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Welfare aspects in rabbit rearing and transport

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ABSTRACT

The review starts with the description of the rabbits' (*Oryctolagus cuniculus*) main habits and the current situation concerning the rabbit husbandry and management systems, as well as their effects on the welfare of these animals. As far as the intensive rabbit husbandry systems are concerned, the main problems are related to the time since rabbits have been domesticated and their adaptive capacity and coping styles as respects the farming environment and management systems. Both these aspects have implications in the present and future of rabbit rearing for different purposes. Examples are given on the effects of different housing and management systems on rabbit welfare, as well as examples of the ethological, physiological and productive indicators used to evaluate these effects. Transportation and, more generally, pre-slaughter phases including catching, fasting and lairage at the abattoir are considered major stressors for farmed rabbits and might have deleterious effects on health, well-being, performance, and finally, product quality. A general statement of the recent scientific studies considering the effects of pre-slaughter factors on physiological and productive measurements are reported. Finally, some indications in order to improve rabbit welfare, already present at the European level, are also outlined, together with the European Food Safety Authority opinions.

Key words: Rabbit, Welfare, Husbandry systems, Management, Transport.

RIASSUNTO

ALLEVAMENTO E TRASPORTO DELLA SPECIE CUNICOLA: ASPETTI DI BENESSERE ANIMALE

L'articolo inizia con la descrizione delle principali caratteristiche del coniglio (Oryctolagus cuniculus) e dei più diffusi sistemi di allevamento e management. Si evidenziano i possibili effetti, sul benessere di questa specie, delle tecnologie di allevamento, in relazione al problema costituito dalla recente epoca di domesticazione ed alle capacità di adattamento della specie all'ambiente in cui viene allevata. In particolare si riportano esempi degli effetti delle diverse tecniche di allevamento sul benessere dei conigli in funzione degli indicatori scientifici integrati di valutazione di tipo etologico, fisiologico e produttivo.

Il trasporto e più in generale le fasi che precedono la macellazione che includono la cattura, il digiuno e la sosta al macello, sono considerate fonti di stress per il coniglio e possono avere effetti negativi sullo stato di salute, sul benessere, sulle performance e anche sulla qualità dei prodotti. Sono presi in rassegna i principali articoli scientifici che hanno messo in relazione i fattori premacellazione ed i parametri fisiologici e produttivi legati al benessere del coniglio.

Vengono inoltre riportate alcune indicazioni riguardanti l'allevamento ed il trasporto, in relazione al benessere dei conigli, attualmente presenti a livello europeo, come pure le principali indicazioni fornite dall'EFSA (European Food Safety Authority).

Parole chiave: Coniglio, Benessere, Allevamento, Gestione, Trasporto.

Introduction

Rabbits (*Oryctolagus cuniculus*) are social animals living in the wild in colonies composed by one/two males and/or 6/12 females (Sanford, 1996). They give birth to altricial kits which need a nest in order to survive. The coping strategy of rabbits allows them to reproduce and grow well, till weaning age, receiving little maternal care, both in the wild and on farms (Hudson *et al.*, 1996). After birth, the kits stay inside the nest (Hudson *et al.*, 2000) in a thermal and energy balanced situation. The nest is prepared by the doe with collected material and plucked hair from the body (Canali *et al.*, 1991; Gonzalez-Mariscal *et al.*, 1994). The nest is covered and hidden from predators; kits do not escape from the nest, thus retrieving behaviour from the doe is not necessary (Denenberg *et al.*, 1969). Normally, rabbit females nurse their litter once a day for less than five minutes (Hoy and Selzer, 2002). Some authors also described the endocrine control of maternal nest-building (Gonzalez-Mariscal, 2007). As far as husbandry systems are concerned, they started with the Romans who kept rabbits in semi-natural conditions ("leporaria"). In the Middle Age, monks started to rear rabbits in a semi-intensive and rational way, in cages and small enclosures. Then, in the 40-50's intensive rabbit production began with the introduction in Europe, from the United States, of the New

