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Animal welfare during transport, evolution, and perspectives of European Union Legislation and Policy

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Abstract

In the one health approach, which summarizes the concept that human, animal, and plant health are interdependent and linked to the ecosystems in which they exist, animal welfare assumes an important role. In addition, the Farm to Fork Strategy of the European Union recognizes animal welfare as an essential component. Transport of animals involves a number of issues related to welfare. Animals are subjected to continuous stress, not only during transit on vehicles, vessels, trains, or airplanes, but also during loading and unloading operations. The handling and transport conditions have improved from basic and relatively rudimentary systems, with elements to attenuate the discomfort of animals having been gradually introduced, especially for long-distance transport. Despite several improvements in animal welfare standards during transportation there are still pressing issues in current EU legislation which deserve reviewing. Recently, several scientific opinions on animal welfare, including during transport, have been published by the European Food Safety Agency, following requests by the European Commission. In addition, the European Court of Auditors published its last report focused on animal welfare during transport. These reports underline the need to review current legislation governing the topic and highlight a number of outstanding issues in the European Union and in Third Countries. This article summarizes the history and current status of this complex issue.

Keywords: Animal welfare, Laws, Transport.

Introduction

Animal welfare, in terms of the physical and mental state of an animal in relation to its living conditions, is a complex and multi-faceted subject with scientific, ethical, economic, cultural, social, religious, and political dimensions. In the one health approach, which summarizes the concept that human, animal, and plant health are interdependent and linked to the ecosystems in which they exist, animal welfare assumes a relevant role. In addition, the Farm to Fork Strategy of the European Union (EU) recognizes animal welfare as an important and integrant issue (EU, 2020). Among concepts and assumptions on animal welfare commonly accepted in the Community, food safety along the supply chain is directly connected to the welfare of food-producing animals. The interconnectedness of animal welfare, animal health, and food-borne diseases necessitates attention. Stress factors and inadequate welfare contribute to the heightened vulnerability of animals to transmissible diseases. Consequently, implementing sound animal welfare practices not only alleviates needless suffering but also promotes improved animal and, by extension, human health,

and taking into account that animal welfare problems have transboundary consequences including threats to public health, as the spread of zoonotic agents and risk of antimicrobial resistance. Evidence shows that an increased stocking density, larger farms, and stress-inducing conditions result in increased occurrence, persistence, and spread of *Salmonella* in laying hen flocks (EFSA, 2019a) or *Campylobacter* spp. in broilers (Giangaspero *et al.*, 2023).

Accompanied by increasing public awareness, during recent decades, operators, scientists and policy makers have increasingly focused on the improvement of the health and welfare conditions of animals. Also, transportation common practices, that may affect animal welfare, have been a subject of close consideration. Several studies could provide evidence of physio pathological changes associated with the transport of animals, in particular for long journeys. For example, among negative states that animals may experience during transport, fear, frustration, and pain, consequent to the threat perceived by animals due to motion stress and sensory overstimulation, could be assessed and measured through large quantities of cortisol released in the blood, for the activation of the

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hypothalamic–pituitary–adrenal axis, and the increased concentration of plasma adrenocorticotrophic hormone, during travel (Knights and Smith, 2007; Odore *et al.*, 2011). Prolonged hunger, among the highly relevant welfare consequences experienced during transport, could also be associated with specific changes. In cattle, feed deprivation during transport caused depletion of hepatic glycogen and lipolysis due to need of alternative energy source, as indicated by negative energy balance with a higher concentration of non-esterified fatty acid and beta-hydroxybutyrate in the blood (Earley and O’Riordan, 2006; Ginane *et al.*, 2015). Especially in sensible species such as horses, pathological changes were more evident. During transport, horses were thirsty after 3 hours and hungry after 12 hours. Clinical respiratory disorders could be present after journeys of 10–14 hours. An increase in gastric pH occurred after 2 hours and gastric ulceration could be seen after 12 hours in unfed horses (Andrews *et al.*, 2005; Padalino *et al.*, 2020).

Since the first official evaluation of animal welfare in the United Kingdom, in 1965 (Brambell, 1965), various associated legal provisions have been developed and implemented. The first European Directive on the protection of animals during transport was prepared in 1991 (EU, 1991a). An international convention on animal welfare during transport was prepared by the Council of Europe in 2003 (CE, 2004). Finally, an EU Regulation, regulating the protection of animals during transport and related operations, entered into force in 2005 (EU, 2005). Currently, large numbers of live animals are transported within the EU and to and from Third Countries for different purposes, including fattening, breeding, and slaughter, by different means of transport. Road transport is the most common means of moving live animals, followed by sea and rail, while air transport accounts for a limited proportion (ECA, 2023). Excluding domestic movements within the EU Member States, approximately 1.6 billion live animals, including 1.4 billion poultry, 31 million pigs, 4.3 million cattle, and 3 million sheep, are transported annually in the EU (ECA, 2023). The welfare of animals during transport has therefore assumed increasing importance. Recent scientific opinions on animal welfare during transport published by the European Food Safety Agency (EFSA) (EFSA, 2022b,c,d,e,f), following the request of the European Commission (EC), and the report on welfare during transport published by the European Court of Auditors (ECA, 2023), have highlighted the need to review current legislation governing animal transport, identifying a number of issues in the European Union and in Third Countries. Accordingly, the European Commission’s activities went in this sense, conducting an inception impact assessment (Ares(2021)4402058) (EC, 2021) to receive input from citizens and stakeholders about the revision of EU legislation on animal welfare, performing an extensive consultation process for the assessment of

