

WELFARE OF CATTLE DURING TRANSPORT:

PRE-REVISION ASSESSMENT
JULY 2023

SITUATION REPORT
AND PERSPECTIVES:
EU REGULATORY
FRAMEWORK

The European Commission intends to propose a revision of existing animal welfare legislation within the framework of the Farm to Fork Strategy, which will undoubtedly include measures affecting beef cattle.

The participating organizations of the Spanish Interprofessional Beef Association requested of PROVACUNO a preliminary assessment of the status of animal welfare during transport and of existing legislation, including the opinion of the transport sector and the possible modifications that the Commission's proposal would entail.

The report includes an assessment of the transport of bovine animals in Spain, a scientific review of the protection of bovine animals during transport, a consultation with a representative group of animal transport professionals, and a study of the possible measures put forward by the Commission. The report is based on the working document impact assessment report on animal welfare measures that has been circulated on European professional media platforms. The combined opinion of scientists and transport professionals has provided for the formulation of a series of proposals from the Spanish sector. Potential Commission proposals have been extracted from the working document.

This document assesses the organizational, social, economic and environmental impact of both groups of proposals and extracts a series of conclusions that are facilitated to the organizations comprising PROVACUNO.

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EXECUTIVE SUMMARY

The Spanish beef cattle sector has for years placed great emphasis on animal welfare throughout the value chain, from livestock activities to industrial processing.

As part of the Farm to Fork Strategy, the European Union anticipates the publication of a new regulation on animal welfare, particularly within the scope of the transport of bovine animals, which is currently regulated by Regulation (EC) 1/2005.

In this context, PROVACUNO agreed to prepare a report with the primary aim of reviewing relevant literature regarding animal welfare during transport and put forward possible revisions to the Regulation. Improved conditions for the transportation of animals with a view to improving animal comfort and wellbeing is considered a priority, with particular emphasis placed on long-haul journeys. Participants included a working group from the academy and Spanish animal transport professionals. The first phase was concluded at the end of 2020, and work resumed in 2022 with the transport professionals.

In recent months a leaked working document impact assessment has been circulated with the proposed legislative reform currently being prepared by the European Commission. This provisional document reveals an interest in revising some of the conditions of the transport of bovine animals within the European Union. Modifications to the length of journeys seem likely, significantly reducing travel duration for all groups of animals, and in particular for unweaned calves and calves intended for the processing industry. The document also considers regulating animal transport in hot weather conditions, as well as other technical conditions such as the minimum age of animals for transport, vehicle loading density, and the height of live animal cargo compartments.

Given this new context, the initial report, which considered a series of specific proposals, has been expanded considerably. It now includes worker background, as well as the socioeconomic impact of the beef cattle sector in Spain. It also briefly describes and justifies the production sector, apparently divided between cattle farms and veal calf fattening farms, although these two types of farms actually pertain to the same production model, which has adapted to the agroclimatic conditions of the Iberian Peninsula and the islands.

The report includes information on the transport status of animals in Spain from both a legal and organizational standpoint, and provides a summary of data on the average type of animal and farm in Spain. The corresponding chapter provides a summary of the conclusions extracted from the literature review performed through the end of 2020, which has been updated for 2023. The section concludes with three points reflecting the opinion of the scientific team responsible for examining the scientific implications of animal welfare during transport.

The next section covers the proposed reforms to the legislation. The first proposals reflect the work done with the Spanish transport sector, which agreed on a series of measures for the transport of unweaned calves and another for the transport of calves on long-distance or lengthy journeys. It also includes a summary of the measures the Commission would potentially include in the proposed legislative reform, in keeping with the leaked document. These are divided into three broad categories: unweaned calves, grazing calves and fattened calves intended for the processing industry.

The following section of the report assesses the consequences of the measures proposed for each area, including the impact of the suggestions from the Spanish transport sector and of the proposals expected from the European Commission. It also includes the estimated organizational, social, economic and environmental impact for each area. The first case considers the changes that may occur in animal transport patterns, and by extension, at the farms that receive these animals. The consequences for these establishments and for meat industries is assessed in the social impact section in terms of loss of sector activity and loss of jobs. The economic impact section addresses increased production costs and, in particular, loss of production value as a result of closing farms, transport companies, meat industries and ancillary industries, including feed and forage production. The environmental impact is based on the recent work of PROVACUNO calculating the life cycle of beef in Spain.

Justification of economic impact figures and information on high temperature conditions in Spain, together with a summary of forecasts reflected in the literature are included in the Appendixes at the end of this document.

The most significant aspect of this pre-revision assessment are the conclusions, which are summarized and presented in this executive summary to describe the impact that the proposed legal amendments could have on the sector.

The conclusions are as follows:

1. Regulation (EC) 1/2005, currently in force, provides for elevated levels of animal welfare for bovine animals transported within the European Union. The modification of any aspect contained therein must be based on robust science and justified from a scientific standpoint.
2. As a general rule, science shows that the primary stress factor linked to the transport of bovine animals is the change of environment and related aspects.
3. There is a lack of agreement in scientific literature regarding the specific impact of the length of the journey on the welfare of cattle, although it seems clear that the duration of a given journey should be kept to a minimum whenever possible.
4. Loading density as provided for in current legislation is appropriate. This factor can be quite useful to optimize cattle welfare by adapting to environmental changes and length of journey.
5. The proposals put forward by the Spanish bovine transport sector represent enhanced animal welfare without any incurring any negative impact on costs or on the social structure of the sector. The environmental impact would be minimum (no greater than 0.1%).

6. Limiting the transport of unweaned calves to the distance that can be covered by a vehicle in 18 hours would prevent the movement of this type of animal to Spain from the majority of points of origin within the European Union. This could represent a loss of activity for 3,200 farms located primarily in Catalonia and Aragon, which would in turn lead to reduced activity in the meat industry, an estimated loss of 4,800 direct and indirect jobs, and a blow to the value of the sector estimated at EUR 820 million.
7. Reducing travel time for short journeys of unweaned calves to a maximum of 8 hours would require a portion of journeys of unweaned calves from the Cantabrian Coast to other areas of the country to be performed using vehicles fitted with systems to feed animals with milk replacers partway through the journey.
8. The obligation to stop for 3 hours during long journeys of unweaned calves in order to feed them may seem to provide enhanced welfare, but milk feeding may lead to dysbiosis; it is therefore recommended to hydrate the animals and provide energy using a different product.
9. Imposing maximum journey times without stops for other types of veal calves, foreseen as the first option in the European Commission document, would have major economic impacts manifesting as a loss of economic activity, which would result in the closure of farms and a reduction in the overall activity of the meat industry and other ancillary industries, such as feed and forage production. The proposed alternative in this document is to authorize intermediate stops, but only for transport between farms. This decision would limit the entrance of calves from member states, leading to the closure of farms, reduced sector-related activity and reduced import-export of livestock. It is estimated that the economic impact of these measures would affect 790 farms, resulting in a total of 1,190 lost jobs and an overall decrease in production value of EUR 210 million.
10. Revisions to legislation on animal welfare associated with limitations on journey times for bovine animals could result in a 25% loss of the economic value of the Spanish beef cattle sector, and a loss of 5,989 direct and indirect jobs.
11. Limiting cattle transport to short journeys when daytime temperatures are forecast between 25°C and 30°C, or to transport at night when forecast temperatures exceed 30°C, could disrupt the organization of the sector that transports unweaned calves, grazing calves and calves intended for the processing industry for 5 months a year in a significant portion of Spanish territory. A decision based on these characteristics could have the following outcomes:
 - Restructuring of fattening farm location, with the closure of a significant number of fattening farms that are currently located in fattening areas and the opening of new fattening farms in regions closer to the areas where nurse cows and dairy cows are raised.
 - Limit on the arrival of calves for fattening from EU member states.
 - As a result of the previous two points, an estimated 2,200 fattening farms would experience a 40% decrease in annual activity, forcing them to close and resulting in a potential loss of 3,300 jobs. At the same time, new fattening farms would have to be built in other regions of Spain.

- Restructuring of slaughterhouse locations resulting from overcapacity in eastern Spain, compared to insufficient capacity in the western half of the country.
 - It is estimated that overall, the value of beef cattle production in Spain could be reduced by 17.1%.
12. Increased space allowance per animal during transport is not necessarily associated with enhanced animal comfort, as this can result in greater difficulties to remain standing during the journey. What is important is that animals have sufficient room to rest when the vehicle is stopped. This model would imply additional production costs and associated emissions.
 13. Increasing the height of cargo compartments for transporting live animals may entail significant additional costs associated with having to eliminate a deck in livestock transport vehicles, which would in turn entail a considerable increase in cost and a greater environmental impact. The annual cost increase is estimated at EUR 115.8 million/year.
 14. Increasing the minimum age for transport of unweaned calves from dairy farms to 35 days would create organizational difficulties and increased costs for dairy farmers estimated at EUR 21.8 million. The greater cost of transporting calves, estimated at EUR 55.2 million, could be partially compensated by a reduction in feeding costs.
 15. The sum of measures included in the European Commission working document impact assessment for animal welfare could mean the disappearance of 6,190 livestock production establishments in Spain, affecting calves in particular. Two thousand two hundred of these establishments would have to be relocated, reducing the number of dressed animals by 25% and reducing the overall activity of the beef industry. Production costs for the value chain would be increased by EUR 220.8 million, representing 3% of production value. Following this assessment, which includes a review of the literature available worldwide, advances in European legislation, proposals from the Spanish sector and the projected proposals of the European Commission, and after discussing and debating the conclusions described above, we would like to provide a final reflection:

European and North American societies are invested in ensuring animal welfare during the transport of calves, and the governments of these countries undertake to guarantee good handling practices and welfare conditions. Policy is different between the two continents, however, as are the consequences for the production systems and the viability of the sectors. While the EU is continuously aspiring to establish maximum limits for transport conditions, in technical and scientific terms the United States and Canada provide for journeys that are three to four times longer than the maximum limits established by the European Union. A specific example is that of unweaned calves, where calves that are an average of 11 days old are transported on journeys of up to 16 hours, with the only perceived harm being the resulting energy imbalance.

01

BACKGROUND

BACKGROUND

ANIMAL WELFARE IN EUROPE

Since the 1970s the EU has put in place a series of actions designed to improve animal handling conditions, and in particular, transportation conditions for bovine animals. Two Conventions were signed by the Council of Europe, one for the Protection of Animals during International Transport (Paris, 13/12/68, in force since 03/02/75; Official State Gazette 266, of 06/07/75), and another for the Protection of Animals kept for Farming Purposes (Strasbourg 10/03/76, in force since 06/11/88; Official State Gazette 259 of 28/10/88).

With these documents, the European Commission (hereinafter, “EC”) began to develop a legal framework based on currently available information, which we will describe later in this document. It is important to highlight that the existing European regulatory framework concerning all aspects of animal welfare is, by far, the most highly developed in the world. The Commission has made multiple interventions for the protection and welfare of animals, including:

- ▷ Community Action Plans, 2006-2011 and 2014-2019
- ▷ ANIT Report
- ▷ Creation of the EU Platform on Animal Welfare
- ▷ EFSA Reports

Legislative activity, including Council Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport.

REVISION OF EU LEGISLATION ON ANIMAL WELFARE

Within the framework of the Green Deal, the European Union adopted an agenda of legislative reforms which includes animal welfare. It is expected that the Commission will publish the proposed revisions in October 2023, including reforms for all species of livestock.

The inclusion of new regulations for beef cattle may be included, affecting farms, transportation and slaughterhouses. However, the technical documents that have been published point to the transportation of cattle as the most relevant point of revision.

In May of the present year an unofficial Commission staff working document impact assessment on animal welfare regulations was circulated within the European livestock sector. The document includes the most significant aspects of the possible areas for revision. Particular weight is given to transport of live animals, as well as issues related to farms and video surveillance at slaughterhouses.

Transportation of bovine animals in Spain is crucial for maintaining and consolidating the full range of production activities deriving from the specialization and efficiency of the Spanish production

system. Following 15 years under current legislation, the Spanish sector feels it is necessary to reassess the application of these standards, the consequences for the animals, and possible improvements to the legislation. This assessment aims to analyze the impact of the proposals expected to be submitted by the European Commission.

THE BEEF CATTLE SECTOR AND ANIMAL WELFARE

Within this framework, the Spanish beef cattle sector has for years placed great emphasis on animal welfare throughout the value chain, from livestock activities to industrial processing. The sector has created and promoted the use of a quality mark to differentiate farms and other activities throughout the value chain that have gone beyond the basic legal requirements for animal welfare. They have also promoted specific assessment of handling systems and of the existing literature in order to identify opportunities for improving animal welfare. This report has been drawn up within this context.

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**THE BEEF
CATTLE
SECTOR** IN SPAIN

THE BEEF CATTLE SECTOR IN SPAIN

ECONOMIC AND SOCIAL SIGNIFICANCE

Overall, the sector generates an annual economic return which in 2022 stood at EUR 4.103 billion (a 30% increase over the previous year), representing around 6.5% of the total agricultural output in Spain, or 16.4% of total livestock production, ranking the sector third in economic importance in Spain. The economic value of the sector has been on the rise in recent years, with exception of the year 2020. (MAPA, 2023).

Within the scope of the EU, Spain ranks third in terms of economic value generated by the bovine sector at community level. It is also the third-ranking livestock sector in Spain, and fourth in the number of bovine stock within the European Union, behind France (with 17.3 million heads of cattle), Germany (11 million) and Ireland (6.65 million).

According to data from the SITRAN comprehensive animal traceability system, 136,536 cattle farms were registered in Spain in 2022. Nurse cows are housed in 61% of these establishments. The majority of calves are housed in the 13% of farms registered as fattening farms. The remaining bovine activities are divided between dairy production and combined production (12,667 dairy farms, and 5,620 combined production sites), among others.

According to data provided by the Ministry of Agriculture, Fisheries and Food (MAPA), the distribution of cattle stock in Spain in 2022 followed a specific pattern depending on production activities and the availability of grazing pasture, which is a conditioning factor for import and fattening. Cattle stock in Spain is distributed primarily throughout the regions of Castile and León (23%), Galicia (15%), Extremadura (13%), Catalonia (9%) and Andalusia (8%). Nurse cows, however, are concentrated primarily in Castile and León (27.5%), Extremadura (22.6%), Andalusia (10.4%) and Galicia (9.8%).

SPANISH FOREIGN TRADE BALANCE

The sector as a whole has maintained a positive foreign trade balance in recent years, both in volume and in value.

The live animal segment in 2022 registered a very narrow positive balance in terms of volume, and a negative balance in terms of value. Spain imported 70,806 tons (15% compared to 2021), for a total of EUR 240.9 million (-1.5%), and exported 69,920 tons (30.4% compared to 2021), for a total of EUR 239.2 million (10%).

NEED FOR LIVE ANIMAL MOVEMENT

The agroclimatic characteristics of the Iberian Peninsula have been a conditioning factor in the Spanish beef cattle production model. Breeding cows have traditionally been located in areas with a greater availability of fodder and pasture for grazing, found on the Cantabrian Coast and in the agroforestry ecosystems of the west, particularly pastureland and mountainous areas.

A significant portion of these areas have sufficient pasture and fodder to sustain breeding animals for most of the year, but there is not enough available biomass to sustain calves as well. Growing calves can take anywhere from two to three years to reach the required weight for distribution, to the detriment of meat quality.

For this reason, beef cattle nurse cows, raised in the western half of the peninsula and in mountainous areas, are put out to pasture throughout the year. Calves are kept with their mothers from the time they are born until they are fully weaned. These grazing calves are then taken from the farms of origin, which use extensive farming methods, to other farms, where they are confined until they reach slaughter weight at around 12-14 months. Confined fattening operations are primarily located in flat areas, typically near the resources used in the calves' diet.

The regions of Galicia and the Cantabrian Coast have traditionally specialized in dairy farming. Male dairy calves raised for beef are usually taken to fattening farms before weaning, leaving the pasture that is needed to feed the cows.

The characteristics of our agroecosystems have led to the development of a beef production model in which there are areas specialized in the production of veal and dairy calves, and other areas for fattening, making it necessary to transport animals from one region to another.

The specialization of our veal calf husbandry system has resulted in a highly efficient activity. A consequence of this are farms that receive animals from both the Iberian Peninsula and other EU member states. Given that Spain is a peripheral region, it is highly dependent on long-haul transportation of live animals.

As a consequence of the geographic distribution of the different sub-sectors –dairy farms, nurse cow farms and fattening farms– and of the import of live animals from within the European Union, the beef cattle sector is highly dependent on the transport of live animals. This movement of cattle is essential for maintaining sector activity and the cultural landscape in each area of production. The different types of animals that are transported fall under the following categories:

- ▷ Unweaned calves: Friesian and Montbeliarde calves leave their farm of origin in northern Spain or other EU member states soon after birth (14-21 days), and are taken to farms located primarily in Aragon and Catalonia. They are milk-fed for 25-30 days, and then switched to cereal and oilseed-based concentrate feed. These animals are fattened for approximately 12 months, and are later transported to the processing industry.
- ▷ Grazing calves: Animals between 6 and 8 months of age are brought from nurse cow farms located primarily in the western part of Spain and grassland areas (Castile and León,

Extremadura and Andalusia), as well as from other EU member states, primarily France and Portugal. These animals are fattened until they reach 14-18 months.

- ▷ Fattened animals intended for the processing industry: Animals between 12 and 15 months are brought from fattening farms, and are primarily intended for the processing industry. These animals have an average live weight of 550 kg.

003

CURRENT STATUS

**OF THE TRANSPORTATION
OF BOVINE ANIMALS IN THE
EU AND SPAIN**

CURRENT STATUS OF THE TRANSPORTATION OF BOVINE ANIMALS IN THE EU AND SPAIN

REGULATORY FRAMEWORK

The first legislation to regulate the transport of live animals was Council Directive 95/29/EC of 29 June, which was incorporated into Spanish legislation through Royal Decree 1041/1997 of 27 June, concerning the protection of animals during transport.

Work to revise these standards was begun in 2001. Four years later, the Regulation on the protection of all species of livestock transported by road or rail vehicles, sea vessels and aircraft was adopted. It was approved by the Council of the European Union on 22/11/2004, was published in the OJEU on 05/01/05, and has been in force since 05/01/07. Council Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport and related operations and amending Directives 64/432/EEC and 93/119/EC and Regulation (EC) No 1255/97 is the legislation applied throughout the EU in this area.

TRANSPORT OF LIVE ANIMALS IN SPAIN

The previous section illustrated the need to transport live animals to and from Spanish farms. Official data from 2021 registered 2,788,247 animals entering fattening farms. The official sources used to prepare this report are the study on the beef cattle sector in Spain prepared each year by MAPA, and information from the Spanish Department of Customs, which provides data on the animals that cross Spanish borders. The data provided is from 2021.

There are two types of transport of live cattle in Spain: transport to fattening farms, and transport from fattening farm to meat processing facilities. The first type of transport can be performed entirely within Spanish borders, when calves are taken from nurse cow farms or dairy farms, or may originate outside the country if the calves were born in other member states. Most will be taken directly to a farm that will house them until time of slaughter, while others may be taken to more than one farm, center or market. The second type refers to cattle transported from the farm where they have reached slaughter weight to their final destination at the slaughterhouse, or cattle exported to other countries.

87% of animals entering Spanish fattening farms were of Spanish origin, and 13% were imported from other countries. The majority of animals enter fattening farms in Catalonia (30%), followed by Aragon (24%), Castile and León (17%) and Castile-la Mancha (13%). Animal movements are summarized below.

A. DOMESTIC MOVEMENTS OF LIVE ANIMALS TO FATTENING FARMS (ORIGIN AND DESTINATION SPAIN)

Domestic movements of unweaned calves, estimated at 350,000 animals, originates predominantly in the north of Spain (Cantabrian Coast and Galicia), and animals are transported primarily to Aragon and Catalonia, while the transport of grazing animals, estimated at 960,000, originates in the regions of Castile and León, Andalusia and Extremadura, and animals are transported to the central and northeastern regions of Spain.

Catalonia tops the list of domestic entries with 31% of the total, followed by Castile and León (15.93%), Aragon (10.2%) and Extremadura (9.91%).

On average, 78.5% of the journeys of grazing and unweaned calves being transported to fattening farms are short (max 8h). Notwithstanding, in the case of unweaned calves, it is necessary to collect animals from several small family holdings in order to fill a vehicle; in these cases, 80% of the journeys will exceed 8 hours.

The autonomous regions of the Cantabrian Coast (Cantabria, Asturias and the Basque Country) are more dependent on long journeys to supply their providers. Specifically, 77%, 82% and 54% of movements originating in these regions are long-haul journeys.

Only 0.3% and 0.6% of journeys to the Balearic and/or Canary Islands originate on the peninsula.

B. TRANSPORT OF ANIMALS IMPORTED FOR FATTENING FARMS

Table 1 shows the number of animals imported from European member states.

Table 1. Live animal imports, 2021 (No. of heads of cattle)¹

| YEAR | UNWEANED CALVES | GRAZING CALVES | CALVES INTENDED FOR THE PROCESSING INDUSTRY | TOTAL |
|------|-----------------|----------------|---------------------------------------------|---------|
| 2021 | 497,000 | 150,000 | 73,500 | 635,630 |

¹Source: Tax Office. Compiled by the author

In 2021, 647,000 animals were received from EU27 member states. 64.23% of these animals originated in France, followed by Ireland (10.33%), Czech Republic (10%), and the Netherlands (2%).

46.5% of animals from France were taken to fattening farms in Catalonia, and 40.3% to Aragon. 64% of animals originating in Ireland and 73% from the Czech Republic were transported to Catalonia. 84% of animals from the Netherlands were taken to Castile-La Mancha. 32% of animals from Portugal were taken to fattening farms in Extremadura, 28% to Castile-La Mancha, and 27% to Castile and León.

It is estimated that animals imported from other countries are subject to an average journey of 1,305 km

C. DOMESTIC TRANSPORT OF ANIMALS FOR THE PROCESSING INDUSTRY

In 2021, around 2,016,000 animals were transported from fattening farms in Spain for the processing industry or for export. 88.3% of these animals remained in the country, while 11.7% were exported internationally.

In most cases, the fattening farm of origin and the processing industry are in the same autonomous community. There are exceptions to this rule, as is the case of animals transported from Aragon and Navarre, 43% and 50% of which are taken to Catalonia. In any case, these are nearly always journeys of less than 8 hours.

While a very high percentage of transport for the processing industry occurs within the same autonomous community or to neighboring regions, we should highlight the situation of Extremadura and La Rioja, where 30% and 22% of journeys to the slaughterhouse are long-haul journeys.

Transport for processing tends to be stable throughout the year, with the exception of August, which is the month with the greatest number of transfers (9.2% of animals). No drop in the number of transported animals occurs during the hottest months.

It is estimated that 15% of domestic transfers to slaughterhouses are long-haul journeys, affecting some 302,000 animals.

D. TRANSPORTATION FOR EXPORT

In 2021, 219,214 animals were transported outside of Spain. The primary point of origin was Aragon, with 40.5% of all exported animals, followed by Castile-La Mancha, with 18.27%, and Castile and León, with 17.47%.

Morocco was the main destination, receiving 17.17% of exported animals. Portugal follows, with 16.25%, Libya with 14.01%, Italy with 13.09%, Algeria with 12.85%, and Lebanon with 12.53%.

66% of animals transported outside of Spain in 2021 were sent to third countries, with just 34% remaining in the European Union.

In 2021, the months of March, April, June and October registered the greatest number of animals transported for export. Only in January, February and May did the number of exported animals fall below 15,000 head/month. No significant drop in numbers is observed during the hottest months.

This type of journey is always long-haul. Approximately 50,000 animals were transported by lorry, 30,000 of which were exported to Italy, and 20,000 of which were transported by lorry and ferry to Morocco. All other animals are transported by sea.

SUMMARY OF DATA TO CONSIDER FOR CALCULATIONS

Some animals spend time on more than one farm before reaching the final fattening farm. Transportation of animals from other EU countries, both for fattening and for further production, as well as those exported to third countries varies each year. In order to perform the impact assessment, we have therefore opted to use the average figures of fattened animals from each point of origin as an average for recent years, as shown in Table 2.