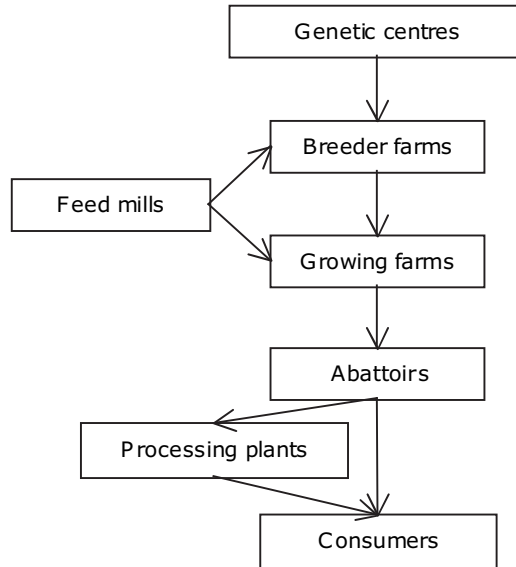
Zealand White breed, reared in cages and fed integrated commercial feed (Sanford, 1996). Nowadays, the production systems for rabbits are generally intensive and organised in production chains which involve a series of interrelated steps (Figure 1). These production systems may cause welfare problems, mainly due to the housing systems and reproductive rhythms for the doe.

Rabbit housing systems and welfare

Reproduction stock

Bucks and does (reproductive stock) are usually housed individually. The individual cages for does have an external nest which is prepared collecting material (given by the farmer a few days before parturition) and hair from the body of the doe (Canali *et al.*, 1991; Gonzalez-Mariscal *et al.*, 1994; Hudson *et al.*, 2000). The kits are usually weaned at 28-35 days of age and moved to the fattening cages. Fatteners, from weaning to slaughter (usually at 75-85 days of age) are kept in groups (2, 3, 4 or more animals) according to the cage size. In Italy, they are normally housed in bi-cellular cages. The cage dimension indications are reported in another section of this review. A more detailed description of the different housing systems for farmed rabbits may be found in the report on "The impact of the current housing and husbandry systems on the health and welfare of farmed domestic

Figure 1. Production chain of rabbits kept for meat purpose.



rabbits” (EFSA, 2005). Some housing systems may act as stressors to the animals (Morisse, 1998; Verga, 2000), negatively affecting both welfare and production (Staufacher, 1992; Drescher, 1996). In fact, due to the cage dimensions, often rabbits are not allowed to run, hop and rise up. Moreover, the environment is often barren and could induce some abnormal behaviours such as stereotypies, aggression and/or apathy (Jordan *et al.*, 2006; Verga *et al.*, 2007).

Some studies were carried out investigating the effect of cage size on the reproductive performance and behaviour of does. Rommers and Meijerhof (1998) examined rabbit does housed in different cages (standard: 50 cm width, 60 cm length and 30 cm high; large: 100 cm width, 60 cm length and 30 cm high; tall: 50 cm width, 60 cm length and 50 cm high). The cage size did not have a significant effect on fertility rate and behaviour or welfare of females. On the contrary, the size of cage may have an influence on nursing behaviour: Selzer *et al.* (2004) observed

a moderate tendency to decrease nursing activity by increasing cage size. Whary *et al.* (1993) studied the effects of group housing comparing does individually housed in conventional cages and as a social group in a proportionately larger enclosure. Group housing provided increased opportunities for exercise, social contact and a novel environment. Analyses of group social behaviour indicated that the rabbits preferred small social groups, had preferences for microenvironments within the enclosure and exhibited behaviours that are not allowed when housed singly. In any case, this method is quite difficult to develop in an intensive farm. In fact, group housing of does may raise aggressive behaviours and worsen maternal care, although changes in rearing technologies and management are used (Ruis, 2006; Szendro, 2006). As regards the breeding cages, sometimes a platform is inserted in a “two-floor” cage in order to increase the floor surface. According to Margarit and Finzi (2000), the walking surface may be increased by 70-