the animal welfare (EC, 2023a), and drafting a proposal for a Regulation of the European Parliament and of the Council on the protection of animals during transport and related operations, amending Council Regulation (EC) No 1255/97 and repealing Council Regulation (EC) No 1/2005, released in December 2023 (EC, 2023b). Not less important, it is the societal demand. A survey conducted among EU citizens during the last twenty years showed unmet expectations implying ethical questions with regard to animal welfare (EC 2007a,b, 2016). The inception impact assessment and the subsequent public consultation, with almost 60,000 respondents, in support of the revision of the EU animal welfare legislation, showed clearly the expectation for changes. In general, the current EU legislation was perceived as not ensuring adequate and uniform protection of all animal species by the majority of the respondents (92%). In particular, with concern on the welfare during transport, a vast majority (94%–95%) were in favor of introducing maximum journey times and prohibition of transport of unweaned calves and other vulnerable animals, such as pregnant cows or export of live animals to non-EU countries for slaughter (EC, 2023b).

History of legal provisions

At the international level, the Council of Europe (CE), established in 1949 and headquartered in Strasbourg, France, with 46 Member States, through his Consultative Assembly, made recommendations for transporting animals across borders, in 1961, underlining that even within the Member States of the Council of Europe, animal welfare standards were not consistently adhered to, and indicating the need for a Convention to govern the global transportation of animals (CE, 1968). In 1965, the Committee of Ministers established a Committee of experts to develop the first such Convention, which was completed in 1968. The Convention was made available for signing in December 1968 and became effective in February 1970. An Additional Protocol (ETS 103) (CE, 1979) was introduced to amend the Convention and came into effect in November 1989, allowing the European Economic Community to sign. The Convention was further revised in 1989, in order to incorporate suggestions put forward by the Committee of Ministers regarding the transportation of various animal species. Notably, the World Society for the Protection of Animals (WSPA, now known as World Animal Protection-WAP), Eurogroup for Animal Welfare, the Federation of Veterinarians of Europe (FVE), the European Confederation of Agriculture (CEA), the European Livestock and Meat Trading Union (UECBV), the International Air Transport Association (IATA), the Animal Transportation Association (AATA), and the Economic Commission for Europe (United Nations), actively participated in this revision process. The Council of Europe drafted and submitted an updated document—the European Convention for the Protection of Animals during

International Transport (CE, 2004)—for ratification, covering the rules governing the international transport of animals from a welfare perspective. Parts of the text of the revised Convention were redacted because of differing motivations, primarily the moral obligation to respect all animals, taking into account their capacity for suffering. Other relevant aspects included the need for transport to be considered compatible with welfare and the adoption of shared provisions to pave the way for progress to be attained. Furthermore, the necessity to reduce the period of transport for reasons of animal welfare, the consideration of loading and unloading as risk activities, and ultimately the aim to safeguard of animal welfare during transport, were additional motivations, alongside the view that if the welfare requirements cannot be fulfilled, an alternative to the transportation of live animals must be put into effect. The Convention was submitted to the Member States in Chisinau, Moldova, in November 2003. The text was further revised in 2004 and included in the European Treaty Series (ETS), designated number 193. According to the Council Decision 2004/544 of 21 June 2004 (EU, 2004), the European Community was permitted to sign the Convention. Later in 2006, the Convention entered in force and was ratified by four EU Member States.

The World Organization for Animal Health (WOAH, formerly the Office International des Epizooties-OIE) adopted the guiding principles on the welfare of terrestrial animals, including the ‘Five Freedoms’ developed in 1979 (FAWC, 1979), in order to align with societal expectations regarding the treatment of animals in human care. The OIE published its first animal standards, the Terrestrial Code in 2004 and the Aquatic Code in 2008, respectively. According to the Terrestrial Code, animal welfare is defined as “the physical and mental state of an animal in relation to the conditions in which it lives and dies.” The Aquatic Code established global guidelines for the well-being of farmed fish (excluding ornamental species) and promotes the implementation of ‘handling methods appropriate to the biological characteristics of the fish and a suitable environment to fulfil their needs’. Despite not being recognized in the World Trade Organization (WTO) SPS Agreement, the animal welfare chapters of the WOAH codes have become internationally recognized standards, based on science, which are updated regularly according to the evolution of scientific knowledge, and adopted by WOAH Members (currently 183 countries). WOAH’s Global Animal Welfare Strategy was presented at its 4th Global Conference on Animal Welfare, held in Guadalajara, Mexico, in December 2016, and adopted by all WOAH Members in 2017 (WOAH, 2017).

At the community level, during the last 30 years, the European Union has also played an important role in efforts to codify the welfare of animals. With the support and close co-operation of the EU Member States, the European Union has been promoting

animal welfare, through the issuing of rules, gradually improving the lives of domestic animals. These rules were based first on the European Convention for the Protection of Animals Kept for Farming (CE, 1976), incorporated into the EU *Animal Welfare Acquis* by Council Decision 78/923/EEC (EU, 1978), and further on the European Convention for the Protection of Animals during International Transport (CE, 2004), both reflecting the “Five Freedoms.” General rules for the protection of animals evolved especially since the entry in force of Lisbon Treaty in 2009 amending the Treaty on the Functioning of the European Union (TFEU) and introducing the recognition that animals are sentient beings (Article 13 of Title II) (EU, 2007), thus implying ethical requirements for breeding and transport practices, and leading to successive changes in the legislations and gradually covering different aspects related with animal welfare. Nevertheless, Community legislation concerning the welfare conditions lays down minimum standards and national governments may adopt more stringent rules, provided they are compatible with the provisions of the Treaty.