Table 2. Domestic movement of calves (Spain, avg. for recent years)

| | SUBTOTALS | TOTALS |
|----------------------------------------------|------------------|------------------|
| FATTENED CALVES | | |
| ORIGIN SPAIN | | |
| FATTENED ON THE FARM | 170,000 | |
| FATTENED ON OTHER FARMS OR EU FATTENING FARM | 1,310,000 | |
| Beef cattle | 960,000 | |
| Dairy cattle | 350,000 | |
| SUBTOTAL | 1,480,000 | |
| ORIGIN EU | | |
| UNWEANED CALVES | 497,000 | |
| Grazing calves | 150,000 | |
| SUBTOTAL | 647,000 | |
| TOTAL | | 2,127,000 |
| ANIMALS FOR DISTRIBUTION | | |
| PROCESSING, SPAIN | 1,820,500 | |
| PROCESSING, EXPORT TO EU | 73,500 | |
| EXPORT TO THIRD COUNTRIES | 175,000 | |
| PROCESSING, EU IMPORTS | 50,000 | |
| TOTAL | | 2,119,000 |

Source: Compiled by the author

SOCIAL ASPECTS OF THE TRANSPORTATION OF BOVINE ANIMALS IN SPAIN

All transportation activities related to animals in Spain is registered and available in [SIRENTRA](#) (General Registry of Hauliers, Containers and Transport), which is managed by the Ministry of Agriculture, Fisheries and Food (MAPA). Data obtained from this register shows that there are 45,670 hauliers authorized to transport live animals. This figure includes not only movement of animals for production, but transport of equids, dogs and cats as well. It also includes hauliers that are authorized to transport animals for health reasons, which includes many livestock operators. It is therefore not possible to know the precise number of individuals or legal entities that are specifically authorized to transport livestock.

According to the data provided by the register, in 2023 there exist 16,775 means of transport, once we exclude those intended for the transport of equids or for the movement of animals for health reasons. Of these, 5.05% are authorized for long-haul journeys of more than 8 hours.

In contacting livestock transportation organizations, we were given the figure of 11,732 vehicles that are economically active in 2023. Of these, approximately one third are vehicles with movable decks, while two thirds are single deck vehicles. Movable deck vehicles are typically the only vehicles used for transporting cattle, which works out to approximately 3,910 vehicles.

Currently available data, including official and private sources, is insufficient to allow for a rigorous assessment of the economic and social impact of transporting cattle in Spain. For the purposes of this report, it is estimated that there are currently 200 hauliers authorized to transport calves domestically, with a fleet of 120 vehicles authorized for short journeys, and 55 vehicles authorized for long journeys.

Given our interest in analyzing the impacts of the expected new animal welfare measures, we have used these figures to calculate the estimated number of vehicles that would require replacement or specific adaptations in order to transport animals on journeys that in future could be considered long journeys, rather than short journeys (under current legislation). This figure stands at 120 vehicles.

SCIENTIFIC BASIS FOR THE PROTECTION OF BOVINE ANIMALS DURING TRANSPORT

The EFSA 2022 document and the report produced from the literature review, which analyzed globally available scientific information on the transport of cattle by road and by sea through December 2020, were used to understand the available science regarding the transport of cattle. The report is included in Appendix 1 of this document.

This report was updated in June 2023 by the same team that drafted the previous report. The update is included in Appendix 2 of this report.

Based on this information, we shall now outline the opinions of the various authors who have experience in the welfare of cattle during transport by road. The data is presented in five sections, summarizing all of the information obtained from the publications.

PRE- AND POST-JOURNEY HANDLING

- Animal loading is a basic element requiring special attention, ensuring homogeneous batches of animals.
- Suitable pre-journey preparation ensures proper energy stores and good physical fitness and health conditions of animals to minimize the stress of transport.
- It is not recommended to mix animals from different farms of origin or sex, either on the truck or in lairage prior to slaughter.
- Wait time in lairage prior to slaughter should be as short as possible, requiring efficient planning of transport and timing.
- Proper training of handlers for all processes involved in transport (loading, transport/driving and handling, unloading, and handling at the processing plant, where relevant) is essential to minimize possible negative impacts on animal welfare.
- In animals transported to fattening farms, welfare aspects are restored after a period of rest and proper feeding following the journey.

LOADING DENSITY DURING TRANSPORT

- Loading density holds a much greater importance for adult animals (steers/heifers, pregnant cows or animals for slaughter), than it does for animals being transported to fattening farms.
- Loading density is an important factor for long journeys (>12h), particularly for very young animals, which should be able to lie down.
- It is not yet clear what effect loading density (high or low) has on the welfare of adult animals during transport. Both situations have advantages and drawbacks.

DURATION OF JOURNEY

- Handling of young animals is important both prior to and during the journey. Group structure (homogeneous breed/sex/point of origin and weight) is more important than the length of the journey itself.
- Journey breaks are risk factors for animal welfare.
- The duration of breaks during which animals are unloaded from the vehicle must be such that the animals are able to maintain their basic needs. A period of 24 hours is suggested.
- On long journeys (>30h), animals will adopt resting positions in the vehicle.
- The period required to recover from the stress of the journey is independent of the duration of the journey itself.

AMBIENT CONDITIONS DURING THE JOURNEY

- Numeric values for critical temperatures are unavailable, although it is clear that ambient conditions must be regulated with greater care during months of extreme temperatures (winter and summer).
- Low temperatures are critical for young animals, and calves must be protected from wind exposure.
- Mortality rate in animals intended for processing is higher in summer than in winter, and bears certain direct relation to the duration of the journey.
- Autumn seems to be the season in which more carcasses present with bruising.
- During months of extreme temperatures, ventilation must be carefully regulated during the journey and during breaks:
 - ▷ **Summer:** increase ventilation during breaks.
 - ▷ **Winter:** decrease ventilation during breaks.

ROUTE AND HANDLING DURING THE JOURNEY

- Animal handling, particularly in the case of young animals (unweaned) is an essential factor. Aspects such as access to water and food, loading density and bedding (comfort) must be carefully managed on long journeys.
- Driver experience has a significant impact on animal welfare.
- Preparation of vehicles transporting live animals is key, particularly for long journeys, and attention must be given to the same elements that guarantee the quality of the journey.
- Post-journey handling (quality feed, hay, ample access to water, etc.) is especially important for animals being transported to fattening farms, steers, heifers and others, to ensure adequate recovery.

- Further research is needed in handling-related issues, such as the use of separators and their relation with extreme temperatures (cold or heat), fasting periods and access to water, etc.
- Loading animals of different sexes or from different farms of origin is detrimental to animal welfare.
- Good journey planning (finding the best roads, such as highways or freeways) improves the quality of the journey.

GENERAL CONCLUSIONS EXTRACTED FROM THE LITERATURE REVIEW

- Scarce literature is available for review.
- The literature that is available primarily assesses the impact of transport on vital sign parameters (biochemical, hematological, immunological, behavioral, somatic) and factors such as weight, injury, lameness, mortality.
- The literature studies aspects of fundamental science that are difficult to correlate with practical recommendations for the normal functions of transport operations.
- Multiple factors are in play when determining the impact of transport by road.
- Authors generally focus their work on specific areas:
 - ▷ Pre- and post-journey handling.
 - ▷ Loading density during transport.
 - ▷ Duration of journey.
 - ▷ Ambient conditions during the journey.
 - ▷ Route and handling during the journey.
- It is not clear whether revising the current legislation is recommendable, as the authors included in the review indicate that the legislation in force provides for acceptable handling.
- Future proposals must be substantiated by a very solid scientific base.

IMPLICATIONS OF THE SITUATION ASSESSMENT

Following a detailed assessment of the factors that currently affect transport of cattle by road, the following conclusions and implications can be highlighted from a Spanish perspective. These implications are a general assessment of the impacts of the regulatory standards currently in place, without taking into account the opinion of the Spanish sector or the ideas or proposals of the Commission.

IMPLICATION 1

Regulation (EC) 1/2005 has provided for high standards of animal welfare for animals being transported within the European Union, notwithstanding certain aspects that could be improved. It is therefore advisable to maintain this regulation, and any proposed changes should be entirely justified as improvements based on available scientific, economic and/or social data that has been assessed by means of an irrefutable impact assessment.

IMPLICATION 2

Regarding the welfare of cattle during transport by road, it is suggested that changes to the current regulation focus on aspects that improve handling, with the understanding that the cargo container is essentially a mobile corral equivalent to a stationary pen. This approach aims to address non-political aspects of transport, focusing exclusively on technical aspects to achieve a better environment by making use of all available resources for better handling (bedding, windows, ventilation, separators, automated elements, etc.). For maximum animal welfare, the following elements should be addressed:

- Journeys should be made in as short a time possible in relation to the distance covered, always avoiding unnecessary delays.
- Prior to loading, animals should be correctly classified in order to prepare the most homogeneous batch possible for transport.
- The discussion regarding optimum temperatures during the journey should be based on handling methods that minimize temperature variations, contrary to current practice in which maximum and minimum limits for operation are debated.
- Wind exposure and drafts are more detrimental to animal welfare than temperature, and should be carefully controlled during transport.
- Handling recommendations according to the type and number of animals, dimensions of the container, duration of the journey and outside ambient conditions should be studied to obtain an optimum environment for animals, including loading density, flooring and airflow in the vehicle.

IMPLICATION 3

Regarding the welfare of cattle during transport by sea, it is suggested that:

- Vessels require updating.
- In general, adequate resources are available.
- It is important to require the presence of a welfare officer on board each ship.

04

**SUGGESTED
REVISIONS
TO THE REGULATION**

SUGGESTED REVISIONS TO THE REGULATION

Given the importance of the transport of cattle for the value chain of the Spanish beef cattle industry, the sector has compiled a series of recommendations for sectoral improvements in relation with the general measures that are expected to be included in the Commission's proposals. Both groups are covered in this section.

PROPOSALS FROM THE SPANISH BEEF CATTLE SECTOR

The Spanish beef cattle sector elected to consult a representative sampling of sectoral operators to understand typical practices in the transport of cattle, both domestically in Spain and in the EU, as well as during transport to third countries.

A list of possible measures for improving transport conditions to ensure maximum conditions of comfort, safety and welfare for calves while at the same time maintaining sector activity has been compiled based on a review of available literature, information regarding the movement of cattle in Spain and the experience of transport professionals.

BACKGROUND RESEARCH AND INQUIRIES

The editing team of this document interviewed 10 companies specializing in the transport of calves, covering all of the different types of transport contemplated in previous sections. The following aspects were covered in each of the online interviews:

- Annual volume of journeys and volume of animals.
- Type of animals and type of transport.
- Average duration of journey (hours) for each type of animal, age of calves, number of animals per vehicle.
- Vehicle specifications, compartment height, etc.
- On-vehicle equipment: conditions for feeding and watering calves.
- Journey timetables: starting and ending times.
- Animal handling during loading and unloading and during journey breaks (where relevant).
- Average injury and mortality rate.

- Strengths and weakness of the transport system and of vehicles.
- Suggested changes to transport conditions and legislation (where relevant) to improve transport-related conditions in general, and the comfort and welfare of animals in particular.

The average interview lasted two hours per company. Interviewees were provided a list of questions prior to the interview.

In total, the companies interviewed represented approximately 8% of journeys to fattening farms, 5% of journeys to slaughterhouses and 22% of journeys for export. Altogether, the companies that were consulted transported the following animals annually:

- 270,000 imported unweaned calves from France, Ireland and Czech Republic
- 10,000 imported grazing calves
- 30,000 domestic grazing calves
- 7,800 domestic unweaned calves
- 91,600 fattened animals intended for processing, and
- 50,000 exported animals, both by road for export within the EU and by ship for export to third countries.

The team also examined the work done by IRTA (Institute of Agrifood Research and Technology) in 2019 within the framework of the Rural Development Program (PDR) 2014-2020 task force on strategies for improving the transport of unweaned calves to optimize welfare, health and productivity. The editing team of this document has summarized all of the responses and used the results to prepare both the proposals described in the following section and the impact assessment report.

PROPOSALS

After analyzing the current logistics situation of Spanish operators, and in particular, the impact of their activity on the quality of life of transported cattle, the following recommendations have been drawn up for inclusion in the revised regulation.

Table 3 includes proposals related to unweaned calves, while Table 4 addresses the transport of cattle in general. It is the opinion of transport operators responsible for moving animals that, broadly speaking, the quality of the journey rests on two main elements: only those calves that exhibit physiological fitness for travel should be loaded for transport, and once the journey has begun, the most important aspect is that the animals should reach their final destination in the shortest time possible.

Table 3. Proposals to improve transport conditions of unweaned calves from the Spanish production sector

| | STATUS QUO (REGULATION (EC) 1/2005) | SCIENTIFIC-TECHNICAL RECOMMENDATIONS FOR TRANSPORT IN SPAIN |
|-------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DURATION OF JOURNEY | 9-1-9 (2h supplement 2 hours if animals arrive at destination) | 9-1-9 (2h supplement for animals to arrive at destination) |
| DRIVERS AND VEHICLES | Vehicles adapted for long journeys | <ul style="list-style-type: none"> - Use the most experienced drivers for transporting unweaned calves - Use modern, stable vehicles with internal ambient control |
| ANIMAL PREPARATION PRIOR TO JOURNEY | Fit to travel | <ul style="list-style-type: none"> - Physically fit to travel, >21 days old - Sort animals properly when preparing batch for transport - Ensure energy metabolism |
| AT THE CONTROL POST | 24-hour break | <ul style="list-style-type: none"> - 12-hour break - Use particular care in handling - Maintain social hierarchy in vehicle (batches, separation of male/female animals, etc.) |
| FEEDING AT CONTROL POST | Animals are provided food and water | <ul style="list-style-type: none"> - Feeding with an electrolyte solution for proper energy balance - 24 hours after unloading, calves can gradually resume milk feeding depending on the type of animal and the milk being used |

Both cases refer to long-distance transport, considered long journeys. Short journeys of less than 8 hours do not require special measures.

Table 4. Proposals to improve long-distance transport conditions of cattle from the Spanish production sector

| | STATUS QUO (REGULATION (EC) 1/2005) | SCIENTIFIC-TECHNICAL RECOMMENDATIONS FOR OPERATORS IN SPAIN |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DURATION OF JOURNEY (EXCEPT UNWEANED CALVES) | Adult animals, cycle: 14-1-14 (2h supplement if animals arrive at destination); unlimited cycles | Adult animals, cycle: 14-1-14 (2h supplement if animals arrive at destination); minimum 2 cycles |
| JOURNEY BREAK | 1 hour with water | Status Quo |
| CONTROL POSTS (STOPPING POINT) | Unloading and rest for 24 hours | Unloading and rest for 12 hours |
| AT CONTROL POST | Animals shall be provided with food and water | <ul style="list-style-type: none"> - Maximum welfare conditions - Maintain social hierarchy of transport vehicle in the same pen - Feeding |
| PREPARATION FOR JOURNEY | Chapter 1, Reg. (EC) 1/2005 | <ul style="list-style-type: none"> - Status Quo - Sort animals properly when preparing batch for transport |
| TEMPERATURE DURING JOURNEY | 5° to 30°C +/- 5°C depending on outside temperature | <ul style="list-style-type: none"> - Status Quo for temperature thresholds -Obligation of member states to implement national strategies to avoid transport of live animals during the hottest times of day, and adapt to domestic conditions - Important to minimize temperature fluctuations during the journey |
| LOADING DENSITY | May vary depending on meteorological conditions and expected duration of journey | Adapt to distance and ambient conditions of journey |
| HEIGHT OF CONTAINER | <ul style="list-style-type: none"> - Animals must have sufficient space and height depending on size and expected journey - Adequate ventilation | Status Quo |
| CONDITIONED VEHICLES | <ul style="list-style-type: none"> - Non-slip floors that reduce leakage - Ventilation - Minimum nominal airflow rate of 60 m³/h/kN - Protect against inclement weather, extreme temperatures and unfavorable meteorological fluctuations | <ul style="list-style-type: none"> - Temperature control: Status Quo - Adequate shavings or hay - Height of container: Status Quo, sufficient with 15 cm above the withers - Important to control wind exposure/drafts by regulating internal air speed |

POSSIBLE PROPOSALS FROM THE EUROPEAN COMMISSION

Transport of bovine livestock in the EU is currently regulated by Council Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport, which establishes the general conditions for the movement of bovine animals.

We have had access to a leaked version of the impact assessment report of the new regulation that is being prepared. The following sections cover the evolution of the regulation for each of the following groups of cattle: unweaned calves, grazing calves, and fattened animals for transport to processing facilities. For each group we have discussed the possible areas of focus of the proposal. Particular attention is given to maximum journey duration, particularly for unweaned calves, and for the remaining animals, the duration of journey breaks and related animal handling, loading density and the height of cargo containers. Another element under consideration is limitation of movement during very hot weather.

For each scenario, we have compared the current regulation with the hypothetical changes of the new proposal, both from the Spanish sector and, where applicable, from the Commission. These are, of course, not definitive proposals.

CURRENT SITUATION AND POSSIBLE EVOLUTION FOR UNWEANED CALVES

Table 5 includes the areas in which revision of the regulation is expected, the current situation in accordance with Regulation (EC) 1/2005, and a suggested revision based on the information compiled. Tables 7 and 8 provide the same analysis, but for grazing calves and animals intended for the processing industry.

Table 5. Comparison of current situation and proposed EC revision regarding the welfare of unweaned calves during transport (h = length of journey in hours)

| SCOPE | CURRENT SITUATION | PROPOSED EC REVISION |
|----------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| DURATION OF JOURNEY: GENERAL | 14 hours | 8 hours |
| DURATION OF JOURNEY: LONG JOURNEY, UNWEANED CALVES | 9h + 1h watering + 9h | Without feeding: 8h 9h + 3h milk feeding + 9h |
| BREAK AT CONTROL POST | 24h following 21h of transport | Not allowed. Animals must arrive at their final destination in 21h |
| LOADING DENSITY DURING TRANSPORT | 0.30 - 0.40 m ² /animal | 0.48- 0.65 m ² /animal |
| MINIMUM AGE FOR TRANSPORT | 14 days | 35 days |
| TEMPERATURE DURING JOURNEY | 5 - 30°C +/- 5°C depending on outside temperature | Short journeys only when daytime temperatures are forecast between 25°C and 30°C. When forecast temperatures exceed 30°C, only allow transport at night |

Compiled by the author Situación actual y posible evolución en los terneros pasteros

CURRENT SITUATION AND POSSIBLE EVOLUTION FOR GRAZING CALVES

Table 6. Comparison of current situation and proposed EC revision regarding the welfare of grazing calves during transport (h = length of journey in hours)

| SCOPE | CURRENT SITUATION | PROPOSED EC REVISION |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| DURATION OF JOURNEY: GENERAL | 14 hours | 12 hours |
| DURATION OF JOURNEY: LONG JOURNEY | 14h + 1h watering + 14h | 9h + 1h watering + 9h |
| BREAK AT CONTROL POST | 24h break, then restart journey | We expect this to be maintained |
| LOADING DENSITY DURING TRANSPORT | 0.30 - 0.40 m ² /animal | 0.48– 0.65 m ² /animal |
| DECK HEIGHT | Animals must have sufficient space and height depending on size and expected journey. Adequate ventilation | 40 cm above withers |
| TEMPERATURE DURING JOURNEY | 5 - 30°C +/- 5°C depending on outside temperature | Short journeys only when daytime temperatures are forecast between 25°C and 30°C. When forecast temperatures exceed 30°C, only allow transport at night |

Compiled by the author

CURRENT SITUATION AND POSSIBLE EVOLUTION FOR CALVES INTENDED FOR THE PROCESSING INDUSTRY

Table 7. Comparison of current situation and proposed EC revision regarding the welfare of fattened calves during transport (h = length of journey in hours)

| SCOPE | CURRENT SITUATION | PROPOSED EC REVISION |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| DURATION OF JOURNEY: GENERAL | 14 hours | 9 hours |
| DURATION OF JOURNEY: LONG JOURNEYS | 14h + 1h watering + 14h | 12h |
| BREAK AT CONTROL POST | 24h break, then restart journey | It seems clear that this will not be maintained |
| LOADING DENSITY DURING TRANSPORT | 1.30- 1.60 m ² /animal | 0.78– 0.96 m ² /animal |
| DECK HEIGHT | Animals must have sufficient space and height depending on size and expected journey. Adequate ventilation | 40 cm above withers |
| TEMPERATURE DURING JOURNEY | 5 - 30°C +/- 5°C depending on outside temperature | Short journeys only when daytime temperatures are forecast between 25°C and 30°C. When forecast temperatures exceed 30°C, only allow transport at night |

Compiled by the author

05

**ASSESSMENT
OF THE IMPACT
OF PROPOSALS
ON ANIMAL WELFARE**

ASSESSMENT OF THE IMPACT OF PROPOSALS ON ANIMAL WELFARE

This section provides an assessment of the potential impact of the revision suggested by the Spanish transport sector, as well as the projected measures expected from the European Commission based on the leaked working document impact assessment report on animal welfare.

In each case we provide a summary of the changes associated with each of the proposals, followed by the impacts, comparing the current situation with the hypothetical scenario of each of the other proposals.

THE SPANISH PROPOSAL

CONSEQUENCES OF THE NEW MEASURES

As described in Tables 3 and 4, the Spanish proposal includes technical adjustments for long journeys, and would not have a significant organizational or social impact other than having to increase the number of journeys for unweaned calves as a result of raising the minimum age for transport.

A summary of the figures used to justify the economic data for this section is shown in Appendix 3. The impacts are described below.

ORGANIZATIONAL IMPACT

- Increasing the minimum age required to transport calves would entail a restructuring of dairy farms, as they would require a larger number of pens or larger stalls.

ECONOMIC IMPACT

- Feeding calves with whey milk replacer prior to beginning long journeys would result in an additional cost of EUR 0.28 million for the sector as a whole.
- Reducing journey breaks from 24 to 12 hours would reduce the transport outlay for 407,000 calves imported from other EU countries on long journeys, representing a cost reduction of EUR 2.3 million for the sector.
- Raising the minimum age for transporting unweaned calves would result in added costs estimated at EUR 12.8 million for dairy farms and EUR 0.68 million for the transport sector.

ENVIRONMENTAL IMPACT

- The proposal to increase the minimum age for transport would increase the number of journeys by 1.11, which would increase emissions to 0.017 kg CO₂-eq/kg dressed weight (+ 0.089%).

In summary, the three measures proposed by the Spanish sector would result in an annual savings of EUR 1.14 million compared to the current situation.

The proposals put forward by the Spanish bovine transport sector represent enhanced animal welfare without any incurring any negative impact on costs or on the social structure of the sector. The environmental impact would be minimum (no greater than 0.1%).

THE EC PROPOSAL FOR UNWEANED CALVES

CONSEQUENCES OF THE EXPECTED PROPOSAL OF NEW MEASURES

The adoption of the measures included in Table 5 would have the following consequences for the beef production sector as a whole:

- A maximum journey duration of 8 hours would mean:
 - 35% of the domestic transport of unweaned calves, particularly journeys from the Cantabrian Coast to other specific areas of Spain, would be prevented.
- Calves could no longer be imported from areas other than the center and south of France. It seems that the proposed alternative for the previous measure is to permit 9-hour journeys with a 3-hour stop to provide milk replacer, followed by another 9-hour journey, which would mean adapting vehicles. In this case, all journeys with unweaned calves exceeding 18 hours would be prohibited. This would mean that:
 - Transport of unweaned calves from France would be maintained, but the import of calves from other European countries would be prevented.
 - A significant number of farms would have to cease their activities, which would have serious repercussions on the supply chain, industry and export.
 - Unweaned calves from the Cantabrian Coast that are fattened in the Valle del Ebro would be transported on what would be considered long journeys, meaning that they would have to be moved in trucks adapted to supply milk replacers.
- All transport of calves would require increased space allowance between the withers of the animal and the ceiling of the deck or the vehicle.
- Space allowance per animal would increase in the transport of all calves.
- Dairy farms would have to keep animals on the farm until they reach 35 days of age.

- Limits would be placed on journeys when high temperatures are expected. Appendix 7 provides average high and absolute temperatures for spring, summer and autumn months in Spain. Limiting long trips when temperatures exceed 25°C would have consequences for the entire sector for at least 5 months per year:
 - ▷ Transport within autonomous communities would continue as before.
 - ▷ Transport of calves between autonomous communities, particularly those located in the eastern and southern regions of the country with final destination Valle del Ebro, would suffer limitations.

Appendix 3 describes the methodology used for the calculations performed for this section.

ORGANIZATIONAL IMPACT

- The obligation to feed animals for 3 hours following a 9-hour journey would entail restructuring all domestic transport of unweaned calves, requiring 35% of Spanish movements of unweaned calves to make a 3-hour stop to provide milk.
- Requiring a 3-hour feeding stop would mean having to upgrade the majority of vehicles. Only those traveling from the southern part of France (90,000) could reach farms in Aragon and Catalonia.
- Allowing only a single transport cycle for unweaned calves would mean restructuring the entire production chain, from farm of origin, to fattening farms and industry.
- Increased space allowance per animal would mean multiplying the number of journeys by 1.60.
- Increasing the minimum age required to transport calves would entail a restructuring of dairy facilities.
- Limiting transport when temperatures exceed 25°C would require a restructuring of the dairy sector, fattening farms and industry.

