represented by adult mares (<24 months; 58.7%), followed by young horses (6-24 months; 33.3%), adult stallions (>24 months; 3.8%), foals (<6 months; 3.5%) and ponies (0.7%).
In about 90% of cases, a tarpaulin was covering one side of the truck at the arrival of the vehicle and was then removed prior to the start of unloading. The unloading procedures took 26 minutes on average.

**Animal Based Measures**

No animals were found dead, unable to move unassisted or severely injured at arrival while a total of 2 (0.2%) showed severe lameness. Slipping was recorded in 36.7% and reluctance to move on 9.6% of the animals. Fourteen horses fell down during unloading and 141 approached the ramp at a fast gait (galloping or jumping). Body condition score (BCS) was mostly within range of slightly poor to slightly fat (BCS 2 to 4), with only 2 animals considered as too poor (BCS 0 or 1) and 3 considered as obese (BCS 5). Signs of sweating were observed on 11.3% of animals. Horses coughing was recorded only at one transport. In the resting pens, no further signs of welfare and health problems were observed among the horses inspected after unloading.

**Resource Based Measures**

An adequate halter design was recorded for only 34.0% of the horses. Additionally, 2.6% of the horses had an inadequate rope length when attached during the travel. Eleven horses (with age over 8 months) were seen not wearing a halter. Most of the ramps assessed during the unloading were made of anti-slip metal floor (49 out of 51), the others of smooth metal floor (n=2). Holes, sharp edges and slipping areas on the ramps were recorded rarely (2, 3 and 6 transports respectively). In the majority of the cases (61%) the ramp was covered with bedding material. However, even when present, bedding quantity was adequate only on 7% of cases. In 39% of cases there was no ramp covering at all. Twenty per cent of the transports used no lateral protection on the ramp during unloading: lateral protection, when present, showed dangerous openings on 28% of the transports and sharp edges on 12% of the transports. Gaps (more than 10cm) between the lorry floor and the ramp were observed in 10% of trucks, gaps between truck and lateral protection on 50% of the trucks and gaps between the end of the ramp and the floor at 20% of the trucks. In 58% of the trucks the ramp slope was maximum 20°, being steeper than 20° in the other 42% of the trucks. Foot battens were present in 96% of cases. In all trucks, except one, deck height was assessed as adequate. For 16% of the unloadings, blocking zones were indicated by the assessor (e.g. large shadows, holes in the ground), causing a delay on the passage of the animals. The light was assessed as adequate for the animals’ orientation and for handling purposes, respectively in 87% and 83%.

The mean space availability per horse was 1.7 m². Stall partitions were present in all inspected trucks; 14% of the trucks had stall partitions with a high barrier in the front part. Potentially harmful openings in the stall partitions were present only in 4% of the trucks. Overall, 58 horses were transported in a group while all the others were transported in single stalls. Bedding quantity in the lorry was sufficient in the vast majority of transports, with straw being the most common used material, followed by wood shavings. Water tank was either completely (50% of the trucks) or partly (50% of the trucks) empty at the arrival of the truck. Drinkers, when present, were mobile ones. Temperature monitoring system was only present and working in half of the lorries. All horses were transported on a single deck.

**Management Based Measurements**

Appropriate handling was recorded on most transports (70%). Nevertheless, in 2 transports forbidden practices, as defined by Council Regulation (EC) No 1/2005, were seen. Furthermore, handlers were moving excitedly during 8 unloadings, making loud noises in 9 and slapping the animals without reasons in 15 unloadings.

**Conclusions**

Overall, the developed protocol for the assessment of horse welfare during the unloading phase proved feasible and sufficiently sensitive to observe variation in parameter outcomes after long journey travels. Based on the results of the feasibility study, the horses were
assessed to be in satisfactory healthy conditions. The high incidence of slipping and falling do however impede an acceptable welfare status. These high incidences can be linked to the unloading facilities (e.g. too steep ramps) or management (e.g. lack of bedding material on the ramp). Additionally, the lack of drinking devices in some trucks and the tarpaulin covering one side of most trucks (likely to impair ventilation inside the truck) warrant further investigation because these are likely to have a major impact on the horses’ welfare.
5.4 Sheep
Evangelia N. Sossidou (Hellenic Agricultural Organisation-DEMETER, Veterinary Research Institute) and Stefano Messori (IZSAM)

Specificities of sheep assessments
Sheep transport within Europe involves 9.5 million animals every year, 62% of them being transported for more than 8 hours (Gebresenbet et al., 2010). A recent survey identified Italy as the main importing country, accounting for 50-60% of the overall sheep import, followed by Greece (7-13%), while main exporters were eastern European countries (Romania, Poland and Hungary) and Spain (Gebresenbet et al., 2010). Although there is a commercial importance for live sheep transportation, to date no protocol exists to objectively assess the welfare status of sheep transported over long journeys throughout Europe. In order to define a set of sheep welfare measures, the available literature together with the EC Regulations and the methodology of the Welfare Quality® protocols were used as base references. The protocol is divided into three parts: 1) animal based measures and management based measures recorded during unloading, 2) resource and transport parameters concerning the journey itself, and 3) a checklist for drivers on the assessment of fitness to travel at departure. This covers most of the adverse effects identified for the transport hazards and addresses 12 welfare criteria grouped into four main principles (good feeding, good housing, good health and appropriate behaviour).