Various legal instruments have been developed concerning the protection of animals kept for farming purposes, laying down the minimum standards for the protection of calves, pigs, and laying hens (EU, 1991b,c, 1997a, 1998b, 1999, 2001, 2008). Provisions for the protection of animals at the time of slaughter or killing (EU, 1993, 2009, 2018) and Directives regarding the protection of animals used for experimental and other scientific purposes (EU, 1986, 2010) have also been issued by the European Union. Standards relating to the welfare of animals during transport have been defined by a number of Directives and Regulations (EU, 1991a, 1995, 1997b, 1998a, 2005, 2014). Following the first Directive on the protection of animals during transport (EU, 1991a), the recognition of animals as “sentient beings” and the signature of the European Convention for the Protection of Animals during International Transport, the welfare of animals during transport is currently regulated in the European Union by the provisions of Regulation 2005/1 (EU, 2005). The Regulation covers relevant aspects relating to the transport of different animal species for commercial purposes and considers different means of transport. Specifications are provided in order to guarantee the welfare of animals, including watering and feeding intervals, journey times, resting periods, space allowance, details of required equipment such as water supply for transport by road, rail, or sea containers, ventilation, temperature monitoring, and navigation systems. To support the application of the provisions on the transport of live vertebrate animals carried out within the Community, including the specific checks to be carried out by officials on consignments entering or leaving the customs territory of the Community, the Regulation includes specific indications for organizers, transporters, keepers and assembly centers

as compulsory transport documentation or planning and journey log, as well as duties and obligations of the competent authorities, as inspection and approval of means of transport, requirements for long journeys transporter authorizations and compulsory exchange of information among the Member States and yearly reports by the competent authorities to the Commission. Technical rules are indicated in annex I, first indicating the essential precondition of fitness for transport, specifying that injured or present weaknesses or diseased animals shall not be considered fit for transport. Provisions on structural requirements are given for all means of transport and additional specifications for transport by road or rail, sea, transport by air, and transport in containers, with concerns to feed and water supply, ventilation, temperature monitoring, and navigation system, in particular for long journeys. Procedures are indicated for handling of animals, loading and unloading operations, and during transport, specifying space allowances, according to the kind of means of transport and the animal species and categories (age, size, or pregnancy), watering and feeding intervals, journey times and resting periods for domestic *Equidae*, cattle, small ruminants, pigs, poultry, other domestic birds and rabbits.

Another important EU Regulation, relevant in particular to long journeys, for example, road vehicles used for the carriage of livestock on journeys exceeding eight hours, is Regulation 1255/97 (EU, 1997b). Article 3 of the Regulation defines the criteria for the approval of control posts (CPs). Also, the entire premises of assembly centers may be approved as CPs (Regulation 1255/97, Article 4, paragraph 2) (EU, 1997b). Across the European Union, 140 approved CPs are located in 16 Member States. CPs are used during the transport of cattle and other domestic species within the EU and prior to export to Third Countries, for example to central Asia, Middle East, or North Africa. They are compulsory mainly for animals in transit within European countries for very long-distance transport for different purposes (fattening, slaughter, or breeding). According to the legislation, in the CPs, transported animals must be accommodated, fed, hydrated, rested, housed, and cared for. Operators at CPs are charged with ensuring the needs of animals are provided for at arrival, during stay, and before departure. Prior to departure, official veterinarians ensure that the animals are fit to proceed with the journey. Facilities for vehicles, drivers, and competent authorities are usually provided by these establishments. Animals are accepted only if they are accompanied by required health status certification, and belong to the category for which the CP is approved. Animals are inspected upon arrival and at least every 12 hours during their stay. For health reasons, no new arrivals are admitted for at least 24 hours after a maximum of six consecutive days of use, to enable cleansing and disinfecting. CPs are located on the main trade routes. For example, in Italy, 5 are

located in the northern provinces of Brescia, Bolzano, Piacenza, Gorizia, and Trieste, 2 in central Italy (provinces of Roma and Perugia), and one in southern Italy (province of Bari). Transporters must comply with the EU regulations even outside the EU borders, as unambiguously indicated by sentences of the Court of Justice of the European Union (CJEU, 2015). However, except for the United Kingdom, no approved CPs are present outside the EU. This represents a concern for the EU's competent authorities, due to the difficulty in verifying appropriate conditions for unloading animals at designated stops once they leave the EU.

A timeline of the development of EU rules relating to the protection of animals on farms, at slaughterhouses, for scientific purposes, and during transport is provided in Table 1.