SOCIAL IMPACT

- Around 120 vehicles currently used for short journeys would have to be substituted or upgraded in order to make long journeys during periods of high temperatures.
- Limiting journeys to a maximum of 8 hours would result in a significant decrease in fattening farm activity, the closure of 3,200 farms and the loss of 4,800 jobs. Allowing no more than a single transport cycle, but allowing 9+3+9h cycles would lead to the closure of 1,280 fattening farms and the loss of 1,920 direct jobs.
- Limiting long journeys when temperatures exceed 25°C would reduce the activity of 2,200 farms by 40% (5 months/year), making activity unfeasible and leading to the loss of 3,300 direct jobs.

ECONOMIC IMPACT

- Limiting the transport of unweaned calves to a maximum of 9+3+9 hours would prevent the import of a significant portion of this type of animal from the EU, which would lead to a loss of EUR 820 million in production value.
- The economic impact of limiting maximum transport duration and including intermediate 3-hour stops is included in the previous point.
- The cost of upgrading vehicles (paid off over 10 years) and the 2 hours added to the stop to feed unweaned calves would result in EUR 2.8 million in additional costs for the sector as a whole.
- Limiting transport to a single cycle and the associated loss of production during periods of high temperatures would lead to a 5.8% loss in industrial activity, which would result in the loss of an estimated EUR 290 million in production value.
- Raising the minimum age for transporting unweaned calves would result in added costs estimated at EUR 38.6 million for the dairy sector and EUR 55.2 million for the transport sector.
- Prohibiting long journeys during periods of high temperatures would result in added costs of EUR 40.2 million for dairy farms, which would have to fatten unweaned animals.
- Substituting vehicles authorized to make short journeys in order to make long journeys during periods of high temperatures would require an investment of EUR 2.8 million over a period of 10 years.
- Overall economic impact for the sector:
 - ▷ Estimated annual costs of EUR 139.6 million on average.
 - ▷ Average decrease in production value of EUR 1.11 billion.

ENVIRONMENTAL IMPACT

- Reducing loading density in vehicles would increase the number of journeys by 2.5. Emissions from the Spanish beef sector derived from transport between farms currently stand at 0.0156 kg of an average total of 21.49 kg of CO₂-eq/kg of dressed weight. The measure would result in an 0.072% increase in emissions.
- The proposal to increase the minimum age for transport would increase the number of journeys by 1.5, which would increase emissions to 0.02 kg CO₂-eq (+0.028%).

THE EU PROPOSAL FOR GRAZING CALVES

CONSEQUENCES OF THE NEW MEASURES

The consequences of the new measures for the movement of animals are as follows, based on the calculations described in Appendix 4:

- Limiting journey time to a maximum of 12 hours would have the following impact:
 - ▷ Domestic long-haul journeys would not be affected, as they do not generally exceed 12 hours. In some cases, however, the driver may be required to include a break before continuing the journey.
 - ▷ It would prevent the import of 90,000 calves for fattening in Spain.
 - ▷ Allowing a 24-hour break between two 12-hour journeys would allow European imports to continue, with an added cost of EUR 3.2 million.
- Limiting long journeys when temperatures exceed 25°C would create the following impacts on domestic transport:
 - ▷ Transport within autonomous communities would continue as before.
 - ▷ Movement of calves between autonomous communities: It is estimated that 20% of the journeys from the primary regions where nurse cows are raised (Extremadura, Andalusia and Castile and León) to fattening farms are considered long journeys, which would be disrupted by the prohibition to travel during periods of high temperatures. This would disrupt the movement of an estimated 80,000 Spanish animals that are fattened in regions or farms of origin in the southwestern region of Spain.
- For movements from EU countries to Spanish fattening farms, limiting long journeys when temperatures exceed 25°C would have the following consequences:
 - ▷ Journeys from central and southern France to farms and establishments in Aragon and Catalonia would generally not be affected. Notwithstanding, they may be limited during summer months, from June to August. Transport from northern regions and countries could see greater disruption.
 - ▷ Journeys originating in Portugal could be restricted during these three months depending on the point of origin and destination.
- Space allowance per animal would increase in the transport of all calves.
- All transport of calves would require increased space allowance between the withers of the animal and the ceiling of the deck or the vehicle.

Appendix 4 describes the methodology used for the calculations performed for this section.

ORGANIZATIONAL IMPACT

- Reducing loading density in vehicles would increase the number of journeys by 1.60.
- Increasing the space allowance between the withers of the animal and the ceiling of the deck or the vehicle would prevent double-deck transport of grazing calves, multiplying the number of journeys by 1.85.
- Limits associated with high temperatures would hinder the habitual fattening of 117,000 animals for 5 months of the year, requiring a restructuring of production:
 - The import of 80,000 animals from EU countries would be prevented, forcing the closure of the receiving fattening farms.
 - Regions in the southwest of Spain would have to build fattening farms to fatten 37,500 animals from May to September.

SOCIAL IMPACT

- Limiting journey time to a maximum of 12 hours would result in the closure of 790 farms and the loss of 1,185 jobs. If 24-hour stops are permitted, the impact in this area would be negligible, so it is not evaluated in this point.
- The 120 vehicles currently used for short journeys in Spain would have to be upgraded for use on long journeys during the hottest months of the year.
- Limiting long journeys during periods of high temperatures would require a restructuring of sector organization and costs:
 - Farms of origin would have to fatten their own animals, or build fattening farms in the center and southwest regions of the country.
 - Currently operating fattening farms would receive 117,500 fewer animals over a period of 5 months, meaning that an estimated 1,175 fattening farms would have to temporarily limit their activity.

ECONOMIC IMPACT

- If journey breaks of 24 hours are permitted (12-24-12), the usual domestic and EU import movements could continue, with an added cost of EUR 3.2 million.
- Reduced loading density in vehicles would result in an average additional cost of EUR 13.3/transported calf, for additional annual costs for the sector of EUR 36.9 million.
- Increasing the height of cargo containers would carry an average additional cost of EUR 20/transported calf, for added costs for the sector of EUR 22 million.

- The cost of upgrading Spanish vehicles for use during periods of high temperatures would result in added annual costs of EUR 13,500/vehicle, and EUR 2.02 million annually for the sector over a period of 10 years.
- Limiting long journeys during periods of high temperatures would represent an average added cost for nurse cow farms of EUR 7,965 for the 5 months during which the calves would have to be fattened on the farms themselves. This would affect 11,000 nurse cow farms, for an annual cost of EUR 87.6 million.
- The economic impact from a loss of activity at fattening farms is estimated at EUR 226 million, which represents 5.8% of production value.
- Overall economic impact for the sector:
 - ▷ Estimated annual costs of EUR 36.9 million on average.
 - ▷ Average decrease in production value of EUR 226 million.

ENVIRONMENTAL IMPACT

- The proposal to reduce vehicle loading density would increase the number of journeys by 1.6. Emissions from the Spanish beef sector derived from transport between farms currently stand at 0.0156 kg of an average total of 21.49 kg of CO₂-eq/kg of dressed weight. The measure would increase emissions to 0.025 kg CO₂-eq/kg of dressed weight (+0.060%).
- The proposal to increase the average height over the animal's head would increase the number of journeys by 1.85. The measure would increase emissions to 0.029 kg CO₂-eq/kg of dressed weight (+0.085%).

THE EC PROPOSAL FOR FATTENED CALVES INTENDED FOR FURTHER PROCESSING

CONSEQUENCES OF THE NEW MEASURES

- Limiting journey time to a maximum of 9 hours would have the following impact:
 - ▷ Movement of calves within autonomous communities would continue as before.
 - ▷ Movement of adult bovines is generally intended for local processing facilities, which would also be maintained without changes.
 - ▷ Approximately 15% of the movements of calves between autonomous communities would be required to make a 24-hour stop between two 9-hour legs of the journey, if permitted.
 - ▷ In export by road to EU member states or third countries, the frequency of breaks would need to be increased, including making a 24-hour stop, if permitted. This would affect an estimated 50,000 animals. The countries that would experience the greatest impact would be Italy and Morocco, and within Spain, the region of Aragon.

- Notwithstanding the previous comments, the leaked document seems to indicate that the alternative to 9-hour journeys for animals intended for further processing would be to increase the journey to 12 hours with no possibility for journey breaks.
- The impact would be the same for movements from EU countries to Spanish processing facilities: the frequency of journey breaks would be increased, ultimately increasing travel times, if permitted.
- Limiting long journeys when temperatures exceed 25°C would create the following impacts on domestic transport:
 - Movement within autonomous communities would continue as before.
 - Movement of animals between autonomous communities:
 - An estimated 125,000 animals would be prevented from moving from regions of the Spanish southwest to the processing industry via long-haul journey, which would increase local industrial activity by 6%.
 - Movements from the Valle del Ebro to European processing facilities or for export would be disrupted during these months, although it is also estimated that they could be diverted to local industries.
- For movements from EU countries to Spanish processing facilities, limiting long journeys when temperatures exceed 25°C would reduce the number of animals imported from the European Union for a period of at least 5 months per year. It is estimated that this would affect around 8,300 animals, leading to an 0.4% drop in activity.
- The measure would prevent movements to other EU countries and to Portugal for 5 months a year.
- Space allowance per animal would increase in all types of transport.
- All animal movements would require increased space allowance between the withers of the animal and the ceiling, preventing journeys on double-deck vehicles.

Appendix 5 describes the methodology used for the calculations performed for this section.

ORGANIZATIONAL IMPACT

- Establishing a maximum duration for journeys and limiting journeys during periods of high temperatures requires the restructuring of the industry and fattening farms.
- Maximum journey times and restricted movement during periods of high temperatures would reduce industrial activity in eastern Spain and increase activity in the southwestern region of the country, and there is no guarantee that this increased demand can be met.

SOCIAL IMPACT

- The 120 vehicles currently used for short journeys would have to be substituted or upgraded in order to make long journeys during periods of high temperatures.
- Limiting long journeys during periods of high temperatures would result in decreased industrial activity in certain regions estimated at -4.5%, and an increase of 6% in other areas.

ECONOMIC IMPACT

- Allowing journey breaks for journeys exceeding 9 hours would increase transport costs by EUR 1.2 million.
- Reducing loading density in vehicles would result in EUR 62.7 million in added costs.
- Increasing height allowance would generate an additional cost of EUR 41.8 million for the sector.
- Substituting vehicles authorized to make short journeys in order to make long journeys during periods of high temperatures would require an investment of EUR 2.8 million annually for a period of 10 years.
- Overall economic impact for the sector:
 - Estimated annual costs of EUR 35.7 million on average.
 - Average decrease in production value of EUR 185 million.

ENVIRONMENTAL IMPACT

- Reducing loading density in vehicles would increase the number of journeys by 2.5. Emissions from the Spanish beef sector attributable to transport between farm and industry are currently estimated at 0.027 kg of CO₂-eq. A reduction in loading density would increase emissions to 0.0675 kg CO₂-eq/kg dressed weight (+0.015%).
- The proposal to increase height allowance would increase the number of journeys by 2, which would increase emissions to 0.054 kg CO₂-eq/kg dressed weight (+0.01%).

SUMMARY OF THE SOCIAL AND ECONOMIC IMPACTS OF THE EXPECTED PROPOSALS OF THE COMMISSION

Table 8 summarizes the social and economic impacts of the most relevant set of measures included in the impact assessment of the measures that the European Commission is expected to submit for the revision of legislation on animal welfare, specifically for the scope of bovine production.

Table 8: Summary of the social and economic impacts of the expected proposals of the European Commission

| | | UNWEANED CALVES | GRAZING CALVES | CALVES FOR FURTHER PROCESSING | TOTAL |
|-------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| MAXIMUM JOURNEY DURATION | SOCIAL | Closure of 3,200 fattening farms and loss of 4,800 jobs | Closure of 790 fattening farms and loss of 1,189 direct and indirect jobs | Estimated reduction of industrial activity in some regions of 12%, and an increase of 14% in others Probable closure of certain industries | Closure of 3,990 fattening farms Loss of 5,989 jobs Loss of sector production value = EUR 1.03 billion (25%) |
| | ECONOMIC | Loss of production value (PV) = EUR 820 million | Loss of production value (PV) = EUR 210 million | | |
| 3H BREAK FOR MILK FEEDING (9-3-9) | SOCIAL | Vehicle upgrade | | | Vehicle upgrade = EUR 1.32 million/year in added costs |
| | ECONOMIC | Vehicle upgrade = EUR 1.32 million/year for 10 years Milk during journey breaks = EUR 1.5 million/year | | | Milk during journey breaks = EUR 1.5 million |
| LOADING DENSITY | SOCIAL | | | | EUR 115.8 million in added costs |
| | ECONOMIC | Reduced loading density = EUR 16.2 million in added costs | Reduced loading density = EUR 36.9 million | Reduced loading density = EUR 62.7 million | |
| INCREASE HEIGHT ALLOWANCE | SOCIAL | | | | |
| | ECONOMIC | | Increased height allowance = EUR 22 million in added costs | Increased height allowance = EUR 41.8 million in added costs | EUR 63.8 million in added costs |
| INCREASE MINIMUM AGE FOR TRANSPORT | SOCIAL | Restructure handling on dairy farms | | | |
| | ECONOMIC | Restructure handling on dairy farms = EUR 38.6 million Increased transport costs = EUR 55.2 million | | | Added costs for dairy farms = EUR 38.6 million Increased transport costs = EUR 55.2 million |

| | | UNWEANED CALVES | GRAZING CALVES | CALVES FOR FURTHER PROCESSING | TOTAL |
|----------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LIMITING TRANSPORT DUE TO HIGH TEMPERATURES | SOCIAL | <p>Sector restructuring. Construction of new farms in other areas</p> <p>40% reduction in activity on 2,200 farms, forcing closure and the loss of 3,300 direct and indirect jobs</p> | <p>Sector restructuring</p> <p>Probable closure of certain industries</p> | <p>Sector restructuring</p> <p>Probable closure or resizing of industries, with increased capacity in central and western regions, and reduced capacity in eastern regions</p> | <p>Gradual closure of 2,200 farms in some regions, and construction of new farms in other regions</p> <p>Loss of 3,300 jobs</p> <p>Sector restructuring</p> <p>Added costs at farms of origin = EUR 128.4 million</p> |
| | ECONOMIC | <p>Restructure handling on dairy farms = EUR 40.2 million</p> <p>Loss of production value = EUR 290 million</p> <p>Vehicle adaptation = EUR 2.8 million/year for 10 years</p> | <p>Added costs for nurse cow farms = EUR 87.6 million</p> <p>Vehicle substitution = EUR 2.02 million/year for 10 years</p> <p>Loss of production value = EUR 226 million</p> | <p>Vehicle substitution = EUR 2.8 million/year for 10 years</p> <p>Loss of production value = EUR 185 million</p> | <p>Loss of production value = EUR 701 million (17.1%)</p> <p>Average increase in vehicle costs = EUR 2.41 million/year for 10 years</p> |

CONCLUSIONS

1. Regulation (EC) 1/2005, currently in force, provides for elevated levels of animal welfare for bovine animals transported within the European Union. The modification of any aspect contained therein must be based on robust science and justified from a scientific standpoint.
2. As a general rule, science shows that the primary stress factor linked to the transport of bovine animals is the change of environment and related aspects.
3. There is a lack of agreement in scientific literature regarding the specific impact of the length of the journey on the welfare of cattle, although it seems clear that the duration of a given journey should be kept to a minimum whenever possible.
4. Loading density as provided for in current legislation is appropriate. This factor can be quite useful to optimize cattle welfare by adapting to environmental changes and length of journey.
5. The proposals put forward by the Spanish bovine transport sector represent enhanced animal welfare without any incurring any negative impact on costs or on the social structure of the sector. The environmental impact would be minimum (no greater than 0.1%).
6. Limiting the transport of unweaned calves to the distance that can be covered by a vehicle in 18 hours would impede the movement of this type of animal to Spain from the majority of points of origin within the European Union. This could represent a loss of activity for 3,200 farms located primarily in Catalonia and Aragon, which would in turn lead to reduced activity in the meat industry, an estimated loss of 4,800 direct and indirect jobs, and a blow to the value of the sector estimated at EUR 820 million.
7. Reducing travel time for short journeys of unweaned calves to a maximum of 8 hours would require a portion of journeys of unweaned calves from the Cantabrian Coast to other areas of the country to be performed using vehicles fitted with systems to feed animals with milk replacers partway through the journey.
8. The obligation to stop for 3 hours during long journeys of unweaned calves in order to feed them may seem to provide enhanced welfare, but milk feeding may lead to dysbiosis; it is therefore recommended to hydrate the animals and provide energy using a different product.
9. Imposing maximum journey times without stops for other types of veal calves, foreseen as the first option in the European Commission document, would have major economic impacts in the loss of economic activity, which would manifest in the closure of farms and a reduction in the overall activity of the meat industry and other ancillary industries, such as feed and forage production. The proposed alternative in this document is to authorize intermediate stops, but only for transport between farms. This decision would limit the entrance of calves from

member states, leading to the closure of farms, reduced sector-related activity and reduced import-export of live animals. It is estimated that the economic impact of these measures would affect 790 farms, resulting in 1,190 lost jobs and an overall decrease in production value of EUR 210 million.

10. Revisions to legislation on animal welfare associated with limitations on journey times for bovine animals could result in a 25% loss of the economic value of the Spanish beef cattle sector and a loss of 5,989 direct and indirect jobs.
11. Limiting cattle transport to short journeys when daytime temperatures are forecast between 25°C and 30°C, or to transport at night when forecast temperatures exceed 30°C, could disrupt the organization of the sector that transports unweaned calves, grazing calves and calves intended for slaughter for 5 months a year in a significant portion of Spanish territory. A decision based on these characteristics could have the following outcomes:
 - Restructuring of fattening farm location, with the closure of a significant number of fattening farms that are currently located in fattening areas and the opening of new fattening farms in regions closer to the areas where nurse cows and dairy cows are raised.
 - Limit on the arrival of fattening calves from EU member states.
 - As a result of the previous two points, an estimated 2,200 fattening farms would experience a 40% decrease in annual activity, forcing them to close and resulting in a potential loss of 3,300 jobs. At the same time, new fattening farms would have to be built in other regions of Spain.
 - Restructuring of slaughterhouse locations resulting from overcapacity in eastern Spain, compared to insufficient capacity in the western half of the country.
 - It is estimated that overall, the value of beef cattle production in Spain could be reduced by 17.1%.
12. Increased space allowance per animal during transport is not necessarily associated with enhanced animal comfort, as it can result in greater difficulties to remain standing during the journey. What is important is that animals have sufficient room to rest when the vehicle is stopped. This model would imply additional production costs and associated emissions.
13. Increasing the height of cargo compartments for transporting live animals may entail significant additional costs associated with having to eliminate a deck in livestock transport vehicles, which would in turn entail a considerable increase in cost and environmental impact. The annual cost increase is estimated at EUR 115.8 million/year.
14. Increasing the minimum age for transport of unweaned calves from dairy farms to 35 days would create organizational difficulties and increased costs for dairy farmers estimated at EUR 21.8 million. The greater cost of transporting calves, estimated at EUR 55.2 million, could be partially compensated by a reduction in feeding costs.

15. The sum of measures included in the European Commission working document impact assessment for animal welfare could mean the disappearance of 6,190 livestock production establishments in Spain, affecting calves in particular. Two thousand two hundred of these establishments would have to be relocated, reducing the number of dressed animals by 25% and reducing the overall activity of the beef industry. Production costs for the value chain would be increased by EUR 220.8 million, representing 3% of production value. Following this assessment, which includes a review of the literature available worldwide, advances in European legislation, proposals from the Spanish sector and the projected proposals of the European Commission, and after discussing and debating the conclusions described above, we would like to provide a final reflection:

European and North American societies are invested in ensuring animal welfare during the transport of calves, and the governments of these countries undertake to guarantee good handling practices and welfare conditions. Policy is different between the two continents, however, as are the consequences for the production systems and the viability of the sectors. While the EU is continuously aspiring to establish maximum limits for transport conditions, in technical and scientific terms the United States and Canada provide for journeys that are three to four times longer than the maximum limits established by the European Union. A specific example is that of unweaned calves, where calves that are an average of 11 days old are transported on journeys of up to 16 hours, with the only perceived harm being the resulting energy imbalance.

ANEXO

**REVISIÓN
BIBLIOGRAFÍA
CIENTÍFICA**

**SOBRE TRANSPORTE
DE BOVINOS VIVOS.**

DICIEMBRE 2020.

TRANSPORTE POR CARRETERA

ANEXO 1.

REVISIÓN BIBLIOGRAFÍA CIENTÍFICA SOBRE TRANSPORTE DE BOVINOS VIVOS. DICIEMBRE 2020.

1. ANTECEDENTES

El objetivo de esta propuesta, aceptada en octubre de 2020, es la elaboración de un Informe en el que se analice el estado actual de la información científica mundial en el ámbito del transporte por carretera y vía marítima de animales bovinos. El Informe está centrado específicamente en la especie bovina dado el interés de la Asociación que lo promueve y dadas además las características concretas del transporte de animales de esta especie, ya que la información obtenida sobre las características de transporte de otras especies animales lo complicaría mucho y enriquecería muy poco el análisis.

Este Informe va dirigido a la defensa de los intereses de las empresas españolas de una manera objetiva y científica, ya que la Comisión Europea en la actual legislatura ha decidido reiniciar la actividad legislativa en el ámbito del bienestar animal en la regulación normativa de la U.E., acción que ha comenzado en lo relativo a las operaciones de transporte animal, alegando insistentemente que el ciudadano lo demanda, en una corriente de opinión cada vez más importante en la sociedad actual. En suma, el ánimo de este Informe es presentar los aspectos principales de la base científica de que se dispone actualmente sobre el bienestar en el transporte de animales bovinos, para así proporcionar a todos los agentes implicados una visión objetiva al respecto.

2. METODOLOGÍA

La búsqueda bibliográfica previa al análisis y estudio del estado de la ciencia en el ámbito propuesto se ha efectuado mediante la utilización de las principales herramientas de internet. Por esta razón, se analizan exclusivamente las fuentes que se encuentran actualmente digitalizadas. Las bases con las que se ha trabajado no han sido exclusivamente técnicas ya que, para ajustarse al objetivo propuesto, se ha considerado centrar la búsqueda en las bases científicas públicas, entre las que podemos citar Google Scholar, principal del Web of Science, Scopus, CABI, etc... En cuanto al periodo de búsqueda, hay que decir que la fecha de creación de la base y de la captación de referencias varía según la base estudiada, de forma genérica se pueden establecer los años 70 como el origen de almacenamiento de la información, aunque adicionalmente, de forma indirecta, se han podido recoger referencias de fecha anterior.

En un proceso de búsqueda científica por internet, es muy importante a la hora de lograr el objetivo deseado, seleccionar adecuadamente las Palabras "Clave" (PC) con las que se busca. El idioma de las palabras clave empleadas ha sido el inglés, para no dejar fuera de la búsqueda ninguna

publicación relevante. Con esta premisa las Palabras Claves empleadas lo han sido después de un trabajo de selección en las que se ha analizado su uso por los distintos autores a la hora de definir cada uno de los términos.

PC-Específica. La palabra clave crucial en este Informe es aquella/s que describen "bienestar" o calidad de vida de los animales. Después de un profundo análisis previo se ha constatado la práctica hegemonía del término "WELFARE", al comparar su uso entre los distintos autores con otros términos, de ellos el principal "WELLBEING", que solo se emplea residualmente.

PC-Tipo de animal. Para recoger los distintos tipos de animales bovinos transportados se han empleado los siguientes términos: "UNWEANED CALVES"/ CALVES / STEER / HEIFER / COW / BULL y para tener una visión global, los generales de animales bovinos "BEEF CATTLE" y ganaderos en general LIVESTOCK.

PC-Acción. En cuanto a la acción se ha buscado empleando términos relacionados con el genérico de viaje y con el medio físico por donde tenga lugar, así se han empleado: TRANSPORT / JOURNEY / ROAD / SEA.

PC-Factor de Variación. Las palabras clave utilizadas para determinar el análisis de la influencia que, según los distintos autores, tiene el transporte sobre los animales, han sido numerosas. Después del referido estudio previo se ha optado por emplear en la búsqueda los siguientes términos relacionados con los Factores de Variación del viaje: SPACE / DENSITY / LOAD / SHIPPING / DURATION / DISTANCE / LONG / SHORT / "AIR TEMPERATURE" / SUMMER / AUTUMN / WINTER / SPRING / HAUL / TRAVEL / HANDL / FEED / DRINK.