Field assessments
Forty eight assessments were carried out on sheep transports over long journeys (trips > 8 hours) between October 2012 and June 2013. Twenty three of them were carried out in Greece, while 25 in Italy. The destinations of the truck were either Control Posts or assembly centres or slaughterhouses. All sheep were transported for slaughtering purpose.

All the inspected trucks were authorised to transport over long journeys, according to Council Regulation (EC) No 1/2005. The countries of departure for the Italian assessments were represented by Hungary (n=14), Romania (6), France (4) and Poland (1), while those arriving in Greece were coming from Romania (n=20), Greece (2) and Spain (1).

On average, the overall travelled distance between the site of departure and the destination was 1385 km for Italy and 979 km for Greece while the average durations of transport were 22.24 and 24.8 hours respectively. The total number of animals unloaded was 13,488 for Italy (mean 540, between 215 and 880 sheep per truck) and 5,592 (mean 373, ranging between 90 and 702 per truck). The outside temperature ranged from -1°C to 23°C. The average duration of the unloading was 22.8 minutes for Italian assessments and 9 minutes
for Greek ones, probably due to the smaller truck loadings. Most of the animals arriving both in Italy and Greece weighed less than 55 kg (about 92% and 96% respectively), according to EC Regulation classification.

Animal Based Measures
The percentage of animals dead on arrival and those that were unable to ambulate unassisted (‘non-ambulatory’) in both countries were very low (less than 0.5%). No animal with severe lesions was observed during unloading in Greece while 12 animals (0.09%) were observed by the Italian assessors. Falling was observed on most of the unloading, with number of animals ranging between 0.3 and 61.6% of the total and being more frequently observed in Italy. In particular, all the four trucks going from France to Italy had falling percentages higher than 10%, with a peak of 61.6% in one of them. On three of these same trucks, the highest rates of injured and non-ambulatory sheep were observed as well. Slipping was recorded for most of the unloaded flocks in Italy (87%) while in Greece it was less frequent (42%). On the other hand, reluctance to move was observed on one third on the unloaded flocks, with almost the same frequency in the two countries. Coughing events were recorded in 2 unloading in Italy and 5 in Greece.

All the assessments carried out 20 minutes after unloading, in the resting pens, did not highlight particular issues. On the 7483 (32% of the total) sheep inspected, only one was found dead in the pen, 17 were exhausted and 4 showed high respiratory rate. No signs of hampered respiration nor coughing were recorded in neither countries.

Resource Based Measures
All ramps used for the assessment were made of anti-slip corrugated metal and had lateral protections. Foot battens were present in all cases. No dangerous holes were recorded on the ramps while sharp edges were present in 15% of cases. Straw was used to cover the ramp during the unloading in 55% of cases, but on one fifth of the cases it was not in adequate quantity as to completely cover the ramp surface. No other materials were used by transporters for this purpose. Steps between the lorry floor and the ramp were observed rarely (3% of cases) while it was more common to observe a step between the end of the ramp and the floor (25% of cases). Ramp slope ranged widely (10 to 70% of the horizontal), being compliant with the Council Regulation (EC) No 1/2005 (less than 50% of the horizontal, corresponding to 26.34° angle) in about 85% of cases. In all but two transports, lighting condition during unloading was adequate, both from an animal (i.e. no light directed toward the animals) and staff safety perspective. Recording of RBM inside the truck showed that the more common drinker type was nipple drinkers (60%), followed by water bowls (20.5%) or both systems together (15%). Water storage tank was empty in 35% of cases and in 40% of cases drinkers were not functioning at the arrival of the truck. Nevertheless, the assessors reported difficulties to appreciate the current level of filling of some water tanks. Deck height was adequate for the transported category of sheep in the vast majority of lorries (85%). Bedding material, straw in almost all cases and sawdust in alternative, was present in all but one transports and the quantity was adequate in 85% of cases. The deck floor normally appeared as acceptably clean (80% of trucks). Temperature monitoring systems were not functioning in half of the lorries.

Management Based Measures
From the assessment of unloading management procedures it emerged that in about 60% of cases the handler behaved appropriately. In the remaining flocks, both forbidden practices, as defined by Council Regulation (EC) No 1/2005, and loud noises were performed on the 20% of cases. Handlers moving excitedly or hitting the animals were recorded more rarely (3 and 7% of unloading respectively).