Scientific opinions, welfare, and transport science based

The Universities Federation for Animal Welfare (UFAW), founded in 1926, London, United Kingdom, at a very early stage introduced the concept that “animal problems must be tackled on a scientific basis, with a maximum of sympathy but a minimum of sentimentality” (Hume CW, UFAW founder), and further a first edition containing animal welfare standards, “The UFAW Handbook on the Care and Management of Farm Animals” was published in 1971 (UFAW, 1971). The first official scientific approach to the concept of animal welfare appeared in the Brambell Report prepared by a panel of experts in 1965, which was commissioned by the Government of the United Kingdom to evaluate welfare issues in intensive livestock farming (Brambell, 1965). Apart from being among the first official documents dealing with animal welfare, this report introduced a detailed applied scientific approach, defining ideal welfare states rather than standards for acceptable welfare. Certain minimum conditions for an ethically sound treatment of animals have been provided, also stating: “An animal should at least have sufficient freedom of movement to be able without difficulty, to turn round, groom itself, get up, lie down and stretch its limbs” (Brambell, 1965). These minimum pre-conditions for animal welfare were later coined “Brambell’s Five Freedoms”. More precisely, in response to the report prepared by Brambell and colleagues, the United Kingdom’s Farm Animal Welfare Advisory Committee was created, renamed in 1979 as the Farm Animal Welfare Council (FAWC) and again renamed in 2019 Animal Welfare Committee (AWC) (Gov UK, 2024), introducing and establishing the principle of the five freedoms: 1) The absence of hunger and thirst can be achieved by ensuring easy access to clean water and a nutritious diet that supports optimal health and vitality; 2) ensuring a comfortable environment, including suitable shelter and a cozy resting area, promotes freedom from discomfort; 3) freedom from pain, injury, or disease can be attained through proactive measures such as prevention, prompt diagnosis, and effective

Table 1. List and timeline of laws on the protection of animals at farm, at slaughterhouse, for scientific purposes and during transport enforced in the European Union.

Animal welfare area	Law	Year	Topic
Farm	Council Directive 91/629/EEC of 19 November 1991 laying down minimum standards for the protection of calves No longer in force	1991	Protection of calves
	Council Directive 91/630/EEC of 19 November 1991 laying down minimum standards for the protection of pigs No longer in force	1991	Protection of pigs
	Council Directive 97/2/EC of 20 January 1997 amending Directive 91/629/EEC laying down minimum standards for the protection of calves No longer in force	1997	Protection of calves
	Council Directive 98/58/EC of 20 July 1998 concerning the protection of animals kept for farming purposes	1998	Animal farming
	Directive 1999/74/EC of 19 July 1999 laying down minimum standards for the protection of laying hens	1999	Protection of laying hens
	Commission Directive 2001/93/EC of 9 November 2001 amending Directive 91/630/EEC laying down minimum standards for the protection of pigs No longer in force	2001	Protection of pigs
	Council Directive 2008/120/EC of 18 December 2008 laying down minimum standards for the protection of pigs	2008	Protection of pigs
	Slaughterhouse	Council Directive 93/119/EC of 22 December 1993 on the protection of animals at the time of slaughter or killing No longer in force	1993
Council Regulation (EC) No 1099/2009 of 24 September 2009 on the protection of animals at the time of killing		2009	Protection of animals at the time of killing
Commission Implementing Regulation (EU) 2018/723 of 16 May 2018 amending Annexes I and II to Council Regulation (EC) No 1099/2009 on the protection of animals at the time of killing as regards the approval of low atmospheric pressure stunning		2018	Protection of animals at the time of killing
Directive 2010/63/EU of the European Parliament and of the Council of 22 September 2010 on the protection of animals used for scientific purposes		2010	Protection of animals used for experiments
Laboratory	Council Directive 86/609/EEC of 24 November 1986 on the approximation of laws, regulations and administrative provisions of the Member States regarding the protection of animals used for experimental and other scientific purposes No longer in force	1986	Protection of animals used for experiments
	Directive 2010/63/EU of the European Parliament and of the Council of 22 September 2010 on the protection of animals used for scientific purposes	2010	Protection of animals used for experiments

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Table 1. Continued...

Animal welfare area	Law	Year	Topic
Transport	Council Directive 91/628/EEC of 19 November 1991 on the protection of animals during transport and amending Directives 90/425/EEC and 91/496/EEC.	1991	Transport
	No longer in force		
	Council Directive 95/29/EC of 29 June 1995 amending Directive 91/628/EEC concerning the protection of animals during transport	1995	Transport
	No longer in force		
	Regulation (EC) No 1255/97 of 25 June 1997 of the European Council concerning Community criteria for CPs and amending the route plan	1997	CPs
	Council Regulation (EC) No 411/98 of 16 February 1998 on additional animal protection standards applicable to road vehicles used for the carriage of livestock on journeys exceeding eight hours.	1998	Transport
	No longer in force		
Regulation (EC) No 1/2005 of the European Council of 22 December 2004 on the protection of animals during transport and related operations	2005	Protection of animals during transport	
Regulation (EU) No 165/2014 of the European Parliament and of the Council of 4 February 2014 on tachographs in road transport, repealing Council Regulation (EEC) No 3821/85 on recording equipment in road transport and amending Regulation (EC) No 561/2006 of the European Parliament and of the Council on the harmonisation of certain social legislation relating to road transport	2014	Transport	

treatment; 4) providing adequate space, appropriate facilities, and companionship with other animals of the same species enables animals to express their natural behaviors freely; 5) creating conditions and providing treatments that prevent mental suffering ensures freedom from fear and distress (FAWC, 1979). The first three freedoms refer to objective and verifiable conditions of the animal, while the final two are more complex and continue to be the subject of scientific study in relation to their evaluation.

The above-mentioned “Five Freedoms” principle in many respects was integrated and in part supplanted by the “Five Domains” model for animal welfare assessment, developed by Mellor and Reid in 1994 (Mellor and Reid, 1994) and updated in 2020 (Mellor *et al.*, 2020). The domains considered by the model are nutrition, physical environment, health, behavioral interactions, and mental state. The first three domains are essential for the survival of the animal and are referred to as “survival-critical affects.” Behavioral interactions are those occurring between the animal and the environment, with other non-human animals and the human–animal interactions. The mental state is the result of the brain processing of sensory inputs elicited by external stimuli. The model allows the assessments

of animal welfare, providing specific guidance on how to evaluate the negative and/or positive impacts, with the possibility of a qualitative grading of the external stimuli experienced by the animals that generate negative or positive perceptions with regard to the first four domains and the subsequent evaluation of the animal’s mental state (domain 5).