La búsqueda se ha efectuado rastreando las interacciones posibles con el operador booleano "Y" o con el operador "O" en las palabras clave de un mismo nivel. En todos los casos en los que se consideró necesario, se ha empleado el complementario "*". Buscando de esta manera se han obtenido los bloques de referencias de cada nivel de interacción triple, cuádruple e incluso quíntuple que posteriormente se han unido y eliminado duplicaciones, obteniéndose las bases de referencias con las que analizar independientemente el ámbito de transporte por carretera y por mar. Las referencias encontradas se dividen en artículos científicos, artículos de revisión, trabajos presentados en congresos, libro o capítulo especializado. De todos los encontrados en la búsqueda se han seleccionado los que según el criterio de los redactores eran de mayor importancia y trascendencia, creando así una base documental con la que trabajar y preparar este Informe. Indicar que, sin duda, pueden existir referencias bibliográficas que han quedado fuera de esta selección, pero, salvo error, se han recogido las más importantes y con las que es posible abordar el objetivo propuesto. Además, en el caso de que en el trabajo posterior se detectara alguna falta de relevancia en las referencias seleccionadas, no habría ninguna dificultad en asimilarla y tenerla en consideración en los necesarios trabajos de actualización posteriores.

Una vez definida la base de referencias, el estudio se ha realizado segregando el análisis de lo descrito por los diferentes autores, estandarizando los Factores de variación de la influencia del viaje sobre el bienestar de los bovinos, en los siguientes grupos:

- Operaciones previas y posteriores a viaje (aptitud para el viaje, carga, descarga, descanso)
- Densidad de carga
- Distancia y duración del viaje (tiempo en el camión, paradas)
- Climatología y condiciones ambientales del viaje (temperatura, humedad, época del año)
- Características del recorrido y del manejo en el viaje (características del medio, trayecto, alimentación-bebida)

Fijando algunos parámetros que podrían ser considerados de carácter variable por algunos autores y viceversa, no se han fijado como FV algunos como, por ejemplo, el sexo de los terneros.

El Informe se ha estructurado en dos grupos de tipos animales, los terneros mamonos y destetados de menos de 200kg de peso vivo y el de "Adultos" que recogen las publicaciones referentes a las restantes tipologías de animales en la que se han incluido los genéricos "vacuno de carne" y los que en la referencia no se indica su tipología.

En paralelo, las variables más utilizadas por los distintos autores para cuantificar el bienestar de los animales se pueden recoger en los siguientes grupos:

- **Comportamiento:** Vocalización, agitación, lucha, dejar de avanzar, erizamiento y temblor.
- **Respuesta endocrina:** cortisol, oxitocina, catecolaminas, CRH, ACTH, vasopresina, β -endorfinas
- **Respuesta somática:** frecuencia cardíaca, presión sanguínea, frecuencia respiratoria, transpiración, temperatura corporal (híper/hipo).
- **Situación sanitaria y respuesta inmunológica:**
- **Índices de privación de alimento:** Ac. Grasos no esterificados, β hidroxibutirato, urea, glucosa.
- **Índices deshidratación (hemoconcentración):** osmolaridad, VCM, proteína total, albúmina.
- **Índices de esfuerzo físico:** Incremento de CK, lactato, lactato deshidrogenasa.
- **Índices de miedo/excitación:** Aumento VCP, glucosa, urea, β -HOB
- **Indicadores de ayuno:** peso vivo, β -HOB, Ac. Grasos libres, glucógeno muscular.
- **Estrés fisiológico:** lesiones, mortalidad.

La presentación de los resultados se realiza en una ordenación jerarquizada a la vía de transporte, el tipo de animal y a las características del mismo considerado como Factor de variación.

3. TRANSPORTE POR CARRETERA

En el transporte por carretera hemos encontrado en torno a 215 publicaciones científicas, almacenadas en todas las bases digitales consultadas. En la tabla siguiente se presenta, para cada periodo analizado, el número de publicaciones encontradas (*Art.: artículos científico-técnicos. Rw: El número de artículos de revisión y CL es el número de libros o capítulos de libro*). Aunque en las bases de datos consultadas la recogida de información tiene origen en los años 70, en esta tabla resalta el escaso número de documentos científicos recogidos, con fecha de publicación previa al año 2000, así como el fuerte desarrollo que tuvo el principio de siglo en publicaciones de este ámbito, expansión que parece estancarse en el segundo decenio.

| PREVIA AL 31/12/2000 | | | | ENTRE 01/01/00 A 31/12/10 | | | | ENTRE 01/01/11 A 31/12/19 | | | |
|----------------------|------|----|----|---------------------------|------|----|----|---------------------------|------|----|----|
| TOTAL | ART. | RW | CL | TOTAL | ART. | RW | CL | TOTAL | ART. | RW | CL |
| 18 | 14 | 3 | 1 | 77 | 59 | 15 | 3 | 121 | 97 | 20 | 4 |

3.1. Análisis Cuantitativo

A continuación, se presenta con carácter general el número de los documentos científicos encontrados en las distintas bases consultadas. Esta presentación se realiza en dos tablas, en la primera, ordenados según tipología animal prefijada, sin segmentar el análisis según el factor de variación que analizará cada artículo y considerando o no la presencia de la palabra clave “welfare”. En la segunda tabla, la ordenación del análisis numérico se presenta según el factor de variación que aborda un determinado artículo, en cada uno de los dos grupos de tipologías: animales jóvenes y adultos. Al grupo de adultos, se han sumado aquellos artículos en los que no se hubiera referido la edad del animal. En esta segunda tabla todo el análisis se ha efectuado en las publicaciones que tuvieran la palabra clave “welfare”.

| CARRETERA | UNWEAN* CALVES | WEAN* CALVES | CALF OR CALVES | STEER OR HEIFER | COW OR BULL | “BEEF CATTLE” | TERNEROS | ADULTOS S/TIPIF. |
|-----------|-------------------|------------------|--------------------|--------------------|--------------------|------------------|--------------------|----------------------|
| s/FV o Va | 2 - 1/1/0/0 | 23 - 22/1/1/0 | 176 - 166/9/6/5 | 98 - 94/3/3/3 | 112 - 102/6/5/4 | 50 - 43/5/4/0 | 179 - 169/9/7/5 | 215 - 186/13/21/5 |
| WELFARE | 2 - 1/1/0/0 | 7 - 6/1/0/0 | 68 - 61/6/2/5 | 46 - 43/2/2/2 | 52 - 44/6/2/3 | 28 - 23/3/1/0 | 71 - 64/6/2/5 | 87 - 74/9/2/4 |

| | TERNEROS + WELFARE | ADULTOS + S/TIPIF. + WELFARE |
|--------------------------------------------------------|-----------------------|------------------------------------|
| S/FV O VA | 68 - 61/6/2/5 | 97 - 84/9/2/3 |
| OPERACIONES PREVIAS Y POSTERIORES AL VIAJE | 26 - 24/1/2/1 | 45 - 39/5/2/2 |
| DENSIDAD DE CARGA | 26 - 25/0/2/3 | 35 - 30/3/2/1 |
| DISTANCIA Y DURACIÓN DEL VIAJE | 50 - 46/3/2/4 | 51 - 47/3/2/3 |
| CLIMATOLOGÍA Y CONDICIONES AMBIENTALES DEL VIAJE | 8 - 6/1/2/0 | 10 - 8/1/2/0 |
| CARACTERÍSTICAS DEL RECORRIDO Y DEL MANEJO EN EL VIAJE | 44- 38/5/2/4 | 61- 51/8/2/2 |

Tot/art/rw/congresos/libros

También es muy relevante a la hora de valorar la trascendencia de lo aportado por una publicación científica, o lo que es lo mismo, su importancia, la medida de su repercusión a la hora de ser citado por otros autores. Para dar una visión general de este factor en las referencias recogidas, se presentan en la tabla siguiente los porcentajes de publicaciones según el número de citaciones en las que se hubiera mencionado cada publicación por otros autores científicos, agrupadas según informara sobre los terneros o animales adultos. De este análisis resalta que son muy escasos los documentos que superan las 100 apariciones en otras publicaciones científicas (menos del 3%), al tiempo que la mayoría no supera las 9 citaciones. Además, analizando los valores encontrados en los segmentos de 1-9 y 0 citaciones se puede observar que casi la mitad de las referencias en animales adultos no han sido citadas en otra publicación científica indexada; este porcentaje es doble del encontrado en animales jóvenes, lo que denota menos interés de los autores por analizar el bienestar en el transporte de los animales adultos.

| CITACIONES | TERNEROS (%) | ADULTOS (%) |
|------------|--------------|-------------|
| >100 | 2,3 | 1,4 |
| 50-99 | 11,6 | 4,7 |
| 10-49 | 23,3 | 17,9 |
| 1-9 | 36,1 | 28,8 |
| 0 | 26,7 | 47,2 |

Como resumen del análisis cuantitativo de la información científica disponible de manera general en relación con el transporte de animales bovinos por carretera, de forma esquemática se sugiere lo siguiente:

- En general se detecta muy poca actividad científica en este campo, como se deduce tanto del número total de referencias en todos los campos, como del bajo nivel de citaciones.
- El análisis numérico sugiere poco interés de los autores por estudiar el transporte de los animales más jóvenes -lactantes-, debiéndose asumir que en este periodo hay unos días de “no aptitud” para el transporte, aunque se debe investigar en esta laguna del conocimiento ya que es un grupo muy numeroso de animales el que sí puede ser transportado a muy corta edad, después del destete.
- En el análisis numérico, segmentado según el tipo de animal, se observa un menor número de referencias en los animales jóvenes respecto a los adultos. Sin embargo, este menor número no refleja un menor interés científico en este campo, ya que las cifras se matizan considerando que en el grupo de animales jóvenes hemos recogido los trabajos que estudian a los animales en un periodo muy corto de su vida, con menos de 200kg PV.
- El análisis numérico de la influencia de los factores de variación, que se han elegido para este Informe, sugiere un interés de los autores focalizado en dos ámbitos: Duración y Manejo durante el viaje. Al tiempo se puede observar un interés muy reducido por la influencia de las condiciones meteorológicas del viaje, factor que necesita un análisis más detallado, dada su importancia en el debate legislativo. Por último en otros dos ámbitos se detecta un interés de trabajar en ellos que se puede calificar como de intermedio en el contexto general: Carga/ Descarga y Densidad de carga.



- En el análisis del número de citas se refuerza el poco volumen de trabajo científico en el ámbito del bienestar del transporte por carretera de animales bovinos. Además, se resalta lo poco que los distintos autores fundamentan su trabajo en experiencias previas de otros investigadores. La escasa repercusión del trabajo científico en este ámbito se manifiesta de manera más evidente en el caso de los animales adultos.
- Como valoración global de lo observado, en el análisis numérico de las publicaciones científicas, se puede concluir que el ámbito de estudio del bienestar en el transporte de los animales bovinos tiene muy poco interés para los investigadores o, lo que tal vez es más exacto, recoge muy poca financiación pública y privada, pudiéndose asumir que es un campo científico de segundo orden, aún en la producción ganadera mundial.

3.2. PRINCIPALES ARTÍCULOS

Se presentan los principales resultados encontrados que forman la base de referencias científicas del bienestar animal en el transporte por carretera, estructurado según un orden de Factor de Variación y dentro de cada ámbito, según los dos grupos tipológicos asumidos, siguiendo una cronología de su año de publicación. Toda la información encontrada en este bloque se presenta en el Anejo 1, donde se refleja el resumen de cada referencia seleccionada según las palabras claves correspondientes, tal como ha sido recogida y analizada. Estos resúmenes de cada referencia científica se presentan sin traducir al español, en su versión en inglés, buscando así transmitir de la manera más fidedigna lo que concluye cada autor.

Asimismo, en este apartado se presenta una síntesis esquemática de las conclusiones de estas referencias seleccionadas, agrupando las sugerencias de manera global y sin referir su autoría. Esta forma de presentar un resumen del estado de la ciencia pretende dar una idea rápida de cuáles han sido los ámbitos de trabajo científico prioritario y subrayar las principales conclusiones a las que los diferentes autores han llegado. Además, ya que en cada una de las referencias se ofrece la fecha de publicación, en cada caso se puede interferir la posibilidad que la evidencia en ella publicada fuera o no considerada en la elaboración o pudiera estar vinculada con la implementación del Rto 1/2005 EC.

FVI- Manejo Previo y Posterior al viaje

FVI-Terberos.

- La mortalidad es mayor en ganado cargado en los mercados que en granjas de cebo ($p < 0,01$).
- La carga es más estresante que la descarga con un nivel de estrés significativamente más alto.
- Con algunas excepciones, el transporte de larga duración es posible en términos de bienestar animal, siempre que se cuiden algunos aspectos entre ellos los asociados a las cargas.
- La situación endocrina sugiere que terneros cargados en un mercado se acostumbraron a un transporte de 12 horas, aunque al final del viaje se puede apreciar deshidratación ligera y estrés físico.

- Una mejora en las condiciones previas al transporte es esencial para mejorar el bienestar de los terneros agrupados en un centro para ser transportados.
- Un buen manejo en la carga se considera el factor más importante que afecta al bienestar animal.
- Para tres tiempos de viaje (24, 48 y 72 horas) con 3 tipos de manejo a la carga: tradicional (manipulación brusca), adiestramiento (manipulación suave) y uso de banderas. El manejo tradicional resultó ser más estresante que el manejo con banderas, estudiando la respuesta en el sistema inmunológico.
- La incidencia de enfermedades respiratorias bovinas (BRD), no directamente relacionadas con la nutrición, pueden servir como un control para diseñar categorías de riesgo para clasificar a los terneros como aptos o no para el transporte.
- El acondicionamiento previo al viaje permite a los terneros tolerar mejor los factores estresantes y la manipulación del transporte.
- Es posible utilizar la capacidad para el aprendizaje (habitación) de los animales jóvenes frente el estrés del transporte y su protección en diferentes condiciones de este.
- El ritmo cardiaco aumenta durante la carga de aproximadamente 80 a 110 latidos/min en los terneros y se normaliza durante el transporte.
- La mezcla de grupos de animales desconocidos conduce a un aumento en el número de interacciones sociales que pueden provocar estrés psicológico y agotamiento físico.
- Terneros de 7/8 meses (258 ± 23.9 kg peso vivo), preparados para el viaje se benefician de duraciones de transporte más cortas, aunque no hay una evidencia clara de que los animales que descansaron 4, 8 y 12 horas después del transporte experimentarían una reducción del estrés del transporte al compararlos con otros que no descansaron.
- La duración del transporte se considera como uno de los factores determinantes, sin embargo, las fases previas al viaje también son de gran importancia e incluyen muchos aspectos como las condiciones de cría, clasificación, pesaje, entrada en un nuevo entorno, reagrupamiento, posible mezcla con animales desconocidos y manipulación en la carga que se considera un factor crítico en el bienestar de los animales.
- En toros jóvenes, los comportamientos agonísticos se dan principalmente durante el viaje a granjas de engorde ($p=0,049$) y en las dos primeras horas posteriores a la descarga ($p=0,003$) en contraste con los porcentajes encontrados en la granja de origen. Cuatro días después del viaje el comportamiento agonista disminuye, sugiriendo los tiempos de creación de las relaciones jerárquicas. Después de la descarga, todos los animales pasaron más tiempo interactuando con otros que explorando su nuevo corral.

FV1-Adultos y sin tipificar.

- Un mayor tiempo de estabulación en el corral de espera del matadero resultó en un aumento de creatin quinasa ($p < 0.05$).
- La frecuencia cardíaca de los animales aumentó un 80% durante la carga y un 72% durante la descarga y se mantuvo alta durante el transporte (38%) ($p < 0,001$).
- Un período de ayuno más largo resultó en un color de carne más oscuro ($p < 0,01$).
- En ganado procedente de los mercados, en particular el que se transporta a una distancia superior a 64 km, se observan un mejor estado en aquellos que han tenido un mayor acceso al agua antes de la carga y con una mejor manipulación en carga y en viaje.
- La mezcla de grupos de animales desconocidos conduce a un aumento en el número de interacciones sociales que pueden provocar estrés psicológico y agotamiento físico.
- Viajes de 12 h por carretera induce en toros un aumento ($p < 0,001$) de la concentración plasmática de cortisol.
- Toros alojados a 4,2 m² tienen concentraciones plasmáticas de cortisol mayores ($p < 0,05$) que alojados a 1,2 m² previamente a la carga.
- Toros alojados a 1,2 m² tienen concentraciones plasmáticas de cortisol mayores ($p < 0,05$) que los toros alojados a 2,7 y 4,2 m² en corrales, después del transporte.
- En terneros, a carga, descarga y conducción están particularmente asociadas con daños físicos y lesiones.
- En viajes desde el norte de Alemania hasta los puertos mediterráneos, se deben preparar cuidadosamente los animales para su equilibrio energético e hídrico.
- Se ha descrito el riesgo que supone para la calidad de la carne mezclar animales de distinta procedencia en las semanas previas al sacrificio o incluso, del estrés agudo si se mezclan en los últimos 15 minutos previos al sacrificio.
- Estudiando novillos en invierno y verano se observa que no existe un efecto beneficioso sobre el bienestar de los animales por un largo tiempo de estabulación en el matadero.
- A partir de las mediciones fisiológicas y hematológicas, un tiempo de viaje de 8 horas, incluso sin acceso al alimento durante las 8 horas previas al transporte, no parece afectar negativamente al bienestar animal.
- En transporte de vacas de desvieje, el principal problema de bienestar animal se origina en la granja de carga. La baja condición corporal es un factor de riesgo en el incremento de la gravedad de los hematomas que junto con problemas mamarios aumentaron el número de canales decomisadas.

- Las condiciones en las instalaciones de la granja, el manejo en la carga y el viaje estaban relacionadas con un mayor porcentaje de hematomas, excepto en el lomo del animal.
- Para minimizar las pérdidas por hematomas en diferentes zonas de la canal, se sugirieron prácticas de manejo para evitar problemas específicos durante el período previo al sacrificio.
- La carga y descarga pueden generar muy poco estrés, aunque están asociadas con cambios en la frecuencia cardíaca, especialmente la carga. Los animales recuperan su ritmo cardíaco si reposan durante el viaje en transportes medianos y largos.
- El estrés durante la carga y las fases iniciales del viaje puede minimizarse mediante un manejo cuidadoso, un buen diseño de las instalaciones, densidades adecuadas y técnicas de conducción.
- En el matadero, que el ganado permanezca en el corral de espera durante la noche previa al sacrificio es un factor de predicción significativo de la ocurrencia de carne DFD.
- La prevalencia de cortes DFD (media = 2% por camión) fue mayor en cargas mixtas, seguidas aquellas sin separación de novillos y novillas, que además mostraban una mayor prevalencia que las cargas mixtas en las que se separaron los sexos.
- El corral de espera en un matadero supone un ámbito estresante que puede comprometer el bienestar animal y la calidad de la carne. El análisis del amiloide sérico con la máxima sensibilidad y especificidad, podría ser un marcador útil del estado de bienestar en este período.
- El ritmo cardíaco aumenta durante la carga de aproximadamente 80 a 140 lpm, en novillas preñadas y de 60 a 75 lpm en bovinos adultos, lo que se normaliza durante el transporte.
- Durante la carga, descarga y viaje, el ganado está sometido a factores de estrés que afectan a su bienestar y a la calidad de su carne, pudiéndose producir grandes pérdidas económicas.
- La duración del transporte (hasta 4 h) no está relacionado con la presencia de hematomas y pH muscular elevado.
- El tiempo de estabulación en matadero aumentó el riesgo de aparición de hematomas en las canales. Un tiempo de espera de 18 a 24 h en la planta aumentó 2,1 veces la prevalencia de hematomas con respecto a periodos de 12 a 18 h. Los novillos tenían menos riesgo de presentar un pH muscular alto.
- En novillos cebú castrados, transportados durante 4 h, la manipulación previa al sacrificio no influyó negativamente en el metabolismo proteico ni provocó deshidratación. Los valores de beta-hidroxibutirato y lactato no cambiaron ($p > 0.05$). El viaje aumentó la concentración de cortisol, glucosa, creatina quinasa y la relación N/L ($p < 0,05$). La espera previa al sacrificio es una fase generadora de estrés, aunque puede afectar al bienestar animal moderadamente con un aumento de las variables fisiológicas, dentro de un rango considerado normal para los novillos.
- Utilizando la puntuación del American Meat Institute se concluye que los problemas en el transporte de vacas de desecho a matadero en Canadá están relacionados con la condición de los animales antes del transporte y la gestión de la descarga.

- Incrementar el tiempo de espera para descargar en 30 minutos en relación a una 1 hora aumentó las probabilidades de hematomas graves en 1,18 veces ($p < 0,01$).
- Si las condiciones de manejo de la carga o las instalaciones empeoran de “buenas” a “malas”, se produce un aumento en la probabilidad de hematomas graves ($p < 0,001$) y del recuento medio de hematomas graves por carga ($p < 0,05$).
- El estrés previo al sacrificio a veces obtiene como resultado que el ganado sufre magulladuras, lo que provoca que partes de la canal sean recortadas o incluso sea decomisada, degradando la canal.
- Las vacas de desvieje son muy vulnerables al estrés del transporte y solo se pueden transportar cuando sean aptas. Sin embargo, la decisión sobre la aptitud es bastante subjetiva y depende del granjero y el chofer a los que es interesante ofrecer una formación y herramientas de evaluación específica.
- En conjunto, todas las variables de análisis de inmunidad, enzimáticos, energéticos y hormonales, indican que la calidad del manejo previo a la carga y el tiempo de transporte fueron determinantes para el bienestar de los bovinos, su equilibrio homeostático y condiciones sanitarias.
- Incluso en transportes de menos de 8 horas los resultados demuestran que las vacas lecheras de desecho son vulnerables a las tensiones del viaje, ya que, en vacas legalmente consideradas aptas para transporte, aparecen síntomas clínicos que se incrementan después de terminado el viaje.
- En la fase previa al transporte hay que cuidar muchos aspectos tales como las condiciones de cría, la clasificación, el pesaje, la adaptación a nuevos entornos, posible reagrupamiento, la mezcla con animales desconocidos y la manipulación durante la carga.
- Mejorar las instalaciones de carga/descarga de regulares a buenas reduce los hematomas. Se deben tomar medidas de manejo y capacitación del personal para mitigar las pérdidas previas al sacrificio, especialmente cuando se trabaja con vacas, ya que son más vulnerables a las contusiones y perjuicio de la canal, posiblemente debido a una mayor reacción de la vaca al cambio de entorno.
- El período previo al sacrificio es muy estresante para los animales, los procedimientos de sacrificio en el año 2007 implican reagrupar y mezclar animales, sacándolos de su entorno habitual pasándolos a entornos desconocidos, transportarlos, manipularlos y privarlos de alimentos, y en ocasiones son entornos de mala calidad. Para mejorar el bienestar animal, se requiere un mayor conocimiento de las causas exactas del estrés.
- Además de la influencia de las condiciones de la granja, del transporte y del matadero, la base genética del animal es importante para determinar cómo el animal percibe y responde a un nuevo entorno. El estrés activa el eje hipotálamo-hipófisis-suprarrenal y origina la liberación de hormonas entre ellos cortisol y catecolaminas, que inducen a un agotamiento del glucógeno previo al sacrificio, con una alteración del pH final del musculo y perjudicando la carnización.
- Al analizar la aptitud para el transporte, es crucial prever la capacidad de adaptación de los animales. A la hora de evaluar el transporte de un animal se deben considerar las implicaciones fisiopatológicas de un mal estado sanitario, como base para que aparezcan lesiones como respuesta del animal a los desafíos físicos y fisiológicos que pueden ocurrir durante el viaje.

FV2- Densidad de carga en el transporte.

FV2-Terberos.