80%. The other function of the platform is to permit the does to go away from their kits. However, cages with a platform may cause hygienic problems when the management is not strictly controlled. For example, manure can accumulate on it and urine may fall down on the pups, drinkers and feeders. Comparing reproductive performance (conception rate, litter size, mortality, weight of kits and feed consumption), no differences were found between traditional and double height with platform cages (Mirabito, 2002, 2003). Different floor cage surfaces could be useful for does, giving them a more comfortable resting area instead of the conventional wire mesh, thus reducing paw injuries (Rommers and Meijerhof, 1996).

Fatteners

Concerning the weaning-fattening period (28-85 days of age), some authors (Maertens and De Groote, 1984) recommend the use of a maximum stocking density of 40 kg rabbit live weight/m². The number of rabbits placed per square meter depends on the finishing weight of the animals. For example the same authors found that the optimum cage density was 15-16 rabbits/m² for rabbits of 77 days of age (body weight 2.5 kg). Aubret and Duperray (1992) reported an optimum cage density of 20 rabbits/m² for growing rabbits up to 68 days of age (body weight 2.3 kg). Matics *et al.* (2004) studied a two-phase method for growing rabbits. Early weaned rabbits were reared at the stocking density of 20 rabbits/m² or at a double density till 6 weeks and then divided over two cages. The performance and the behaviour of animals were similar between 3 and 10 weeks of age using the two housing systems.

Some studies have been carried out on alternative housing systems that may improve the welfare of farmed rabbits, allowing animals to express a wide range of behaviour (Morisse *et al.*, 1999; Maertens and

Van Oeckel, 2001; Maertens *et al.*, 2004). The quality of life for group caged fatteners may be improved (Batchelor, 1999), but the daily weight gain is reduced compared to animals reared in standard cages (Dal Bosco *et al.*, 2002; Verga *et al.*, 2007). Dal Bosco *et al.* (2002) compared rabbits reared in pens of 100 animals to rabbits reared two per cage at six and ten weeks of age. During the light period penned rabbits showed higher frequencies of social and locomotory behaviours and a lower level of resting and feeding behaviours. Maertens and Van Herck (2000) showed that the higher mortality rate in pens could be due to increased infectious pressure caused by the larger group size.

Welfare evaluation and improvement in rabbit rearing

The effects of housing systems on welfare may be evaluated through behavioural, physiological, health and productive indicators. Behaviour is the first and most evident sign of the organism's status: abnormal behaviour may be shown as a consequence of stressors such as, for example changing of the cage, transportation or sudden noises (Finzi *et al.*, 1986). According to Podberscek *et al.* (1991) the presence of "abnormal behaviour" (for example stereotypies) might indicate the existence of welfare problems. Other significant parameters of stress may be studied taking into account other behaviours, such as feed intake and maternal behaviour (Verga, 1997). A review of rabbit behaviour under commercial conditions is given by Marai and Rashwan (2004).

Besides the ethogram, also the response to behavioural tests is useful in evaluating rabbit welfare. Tests aimed at measuring fear in a new environment or towards humans may be used: for example, 'open-field' (Hall, 1934; Gray, 1991); 'emergence' and 'tonic immobility' test (Erhard and Mendl,

1999). The reaction of rabbits may be affected by the housing system and management. Rabbits at the highest density show a more passive (freezing) stress reaction. Emergence and tonic immobility tests have been performed to verify the effects of weaning time on the rabbits' reactions. A trend was found in rabbits weaned at 32 days compared to 24 days of age for higher emergence time. In the tonic immobility test a trend to higher immobility times was found in rabbits weaned at 24 days of age (Verga *et al.*, 2004, 2006). In order to meet physiological and behavioural rabbit requirements, social contacts and environmental enrichment are important tools in order to avoid stress responses (i.e. stereotypies and lower production). Environmental enrichment, which reduces the negative effects of boredom, contributes both to meet the rabbits' needs and to improve their quality of life. Although a few studies have been conducted on the effects of environmental enrichment on rabbits, some authors have found that the presence of objects to gnaw and leave an olfactory mark in the cage increases growth performance in fattening rabbits (Verga *et al.*, 2004), and reduces stereotypies (Berthesen and Hansen, 1999; Luzi *et al.*, 2003; Jordan *et al.*, 2006; Princz *et al.*, 2007). Environmental enrichment such as a wooden stick does not have a negative effect on rabbit performances (Verga *et al.*, 2004). However, it is necessary to avoid environmental contaminations, for example hanging the wooden stick to the ceiling of the cage.