The EFSA has contributed significantly to the development of definitions for animal welfare standards. EFSA has provided scientific opinions related to welfare at slaughter and at farm levels. Concerning welfare at slaughter, EFSA has prepared two scientific opinions on poultry and rabbits (EFSA, 2019b, 2020). It is opinions relating to on-farm welfare have focused on pigs, broilers, laying hens, and calves raised for producing white veal meat (EFSA, 2022a, 2023a, 2023b, 2023c). Concerning transport, the existing legislation within the European Union regarding the safeguarding of animals during transportation is founded upon a scientific opinion provided by EFSA in 2004 (EFSA, 2004). This opinion, developed by the Scientific Panel on Animal Health and Welfare (AHAW), was formulated in response to a request from the European Commission (Question N° EFSA-Q-2003-085). Its primary focus was to establish standards for maintaining an

appropriate microclimate within vehicles used for the transportation of animals by road. In 2022, the EFSA AHAW Panel prepared a number of scientific opinions on the welfare of animals during transport, concerning small ruminants (EFSA, 2022b), domestic birds and rabbits transported in containers (EFSA, 2022c), cattle (EFSA, 2022d), *Equidae* (EFSA, 2022e), and pigs (EFSA, 2022f).

Recent scientific guidance from EFSA has identified a number of factors that have an impact on the welfare of animals in transit. In summary, the opinions have identified that animal transportation is a very complex, multivariate stressor, and the scale and degree of risk to which the animals are subjected during transportation affect welfare outcomes, and a number of changes have been suggested. Animal-based measures (ABMs) should be the foundation of scientific approaches used to evaluate the welfare status of animals. It is crucial to correctly evaluate fitness for transportation in order to prevent detrimental effects on the health and welfare of animals. Clear accountability amongst the different parties should be established, and the experts involved should receive adequate training. To reduce the negative effects of transportation on animal wellbeing, shorter travel times, appropriate temperatures, and greater space are required. Considering the continuous stress that the animals experience during transport and that, despite circumstance-dependent, according to EFSA's scientific opinions (EFSA, 2022b, 2022c, 2022d, 2022e), ruminants, small ruminants, horses, domestic birds, and rabbits after twelve hours, they will become hungry and thirsty, journey duration should be kept to a minimum. The microclimatic conditions in stationary as well as moving vehicles should be maintained at optimal levels and, temperature inside vehicles transporting animals should be carefully controlled to maintain it within established tolerances. The amount of space required for animals to change their posture and balance should be determined using proven scientific methodology. For example, the deck height available should be calculated by a formula to determine the correct height above the animal. To allow natural movements and ventilation for adult cattle, the space above withers should be obtained by adding 20 cm to the 17% of wither height of the animal (41.5 cm above wither for a cow with wither height of 126 cm or 45 cm above wither for a cow with wither height of 146 cm) (Fig. 1).

Another European institution, the European Court of Auditors (ECA), has conducted analyses relating to the welfare of animals during transport. The ECA, an independent European authority established in 1977 and located in Luxembourg, is an EU external auditor, with a mission to improve the way the Union's finances are managed and public accountability regarding the raising and spending of the EU budget. In 2023, the ECA published a review on the transport of live animals in the EU (ECA, 2023). The review described

the main factors and trends in live animal transport, highlighting the long-term transport of animals as a source of stress and suffering (hunger, thirst, injury, and heat stress), as shown by recent evaluations made by EFSA, and emphasizing that economic considerations often resulted in suboptimal welfare conditions.

Revision of the current EU animal welfare legislation

Although current EU rules on the protection of animals during transport have brought some harmonization to the sector, the European Commission's assessment revealed that there are significant shortcomings related to EU animal welfare legislation in force (EC, 2021, 2023b). The lack of clarity of the current legislation is among the core problems identified as recurrent. Common definitions are insufficient and some terms utilized within the Transport Regulation are not characterized. In addition, certain provisions are vague or lacking. This results in divergent interpretation and thus transposition and incoherent implementation and enforcement of EU animal welfare legislation across the EU Member States, causing distortions of competition among operators in the single market and suboptimal animal welfare protection. For example, the roles and duties of transporters and travel coordinators are not clearly defined by the legislation, which once in a while leads EU Member States to abstain from taking action or to act in an inconsistent and uneven way. Certain loopholes in the law, as for temperature requirements, prevent effective enforcement. Furthermore, species-specific provisions are lacking for several species, such as farmed fish or companion animals, in the case of transport for commercial purposes. The lack of sufficiently specific and detailed requirements for the protection of certain animal species results in inadequate protection of the welfare of those species. Similarly, current rules are not aligned with developments in breeding goals for higher productivity, which make animals of certain species considerably more fragile during transport, as spent hens suffering from frequent bone fractures.