- En transporte de más de 12 horas en terneros de 5 a 10 días, la densidad más baja tiene un efecto beneficioso ya que los terneros pueden acostarse durante todo el viaje y, por lo tanto, tenían un perfil metabólico similar al de reposo de animales no transportados.
- Los terneros transportados en viajes de 9 h (con un espacio de 0,375 a 0,475 m²/ternero) están significativamente menos tiempo tumbados respecto a los animales del lote control y además tienen una mayor concentración de cortisol plasmático. El aumento de espacio disponible no se asocia con la pérdida de estabilidad o un mayor número de lesiones.
- En terneros machos de 24 semanas (234 kg), transportados en viaje de 3 h con 0,7 a 0,95 m²/ternero y 1,5 h de estabulación posterior no se encontró un efecto del espacio disponible sobre el ritmo cardíaco o la ocurrencia de situaciones potencialmente traumáticas durante el viaje, ni con la concentración de cortisol o CPK plasmática posteriores al mismo. No se detectó ningún efecto del transporte en la aparición de hematomas en la canal.
- Evaluando toros de 9 meses (250 kg) antes y después de un viaje por carretera de 12 h se observó que, dentro de las condiciones del estudio, no hubo una mejora de bienestar transportándolos a 1,27 m² respecto al espacio estándar de 0,85 m². La concentración plasmática de cortisol era igual en ambas densidades de carga.
- Comparando los transportes realizados por ganaderos o comerciantes, en 721 transportes de terneros desde 34 granjas lecheras a granjas de cebo, los animales disponían de una superficie media de 2 m²/ternero (0,4-6 m² si transportaban los ganaderos) y de 0,6 m² (0,4-2,7 m² los comerciantes). Aunque es legalmente obligatorio, no se proporcionó cama en 3 transportes realizados por ganaderos y la vacunación intranasal contra enfermedades respiratorias solo se realizó en el 7% de las 88 granjas de nacimiento.
- En viajes de terneros con una duración total de 9 horas, para estudiar la incidencia del descanso intermedio se efectuaron paradas de estabulación durante 1 hora o 22 horas. De esta forma, se ha observado que la duración de la parada no es un factor importante para el bienestar de los animales, incluidas las variables inmunológicas, ya que el menor tiempo de descanso fue suficiente para recibir un sustitutivo lácteo, aunque poco para descansar. Solo parcialmente se detectó alguna incidencia negativa en la salud de los terneros en los descansos cortos.
- Con regímenes de alimentación y protocolos de transporte correctos, se puede minimizar la incidencia sobre el bienestar de los terneros jóvenes y sanos que se transportan en viajes de hasta 12 horas.

FV2-Adultos y sin tipificar.

- Se ha trabajado con transportes de larga duración y con espacio de carga de 1,6 m²/cabeza en todas las estaciones de año. Observándose que el ritmo cardiaco y las concentraciones plasmáticas de T3, colesterol y proteína totales fueron más altas justo después del transporte que pasada 1 semana. En ninguna condición se encontró que el estrés del transporte produjera situaciones graves, ya que tampoco se mantenían los cambios plasmáticos entre antes la situación previa y posterior al viaje en las concentraciones plasmáticas de cortisol, lactato, NEFA, triglicéridos y pH.
- El número de hematomas en la canal y la actividad plasmática de la CPK aumentan con la densidad de carga, aunque el porcentaje de músculos con valores finales de pH superiores a 6, no se relacionó con la densidad de población. Los resultados muestran que las densidades de población superiores a 550 kg/m² son inaceptables en viajes largos para novillos frisonos. A densidad de carga media y baja, los datos fisiológicos sugieren que un aumento en el tiempo de viaje o deterioro de las condiciones del viaje es perjudicial para el bienestar.
- En novillos frisonos en pie, la orientación más común es la perpendicular a la dirección de viaje y hay una fuerte resistencia a las orientaciones en diagonal. Algunos animales se tumbaban durante el viaje, en todas las densidades de carga estudiadas, pero solo en la densidad de carga alta los animales quedaron atrapados y no podían levantarse.
- En el año 2016 hay pocas evidencias sobre pautas de cómo gestionar y realizar de manera más eficaz el manejo en las paradas de descanso.
- En toros alojados en granja durante 96 días, con un espacio de 1,2; 2,7 o 4,2 m²/toro, su transporte durante 12 horas por carretera no afectó a la respuesta de cortisol o a los parámetros inmunológicos, lo que sugiere que el viaje no tiene efectos adversos que se mantengan de forma estable una vez terminado el viaje. Además, el transporte de toros alojados en un espacio mayor a 4,2 m²/toro resulta en una mayor respuesta de cortisol plasmático, aunque todavía dentro del rango fisiológico normal.
- En transportes de bovinos a larga distancia (1.240 km), con dos densidades 0,66 m² y 0,86 m²/ cabeza, si se limita la disponibilidad de alimento y agua, los alojados con menos espacio evidencian desnutrición y baja hidratación, pero también en estos casos se redujo la respuesta al estrés, probablemente porque hubo menos peleas. El ganado que disponía de más espacio pasó más tiempo comiendo y rumiando, pero también en ellos el viaje incremento el cortisol.
- En general, la probabilidad de magulladuras graves y su número medio en la canal, por animal y en una carga, aumentaron ($p < 0,05$) cuando el ganado se transporta en camiones más grandes o cuando la densidad de carga es superior a 431 kg/m².
- El sexo es el factor que tiene mayor influencia en la aparición de hematomas de la canal. Las hembras mostraron más hematomas en todas las zonas de la canal. Con densidades de carga superiores a 401 kg/m² se observaron más hematomas, exceptuando la zona del lomo.
- La densidad de carga de los camiones, las paradas durante el viaje y el tiempo de espera en el corral de descanso del matadero aumentan el riesgo de aparición de hematomas en la canal.

- Las densidades de carga medias causaron mayor porcentaje de magulladuras que las densidades bajas ($<370 \text{ kg/m}^2$) y que las altas ($> 431 \text{ kg/m}^2$).
- El peso total cargado aumenta y el número total de animales disminuye con el aumento del peso vivo de los animales. El espacio disponible (SA: m^2/animal), el coeficiente alométrico ($k = \text{SA} / \text{peso vivo (kg)} \times 0,6667$) y el porcentaje de desviación sobre el espacio disponible recomendado (%) fue menor para terneros y pasteros, en comparación con los animales cebados y de desvieje ($p < 0,01$). El peso total y el número de animales cargados aumentan con el número de ejes del remolque. El porcentaje de mortalidad es mayor en animales alojados con menor espacio ($p < 0,05$). El espacio disponible es menor en los vehículos con mayor número de ejes y que transportaban el ganado más pequeño. En conclusión, densidades demasiado bajas o altas son un problema importante en viajes de larga duración.
- Novillos cruce Japanese Black x Holstein transportadas 1.013,1km (25h incluidas paradas). No hubo diferencias estacionales en las condiciones de conducción sobre el ruido interno. La velocidad del flujo de aire interno del camión fue mayor en primavera ($0,75 \pm 0,70 \text{ m/sg}$) que en otoño ($0,45 \pm 0,40 \text{ m/sg}$) ($p < 0,05$). Los novillos se tumban con más frecuencia de lo esperado mientras se mueven en las autopistas ($p < 0,01$). Los novillos se orientaron en paralelo al sentido de la marcha (hacia la cabina delantera: 27,9%; hacia el portón trasero: 23,4%).
- En toros seleccionados para donantes de Inseminación Artificial, el transporte con unas condiciones de espacio entre $1,50 \text{ m}^2$ y $3,75 \text{ m}^2/\text{animal}$ solo afectó ligeramente al comportamiento y a las variables sanguíneas estudiadas, aunque de forma que podría considerarse satisfactoria para su bienestar. Los toros dentro del camión no mostraron preferencias en una orientación estando de pie y se observaron tumbados por períodos cortos de tiempo en los que se les observó rumiar, especialmente durante las paradas del viaje.

FV3- Duración del viaje.

FV3-Terneros.

- Estudiando la reacción al estrés del viaje debida a la genética del animal, comparando su cría en un sistema en el que los terneros lactantes mamaban de su madre (en rebaño de vacas lecheras) respecto a otros que se alimentaban con cubo, se les sometió en las 3 primeras semanas de vida a un viaje estándar de 60 minutos de duración. Se observó que los cambios medios de peso corporal posterior al viaje diferían entre los tipos de animales, aunque no lo hizo la temperatura rectal y concentración de CPK. El cortisol plasmático y la concentración de Fe aumentaron inmediatamente después del transporte, mientras que se produjeron diferentes cambios (intensidad y sentido) en las concentraciones plasmáticas de proteínas totales, albúmina, glucosa, Ca, P, Mg, noradrenalina y adrenalina. Para los cambios en cortisol, se pudieron establecer diferencias significativas entre razas y sistema de cría.
- Comparando los transportes realizados por ganaderos o comerciantes y definir las características de los transportes de terneros a granjas de cebo, se estudiaron 721 viajes de 34 granjas observando que tenían una duración media de 20 minutos (entre 1 y 330) cuando el transporte se realizaba por un ganadero y de 45 minutos (2-414) cuando era un comerciante.
- En viajes de terneros macho (15.735) de razas Charoláis, la distancia del viaje se asoció negativamente con la ganancia diaria de peso (-12 g/d , por cada 120 km adicionales de viaje).

Los lotes con la mayor heterogeneidad de peso vivo, la menor mezcla, la distancia de transporte más corta y un alto porcentaje de animales vacunados contra Enfermedad Respiratoria Bovina (BRD) antes del destete tuvieron un mejor rendimiento de crecimiento posterior al viaje (+61 g/d; $p < 0,001$). Los resultados sugieren que podrían obtenerse mejoras importantes en el rendimiento del crecimiento de los toros jóvenes en el engorde minimizando la distancia de transporte, proporcionando programas de vacunación contra la BRD antes del destete y manteniendo grupos de la misma granja de madres, en lugar de constituir grupos de animales con peso corporal similar y de distintos orígenes en el comienzo del engorde.

- En transporte de larga distancia (63 horas) de terneros recién destetados a granja de cebo, los valores de cortisol plasmático fueron significativamente más bajos en la descarga ($1,0 \pm 0,4 \mu\text{g/dl}$), en comparación con los previos a la carga ($1,5 \pm 0,4 \mu\text{g/dl}$). También se detectó una pérdida significativa de peso corporal entre el previo a la carga ($240 \pm 26,9 \text{ kg}$) y la descarga ($210 \pm 24,2 \text{ kg}$), así como un largo tiempo de recuperación. Se recomienda mejorar las condiciones de los terneros transportados mediante el uso de vehículos especializados.
- En novillas recién destetadas transportadas, desde Irlanda a un cebadero en España y de novillos también destetados a uno en Italia, se encontraron cambios transitorios en las variables fisiológicas, hematológicas e inmunológicas en relación con los niveles basales al control. Todos los valores estaban dentro del rango fisiológico normal para la edad y el peso de los animales estudiados. Las mediciones fisiológicas realizadas después de los viajes por carretera y mar indicaron que el descanso de 24 h en el corral, con heno y agua disponibles "ad libitum", permitió que los animales se recuperaran a un óptimo estado.
- En transportes de vacuno de 14, 21, 26 y 31 horas, incluyendo una parada para descansar y beber en el camión a las 14 horas, se concluye que los viajes más largos de 31 horas no eran radicalmente exigentes desde un punto de vista físico, ya que muchos de los animales optaban por acostarse una vez transcurridas las primeras 24 horas de viaje. Los animales que se acostaban tenían mayores niveles plasmáticos de cortisol, que los que permanecían de pie. Muchos animales optaron por no beber durante la parada de descanso. Las mediciones fisiológicas realizadas después de los viajes indicaron que 24 horas en el corral, con heno y agua disponibles libremente, permitían que los animales se recuperaran sustancialmente, aunque no completamente y ello independientemente de la duración del viaje.
- El Reglamento Sanitario de los Animales de Canadá (punto XII) permite que los terneros no destetados o recién destetados pueden transportarse hasta 12 o 36 horas respectivamente, siendo posteriormente obligatorio un descanso de 8 h.

FV3-Adultos y sin tipificar.

- Los problemas de bienestar más importantes en viajes largos de bovinos son la duración total del viaje, las asignaciones de espacio, la temperatura ambiente demasiado alta o baja y la experiencia de los conductores de camiones.
- En 86 viajes con un total de 1.179 animales, las paradas intermitentes durante el viaje son un factor de riesgo en la incidencia de hematomas. Sin embargo, el tiempo de transporte (hasta 4 h) no se relacionó con la presencia de hematomas ni con un pH muscular elevado.
- Con algunas excepciones, el transporte de larga duración de animales bovinos es posible en términos de bienestar animal, siempre que se prepare adecuadamente en estos cuatro

aspectos: el estado fisiológico y clínico del animal antes del transporte; alimentación y agua; descanso y ambiente térmico.

- En toros transportados por carretera unos 30min, 3h y 6h, el tiempo de transporte no influyó en la calidad de la carne. En buenas condiciones, el transporte tuvo un ligero efecto sobre el bienestar, la calidad de la carne o los parámetros fisiológicos relacionados con el estrés.
- En novillos de 5 a 10 días de edad, en viajes de más de 12 horas, el ayuno de 30 horas no tuvo efectos perjudiciales sobre el metabolismo de los terneros sanos y clínicamente normales. Con protocolos de alimentación y de transporte correctos, la incidencia negativa de un viaje de esta duración sobre el bienestar de terneros jóvenes y sanos se puede minimizar si se sacrifican dentro de las 30 horas siguientes al inicio del transporte.
- En novillas y novillos transportados en verano e invierno en viajes de 29 horas, el ayuno prolongado por largos períodos de tiempo condujo a pérdida de peso y deshidratación, lo que es estresante para los animales y reduce la calidad de la canal y la carne.
- Machos castrados, de entre 12 y 18 meses, eran transportados por carretera durante cinco, 10 o 15 horas, a una distancia de 286, 536 y 738 km. La recuperación del peso corporal a los valores previos al transporte necesitó 5 días. Los cambios en la composición plasmática no fueron concluyentes en que un viaje de 15 horas fuera más estresante que uno de 10. La concentración de cortisol aumentaba por el estrés de la carga y en la primera parte del viaje, pero luego se recuperaba a medida que discurría el viaje. La actividad de la CPK se relacionó directamente con la duración del viaje. Los aumentos en plasma de albúmina, proteínas totales y osmolaridad indicaron una ligera deshidratación que desaparecía rápidamente con el acceso al agua. Los dos tipos de razas estudiadas respondieron de manera similar al transporte, excepto en los aumentos de CPK. De acuerdo con las mediciones fisiológicas realizadas y las observaciones subjetivas de comportamiento, un período de transporte de 15 horas en buenas condiciones no es inaceptable desde el punto de vista del bienestar animal.
- En novillos y vaquillas Hereford de 400 kg transportados en invierno en viajes de hasta 36 horas, con y sin período de descanso, se observó una alta variación individual en el estrés debido al viaje. En general en un viaje de 36 horas, con o sin parada de descanso, fue perjudicial para el bienestar de los animales, ya que se produjo un aumento de las concentraciones plasmáticas de cortisol, glucosa y CPK. No obstante, el período de reposo tuvo un efecto beneficioso sobre los valores plasmáticos de CPK, pero en menor medida que sobre la movilización de grasas.
- En novillos transportados durante 3 o 16 horas y con una estabulación durante 3, 6, 12 o 24 horas, los viajes más largos se asociaron con una reducción media en el peso vivo de $8,5 \pm 2,8$ kg, detectándose además una disminución adicional de $0,42 \pm 0,18$ kg por cada hora que los animales se mantuvieron en corral después de 16 horas de viaje. Los pesos de las canales también tendían a ser más bajos después del viaje más largo y después de períodos más largos de estabulación.
- En transporte por carretera de larga distancia, desde Alemania hasta puertos mediterráneos, de novillas, novillos y toros, la pérdida de peso corporal en los novillos era del 6,65% cuando provenían de pasto, mayor que la de los toros 4,6%, aunque se recuperaron mejor durante el tiempo de descanso. Todas las categorías de ganado mostraron un metabolismo energético catabólico durante el transporte, pero solo en los toros y en menor medida en las novillas, esto

condujo a un metabolismo cetónico durante las segundas partes del viaje y en el tiempo de parada. Durante todo el tiempo del viaje, no más del 20% de los toros y novillos estuvieron acostados y menos del 5% comieron durante los periodos de movimiento. En todas las fases de transporte, los parámetros generales de estrés y la frecuencia cardíaca (con la excepción de los novillos) y el cortisol se incrementaron, como parte de la adaptación al entorno de transporte, pero indicando una fuerte carga física y emocional, por poco descanso y alimentación. Se sugiere que las paradas sean del tiempo suficiente como para mantener todas las necesidades básicas de comportamiento y fisiológicas de los animales.

- Analizando el transporte de animales a matadero en Sudamérica, se detectó que dentro de cada país existe una tendencia a viajes relativamente cortos (300-500 km), aunque también se pueden encontrar distancias largas (1.000-1.500 km) y todos ellos en un intervalo amplio de duración (1 a 12 horas), incluso ocasionalmente llegando hasta las 60 horas. Son comunes las malas prácticas durante la carga, transporte y descarga de animales, así como el exceso de carga de los camiones. Según los autores, en el año 2008, incrementar la investigación en el ámbito regional y la capacitación de los operarios en todos los niveles de la cadena de la carne, se considera una herramienta importante para mejorar el transporte de los animales.
- En viajes de una distancia menor de 50 km, de 51-100 km, 101-200 km, 201-300 km y superior a los 300 km, la tasa de mortalidad encontrada en vacas lecheras fue del 0,0396%, en terneros del 0,0269% y animales cebados del 0,0069%. Las tasas de mortalidad más bajas ocurrieron en distancias de viaje más cortas, menos de 100 km en comparación con la de distancia de viaje superior a los 101km con una significación ($p < 0,05$). Comparando esta variable entre cerdos de cebo, vacas lecheras y bovino cebado, fueron estos últimos donde se observó mayor resistencia.
- Estos resultados sugieren que el estrés del transporte induce un aumento en la actividad de la función tiroidea y suprarrenal en toros Limousine, que se evidencia incluso después de un viaje corto por carretera. En viajes largos incluso puede continuar aumentando después del viaje hasta que pasados los 15 días se reduce.
- En becerros de 18 meses y raza piemontesa, el transporte de corta duración a matadero provocó un aumento significativo de las concentraciones plasmáticas de cortisol y catecolaminas, lo que confirma una activación del eje hipotalámico-pituitario-adrenal y del sistema adrenérgico incluso en el viaje corto. Además, se observa que, en estas condiciones de transporte, las concentraciones de progesterona plasmática no exceden de límites normales.
- En un análisis de los resultados del transporte por carretera de 203 vacas Danish Holstein provenientes de 18 rebaños comerciales a matadero, se detectó que la duración promedio es de 84 km (1h 55min), observándose que las características y valoración de la locomoción de los animales no eran alteradas significativamente por el viaje y que ninguna vaca quedó coja como consecuencia del transporte.
- En un estudio del efecto del transporte por carretera de toros cruzados de charoláis ($486,0 \pm 57,0$ kg) durante 18 horas, con una parada de descanso de 12 horas a mitad del viaje y con una asignación de espacio de $1,3$ m²/animal, se detectó un aumento de las concentraciones plasmáticas de albúmina y urea ($p < 0,05$) después de las primeras 9 horas de viaje, que volvían a valores basales al final de un período de recuperación de 24 horas. Los toros pasaron más tiempo acostados durante las primeras 9 horas de viaje, que en las segundas 9 horas ($p < 0,05$).

Las diferencias en peso vivo, comportamiento y algunas variables sanguíneas muestran que el transporte es más estresante para los toros transportados en un ambiente y con un manejo nuevo para ellos. Mientras que algunas variables biológicas retornan a los valores iniciales, otras requieren más tiempo, como la concentración de haptoglobina, proteínas totales, glucosa y ácidos grasos no esterificados. En resumen, los datos sugieren que la recuperación efectiva de los toros expuestos a un viaje de 18 h por carretera requiere un período de descanso de al menos 24 h con acceso a alimento y agua antes de otro transporte posterior.

- De 142 viajes a matadero de novillos y vacas de desecho se concluye que el sexo de los animales es el factor más importante en el porcentaje de hematomas de la canal y el número de hematomas por carga y que las hembras muestran un 91% más de hematomas que los machos. En general, los hematomas están relacionados con los tiempos de viaje y descarga más largos. La presencia de hematomas se redujo mejorando las instalaciones de carga de regulares a buenas. El transporte en vehículos con mayor capacidad de carga resultó en un mayor porcentaje de hematomas. También se recomiendan prácticas especiales de manejo y una formación del personal.

FV4- Condiciones ambientales en el viaje.

FV4-Terberos.

- Es muy importante manejar con tranquilidad el transporte de terneros jóvenes, especialmente de los terneros menores de 14 días. Hay una incidencia climática con el aumento de cojeras asociadas al frío y al clima húmedo que también se detecta en ganado adulto.
- Las alteraciones de la fisiología de los terneros puede estar relacionada con el estrés en las condiciones de transporte comercial de verano en España de manera similar a la observada en condiciones más frías.
- En terneros frisonos muy jóvenes (de 5, 15, 40 y 60 días de edad) se ha estudiado el efecto estacional (nacimiento diciembre vs abril) sobre el movimiento de los animales en corta distancia, concluyéndose que no hay diferencias entre los dos momentos considerados del año y la importancia crucial de las condiciones de cría y de manejo en los siguientes aspectos: planificación y detalles de manejo; edad concreta; desarrollo y estado funcional del animal y su adaptación al corral de destino.
- En transportes de verano e invierno, de terneros menores de 4 semanas por carretera durante 19 horas, se observó que los efectos negativos del viaje son mayores durante el invierno, cuando además el descanso y la alimentación a mitad del viaje tuvo un beneficio mínimo. Administrar electrolitos redujo el nivel de deshidratación y dar solo agua es perjudicial. En el estudio se recuperaban los valores vitales dentro de las 24 horas posteriores al final del viaje, aunque se destacó el problema que tienen los terneros jóvenes para mantener su temperatura corporal durante el viaje, especialmente durante el clima más frío.
- En terneros de menos de un mes se detectó que su respuesta a la privación de alimento y agua durante 24 horas de viaje, es similar a la observada en ganado de más edad, aunque los terneros no tenían la misma respuesta en frecuencia cardíaca, cortisol y glucosa plasmática que se observan en el ganado mayor. Los terneros también parecen incapaces de regular con precisión su temperatura corporal en transportes durante el invierno se sugiere que esta falta

de respuesta no se debe a que no se vieran afectados, sino a que no están todavía adaptados fisiológicamente para hacer frente al estrés térmico del viaje.

FV4-Adultos y sin tipificar.

- Los resultados indican que, en la primavera y otoño de Japón, el transporte de larga distancia puede no causar un estrés severo a los novillos siempre que tengan condiciones adecuadas: una baja densidad de carga, suficiente tiempo de descanso y suministro de comida y agua.
- En novillos de 7,8 meses de edad y 310,3 kg PV, las concentraciones plasmáticas de cortisol, lactato, el pH sérico y el ritmo cardíaco no cambiaron después de un viaje de 1.013,1 km.
- En novillos transportados 1.013,1 km (25 h incluidas paradas) la concentración de cortisol fue mayor en primavera que en otoño ($p < 0,05$). El pH sérico fue mayor en otoño que en primavera ($p < 0,01$). La tasa de glucemia fue significativamente mayor en el mercado previo al transporte.
- Después de un viaje de 25 horas por carretera y ferry, aún en primavera y otoño, los resultados recomiendan que se instalen comederos de heno y bebederos adicionales en el corral de recepción, justo después del transporte de larga distancia, ya que no se debe limitar el número de animales que puede comer y beber al mismo tiempo.
- La densidad de carga se debe controlar para disminuir la influencia negativa del calor en el bienestar animal. En un vehículo bien ventilado, son las paradas y no los períodos en movimiento los que presentan el mayor riesgo de estrés por calor. Lo contrario es cierto para condiciones muy frías.
- La tasa de mortalidad más alta en todas las categorías de animales bovinos transportados se observa en los meses de primavera. La tasa de mortalidad más baja se encuentra en los meses de otoño para el ganado cebado y las vacas lecheras y en los meses de invierno para los terneros y pasteros. La tasa de mortalidad puede servir como indicador del bienestar animal durante el transporte a matadero.
- La época del año en que se transporta a matadero es un factor potencial de hematomas en la canal, ya que las posibilidades de magulladuras graves y el número medio de magulladuras graves por carga son mayores ($p < 0,001$) para el ganado sacrificado en el otoño.
- Para conocer la incidencia de la temperatura ambiental se han estudiado 121 viajes de toros en larga distancia (30 horas, incluido un descanso de 2 horas), encontrándose un mayor porcentaje de animales encogidos en el verano (agosto: 8,39%) e invierno (diciembre: 7,27%), ambos fuera de la zona termoneutra para el ganado de carne. Los menores porcentajes de animales encogidos se observaron en los meses de otoño (octubre: 2,99% y noviembre: 1,77%), que si se encuentran dentro de la zona termoneutra. La tasa de mortalidad media en todos los viajes fue del 0,464% una tasa de mortalidad alta, pero en la que el efecto del mes no fue significativo. En conclusión, para prevenir los efectos adversos del transporte de larga distancia, se recomienda en lo posible maximizar el número de transportes dentro del rango de confort térmico y realizar un cuidadoso manejo de los animales.
- Novillos japoneses del cruce Black x Holstein ($7,9 \pm 0,6$ meses de edad y $320,0 \pm 19,0$ kg) se transportaron 1.020,6 km (25 h incluidos los períodos de estabulación), el espacio disponible en

el camión era de 1,6m²/ cabeza. En estas condiciones no se observó una gravedad en el estrés inducido, ya que no se detectaron diferencias significativas entre situación previa y posterior al viaje en las concentraciones de cortisol, lactato, NEFA y triglicéridos plasmáticos, así como en el PH sérico y peso vivo. Los novillos se tumbaban mientras se desplazan por vías rápidas ($p < 0,001$). Las concentraciones de glucosa en sangre, cortisol plasmático y triyodotironina (T3) sérica y la actividad de ALT fueron más altas en primavera (todos $p < 0,05$), lo que podría explicarse porque la aceleración de las vibraciones del camión, en dirección longitudinal, fue mayor en esta estación.