Conclusions
The assessment protocol developed in this study can serve as a feasible tool to assess sheep welfare after long journey transports in on-field practical conditions. It provides direct
feedback to transporters on weaknesses and strengths of their work, and could be developed into a routine check for certification purposes, in collaboration with the transport industry.
6. DELPHI
Hans Spoolder & Vincent Hindle (Wageningen Livestock Research)

The Welfare Plus certification system requires clear cut-off values between different levels of each measure: certifiable, acceptable and unacceptable animal welfare scores. These cut-off values were determined based on expert opinion, using a Delphi procedure, in two phases. The 1st phase identifies acceptability of outcomes per measure, the 2nd phase identifies the acceptability level of the combined set of measures. For each animal category (weaner pigs, finishing pigs, calves, heifers, other cattle, horses, lambs and adult sheep) an own set of measures was used. In both phases the aim was to reach maximum consensus between experts.

During phase 1, experts were asked to provide two threshold levels on a sliding scale. All values smaller than Threshold 1 were considered ‘certified’, and all values larger than Threshold 2 were ‘unacceptable’. Values between Threshold 1 and Threshold 2 were ‘acceptable’.

A total of 185 replies (each addressing 1 animal category) were received from experts in 10 different countries during the 1st round. The replies were collated and the medians determined per threshold. For the 2nd round an anonymised overview was presented to each expert asking them to reconsider their response, in the light of the values other experts had submitted. If their opinion continued to differ from the group median, they were asked to provide argumentation to support their opinion. This 2nd round provided 106 replies. Once again the results were collated, together with the expert opinions for deviations from the median. These new medians and anonymised comments were then returned to the experts in a 3rd round, asking them for their final assessment after taking the comments of their anonymous colleagues into consideration. A total of 91 replies were received in the final round of the 1st phase. The Delphi procedure was not always helpful in improving consensus on measure thresholds, but it worked well for most (see examples in Figure 6.1).

Fig 6.1 Two examples of outcomes in the 1st Delphi phase. In the weaner example consensus regarding the median decreased from steps 1-3, the horse example shows an improvement.

The outcomes of the first phase are graphically summarised in Figure 6.2.
In phase 2 all experts were approached again to ask them the maximum number of measures which are allowed to score at the ‘acceptable’ level, for a set of measures outcomes still to be classified as ‘certified’. The question implicitly assumes that if one or more measures score at an ‘unacceptable’ level, the set cannot be considered ‘certified’. Figure 6.3 shows the outcomes of both rounds (127 and 101 replies respectively), with increased consensus from step 1 to 2. The number of ‘acceptables’ / total number of
measures as proposed by the experts are: 3/11 weaner pigs, 4/12 finishing pigs, 3/13 calves, 4/14 heifers, 3/14 other cattle, 4/14 horses, 3/10 lambs and 4/10 adult sheep.

Fig 6.3 Phase 2: results of 1\textsuperscript{st} and 2\textsuperscript{nd} step regarding the maximum number of ‘Acceptables’.

**Conclusions**

We conclude that the Delphi procedure helped to achieve expert consensus. The resulting threshold values are recommended for use in the development of a Welfare Plus certification system.
7. RECOMMENDATIONS TO CERTIFICATION BODY

1. The basis of any Welfare Plus certification scheme should be the legal requirements as specified in Council Regulation (EC) No 1/2005, with additional requirements regarding animal based measures assessed after transport.

2. WP2 recommends a set of 10-14 measures to provide the animal based justification of any long journey transport to be certified at a Welfare Plus level.

3. For each of these measures clear cut of values for acceptability and certifiability of the measure as part of the Welfare Plus scheme are recommended.

4. The methodology followed in this WP could also be applied to other species, such as chickens and goats.

5. The project focussed on long journeys, but the majority of transports are over far shorter distances. The animal based approach in this WP can also be applied for short transports to define relevant measures and thresholds.

6. The training material that is collected in this part of the project can be used as a basis for training auditors. However, it will have to be tailored to the certification requirements developed in WP3.

7. Training must include theoretical and practical sessions and should consider obtaining good inter-observer agreement.

8. For automated registration of management and environmental parameters as required by legislation, it is essential that a standardised data format and protocol is used. Own data should be the basis for transporters to perform a risk based transport planning to enhance Animal Welfare quality management.

9. For some animal species, the assessments were performed only during a particular season (e.g. winter for horses), hence the outcomes of the assessments may differ for other seasons.
8. LITERATURE CITED

Sossidou N. Evangelia and Messori Stefano ‘Assessment of protocol for sheep transported in long distance routes throughout Europe’. Behavioural signs for stress and pain in animals, Proceedings ‘The Joint East and West Central Europe ISAE Regional Meeting 2013’, 8-10 October, Skopje, p. 70