The current EU legislation allows Member States to adapt to their own national/regional situation, including stricter national rules, leaving to national authorities the choice of forms and methods for implementation. EU Member States or regions having their own, differing legislation on animal welfare requirements for the trade of animal transports, applying certain provisions and enforcing rules differently, also leading to different levels of animal welfare within the Union, created obstacles through regulatory fragmentation, jeopardizing the integrity of the internal market, taking into account that national rules cannot apply to operators from other Member States and, therefore, rendering cross border movements a driver for lower animal welfare standards. Available information indicates that there is a variation in the application of the EU animal welfare legislation, with a lack of coherent and strict enforcement by competent authorities, including exports of live animals to Third Countries. In addition

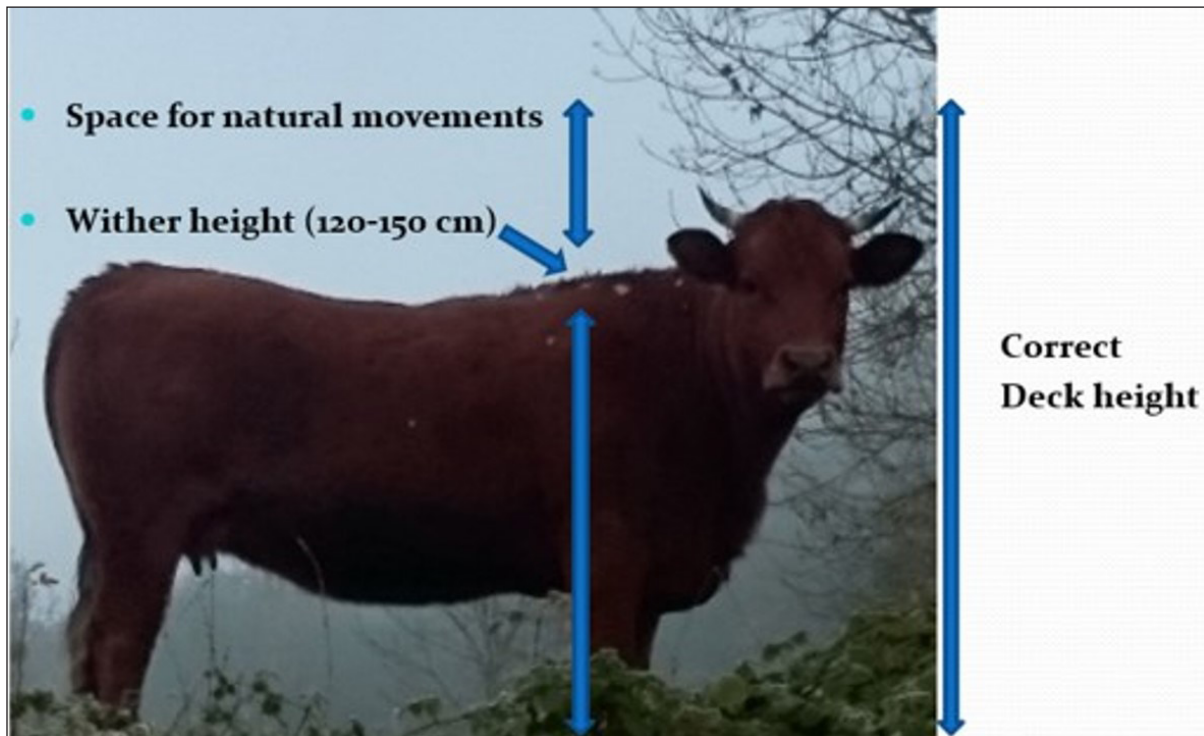


Fig. 1. Calculation of the deck height, available on means of transport, to ensure natural movements of the animals. The formula to determine the correct height above the animal takes into account the animal wither height (cm), a multiplying coefficient (1.17), and an additional space (20 cm): deck height = wither height + space based on formula value (space above wither = wither height x 1.17 + 20 cm) (EFSA, 2022d).

to the different levels of resources that Member States put into controls, the low quality of monitoring data and specific welfare indicators and the lack of tools to properly monitor, measure, and report the result, also the weaknesses in the design of the law contribute to the enforcement issues. Furthermore, the current rules seem to be outdated in light of new scientific and technological developments in animal welfare. Despite the Administrative Assistance and Cooperation system in place for Community official controls, there is a lack of coordination among the competent authorities of the involved Member States, as well as the implementation of remedial action following non-compliance is not homogeneous across the EU Member States. Animal welfare problems arising from transport under sub-optimal conditions, occur across the EU, with variable intensity, and underlying regulatory drivers. The current system for animal welfare during transport is largely paper-based and declarative, depending to a great extent on information provided by business operators, and proves to be ineffective in allowing proper enforcement of the rules. For example, a lack of enforcement of existing rules towards EU operators concerning the leg of the journey in non-EU countries has been reported. Also, the lack of appropriate training to acquire competencies of staff handling animals results in poor management of animals, and the lack of

tools and resources to assess skills and competencies creates difficulties to business supervisors and inspectors performing official controls.

The assessment pointed out unmet expectations of parts of citizens and consumers in terms of the protection of animals and problems related to the EU rules on labeling and information to consumers as regards compliance with animal welfare standards applied to food-producing animals. Consumers are thus prevented from making informed purchase choices of “animal welfare friendly products.” Apart from some EU rules providing consumers with a certain degree of information on farming methods and thus on the level of animal welfare (organic farming, eggs in shell mandatory labeling, poultry meat from broilers voluntary labeling), there is no satisfactory EU legislation on animal welfare claims or labeling. Generally, the information to consumers on animal welfare is based on few divergent national labeling initiatives, which follow various approaches and provide different levels of animal welfare protection. In addition, several different voluntary private animal welfare labeling schemes have emerged, providing unequal guarantees, confusing consumers, and leading to unfair market conditions for businesses operating in different EU Member States, detrimental to cross-border exchanges and hampering the smooth functioning of the EU internal market. Finally, other

elements to be addressed were identified in the low incentives for producers to achieve high welfare standards, including imported products, and the inconsistencies with different objectives of other policy areas, as the health status of animals intended for scientific purposes, transport of end-of-career cows and social rules on drivers' resting time.