- Los sistemas de puntuación que se han desarrollado para auditar, en la descarga de vacas de carne de desvieje, su transporte a matadero en Canadá en invierno tiene poca variación entre los distintos viajes. Se sugiere que, en condiciones comerciales, debe aumentarse la ventilación dentro de los remolques en la carga y durante el viaje, mientras que se reduzca durante los períodos de parada.
- En la República Checa, la tasa de mortalidad del transporte de bovino cebado es del 0,007% \pm 0,003%. Lo que varía significativamente con la distancia de viaje ($r=0,9$; $p < 0,05$), en viajes a matadero, desde 50 km a más de 300 km. Los resultados indican una sensibilidad relativamente baja del ganado cebado al estrés del transporte, con una baja mortalidad inducida. La mayor duración del viaje y que éste fuera en los meses de verano o invierno aumentaba las tasas de mortalidad inducidas por el mismo.

FV5- Recorrido y el manejo en el viaje.

FV5-Terberos.

- El comportamiento del operador (p.e., impaciencia) puede asociarse al porcentaje de cojeras.
- En el transporte de terneros jóvenes se puede llegar a una incidencia del 50% de sofoco y magulladuras, incluso tasas de mortalidad superiores al 20%, estos resultados negativos pueden encontrarse especialmente cuando se transportan animales menores de 14 días.
- Se recomienda mejorar las condiciones de transporte en terneros, mediante el uso de vehículos especiales con más comodidad, así como con acceso a agua y alimento durante el viaje.
- La incidencia del transporte sobre las variables inmunitarias, en un viaje de 2 horas de machos de raza Holstein, de 2 a 4 semanas de edad, aumentaba significativamente la concentración plasmática de cortisol. El peso vivo de los animales no afectó a ninguna de las variables estudiadas. Sin embargo, la interacción del transporte y el peso corporal fue significativa, terneros de bajo peso vivo (≤ 46 kg) mostraron un aumento en el recuento de monocitos, algo relacionable con una mayor susceptibilidad a enfermedades de los terneros con bajo peso cuando se transportan. La concentración de gammaglobulina se identificó como un factor importante en estudios sobre capacidad inmune de terneros recién nacidos.
- Se estudia el efecto de la posición en el camión (compartimento trasero o delantero) en transportes a corta distancia, de terneros frisonos, de 28 semanas de edad. El ritmo cardíaco de los animales aumentó un 80% durante la carga y un 72% durante la descarga, manteniéndose alto durante todo el viaje (38%) ($p < 0,001$). Asimismo, el ritmo cardíaco aumentó un 3% en los animales que viajaban en el compartimento trasero. El cortisol plasmático aumentó más para

los animales que viajaban en el compartimento frontal ($p < 0,05$). El pH sérico fue menor en los animales que viajaban en el compartimento delantero ($p < 0,001$) y la diferencia de pH en la muestra fue mayor en los animales que viajaban en el compartimento trasero ($p < 0,001$). El color de la carne de los terneros que viajaban en el compartimento delantero fue más claro ($p < 0,01$). Un período de ayuno más largo resultó en un color de carne más oscuro ($p < 0,01$). Un tiempo de espera mayor resultó en mayor aumento de CPK ($p < 0,05$).

- Terneros cruzados lactantes, machos, con 21 a 47 días de edad, se transportaron una distancia de 306,9 km durante 7 horas. Las respuestas fisiológicas encontradas sugieren que el estrés provocado por este transporte tuvo efectos significativos en su función hepática.
- Inspecciones del año 2012 a 246 camiones con un total de 13.857 terneros de engorde mostraron una relación directa entre el número de terneros por vehículo y la exposición a un posible hacinamiento por la falta de tabiques separadores. No se encontró una relación significativa entre la distancia recorrida y la falta de partición en la caja del camión. La información obtenida de las inspecciones proporciona no solo una base para evaluar el bienestar de los terneros durante el transporte, sino también una contribución objetiva a la evaluación de los riesgos relacionados con su transporte.
- Datos obtenidos en EE. UU. indican que si es posible se deben evitar viajes de más de 30 horas, ya que la mortalidad aumenta considerablemente. Las temperaturas por debajo de -15°C o por encima de 30°C son perjudiciales; las asignaciones de espacio con un coeficiente alométrico inferior a 0,015 o superior a 0,035 están asociadas con mayor mortalidad. Los camioneros con más años de experiencia tienen menos animales con problemas. Los terneros destinados a granjas de cebo tienen una probabilidad doble de morir durante el viaje que los terneros ya cebado en su viaje al matadero. Se recomienda un incentivo económico para reducir la mortalidad en transporte de este tipo de animales.
- En transportes de 6 horas, 12 horas, (1hora + 6h descanso + 5horas), de terneros de rebaños lecheros, con 5 / 9 días de vida, la retirada de alimento durante 30 horas provocó que los terneros perdieran un 6% del peso vivo. La concentración plasmática de glucosa en sangre varió de 3,96 mmol/l, inmediatamente antes de la alimentación diaria a 5,46 mmol/l, en las 3 horas después de la alimentación, para disminuir hasta los 3,43 mmol/l a las 30 horas. Los terneros pasaron tumbados el 22-32% del tiempo del viaje y no mostraron un efecto de rebote en el comportamiento de tumbarse ni diferencias respecto al modelo estándar. Las mejores prácticas para transportes de 6/12 horas de duración, incluido el transporte vía un centro de agrupamiento, no afectaron significativamente a la bioquímica ni al metabolismo sanguíneo de terneros. Sin embargo, aumentar el tiempo de ayuno más allá del intervalo de alimentación diario resultó en una reducción de la glucemia, lo que sugiere que el tiempo de ayuno debe manejarse con cuidado en el transporte de los terneros mamones.
- En un estudio con 10 terneros se observó que las autopistas brindan a los animales la oportunidad de descansar y evitar las molestias derivadas de la conducción con sucesos inesperados. Si los conductores se anticipan y preparan para posibles eventos en la conducción, se reducirá la probabilidad y gravedad de las pérdidas de estabilidad de los animales, pudiéndose mantener los animales en pie durante la mayor parte del viaje. Se ha encontrado que los terneros pasan más tiempo acostados durante segundas etapas del viaje que durante las primeras. Algunos animales sufrieron caídas repetidas, que ocurrían después de una serie de diferentes tipos de

eventos. Las menores pérdidas de equilibrio se producían en la autopista. En conclusión, las autopistas y la previsión de los choferes ofrecen las mejores condiciones para el bienestar de los animales transportados.

- Los resultados indican que cuando se administra leche entera tibia con una tetina, se puede aumentar la cantidad de leche que los terneros ingieren, más allá de la dosis recomendada tradicionalmente, sin riesgo de que la leche pase al rumen. Por lo tanto, se puede alimentar con más leche a los terneros sin necesariamente establecer una toma adicional. *(Se adjunta esta referencia por el interés de la alimentación en el transporte de animales más jóvenes).*

FV5-Adultos y sin tipificar.

- ¿Qué nivel de estrés fisiológico o mortalidad es aceptable?, se presenta una revisión de las medidas de los indicadores fisiológicos de ayuno, deshidratación y de reacción general al estrés y la actividad física. La conclusión del autor es que el bienestar animal, para su valoración, no es totalmente objetivo.
- Las instalaciones de estabulación posteriores al viaje son muy importantes para los toros y en el caso de las novillas se debe mejorar la alimentación durante este tiempo además de asegurarles la posibilidad de un buen descanso para la recuperación de los animales después del transporte.
- Desde el norte de Alemania hasta los puertos del Mediterráneo, durante todo el viaje, no más del 20% de los toros y novillos estuvieron acostados y menos del 5% se alimentaron durante los periodos en movimiento.
- Comparando novillos de dos genéticas Angus, Bonsmara y Nguni, se observó que reaccionan de diferente manera al transporte, siendo la Bonsmara la que mostraba unos mayores niveles de estrés en el momento del sacrificio.
- Los Factores que inducen estrés en el transporte de animales de la especie bovina se pueden esquematizar en: tiempo de transporte, carga y descarga, densidad de carga, vibraciones, calidad del aire, condiciones de reposo en matadero, sistema de control logística y respuesta individual de los animales.
- El transporte del ganado es inevitable y se requiere investigación para desarrollar las prácticas óptimas, en las condiciones australianas, a fin de minimizar el impacto negativo sobre el bienestar animal.
- Hay más novillos tumbados mientras se viaja en autopista ($p < 0,001$). En animales procedentes de pasto, los novillos tienen una pérdida de peso corporal (-6,65%) mayor que los toros (-4,6%).
- El ganado lechero adulto y los terneros jóvenes tenían tendencia a dar cabezazos al techo de camión, mientras que las novillas preñadas no lo hacían.
- El ganado adulto se mueve menos ($p < 0,001$) que los terneros jóvenes durante el transporte.
- En encuestas a agricultores, transportistas de ganado, veterinarios, procesadores de carne, animalistas, científicos especialistas y funcionarios, fueron preguntados sobre la importancia

relativa de las diferentes prácticas relacionadas con el bienestar del bovino de carne en Australia. El orden de opinión sobre la importancia de las diferentes prácticas para el bienestar del ganado de carne fue: manejo en granja> transporte terrestre (por carretera y ferrocarril)> esterilización> suministro de alimentos> descornado> aturdimiento> alojamiento> identificación> privación de agua y alimentos antes del transporte> castración> transporte marítimo> recogida/agrupamiento de animales> confinamiento. Los entrevistados opinaban que la forma de realizar cada uno de los procedimientos se percibía como más importante que el procedimiento en sí. Las diferencias de opinión eran marcadas entre distintos grupos de encuestados, así, los animalistas tendían a centrarse en la denuncia de los procedimientos más dolorosos, más que en aquellos que implican principalmente a la industria.

- La clave del bienestar animal es la forma en que se realiza el transporte. Las instalaciones de que disponga el vehículo deben minimizar los riesgos de lesiones físicas causadas por caídas, golpes, hematomas y la protuberancia de partes del cuerpo.
- Se sugiere que con un espacio libre de más de 20 cm por encima de la cruz del animal se disminuyen los periodos en que el animal cabecea al techo del camión.
- La provincia de origen, la velocidad de descarga del ganado, la capacitación de los conductores, la ventilación en el camión, el sexo, el origen (corral de agrupamiento o de engorde) fueron predictores significativos para la aparición de carnes DFD.
- El transporte de animales de forma cuidadosa reduce la cantidad de hematomas en las canales.
- Los vehículos articulados, con mayor capacidad de carga, tienen más probabilidades de causar hematomas.
- Duplicar el espacio de comederos, en las paradas de descanso de un viaje, aumenta la proporción media de animales que comen durante la parada (en un 30%) y se disminuye el número de enfrentamientos jerárquicos con interrupción de la comida. Este aumento del espacio del que disponen los animales para alimentarse durante la parada no tiene ningún efecto sobre los comportamientos de bebida ni de tumbarse. Se puede concluir que Incrementar el acceso al comedero durante el descanso en el viaje es beneficioso para el bienestar y la salud de los bovinos.
- 66 choferes de ganado daneses (55% del total nacional) respondieron a un cuestionario donde declaraban mayoritariamente que las vacas de desvieje son vulnerables al estrés en el transporte a matadero. También que, dado que los conductores son en parte responsables de la calificación de aptitud para el transporte de los animales y que la definición de apto/no apto es bastante vaga, los conductores de ganado necesitaban formación y herramientas de evaluación con el fin de optimizar el bienestar de los animales en el viaje.
- Se evaluaron en un matadero un total de 1.599 canales por el número de hematomas y 1.440 por las pérdidas debidas a lesiones, concluyendo que las mayores distancias aumentan el riesgo de hematomas en la canal. El transporte de animales no aptos, las condiciones de los vehículos y el manejo inadecuado son las principales causas de los hematomas. Además, factores inherentes a los animales también pueden favorecer la aparición de hematomas y lesiones, como son una menor cobertura de grasa en las hembras y un comportamiento más agresivo en los machos no castrados respecto al de los que lo están.

- En el transporte a matadero, en EE.UU., se detectó que el bienestar animal puede estar expuesto a múltiples factores de estrés tales como ruidos, presencia de animales y humanos desconocidos, temperaturas extremas, privación temporal de comida/agua, distancia, grado de experiencias del chofer y condiciones del nuevo corral. Se identifican las áreas que han tenido poca investigación y es necesario desarrollar herramientas para que la industria garantice el bienestar de los animales, entre ellas, el diseño de los remolques, el uso de separadores en los remolques, cuidado en condiciones climáticas extremas y aspectos de la interacción humano/animal.
- En un total de 154.100 canales procedentes de 5.028 cargas, se detectó que el sexo fue la fuente de variación más importante en la aparición de hematomas graves en la canal, siendo mayor en las hembras ($p < 0,001$), al igual que el número medio de hematomas graves por carga ($p < 0,05$).
- La respuesta hormonal podría atribuirse principalmente a la desyodación intracelular de T4 a T3. La triyodotironina (T3) y las yodotironinas libres (ft(3) y Pr4) resultan más sensibles al estrés del manejo, mostrando un patrón diferente según la especie, las diversas condiciones de manejo y las condiciones ambientales en las que el animal realiza la actividad. Toros jóvenes de raza Limousine, de carácter temperamental, mostraron después de un transporte prolongado concentraciones más bajas de T4 y ft4 que novillos de genéticas más tranquilas, así como una disminución concomitante de las concentraciones plasmáticas de ACTH, cortisol, T3 y ft(3), caída probablemente inducida por el retrocontrol negativo del eje HPA. Estos datos refuerzan la importancia de tener en cuenta la evaluación de las yodotironinas, y en particular de la T3, como marcadores de bienestar y estrés y su papel en asegurar la homeostasis energética y productiva.
- En diversas condiciones de transporte de ganado bovino por carretera, se concluyó que el QBA (Análisis Cualitativo de Comportamiento) es un método valioso para evaluar el bienestar animal, ya que hubo un consenso significativo en la capacidad de los observadores para interpretar la expresión del comportamiento del ganado durante estas condiciones experimentales (el QBA es repetible). Asimismo, los observadores pudieron distinguir entre las distintas condiciones de transporte según las puntuaciones QBA de los animales, y estas puntuaciones se correlacionaron significativamente con medidas fisiológicas.
- En Uruguay se inspeccionaron 448 camiones a su llegada a matadero encontrando que la distancia media recorrida por el camión cargado fue de 240 ± 9 km y la duración media del viaje fue de 305 ± 7 min. y que la experiencia laboral de los choferes que transportan ganado es mayor de 10 años. El uso de dispositivos para obligar a los animales a moverse tuvo la siguiente importancia: pica eléctrica (75%), palo (3%), gritos fuertes (40%) y una combinación de estos se correlaciona positivamente con la aparición de hematomas en las canales.
- Las cargas mixtas, en que no se separaban novillos y novillas, de viajes efectuados en Canadá, tuvieron una mayor prevalencia de carnes DFD que las cargas mixtas en las que los animales estaban separados en distintos compartimentos según el sexo. Predictores estadísticamente significativos de la aparición de carne DFD son la provincia donde está localizada la granja, velocidad de descarga del ganado, experiencia de los choferes, ventilación del camión, sexo, punto de carga (granja madres, cebadero, centro agrupamiento) y si se mantuvo en corral de espera toda la noche.
- Este estudio determinó niveles de vibración y frecuencias de resonancia para camiones de transporte de vacas lecheras, en concreto, un camión con suspensión neumática, conducido

a 30, 50, 70 ó 90 km/h. Los valores de exposición a vibraciones en período de transporte de 8 horas en las direcciones vertical, horizontal y lateral fueron $0,61 \pm 0,12$; $0,92 \pm 0,35$ y $1 \pm 0,21$ m/sg², respectivamente. Las vibraciones en las direcciones horizontal y lateral, recibidas por los animales colocados perpendicularmente a la dirección de viaje, fueron menores que en el caso de los animales miraran hacia adelante. Éstos superan el límite de exposición diaria de la UE ($0,5$ m/sg²) pero era inferior al límite de exposición diaria de $1,15$ m/sg².

- En 2.288 canales la prevalencia de hematomas fue del 84,3%. El sexo, el peso vivo, la densidad de población y el tiempo de estabulación en el matadero se asocian con la presencia de hematomas ($p < 0,005$). El tiempo de transporte no se reveló un factor de riesgo para la presencia y gravedad de los hematomas ($p > 0,005$). Se concluye que hay que mejorar varios factores, entre otros, capacitación del personal, reducción del tiempo de estabulación, mantenimiento preventivo de equipos, transporte especializado, estrategias de diseño sanitario y divulgación de la normativa.
- En la República Checa de 1.552.574 bovinos transportados a matadero, se detectó una tasa de mortalidad del 0,125% en el período 2009-2014 y de 0,02% en el período 1997-2006. Estos resultados sugieren que el marco legal para la protección de los animales durante el transporte comercial, puede no ser una garantía de que el bienestar de los animales transportados alcance unos niveles deseados. Por otro lado, poca inversión y particularmente en períodos de recesión económica, puede llevar a un aumento de la mortalidad en los transportes por carretera, a pesar de la mejora de la legislación y de la supervisión estatal.
- El transporte de ganado es un componente vital de la economía agroalimentaria mundial. En México las características de los transportistas son: edad de 29 a 48 años, con estudios elementales o secundarios y el 65% de los choferes declara tener una experiencia de 6 años en el transporte de ganado. Declaran que es necesario desarrollar sistemas de evaluación del bienestar y de la toma de decisiones que proporcionen herramientas para minimizar el coste biológico para los animales transportados, como base para la profesionalización y buena imagen del sector.
- Transporte de novillas, de dos genéticas, durante 6 horas, empezando 2 horas por un camino sin asfaltar para pasar a vías asfaltadas durante 4 horas. El viaje a lo largo de la carretera asfaltada no afectó significativamente la temperatura rectal de las novillas ni de su comportamiento, sin embargo, cuando se transporta por una carretera sin asfaltar ambas variables pueden verse comprometidas.
- En un estudio con 154.100 canales de 5.028 viajes, el sexo de los animales fue la variable más influyente sobre la probabilidad de hematomas graves en la canal, siendo mayor para las hembras ($p < 0,001$), al igual que el número medio de contusiones graves por carga ($p < 0,05$). También se detectó un aumento en la probabilidad de hematomas graves ($p < 0,001$) si las instalaciones de carga eran "malas" vs "buenas" y en el recuento medio de hematomas graves por carga ($p < 0,05$). La época del año en que se produjo el viaje a matadero también tuvo una importante influencia sobre el número de canales con hematomas, ya que las posibilidades de magulladuras graves y el número medio de magulladuras graves por carga fueron mayores ($p < 0,001$) para el ganado sacrificado en el otoño. En general, la probabilidad de magulladuras graves en la canal y el número medio de magulladuras graves por carga aumentaron ($p < 0,05$) cuando el ganado se transportaba en camiones más grandes o cuando la densidad de carga era superior a 431 kg/m². Además, los recorridos en carreteras sin pavimentar durante más de 31 km aumentaron las

posibilidades de sufrir hematomas graves ($p < 0,001$), mientras que la distancia total recorrida mayor de 151 km aumentó el número medio de hematomas graves por carga ($p < 0,05$).

- En España, años 2004/5, en una entrevista con 119 parámetros a 44 operadores del transporte de vacuno representativos del sector, se obtuvieron las siguientes características: los viajes a sacrificio fueron de media más cortos (125 km y 2,5 horas), que los que terminaban en granja que tenían el doble de duración ($p < 0,001$). Los viajes con destino en granja transportaron más animales y con una densidad de carga mayor ($p < 0,001$), la mayoría de los chóferes declaró que era posible transportar con más densidad de carga de manera adecuada. Los transportes fueron realizados por empresas especializadas bajo demanda (60%). En los viajes a matadero, el vehículo era propiedad de un comerciante el 30,5% y del ganadero un 27% ($p < 0,001$). Los conductores tenían una experiencia media de 17 años. Un alto porcentaje de conductores declaró conocer la legislación sobre bienestar animal y declaraban que las leyes deberían estar más cerca de las circunstancias reales. Casi la mitad de los conductores de transporte a matadero no tuvo interés en proponer mejoras en la legislación.
- Un análisis de la literatura científica sobre bienestar animal en vacuno de carne, desde 1990 a 2019, indicaban que los tres temas encontrados como más relevantes en la investigación son: comportamiento y manejo de los terneros; eficiencia y sostenibilidad ambiental; efectos del transporte y del sacrificio en la calidad de la carne.
- Está claro que el efecto del transporte por carretera es un problema multifactorial, mucho más que la influencia de un solo factor responsable del bienestar animal y en viajes a matadero de la calidad de la carne. Una revisión de 2012 concluye que se necesita más investigación para identificar los factores o la combinación de ellos que tienen el mayor impacto negativo en el bienestar.

3.3. PRINCIPALES RESULTADOS INFORMADOS EN LOS ARTÍCULOS

FVI- Manejo Previo y Posterior al viaje.

- La carga de los animales se muestra como aspecto básico a cuidar.
- La correcta preparación y estado de los animales antes del viaje permite minimizar los efectos estresantes del transporte.
- La mezcla de animales de distintos orígenes o distinto sexo, tanto en el camión como en los recintos previos al sacrificio son prácticas no recomendables.
- El tiempo de espera de los animales en los corrales antes del sacrificio debe ser el menor posible, por lo tanto, es importante la planificación del viaje en su conjunto, desde el momento de la carga hasta la llegada al matadero.
- La formación del personal en los procesos relacionados con el transporte (carga, transporte-conducción y manejo de los animales, descarga, manejo de animales en la industria si procede) es esencial para minimizar los posibles efectos negativos en el bienestar de los animales.
- En animales destinados a engorde, los valores relacionados con el bienestar animal se recuperan tras un período de descanso y alimentación correctos después del viaje.

FV2- Densidad de carga en el transporte.

- La densidad de carga es un aspecto mucho más trascendente en animales adultos (novillos, vacas preñadas o animales destinados a sacrificio) que en animales destinados a cebo.
- La densidad de carga es un factor importante en transportes de larga duración (>12h) especialmente en animales muy jóvenes, en donde pueden necesitar tumbarse.
- En animales adultos no está muy claro el efecto de la densidad de carga baja o alta en el b.a. del transporte.

FV3- Duración del viaje.

- En el transporte de animales jóvenes parece más importante el manejo de animales tanto antes como en el propio acto de transporte, la composición del grupo -evitando mezclas de lotes y homogeneizado el peso-, que la duración de este.
- Las paradas son factores de riesgo para el Bienestar de los animales.
- La preparación de los animales previa al viaje es fundamental en viajes de larga duración (<12h), debiendo cuidar aspectos tales como el estado de animales (fisiológico y clínico), la alimentación y el acceso al agua o la temperatura.
- Las paradas en el caso de bajada del camión deben ser de una duración tal que los animales puedan mantener sus necesidades básicas, sugiriendo un período de 24 horas.
- En viajes de larga duración (más de 30 horas), los animales adoptan posición de descaso en el camión.
- El periodo de recuperación es independiente de la duración del viaje.

FV4- Condiciones ambientales en el viaje.

- No se han encontrado valores numéricos de temperaturas críticas, aunque parece evidente que el cuidado de los aspectos ambientales debe ser mayor en los meses de temperaturas extremos, invierno o verano.
- En animales jóvenes son críticas las bajas temperaturas.
- En animales destinados a matadero la tasa de mortalidad es más elevada en verano e invierno, teniendo una relación directa con la duración del viaje.
- En los meses de temperatura extrema se debe cuidar la ventilación de los animales en los períodos de conducción y paradas:
 - ▷ Verano: aumentar la ventilación en paradas.
 - ▷ Invierno: disminuir la ventilación en paradas.

FV5- Recorrido y el manejo en el viaje.