Besides housing modifications, management changes may also improve rabbit welfare. For example, handling of animals at an early age may be a useful management practice which could reduce fear towards human beings. Handling pups during the first week of life, although just for a very brief period (i.e. 1 minute per day), may positively affect both behaviour and production. Higher

exploration activity in the open-field test, lower mortality rate and higher growth rate (Duperray, 1996; Jezierski and Konecka, 1996) have been found in handled pups with respect to the control ones. Moreover, the handled pups also show less fear reactions in behavioural tests aimed at evaluating fear both towards a new environment and towards human beings (Verga *et al.*, 2006).

Ongoing indications on rabbit rearing at the European level

Indications on rabbit housing and management systems have been established in some European Countries. For example, in Table 1 the minimum space allowance for rabbits according to the UK Code (Science, Research & Statistics, 1987) is shown. Other suggestions have been proposed by the World Rabbit Science Association (1991), German Section, and by the European Food Safety Authority Report on "The impact of the current housing and husbandry systems on the health and welfare of farmed domestic rabbits" (EFSA, 2005).

In Germany and in The Netherlands, there are some national regulations which established maximum stocking densities (Luzi *et al.*, 2006).

As regards the minimum requirements for rabbits (Table 2), the German Branch of WRSA (9 of May 2007) has established the following management criteria: a) permanent access to water of good quality b) one nipple waterer per cage/box in single housing; c) more than 1 nipple waterer in groups of >10 rabbits; d) width of the feeding place 6 – 8 cm (in dependence on the size of the rabbits up to a live weight of 4 kg), for bucks 10 cm, if fed ad lib – half width; e) nest box 3 days before kindling f) light program in windowless rabbitries with min. 8 h light and min. 8 h darkness during 24 h, intensity 20 lx; g) no permanent excess of a limit of 20

Table 1. Minimum space allowance for rabbits (According to Science, Research & Statistics, 1987).

System	Minimum Floor Space
In Cages	
Doe and litter to 5 weeks of age	5600 cm ² total area
Doe and litter to 8 weeks of age	7400 cm ² total area
Fatteners to 12 weeks of age	700 cm ² per rabbit
Fatteners 12 weeks and over ¹	1800 cm ² per rabbit
Adult does and bucks for rearing	5600 cm ² per rabbit
In Hutches	
Doe and litter to 5 weeks of age	7500 cm ² total area
Doe and litter to 8 weeks of age	9300 cm ² total area
Rabbits 5 to 12 weeks of age	900 cm ² per rabbit
Adult does and bucks for rearing	7500 cm ² per rabbit

¹ other than those used for rearing (multiple occupation cages).

ppm NH₃ and 3.000 ppm (0.30 %Vol.) CO₂ h) in minimum once a day control of animal health situation and the technical function of feed and water supply and of microclimate (Hoy, 2006; Hoy and Verga, 2007).

The Dutch Rabbit Housing Directives establish that in the cages of does 3 days before parturition a nest-box must be available until 18 d after parturition. The nest-box must have a minimum surface of 700 cm². In the cage there must be an elevated floor of at least 900 cm². The distance from the elevated level to the floor of the cage and the top of the cage must be 25-35 cm. The cage must have a floor surface of at least 4500 cm², including the nest-box surface. The height of the cage must be at least 60 cm for 1/3 of the floor surface. The wire of the floor must be at least 3.02 mm thick. For pregnant does that are not productive (lactating) and rearing does (so called waiting cages); the floor surface must be at least 2000 cm², the height of the cage must be 40 cm, and the wire of the floor must be 3.02 mm thick.