The purpose of the revision is to achieve a higher level of animal welfare during transport and related operations, broaden the scope of the EU animal welfare legislation, covering cats and dogs transported for commercial purposes and experimental or laboratory animals to ensure their welfare during transport. As regards cats and dogs, specific provisions should support the contrast against the illegal trade, added to the list of environmental crimes the EU should tackle. Other objectives for a revision are the making application and enforcement uniform and easier, and the alignment with the latest scientific evidence and current political priorities as well as citizen's growing expectations, including European Citizens' Initiative "End the Cage Age" and animal welfare labeling to better transmit value through the food chain (EC, 2023b).

Discussion

Since the Brambell Report in 1965, major developments in livestock farming and welfare during transport have been achieved. Prior to this, transport conditions were crude, and in the 1950's or earlier, it was common to observe cattle in crowded enclosures, waiting to be loaded onto simple and poorly equipped railway wagons (Science Source, 2016; NRM, 2020). However, despite some improvements, there are still a number of issues associated with animal welfare during transport. Standards remain inadequate especially in Third Countries, where, despite welfare for animals aimed, even with very limited resources, as protecting calves from cold with simple means (Fig. 2), efforts are disattended when animals are transported, with insufficient space provided, and animals being bound in contravention of international welfare norms, as shown by images taken in Bangladesh in 2016 (Fig. 3).

However, in Europe, improved practices were already being introduced in the 1950's, albeit primarily for elite animals used in sports. For example, Ribot, the famous race horse, when traveling from Italy to USA from the Malpensa International Airport of Milan, Italy, in 1956, on a Super Constellation of the Trans World Airlines (Fig. 4), enjoyed the best conditions in terms of welfare, in line with the international Convention on animal welfare during transport, promulgated years later. Trained staff accompanied Ribot and other horses throughout the journey, to ensure surveillance and care (Fig. 5), corresponding to the provisions of Article 8 of the Convention that require attendants to accompany animal consignments to ensure care throughout the journey. Other horses accompanied Ribot, in order to reduce travel stress (Fig. 6), corresponding to the

provisions of Article 15 of the Convention which foreseen that animals should not be separated if accustomed to each other and if separation will cause distress. In addition, a large stock of feed to which horses were accustomed, to avoid nutritional stress, was made available onboard the aircraft (Fig. 7), corresponding to the provisions of Articles 8, 11, and 20 of the Convention on feed (animals shall be offered feed of good quality, animals should be accustomed to the feed provided during travel and a feed double quantity of scheduled travel time should be available). Efforts to improve animal welfare have since been undertaken by all the EU Member States, at national and regional levels. For example, in Italy, in the southern region of Calabria, the veterinary task force, established in 2011 by the Ministry of Health to strengthen the regional health sector, worked on the welfare of animals during transport, issuing regional decrees and organizing specific activities encompassing different aspects of animal welfare. This included field controls to monitor and verify compliance with welfare rules. Courses on animal welfare during transport were organized for the operators in the sector. Currently, competent authorities of the Member States perform regular controls to verify compliance with relevant EU legislation on animal welfare, including transport. Also, the European Commission is empowered to monitor the correct application of welfare rules in Member States or Third Countries, through on-the-spot checks carried out by Commission staff, according to Article 28 of Regulation 2005/1. Commission audits have revealed problems on some occasions. For example, audits performed between 2018 and 2020 on Member States functioning as exit points for sea



Fig. 2. Welfare of cattle in Third Countries. Calf protected from cold with simple means, Bangladesh, 2016.



Fig. 3. Transport of cattle. Cattle transported on trucks, Bangladesh, 2016. Despite constant improvements on the welfare of transported animals, still insufficient standards are applied, especially in Third Countries.



Fig. 4. Ribot traveling from Italy to USA. Malpensa International Airport, Milan, Italy, 1956.

exports highlighted inadequate official controls with potential consequences for the welfare of exported animals (EC, 2019). These audits concerned livestock vessels transporting ruminants. Verification checks were conducted on different aspects such as facilities

at the port, planning, journey logs, and expertise of official veterinarians. The most common identified problems were non-compliance with reference to Member State competent authority obligations at departure ports, incomplete or incorrect documentation



Fig. 5. Staff assisting Ribot and other horses, to ensure surveillance and care during travel. Malpensa International Airport, Milan, Italy, 1956.



Fig. 6. Other horses accompanying Ribot, in order to reduce travel stress. Malpensa International Airport, Milan, Italy, 1956.



Fig. 7. Stock of feed to which horses were accustomed to, to avoid nutritional stress. Malpensa International Airport, Milan, Italy, 1956.

(inadequate planning of departure, missing information from journey plan, sea transporter not identified or livestock vessel not identified, or no journey log), lack of identified responsibilities and emergency planning, inadequate vessel inspections and approvals, livestock vessels with structural deficiencies (water supply, lighting, forced ventilation, drainage, and alarms).