- El manejo de los animales, especialmente en el caso de los de corta edad (lactantes) es un factor esencial; en viajes de larga duración deben cuidarse aspectos tales como el acceso al agua, alimentación, densidad y cama -confort-.
- La experiencia de los conductores tiene enorme influencia en el bienestar de los animales.
- El vehículo habilitado para los animales es clave, especialmente en viajes de larga duración, debiendo contemplar el mismo los elementos que manejan la calidad del viaje.
- En el caso de viajes de animales para vida -engorde, novillos, etc., es importante el manejo post viaje -alimentación de calidad, heno, amplio acceso a bebida, etc.- para facilitar su recuperación.
- Se requieren áreas de conocimiento que precisen manejar investigación, tales como el uso de las separaciones y su interacción con los transportes con temperaturas extremas (frío o calor), períodos de ayuno e hidratación, etc.
- Las cargas con animales de distinto sexo o distintos orígenes son perjudiciales para el bienestar de los animales.
- El otoño parece ser la época con mayor incremento de canales con hematomas.
- La planificación del viaje, buscando las mejores carreteras -autopistas, por ejemplo- mejoran la calidad del viaje.

4. CONCLUSIÓN E IMPLICACIONES

En conclusión, la bibliografía del transporte de bovinos por camión no es muy extensa, aunque los diferentes autores se centran en algunos aspectos concretos de los ámbitos de estudio en los que se divide la operación de transporte de los animales, como son la selección y preparación del ganado previa carga en la granja de origen, las condiciones del viaje y la descarga de los camiones en destino, bien sea otra granja donde se continuaran criando o en matadero. Del viaje los factores críticos son la densidad de carga de los animales, duración, situación ambiental, trayecto y manejo.

Como resumen esquemático que nos permite definir los resultados encontrados en este análisis de la situación actual de la base científica sobre transporte de animales bovinos, se pueden enumerar las siguientes conclusiones:

- La bibliografía mayoritariamente estudia la incidencia del transporte sobre unos parámetros vitales analizados mediante variables biológicas: bioquímicas, hematológicas, inmunológicas, comportamentales, somáticas (peso, lesiones, cojeras, mortalidad).
- La bibliografía escasamente estudia, o lo hace de forma indirecta, la influencia sobre el bienestar de los Factores de Variación que definen el transporte. En este punto se debe subrayar que

la normativa regula justamente estos aspectos, por lo que no es posible en la mayoría de los casos tener sobre los mismos unas conclusiones firmes y directamente aplicables a la hora de redactar la legislación. Además, quedan claras lagunas de conocimiento científico ya que además se pueden detectar el interés de los autores por ámbitos concretos, existiendo pocos o nulos trabajos en otros de ellos.

- La bibliografía mayoritariamente estudia aspectos de ciencia fundamental de difícil correlación con recomendaciones de aplicación práctica en la realidad cotidiana del transporte.

Asimismo, consideramos relevante referenciar las siguientes implicaciones de este trabajo:

- El efecto del transporte por carretera es un problema multifactorial que necesita más investigación para identificar los factores o la combinación de ellos sobre el bienestar de los animales.
- Es necesaria más investigación aplicada que valore la incidencia de los Factores de Variación sobre el bienestar de los animales transportados ya que es sobre lo que entiende y regula la legislación.
- Podría ser de interés para aprovechar toda la información de la Investigación básica relacionada de la se puede disponer actualmente, realizar un análisis conjunto por métodos multivariante, en los que se filtre, homogenice y procese toda la información aportada por los distintos autores y de esta forma obtener conclusiones estándar de carácter aplicativo.
- No está claro que puede ser recomendable la modificación de la regulación normativa actual, ya que según los diversos autores ofrece un manejo aceptable, si antes no se fundamentan las propuestas futuras de una forma científica totalmente sólida. Más bien, parece que debe ser recomendado la línea de actuación que en los últimos años se ha venido siguiendo, en orden al cumplimiento general de la normativa en todos sus matices, antes de desarrollar nuevos requisitos, sin una clara base científica con la que mejorar las condiciones de bienestar actuales para los animales bovinos transportados.

ANEXO

2

**REVISIÓN
BIBLIOGRAFÍA
BIBLIOGRAFÍA
CIENTÍFICA**

**SOBRE TRANSPORTE
DE BOVINOS VIVOS.**

JUNIO 2023

ANEXO 2.

ACTUALIZACIÓN REVISIÓN BIBLIOGRAFÍA CIENTÍFICA SOBRE TRANSPORTE DE BOVINOS VIVOS. JUNIO 2023

INFORME

Este Anejo se centra en el análisis de publicaciones científicas relacionadas con el transporte de animales de la especie bovina por carretera, en los años 2021, 2022 y 2023, y cuyo objetivo es complementar la revisión bibliográfica realizada para Provacuno y que se entregó en la primavera del año 2021.

En el periodo analizado se han encontrado pocas publicaciones, un total de 29, lo que remarca la escasez y limitaciones de base científica en este ámbito del conocimiento. Excluyendo el Informe de la EFSA, solo dos tienen un cierto impacto, una con 15 y otra con 8 citas. La mayoría de las publicaciones no son citadas todavía, o lo son menos de 4 veces. Esta situación es lógica dado lo reciente de su publicación.

Es interesante resaltar la aparición de cinco documentos dirigidos a la revisión de las publicaciones existentes tanto científicas como técnicas, de las que resaltan dos: una centrada en el transporte de animales jóvenes (menores de 3 meses) **que remarca la importancia de más investigación**, y la segunda, un importante Informe de la EFSA, del año 2022, en el que un equipo coordinado por Nielsen presenta una detallada revisión de la situación de la ciencia en relación al transporte de animales bovinos.

De todas las publicaciones identificadas de carácter específico se han seleccionado 17. En líneas generales se puede indicar que las aportaciones científicas del periodo son muy concretas. Para ofrecer una idea de las características de las aportaciones de los diversos autores sobre la incidencia del viaje en el bienestar de los bovinos, se resume su aportación al conocimiento en los siguientes puntos:

- Es muy importante preparar (acondicionar) a los terneros para minimizar la incidencia negativa del viaje.
- Es muy importante comprobar la aptitud para el transporte, sobre todo en bovinos de desvieje.
- Una duración mayor del viaje induce una mayor nocicepción en momentos posteriores al mismo.
- Es importante realizar el mejor manejo, con mucha tranquilidad, en cargas a matadero considerando que los animales de desvieje son especialmente delicados.
- En caprino, se sugiere la necesidad de un reposo de 3 horas para minimizar el estrés de un viaje de 6 horas.

- Una buena preparación de los terneros para el viaje y una buena carga pueden reducir la aparición del BRD (síndrome respiratorio bovino) y la fatiga inducida por el viaje, en la granja de destino.
- Se aporta nueva información sobre las características alométricas de distintas tipologías de animales bovinos en relación con sus necesidades de espacio de pie, reclinados y durmiendo.
- En viajes de menos de 8 horas en invierno, aunque el manejo, la mezcla de animales y el viaje fueran fuente de estrés, en viajes bien preparados no llegaban a incidir negativamente en el bienestar de los terneros.
- En viajes de 40 horas de duración se ha encontrado, en novillas, signos de ruptura de la homeostasis en los niveles de cortisol, TNF y linfotoxina. El impacto negativo del viaje se mantiene en el proceso inflamatorio, aunque reduciéndose, 25 días después de finalizado.
- Transportes de larga duración (6, 12, 16 horas) de 175 terneros lactantes, excedentes en 5 rebaños lecheros de Canadá, con una edad media de 11 días (intervalo 2 a 19 días), alimentados por lactoreemplazante, se detectó que se inducía en unos animales tan jóvenes una reducción de glucemia plasmática y un estado energético subóptimo de los animales, aunque la situación de estas variables está muy ligada a la edad de los terneros.
- Se ha encontrado una relación inversa entre duración del viaje y la terneza de la carne, aunque de manera no concluyente, al poder influir otros factores operativos.
- Es necesaria investigación urgente sobre la posible incidencia en la transmisión de resistencias antimicrobianas, como resultado de los viajes, así como de la incidencia de las paradas.
- Solo se ha encontrado un artículo relevante en el estudio específico de la importancia del medio ambiente sobre el bienestar de los animales bovinos transportados. Se apunta que el viaje facilita la transmisión de enfermedades, especialmente las condiciones climáticas en las que se desarrolla. La incidencia negativa se relaciona con los cambios ambientales bruscos y especialmente el intervalo de temperatura sufrido ya que predisponen la trasmisión de muchos de los patógenos.
- Analizando 9 años de transportes reales en la Republica Checa se concluye que los bovinos cebados tienen menos riesgo de sufrir golpes, que los de desvieje. Así como que los animales que sufren más traumas en miembros y cuerpo son las vacas transportadas.
- El suministro de comida y agua reduce el estrés del viaje largo, en pruebas realizadas en cabras.

Como valoración global de la revisión realizada, se remarca la necesidad de fundamentar científicamente los cambios legislativos, de acuerdo a la mayoría de los autores. También aparece el que debería ser un importante elemento de debate, ya que algunos autores informan sobre un reducido impacto en animales muy jóvenes (11d) de viajes de hasta 16 horas.

ABSTRACTS DE LOS ARTÍCULOS SELECCIONADOS

En este apartado se presentan los resúmenes que describen las conclusiones del trabajo en las publicaciones que se han seleccionado como las de mayor relevancia en el periodo. El resumen de cada artículo se trae a este Informe de forma tal y como ha sido publicado por cada uno de sus autores, excluyendo de cada resumen la información descriptiva del trabajo experimental. En esta relación de resúmenes se ha seguido la ordenación del Anejo número 1 de esta revisión bibliográfica.

FVI- Pre y Post Viaje.

- Abubakar et al., (2021). Results revealed that the intensity of cortisol responses and EEG parameters (such as $\alpha < 0.001$, $\beta < 0.001$, $\delta < 0.001$, $\theta < 0.001$, $MF < 0.001$ and $P_{tot} < 0.001$) increased significantly. Long-distance transport also resulted in significantly more intense (< 0.001) responses to nociception during slaughter than animals that had been transported over a shorter distance, as indicated by EEG and cortisol.
- Melendez et al., (2021). Few and inconsistent indicators of reduced welfare were observed between auction market and ranch direct calves, while non-conditioning was associated with greater physiological and behavioural indicators of reduced welfare. Based on these results, conditioning should be implemented as a management practice to improve the welfare of transported calves.
- Melendez et al., (2022). This study suggests that conditioned (C) calves are better fit for transport than or non-conditioned (N) calves as evidenced by behavioural and physiological parameters. Fewer and inconsistent differences were observed for rest and post-rest transport treatments.
- Othman et al., (2021). This preliminary trial investigated the effect of transportation and lairage periods on physiological parameters of goats subjected to slaughter, suggesting that the pre-slaughter stress may have affected the pain threshold. It is suggested that after 6 h of transportation, goats should ideally be placed in lairage for a minimum period of 3 h before slaughter.
- Ozdemir et al., (2023). In conclusion: to reduce the presence and severity of carcass bruises, it may be beneficial to focus on the improvement of handling and coercion practices applied by the stock person, to slaughter the cattle in the nearest slaughterhouse, and to pay more care to the handling of culled cattle.
- Valadez-Noriega et al., (2022). Our study underscores the importance of applying preconditioning practices in cow-calf rearing systems at least a couple of months prior to the long-distance journey, in addition to implementing good loading practices to select which animals are best suited for a given compartment. Our results may be useful to minimize the impacts of post-transport fatigue (PTF) and bovine respiratory disease (BRD), to propose best practices for livestock transport in countries with similar production systems and agroecosystems.
- Valkova et al., (2022). Emphasis should be put on the assessment of animal fitness before transport. This is especially important for animals at the end of their production cycle such as dairy cows, sows, and laying hens. They were more likely to die during the journey.

FV2- Densidad de Carga en el transporte.

- Gallo et al., (2023). Provide a scientific basis on which to objectively establish absolute minimum static space requirements for cattle of different breeds, types, weights and anatomical conformations and calculate k values in static standing (ST), recumbency (SR) and sleeping (SL). The allometric coefficient k value was obtained for each posture using linear regression equations from the measured weight (kg (0.66)) and area occupied. Results Less but more variable space was occupied by each individual in the ST posture compared to SR or SL posture, with clear correlations between weight and occupied area. The k values obtained were 0.014 (ST), 0.023 (SR) and 0.021 (SL).
- Pagliasso et al., (2023). Transportation took no more than 8 h and was carried out between January and March 2021. The results showed a typical stress leukogram with neutrophilia and changes in the neutrophil: lymphocyte ratio. No significant alterations were observed in either serum proteins or pro-inflammatory cytokines. Significant, albeit transient, alterations were observed in some clinical chemistry parameters after transportation, which could be accounted for by stressful conditions such as the transportation itself and handling and mixing with other animals. Our results indicated that the adopted transportation conditions only slightly affected the blood variables under study with no significant impact on animal welfare.

FV3- Duración del Viaje.

- Avila-Jaime et al., (2021). Blood samples were obtained from 16 high-risk heifers; eight were newly arrived from a 40 h road trip (0 days post-arrival (DPA)), whereas the other eight heifers had been in the feedlot at 25 DPA. Both groups were transported from the southeast tropical region of Mexico to a feedlot in the northeast and were sampled on the same day >22horas. The TNF-alpha expression level was higher ($p = 0.001$) in the 25 DPA group than the 0 DPA group according to the semi-quantitative expression analysis. This may indicate a persistent inflammatory process that could be related to trauma and disease, which can negatively impact their subsequent health and growth performance. In conclusion, homeostatic disruption was apparent in the 0 DPA heifers, which showed higher cortisol and reductions in TNF-alpha levels and stress-induced bovine lymphotoxin (SIBL) co-expression.
- Goetz et al., (2022). In surplus dairy calves following 6, 12, or 16 h of continuous road transportation. Calves transported between 15 and 19 d of age had a higher concentration of cholesterol and CK ($A = 0.27$ mmol/L cholesterol; 37.18 U/L CK) compared with 2-to 6-d-old calves, and calves 12 to 14 d old had greater reduction in HCO_3^- ($A = -0.92$ mmol/L) compared with 2-to 6-d-old calves. These findings show that transporting calves for long distances results in lower glucose concentration and suboptimal energy status, and that this effect varies based on the calf's age.
- Hultgren et al., (2022). This study shows a negative effect of long transport distances on beef tenderness. It also provides evidence of differences in beef quality between a mobile abattoir and a stationary slaughterhouse, although these differences may be attributable to specific routines for carcass handling and ageing at the studied facilities, and not the transport and slaughter strategy itself.

- Koutsoumanis et al., (2022). The transmission of antimicrobial resistance (AMR) between food-producing animals (poultry, cattle and pigs) during short journeys (< 8 h) and long journeys (> 8 h) directed to other farms or to the slaughterhouse lairage (directly or with intermediate stops at assembly centres or control posts, mainly transported by road) was assessed. Data gaps relating to the risk factors and the effectiveness of mitigation measures have been identified, with consequent research needs in both the short and longer term listed. Quantification of the impact of animal transportation compared to the contribution of other stages of the food-production chain, and the interplay of duration with all risk factors on the transmission of ARB/ARGs during transport and journey breaks, were identified as urgent research needs.

FV4- Condiciones Ambientales en el Viaje.

- Padalino et al., (2021). Transport also significantly increased co-infection passing from 16.0% at T0 to 82.8% at T1 ($p < 0.001$). An extra stop during the journey seemed to favor BRSV, *M. haemolytica*, and *P. multocida* ($p < 0.05$). Weather conditions, in particular sudden climate changes from departure to arrival and daily temperature variance, were found to be predisposing factors for many of the pathogens. The farm of arrival also played a role.

FV5- Recorrido y el manejo en el Viaje.

- Valkova et al., (2021). Animals reared and slaughtered in the Czech Republic, along 9 years. In the studied animal species, findings of traumatic lesions were detected at low frequency. The low frequency of traumatic lesions is favorable from the perspective of the welfare of slaughtered animals. In terms of further improvements to animal welfare, it would be desirable to focus on the prevention of trauma in cattle in particular, in which findings of trauma were more frequent than in the other species studied. The category most affected by trauma both to the limbs and body was cows. . The results showed that fattened animals are affected by the risk of trauma to a lesser extent than both culled adult animals and young animals. Statistically significant differences ($p < 0,01$) were also found between the studied species and categories of animals. The category most affected from the viewpoint of injury both to the limbs and body was cows.
- Xu et al., (2023). Results imply that water and feed supplementation to livestock can effectively alleviate stress responses in goats subjected to road transportation and emphasize the necessity to establish water and feed supplies even at a temporary holding pen.

PUBLICACIONES TRANSVERSALES O SIN INCLUSIÓN

- Roadknight et al. (2021), young calves aged ≤ 3 mo are particularly vulnerable to compromised welfare, and are at a relatively high risk of morbidity and mortality compared with adult cattle. Calves face several potential challenges to welfare during and after transport, including food and water deprivation, disease, injury, and stress from handling, social mixing, and new environments. The key risk factors identified for poor calf welfare associated with transport include long transport and fasting durations, young age at transport, poor colostral immunity, timing within the calving season, lack of bedding in trucks, and high stocking density. Maximizing calf welfare thus requires a multifaceted approach, such as minimizing transport and fasting durations, transporting at an appropriate stocking density with comfortable bedding, only transporting

calves that are healthy and fit, and optimizing pre-transport calf management. More research is needed to understand the effect of transport on the mental or affective state of calves.

- Davis et al. (2022). Pre-slaughter management factors were then categorized by: animal characteristics; environmental characteristics; handling; lairage; transportation; and water/feed. The results of this review offer a catalogue of commonly researched factors and indicators of welfare measured during the pre-slaughter phase, as well as the relationships between them. This review also offers further substantial evidence that a multitude of events in the pre-slaughter phase affect fed beef cattle welfare and a collection of highly applicable welfare indicators to expedite further research on the effects of pre-slaughter factors and the application of improved practices.
- Nielsen et al. (2022). The EFSA Report contains general and specific conclusions relating to the different stages of transport for cattle. Recommendations to prevent hazards and to correct or mitigate welfare consequences have been developed.
- Bachelard et al. (2022), in an informative publication present a biased approach to animal transport in Europe, according to an NGO.
- Goetz et al. (2023). As the transport-related risk factors and outcomes measured assessed varied widely between studies, future quantitative synthesis (e.g., meta-analysis) in this area may be limited. Several knowledge gaps were identified, including methods to prepare calves for transportation, such as improving nutrition, administering medication, or transporting calves at an older age or weight. Further research could also focus on consistent and clear reporting of key items related to study conduct and analysis, as well as the development of a core outcome set for calf transport studies.

APPENDIX

3

CALCULATIONS

**FOR PROPOSED SECTOR
IMPROVEMENTS**

APPENDIX 3.

CALCULATIONS FOR PROPOSED SECTOR IMPROVEMENTS

IMPACT BREAKDOWN OF PROPOSED SECTOR IMPROVEMENTS FOR REGULATION (EC) 1/2005

1. PRE-JOURNEY ENERGY SUPPLEMENT PRIOR TO BEGINNING LONG JOURNEYS

- **Measure:** Given the lack of available slow-release energy supplements, the proposal is to provide whey before beginning the journey.
- **Cost:** This would derive in an added cost of transporting unweaned calves of EUR 0.37/animal, and EUR 96/journey. This represents an investment of EUR 0.28 million for all unweaned calves transported via long-haul journey.

2. REDUCED DURATION OF JOURNEY BREAK

- **Measure:** This measure would reduce the duration of journey breaks from 24 to 12 hours at control posts, as it is considered that this is sufficient time for animals to rest and be fed without incurring any negative welfare consequences.
- **Cost:** It is assumed that the cost of the break would be similar, while associated personnel costs (work hours) would be reduced by 38%. For example, 69 journeys could now be made at the same cost as 50 journeys previously. For an 1,800-km journey, reducing the duration of the journey break would result in a savings of EUR 1,466/journey, i.e. a savings of EUR 5.63/calf.

3. INCREASE MINIMUM AGE TO 21 DAYS

Raising the minimum age for transport of calves from 14 to 21 days would be much less costly for the sector as compared to the proposal of 35 days, and would still result in improved animal welfare.

- **Measure:** Increase minimum age for transport of calves from 14 to 21 days.
- **Organizational requirements and economic cost:**
 - a.1) Farm of origin:

The average daily cost of maintaining an unweaned calf is EUR 5.26/calf, so these 7 additional days on the farm would result in an added cost of EUR 36.82/calf.

Given the estimated average number of weaner bulls produced each year in Spain, this measure would result in an added cost of EUR 12.8 million.

▷ a.2) Transport sector:

Increasing the minimum age would mean transporting heavier animals (+3.5 kg). Respecting the current loading density provided for in the legislation, this would mean transporting 25 fewer animals/journey (-9.6% animals), so a vehicle that currently transports 260 animals would transport 235 with this measure. If transporting an unweaned calf costs EUR 13 on average, this measure would result in an added cost of EUR 1.38/animal.

Given that Spain transports 847,000 unweaned animals annually, it is estimated that raising the minimum age to 21 days could result in an added cost of EUR 1.2 million.

APPENDIX

4

**COST OF
TRANSPORTING
UNWEANED
CALVES:**

**DOMESTIC AND
INTRA-COMMUNITY
JOURNEYS**

APPENDIX 4.

COST OF TRANSPORTING UNWEANED CALVES: DOMESTIC AND INTRA-COMMUNITY JOURNEYS

METHODOLOGY USED TO ESTIMATE COSTS

The methodology used to calculate the impact assessment is based on a standard company that performs 50 journeys per year (1,800 km + 1,800 km = 3,600 km round trip), carrying a total of 260 unweaned calves per triple-deck vehicle, with an average weight of 52 kg/animal, loaded at two different points of origin.

For domestic journeys, we base our calculations on a standard company that performs 50 journeys per year (800 km + 800 km = 1,600 km round trip), carrying a total of 260 unweaned calves per triple-deck vehicle, with an average weight of 52 kg/animal, loaded at two different points of origin.

This model responds to the need to load animals at the farm of origin.

The cost for the domestic transport of unweaned calves is EUR 11/animal, and EUR 15 for imported animals. We will therefore calculate an average transport cost of EUR 13/animal.

The hourly cost for these journeys is estimated at EUR 1.20/km for domestic journeys, and EUR 1.40 for journeys within Europe. We will therefore calculate an average hourly cost of EUR 1.30/km.

The farms used to estimate costs are average-sized Spanish farms, according to official MAPA sources: fattening farms with a capacity of 100 animals, and dairy farms with 64 cows, which sell an estimated 30 calves/year for fattening.

Net yearly output in Spain is 700,000 t produced on 100,000 nurse cow farms and fattening farms.

Official figures indicate that a total of 10,600 dairy farms supply animals. It is estimated that these farms wean 350,000 steers.

It is estimated that each cattle farm creates 1.5 direct and indirect jobs.

As of December 2022, the daily cost of raising an unweaned calf is EUR 5.26/animal (Source: Vicente Jimeno, ETSIAAB-UPM. ANÁLISIS ECONÓMICO DEL SECTOR VACUNO DE CARNE. 12 December, 2022).

It is estimated that there are currently 200 haulers of live calves in Spain, with a fleet of 120 vehicles authorized for short journeys and 55 vehicles authorized for long journeys.

According to sector sources, the investment required for a vehicle authorized for long journeys would be EUR 13,500/year for 10 years.

Emissions from the Spanish beef sector derived from transport between farms currently stand at 0.0156 kg of an average total of 21.49 kg of CO₂-eq/kg of dressed weight (Source: Informe sobre ciclo de vida carne de vacuno, PROVACUNO).

BREAKDOWN OF THE IMPACT ASSESSMENT FOR EACH OF THE MEASURES PROPOSED BY THE EC

Maximum duration of journey

The current regulation does not specify a maximum duration for journeys, but the leaked EC proposal advocates for a maximum duration of 8 hours. This would prevent the entry of 407,000 animals from other EU countries and the movement of 31,500 domestic animals, which would have to be fattened at the farm of origin.

Such limitations would result in a 20% loss in fattening farm activity, particularly in the regions of Aragon and Catalonia, and a 20% loss for the processing industry, leading to the closure of 3,200 farms, the loss of 4,800 jobs, and a loss of production value estimated at EUR 820 million.

Alternatively, if after an 8h journey a 24h stop is permitted, followed by another 8h journey, it is estimated that:

With the exception of animals originating in France, the transport of 100,000 unweaned animals from other EU member states for which the journey exceeds 16 hours would be prevented. This would result in a 4.7% loss in fattening farm activity and a 4.7% loss for the processing industry, with a loss of production value estimated at EUR 193 million.