In the cages of bucks, the floor surface

must be 4000 cm², the height of the cage must be at least 60 cm and the wire of the floor must be 3.02 mm thick. The fattening rabbits have to be housed at least in groups of 2 when group is <5 then the surface area must be 700cm² per meat rabbit, when group is => 5 then the surface area must be 600 cm² per meat rabbit. The cage height must be 40 cm for at least 1/4 of the floor surface area. If elevated floors are installed, they must be at least 10 cm width and the distance to the floor and top of the cage must be at least 25 cm (so the cage height must be 50 cm). The surface of the elevated floor can be included in the total surface available per meat rabbit. If a wire floor is used it must have a thickness from at least 3.02 mm (Productschap van Vee, Vlees en Eieren, 2006).

Rabbit transport and welfare

It is well known that events which occur before rabbit slaughtering (feed and water withdrawal, crating, transportation, abat-

toir lairage) are critical for several aspects of animal welfare (Jolley, 1990). Below the main pre-slaughter aspects influencing animal welfare are considered individually.

Preparation of animals to transport (catching and crating)

Before transport to the abattoir, rabbits are removed from the growing cages and loaded into crates by hand. Loading can be carried out either inside the farm by placing the crates close to the cages or outside by moving the rabbits near to the truck and putting them into crates placed on the truck. In a comparative study under commercial conditions, it was shown that rabbits loaded into crates placed on the truck had a slight reduction (0.44%) in prevalence of carcass with loin bruises compared with those crated on the farm (FENALAP, 1992). Without regard to the crating method, more careful rabbit handling to reduce trauma has been reported as a crucial factor to reduce pre-slaughter mortality and main carcass defects such as hemorrhages, bruises and broken bones. The areas of the rabbits most frequently bruised are legs, thoracic muscles and the internal part of the loin region. These bruises are mostly not detectable in the live rabbit and become visible only during slaughtering after skin removal

(Cavani and Petracchi, 2004).

Crate size, space allowance, floor type

Under commercial conditions, growing rabbits marketed for slaughter are generally transported in crates made of plastic wire. The dimension of the crates can be quite variable, however the standard crates measure 100-110×50-60×22-30 cm (length×width×height). The number of rabbits loaded into crates varies according to animal weight and environmental conditions: 14-16 animals/crate for rabbits weighing 2.0-2.7 kg and 12-14 animals/crate for rabbits weighing 2.8-3.2 kg. The resultant commercial stocking density varied from 0.03 to 0.05 m²/rabbit. As reported before, the scientific report EFSA-Q-2003-094 indicated a recommended stocking density of 0.06 m²/rabbit. De La Fuente *et al.* (2004) comparing rabbits transported at low (0.05 m²/animal) and high (0.03 m²/animal) stocking densities did not find any difference in physiological parameters related to stress. They suggested that other factors such as the height of the cage or the number of piled crates have to be taken into account when studying the effect of stocking density. Regarding the crate floor type, Jolley (1990) recommended adopting solid floors in transport crates to prevent the transfer

Table 2. Minimum requirements for breeding rabbits (German Branch of WRSA, 2007).

	Space per rabbit (cm ²)	Minimum height (cm)
up to 4.0 kg	2.000*/2.400	40/60*
up to 5.5 kg	3.000*/3.600	40/60*
> 5.5 kg	4.000*/4.800	40/60*
elevated seat *	1.000	25
nestbox	800	30

*If an elevated platform is used, the floor space of the cage plus the space of the elevated seat plus the nest box space are added to available surface.

of urine and faeces from higher crates in a stack to those below. There are several particular concerns about this aspect because ventilation is generally passive on vehicles and can be partially impeded by crates with solid floor. A further important practical concern is the greater difficulty to wash the crates with solid floors at the abattoir after slaughtering with respect with those made of wire.