Animal transports have increased in both quantity and distance, as EU regions become specialized in species breeding or production stages (reproduction, fattening, and slaughter), resulting in increasing animal movements. For example, in 2021, France exported 350,000 dairy calves to Spain for fattening (a three-fold increase since 2012), many of which were then exported by sea to be slaughtered in Third Countries such as Libya or Turkey. Long-distance transport remains one of the main welfare problems, despite the measures taken through the improvements set out in the Travel Regulation (EU, 2005). However, exports of fattened animals to distant countries are not avoided more often as they are due to factors such as specialized livestock farming in some European regions and more generally the way in which the food industry is carried

out at the level of international trade, which adds to animal welfare concerns. Other relevant issues raised by the ECA review were the shortcomings found in research studies (EFSA reports 2022–2023) and by the European Commission, and the consideration that the European laws pertaining to the safety of animals in transit date back 19 years, therefore justifying a revision of the legal framework. Finally, the ECA underlined the need to find alternatives to the transportation of live animals, improve consumer education, encourage structural changes in the direction of a more sustainable food supply chain, place a monetary value on the suffering of animals that is added to the cost of meat and transportation, and support emerging technologies. In light of the identified shortcomings, different possible solutions have been considered (EC, 2023b). Primarily, improve legal clarity with more precise common terminology, new definitions, and directly applicable standards to support uniform implementation and enforcement (including the repealing of Council Directive 98/58/EC) (EU, 1998), use animal welfare indicators through mandatory or voluntary application of ABMs and thresholds for

action, to facilitate compliance and enforcement, in complement to Resource Based Measures, to evaluate animal welfare and ensuring that animals have access to key resources (space, drinkers, feed) (Mellor and Stafford, 2001) and enhance competence, defining training requirements for all animal handlers. Specifically for animal transport, update requirements in the light of new scientific evidence to increase animal welfare, as regards travel times, space allowances, and minimum and maximum temperature limits, exploiting opportunities offered by technical developments as regards vehicle equipment (ventilation, cameras, heat sensors and so on) or the progressed digitalization of the livestock systems. Means of transports should be adapted to new technologies, upgrading classifications and safety standards of livestock vessels and road vehicles, including use of closed-circuit television. For the exports of live animals to non-EU countries, the export of certain categories of live animals to Third Countries, taking into account the difficulties of ensuring compliance with EU welfare standards after transport means leave the Union territory, should be either prohibited or specific conditions should be laid down, as assurance systems at departure and arrival, presence of veterinarian, application of acceptable standards of animal welfare by concerned Third Countries, and clarify the provisions applicable to the leg of the journey in Third Countries, specifying training and competence required for transporters/organizers and vessel crews. Other measures for vulnerable animals, as unweaned subjects, might be the prohibition of long journeys or upgrading requirements, including compulsory veterinary inspection of animals before and during loading. To address existing enforcement issues, introduce new technologies for better monitoring implementation and compliance of the operators and facilitate the official controls, creating an EU central IT system for digitalization of certificates and authorizations, automatic checks of documentation and real-time access to data on journeys to competent authorities, including mobile app. For companion animals (cats and dogs), requirements for commercial cross border transports should be introduced, as inspection of animals prior to departure, health certificates, approval of journey plans to be registered in the Trade Control and Expert System, and defining rules on space allowances, travel times and temperature limits. In order to meet citizens and consumers expectations, animal welfare claims should be regulated, providing common minimum requirements on general principles and conditions of use and scientific substantiation, for an EU animal welfare label, with key criteria, including scheme governance, technical standards, verification of compliance and logo/visual entity. Obviously, the EU measures will be compatible with relevant WTO rules. However, while current rules are focused on domesticated animals transported for commercial

purposes, the potential welfare harms experienced by animals during transport are not dependent on the reason for transportation. Therefore, solving the gaps in the current EU legislative regime on animal transport should be beneficial also to guarantee that minimum standards are applied to all animals, regardless the purpose of being transported.

Furthermore, efforts in Third Countries should also be considered and supported by EU bodies, such as the Technical Assistance and Information Exchange (TAIEX) instrument of the European Commission. Third countries that are EU trade partners for live animals, must not only notify welfare incidents to Member State authorities of consignment origin, but also request specific assistance from the EU to improve their animal welfare standards. In May 2023, a TAIEX workshop on animal health and welfare was organized to support the National Centre for Animal Health of Libya, to support the policies and animal health and welfare regulations and legislation of the country. Given the close link between animal health and welfare, with relevant implications for public health (zoonoses, food-borne diseases), efforts should not focus only on welfare, but extended to general and disease specific surveillance/alert systems, laboratory and epidemiology, applying the One Health approach. Regarding infrastructures important for animal welfare, Third Countries should be assisted to establish suitable premises necessary for long journey transports, with adequate facilities, to be approved in line with EU requirements. The development of a new legislative framework, covering all the aspects of animal health and welfare, in line with the WOAHA standards as well as the *Acquis Communautaire* (EU legal framework), will also be of utmost importance for these countries.

Conclusion

The EFSA scientific opinions, the EU Commission audit reports, and the ECA analysis have highlighted the shortcomings in the management of animal transport currently applied in the EU. According to Pillar 4 (Science, Innovation, Research) of the EU Community Animal Health Strategy, the new animal health policy was based on science. Clearly, this approach should also be applied to animal welfare legislation. In light of the recent scientific advice provided by EFSA, the protection of animals during transport and related operations (Regulation 2005/1) should be revised accordingly. The European institutions should work in collaboration with international organizations such as the WOAHA to define new legislation, taking into account new scientific elements, and considering that the scope is not limited to Europe. Adequate stakeholders' implementation of animal welfare protection rules and improved controls performed by the competent authorities for monitoring and enforcing compliance, along with technical support on animal health and welfare in Third Countries, will help to

upgrade and harmonize norms on welfare and to face the challenges of a globalized society.

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Authors' contributions

M. Giangaspero and P. Turno contributed equally to the present study.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

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