Other animals originating in France that are transported on journeys exceeding 8 hours (250,000 calves), and long domestic journeys of unweaned calves from the Cantabrian Coast (31,500) to the regions of Aragon and Catalonia, could be maintained at an additional cost.

The limitation on maximum transport time proposed by the CE would require an average increase in travel time of 137% for an average journey of 16 hours (current journey times of 17 hours, 9-1-7, would become 40 hours, 8-24-8). This measure would increase the cost per kilometer from EUR 1.30/km to EUR 1.78/km, i.e. an added cost of EUR 912/journey. Considering the number of long journeys that would be required to supply the sector with unweaned calves, it is estimated that this proposal would incur added costs of EUR 2.7 million for the sector.

Including a 3-hour journey break using vehicles adapted for feeding

Regulation (EC) 1/2005 does not provide for the obligation of authorizing long journeys only for those vehicles that are able to feed the animals during a 3-hour stop following a 9-hour journey. Vehicles that are not so equipped would be limited to 8-hour journeys. This limitation would prevent the import of unweaned calves from EU countries, as well as the movement of a large percentage of animals from the north of Spain (est. 122,000 animals) to Aragon and Catalonia, which are the primary regions for fattening this type of calf in Spain.

The modification of the regulation would have a significant organizational and economic impact on animal welfare and on the environment. It is therefore our understanding that hauliers will adapt to the requirement of feeding animals during journeys exceeding 8 hours in order to continue with their activity.

- 407,000 unweaned calves from EU countries would be affected by the obligation to adapt vehicles for milk feeding and 3-hour breaks.
- Vehicle would have to be adapted to feed 122,000 (35% of total) domestic unweaned calves originating in Galicia and the Cantabrian Coast and transported for fattening in Aragon and Catalonia, and the duration of the journey would increase in order to comply with the 3-hour break.
 - ▷ A **required 3-hour journey break** for feeding would entail the following investments:

a) Cost to upgrade vehicles or acquire new vehicles estimated at EUR 30,000 and EUR 450,000 respectively. We shall apply an average cost of EUR 240,000.

The average cost to upgrade existing vehicles or invest in new ones would require an outlay of EUR 24,000/year for 10 years. For a company that makes 50 journeys/year, this would represent an added cost of EUR 480/journey, i.e. an added cost of EUR 1.80/calf.

It is estimated that 55 vehicles authorized for long journeys would need to be upgraded. This would result in added costs for the transport sector of EUR 1.32 million/year for 10 years.

b) Cost of providing milk vs. providing whey:

Providing milk would carry an additional cost of EUR 26/journey for unweaned calves, which represents an average added cost of EUR 0.10/animal compared to providing whey.

c) Two additional hours of journey break (cost/hour/journey):

The hourly cost for these journeys is estimated at EUR 1.30/km. Given that the duration of the journey would increase by 10%, the cost per kilometer would increase to EUR 1.43/km.

For an 1,800-km journey, this additional stop would result in EUR 234 of added costs, i.e. an added cost of EUR 0.90/calf.

The obligation to stop for an additional two hours to feed unweaned calves with milk would carry an added cost of EUR 2.80/calf, affecting 529,000 unweaned calves, for a total additional cost for the sector of EUR 1.5 million.

Limiting transport to a single 21-hour cycle without a 24-hour break

Regulation (EC) 1/2005 does not limit the number of transport cycles for unweaned calves. Vehicles may perform a 21h cycle, after which the vehicle must stop for a 24h break and then continue for a second 21h cycle.

The leaked EC document proposes a single 21h cycle, during which the animals would have to arrive at their final destination. This new proposal would prevent the import of unweaned calves from the EU, with the exception of animals originating in certain areas of France, with final destination in the north of Spain. This would affect 25% of imported animals (124,000), which would lead to a 5.8% loss in fattening farm activity and a 6% loss for the processing industry, with a loss of production value estimated at EUR 247 million.

Given the average size of fattening farms in Spain, this would lead to the closure of 1,240 farms, and the loss of 1,860 direct jobs and 12,400 indirect jobs.

Loading density during transport

The loading density currently established by the legislation for this category is 55 kg for a surface area of between 0.30 and 0.40 m². The table of recommendations published by EFSA¹ establishes an increased space allowance of approximately 60%, which would increase the cost of transport by the same proportion, in addition to the potential fallen stock that could result from an unstable vehicle. It is this aspect in particular that, in the opinion of the editing team of this document, poses the greatest risk to animal welfare, and should be indisputably substantiated by scientific evidence and experience. This is likewise the case for grazing animals and animals intended for the processing industry.

With this measure, a vehicle that currently transports 260 animals would transport 104, i.e. 60% less. If transporting an unweaned calf carries a cost of EUR 13 on average, this measure would result in an added cost of EUR 32.50/calf.

Given that Spain moves 497,000 unweaned animals annually, it is estimated that the proposed reduction in loading density could result in an added cost of EUR 16.15 million.

Minimum age of animals for transport

The EC proposes raising the minimum age currently reflected in Regulation (EC) 1/2005 from 14 to 35 days.

Said modification would have a significant organizational impact on dairy farms and on the volume of animals that are transported, particularly of an economic nature, but also environmental.

- Organizational requirements and economic cost:

- **a.1) Farm of origin:**

The daily cost of maintaining an unweaned calf is EUR 5.26/calf, so these 21 additional days on the farm would result in an added cost of EUR 110.50/calf.

Given the estimated average number of weaner bulls produced each year in Spain, this measure would result in an added cost of EUR 38.6 million.

- **a.2) Transport sector:**

Increasing the minimum age for transport while respecting loading density as per current legislation would also mean reducing the number of animals that are transported.

¹ *Welfare of cattle during transport (wiley.com)*

It is estimated that an animal transported at 14 days old weighs approximately 42 kg. If animals were instead transported with a minimum of 35 days, each animal would weigh approximately 55 kg.

The difference between transporting 14-day-old animals (42 kg approx.) and transporting 35-day-old animals (55 kg approx.) in 99 m² distributed on three decks would mean transporting 82 fewer animals (24% fewer animals, with a 31% increase in cost/animal).

This measure would carry an additional cost of EUR 3.40/animal.

Raising the minimum age for transport would represent EUR 55.2 million in additional costs for the sector.

Limiting long journeys when temperatures exceed 25°C

Regulation (EC) 1/2005 prohibits long journeys when maximum temperatures reach the threshold of 30°C +/- 5°C.

The leaked EC proposal would prohibit long journeys at temperatures exceeding 25°C. Given the climate characteristics in Spain, many regions of the country exceed 25°C for an average of 5 months per year. The limitation would thus prevent long journeys in Spain for a period of 5 months, from May to September each year, impeding the import of 170,000 animals from EU countries and disrupting the movement of 51,000 animals from Spanish dairy farms, which would presumably have to be fattened at the farm of origin. Fattening farms would receive 221,000 fewer animals over this period of 5 months, which would lead to the closure of 2,200 of these establishments. Spanish industry would lose 9% of its production activity, resulting in a loss of 25,000 jobs.

Vehicles authorized for short journeys are very specific, and cannot be adapted to perform long journeys. This measure would mean that all hauliers in Spain authorized to make short journeys would have to invest in the purchase of vehicles equipped for long journeys.

- **Organizational** requirements and economic cost:

- ▷ **a.1) Farm of origin:**

Farms of origin would have to feed and provide bedding for the calves for an average of 5 months. Most farms lack sufficient pasture, infrastructure and experience to feed calves during periods of high temperatures. The average daily cost of maintaining a calf on the farm is EUR 5.26/animal/day, which means that maintaining animals on the farm of origin for an additional 150 days would result in added costs of EUR 40.2 million for dairy farms.

- ▷ **a.2) Transport sector:**

The average cost of EUR 240,000 to adapt Spanish vehicles for periods of high temperatures would entail added costs of EUR 24,000/year/vehicle for a period of 10 years, and EUR 1.80/calf, for an added annual cost of EUR 2.8 million for the sector over a period of 10 years.

- ▷ **a.3) Slaughterhouse:**

Spanish slaughterhouses would receive 170,000 fewer animals for fattening from EU member states. This would result in 9.3% fewer available animals and a 9.3% decrease in activity, for an 8.13% decrease in net output equivalent to a reduced production value of EUR 334 million.

APPENDIX

5

**COST OF
TRANSPORTING
GRAZING
CALVES:**

**DOMESTIC AND
INTRA-COMMUNITY JOURNEYS
METHODOLOGY USED TO
ESTIMATE COSTS**

APPENDIX 5.

COST OF TRANSPORTING GRAZING CALVES: DOMESTIC AND INTRA-COMMUNITY JOURNEYS

METHODOLOGY USED TO ESTIMATE COSTS

The methodology used to calculate the impact assessment is based on a standard company that performs 50 journeys per year (1,800 km + 1,800 km = 3,600 km round trip), carrying a total of 110 calves per double-deck vehicle, with an average weight of 250 kg/animal, loaded at two different points of origin.

For domestic journeys, we base our calculations on a standard company that performs 50 journeys per year (800 km + 800 km = 1,600 km round trip), carrying a total of 110 calves per double-deck vehicle, with an average weight of 250 kg/animal, loaded at two different points of origin.

This model responds to the need to load animals at the farm of origin.

The cost for the domestic transport of grazing calves is EUR 18/animal, and EUR 22 for imported animals. We will therefore calculate an average transport cost of EUR 20/animal.

The hourly cost for these journeys is estimated at EUR 1.70/km for domestic journeys, and EUR 1.90 for journeys within Europe. We will therefore calculate an average cost of EUR 1.80/km.

The farms used to estimate costs are average-sized Spanish farms, according to official MAPA sources: fattening farms with a capacity of 100 animals, and dairy farms with 26.5 nurse cows, which wean an estimated 18.5 calves/year and sell an estimated 17 for fattening.

Net yearly output in Spain is 700,000 t produced on 100,000 nurse cow farms and fattening farms.

Official figures indicate that there are a total of 16,000 active fattening farms in Spain. It is estimated that each farm creates 1.5 direct and indirect jobs.

As of December 2022, the daily cost of raising a grazing calf is EUR 7.50/animal (Source: Vicente Jimeno, ETSIAAB-UPM. ANÁLISIS ECONÓMICO DEL SECTOR VACUNO DE CARNE. 12 December, 2022).

It is estimated that there are currently 200 hauliers of live calves in Spain, with a fleet of 120 vehicles authorized for short journeys and 55 vehicles authorized for long journeys.

According to sector sources, the investment required for a vehicle authorized for long journeys would be EUR 13,500/year for 10 years.

Emissions from the Spanish beef sector derived from transport between farms currently stand at 0.0156 kg of an average total of 21.49 kg of CO₂-eq/kg of dressed weight (Source: Informe sobre ciclo de vida carne de vacuno, PROVACUNO).

IMPACT BREAKDOWN OF PROPOSED EC IMPROVEMENTS FOR GRAZING CALVES

Maximum duration of journey: 12 hours

- Regulation (EC) 1/2005 does not establish a maximum duration for journeys, but the leaked EC proposal advocates for a maximum duration of 12 hours.
- This would in essence prevent the transport of animals to Spain from other EU countries.
- Spain imports approximately 150,000 grazing animals for fattening from other EU countries. Approximately 90,000 of these imported animals must make a long journey.
- If journey breaks are not permitted, this limitation would prevent these journeys from happening, reducing the number of animals processed in Spain by 4.2%. This measure would result in an estimated 5.1% decrease in net output, and a decrease in production value of EUR 210 million. This would force the closure of 790 fattening farms, primarily in the central region of Spain and Murcia, with a loss of 1,185 jobs.

However, with a 12-hour journey + 24-hour break + 12-hour journey, the usual movements could continue within the sector with the following impact:

For a journey of 1,800 km, the cycles currently permitted by EC regulation (9h + 1h break + 9h = 19h), would be distributed as 12h + 24h break + 6h. In other words, the same journey would take 121% longer, with an average cost per journey of EUR 3,924. Added costs of EUR 3.2 million would affect the 90,000 calves imported to Spain from European countries via long-haul journey.

Loading density during transport

The loading density currently established by the legislation for this category is 250 kg for a surface area of between 1.0 and 1.2 m². The table of recommendations published by EFSA² establishes an increased space allowance of approximately 60%, which would increase the cost of transport by the same proportion, in addition to the potential fallen stock that could result from an unstable vehicle.

With this measure, a vehicle that currently transports 110 animals would transport 66 animals, i.e. 60% less. If transporting a grazing calf from Spain and the EU carries an average cost of EUR 20, this measure would result in an added transport cost of EUR 33.30/calf.

Given that Spain transports 1,110,000 grazing calves domestically and within EU member states, it is estimated that the proposed measure to reduce loading density could carry an added cost of EUR 36.9 million.

² *Welfare of cattle during transport (wiley.com)*

Minimum height allowance inside cargo containers

The regulation does not currently provide for a minimum height allowance between the withers of the animal and the ceiling of the deck or the vehicle. Sector sources indicate that this allowance is 20 cm. EFSA³ recommendations, however, establish this allowance at 40 cm, which would prevent grazing animals from being transported in double-deck vehicles.

With this measure, a vehicle that currently transports 110 animals would transport 55 animals, i.e. 50% less. If transporting a grazing calf from Spain and the EU carries an average cost of EUR 20, this measure would result in an added transport cost of EUR 40/calf.

Given that Spain transports 1,110,000 grazing calves domestically and within EU member states, it is estimated that the proposed measure to reduce loading density could carry an added annual cost of EUR 22 million for the sector.

Limiting long journeys when temperatures exceed 25°C

Regulation (EC) 1/2005 prohibits long journeys when maximum temperatures reach the threshold of 30°C +/- 5°C.

The leaked EC proposal would prohibit long journeys at temperatures exceeding 25°C. Given the climate characteristics in Spain, many regions of the country exceed 25°C for an average of 5 months per year. The limitation would thus prevent long journeys in Spain for a period of 5 months, from May to September, affecting farms of origin, fattening farms and industry.

This measure would mean that all hauliers in Spain authorized to make short journeys would have to invest in the purchase of vehicles equipped for long journeys.

- **Organizational** requirements and economic cost:

- ▷ **a.1) Farm of origin:**

Spanish farms of origin would have to assume the task of fattening animals that cannot be sold to fattening farms during these months. Most farms lack sufficient pasture, infrastructure and experience to feed calves during periods of high temperatures. The average daily cost of fattening a calf on the farm of origin would mean an added cost of EUR 7.50/animal/day. This would result in a cost of at least EUR 7,965 for the 5 months during which animals would have to be fattened on the farm of origin, and would affect 11,000 farms, for a total added cost of EUR 87.6 million.

- ▷ **a.2) Transport sector:**

The cost of substituting Spanish vehicles to adapt to periods of high temperatures would entail added costs of EUR 13,500/year/vehicle for a period of 10 years, and EUR 2.02 million/year for the sector.

³ *Welfare of cattle during transport (wiley.com)*

▷ **a.3) Slaughterhouse:**

Spanish slaughterhouses would receive 170,000 fewer grazing animals from EU member states. This would result in 8% fewer available animals and an equivalent decrease in activity, for a reduced production value of EUR 328 million.

APPENDIX

6

**COST OF
TRANSPORTING
FATTENED
CALVES
INTENDED**

FOR THE PROCESSING INDUSTRY

APPENDIX 6.

COST OF TRANSPORTING FATTENED CALVES INTENDED FOR THE PROCESSING INDUSTRY

METHODOLOGY USED TO ESTIMATE COSTS

The methodology used to calculate the impact assessment is based on a standard company that performs 50 journeys per year (1,800 km + 1,800 km = 3,600 km round trip), carrying a total of 70 calves per double-deck vehicle (34 m² per deck) with an average weight of 550 kg/animal, loaded at two different points of origin.

For domestic journeys, we base our calculations on a standard company that performs 50 journeys per year (800 km + 800 km = 1,600 km round trip), carrying a total of 70 calves per double-deck vehicle (34 m² per deck) with an average weight of 550 kg/animal, loaded at two different points of origin.

This model responds to the need to load animals at the farm of origin.

The average cost of transporting calves to industry is estimated at EUR 1.30/km.

The farms used to estimate costs are average-sized Spanish farms, according to official MAPA sources: fattening farms with a capacity of 100 animals.

Net yearly output in Spain is 700,000 t produced on 100,000 nurse cow farms and fattening farms. It is estimated that each farm creates 1.5 direct and indirect jobs.

It is estimated that there are currently 200 hauliers of live calves in Spain, with a fleet of 120 vehicles authorized for short journeys and 55 vehicles authorized for long journeys.

According to sector sources, the investment required for a vehicle authorized for long journeys would be EUR 13,500/year for 10 years.

Emissions from the Spanish beef sector from transport between farm and industry are currently estimated at 0.027412 kg of CO₂-eq/dressed carcass (Source: Informe sobre ciclo de vida carne de vacuno, PROVACUNO).

BREAKDOWN OF COSTS ASSOCIATED WITH EC PROPOSALS

Maximum duration of journey: 9 hours

Regulation (EC) 1/2005 does not establish a maximum duration for journeys, but the leaked EC proposal advocates for a maximum duration of 9 hours.

This limitation would prevent the domestic movement of 302,000 animals from southwest Spain on long journeys from farm to industry. These animals would have to be processed regionally rather than at their final destination, which would increase activity by 14%.

The measure would also prevent the entrance of 40% of animals imported from EU member states for the processing industry, as well as the export of 50,000 animals to Italian industries and third countries. These 50,000 animals would partially compensate the deficit of animals intended for processing in Catalonia and the autonomous community of Valencia, which would experience a 12% decrease in activity, resulting in the closure of certain industries.

The second possibility among the leaked proposals is that these journeys intended for the processing industry could have a duration of 12h. In this case, domestic journeys to processing facilities could be made comfortably, although the measure would still prevent the entrance of 40% of animals (25,000 calves) imported for industry from other EU member states, as well as the movement of 50,000 animals intended for Italian industry and industry in third countries. This would therefore result in a surplus of 25,000 animals intended for processing, which would result in an increase in industrial activity.

If after a 9-hour journey a 24-hour stop is permitted, nearly all deliveries to industry could be made from EU member states, except those from countries that are farther away, like Poland or Ireland, which would affect some 10,000 animals. Movements outside the European Union and to third countries could be maintained with added costs, which are estimated at EUR 1.2 million.

Loading density during transport

The loading density currently established by the legislation for this category is 550 kg for a surface area of between 1.30 and 1.60 m². The table of recommendations published by EFSA⁴ establishes a 60% reduction in space allowance, which would increase the cost of transport by the same proportion, in addition to the potential fallen stock that could result from an unstable vehicle.

A vehicle that currently transports 70 animals would transport 28 with this measure. If transporting a fattened calf carries a cost of EUR 20 on average, this measure would result in a total cost of EUR 50/calf.

Given that Spain moves 2,090,000 animals from fattening farm to industry annually, it is estimated that the proposed reduction in loading density could result in an added cost of EUR 62.7 million.

Minimum height allowance inside cargo containers

The regulation does not currently provide for a minimum height allowance between the withers of the animal and the ceiling of the deck or the vehicle. Sector sources indicate that this allowance is 20 cm. EFSA⁴ recommendations, however, establish this allowance at 40 cm, which would prevent the transport of fattened calves on double-deck vehicles.

⁴ *Welfare of cattle during transport (wiley.com)*

With this measure, a vehicle that currently transports 70 animals would transport 35 animals, i.e. 50% less. If transporting a fattened calf carries a cost of EUR 20 on average, this measure would result in a total cost of EUR 40/calf.

Given that Spain moves 2,090,000 animals from fattening farm to industry annually, it is estimated that the proposed reduction in loading density could result in an added cost of EUR 41.8 million.

Limiting long journeys when temperatures exceed 25°C

Regulation (EC) 1/2005 prohibits long journeys when maximum temperatures reach the threshold of 30°C +/- 5°C.

The leaked EC proposal would prohibit long journeys at temperatures exceeding 25°C. Given the climate characteristics in Spain, many regions of the country exceed 25°C for an average of 5 months per year.

- It is estimated that Aragon would be the most seriously affected producing region due to the inability to export animals to Italy and to third countries. These animals could, however, be delivered to local industries.
- Spanish industry, primarily in the regions of Catalonia and the autonomous community of Valencia, would have 125,000 fewer animals from other regions in the southwest of Spain, and 10,000 fewer animals from EU countries. This would result in a 4.5% decrease in activity during months of high temperatures, and a resulting decrease in production value of EUR 185 million.
- Industries in the southwestern regions of Spain would be required to increase activity by 6% during these 5 months in order to process the 125,000 calves that cannot be transported to industry in Catalonia and Valencia, primarily.

This measure would mean that all hauliers in Spain authorized to make short journeys would have to invest in the purchase of vehicles equipped for long journeys.

• **Organizational requirements and economic cost:**

The cost of substituting Spanish vehicles to adapt to periods of high temperatures would entail added costs of EUR 24,000/year/vehicle for a period of 10 years, and EUR 1.80/animal. The sector would have to cover added costs of EUR 2.8 million/year for a period of 10 years.

APPENDIX

**TEMPERATURES
IN SPAIN:**

2021-2022

APPENDIX 7.

TEMPERATURES IN SPAIN: 2021-2022

According to the Spanish Meteorological Agency (AEMET), the summer of 2022 (1 June - 31 August) was exceptionally hot, with an average temperature in mainland Spain of 24°C, which is 2.2°C warmer than the average for this season. We can analyze data of absolute maximum temperatures by month, and the average maximums for the 2021-2022 agricultural year for the meteorological monitoring stations of reference. The findings show that:

- All of the meteorological monitoring stations reviewed, with the exception of Navacerrada and Izaña, registered absolute temperatures exceeding 25°C on at least one day during the months of May, June, July, August and September. A significant number of stations located in low areas of the southern two-thirds of the country and the eastern area of the peninsula registered temperatures exceeding 25°C in April and October as well.
- In May of the 2021-2022 meteorological year, the average maximum temperature exceeded 25°C in 46 of the 86 reference meteorological monitoring stations of the Spanish Meteorological Agency.
- In August of the 2021-2022 meteorological year, the average maximum temperature exceeded 25°C in 80 of the 86 reference meteorological monitoring stations of the Spanish Meteorological Agency.
- In September of the 2021-2022 meteorological year, the average maximum temperature exceeded 25°C in 58 of the 86 reference meteorological monitoring stations of the Spanish Meteorological Agency.

There is not sufficient open data available to estimate the number of days on which temperatures exceeded 25°C in each autonomous community and for each month. We can, however, highlight the following:

- Between the months of June and August, the probability of maximum temperatures exceeding 25°C is highly likely in nearly the entire peninsula and the Spanish islands.
- During the months of May and September, it is highly likely that maximum temperatures will exceed 25°C in 60% of the geographical regions of our country.

Figure 1A shows the map of annual absolute maximum temperatures in °C (2021-2022 agricultural year), according to figures from the Spanish Meteorological Agency (2023). This figure shows the areas of the country with the highest temperatures.

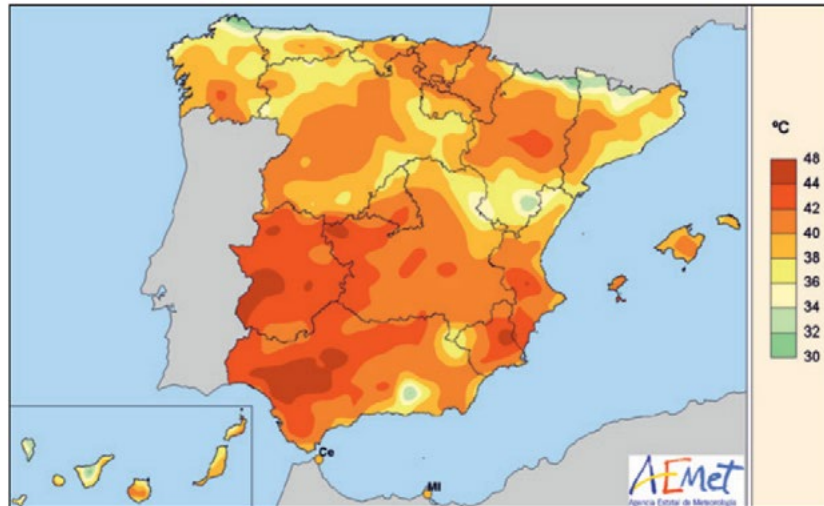


Figure 1A. Annual absolute maximum temperatures in °C (2021-2022 agricultural year) (AEMET, 2023)

Given this information, and with a view to estimating the impact of the application of the proposed regulation on the welfare of bovine animals during transport, we consider that limiting the transport of cattle when temperatures exceed 25°C will prevent long journeys of more than 8 hours during at least 5 months a year, particularly in the central and southern peninsular regions, which is where a great number of nurse cow farms and some dairy farms are located.

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