Fasting

During the period lasting between catching at the farm and hanging at the abattoir line rabbits are kept without feed and water. Moreover, feed can be removed before rabbits are caught to allow time for the evacuation of the intestinal contents. This practice may contribute to reducing the incidence of faecal contamination of the carcass which may occur during gastrointestinal tract removal as well as reducing stress during transportation even if it is a less common practice than for poultry. In this case, fasting should be referred to the total length of time rabbits are without feed before processing including the time the rabbits are on the farm without feed, as well as the time rabbits are in transport and in the lairage area at the processing plant. Time of food deprivation is important because it affects animal welfare, but also carcass yield (live weight losses), carcass contamination and product safety (pathogenic and spoilage bacteria) and quality (ultimate muscle pH) (Jolley, 1990; Dalle Zotte, 2002). However, due to caecotrophy, rabbits are usually considered to be very resistant to hunger (Lebas *et al.*, 1986). Of course the way in which transport affects the pattern of changes to gut fill depends on whether the rabbits are allowed free access to feed and water before crating. Crating and transportation can also cause the rupture of caecotrophy practice which

leads to higher spillage and rabbit contamination (Jolley, 1990). Rabbits lose 3-6% of body weight during the first 12 h of fasting, increasing to about 8-12% at 36-48 h (Cavani and Petracci, 2004). Generally, weight loss is slightly lower if fasted rabbits are allowed access to water before crating (Ouhayoun and Lebas, 1995). In the first 4-6 hours, weight loss in rabbits is mainly due to emptying of the gut, so carcass yield is not negatively influenced (Lambertini *et al.*, 2006). After 6 hours, there is also a loss in moisture and nutrients from body tissues, which can impair carcass yield as pointed out by Trocino *et al.* (2003).

Transport

Under commercial conditions, rabbits are conducted to the abattoir using a commercial lorry which has two or three axles and a loading capacity ranging from 1,500 to 6,000 rabbits. The crates are placed on the vehicle in multi-floor crate roller stands. In a survey conducted in Spain, Buil *et al.* (2004) found that the average transport time was 154 min (range: 20 to 600) corresponding to 137.5 km (range: 25 to 500). Similar journey durations are present in Italy (Petracci *et al.*, 2008). Moreover, Luzi *et al.* (1992) conducted a survey in the Northern Italy studying pre-slaughter transports from farms located at different distances (25, 50, 100 and 150 km) over one year. They observed that the most critical conditions for rabbits are when they are transported over 4 hours and at environmental temperatures above 18-20°C and a relative humidity of 70-75%. Close environmental control in the crates or modules on the vehicle is difficult, mainly because on most vehicles ventilation is passive and is impeded by the close stacking of adjacent crates. When lorries are full of rabbits, the ventilation inside tends to be poor, particularly when the truck stops, either during the journey to, or on arrival at the

abattoir so rabbits on the inside of a load may suffer hyperthermia (Jolley, 1990). The high probability of thermal stress being suffered by at least some rabbits in transit has been documented by De La Fuente *et al.* (2004) who found that the rabbits transported in summer rather than in winter showed signs of severe heat distress, since they had higher blood cortisol, lactate and glucose, creatine kinase and lactate dehydrogenase enzymes, and evidenced more dehydration with greater osmolarity. Nevertheless, the same authors observed that winter transport increased muscle activity as evidenced by the lower liver and muscle glycogen concentration. Moreover Liste *et al.* (2006) found that rabbits placed in the middle and bottom of crate stacks showed higher levels of some stress indicators (blood glucose, and corticosterone) than those located at the top floor without regard to journey length. A recent survey has evidenced that the mortality rate between crating and hanging at the abattoir line is very low (0.1%) (Petracci *et al.*, 2008).

Lairage at the abattoir

Upon arrival at the abattoir, crates are unloaded from the lorry and kept in a protected area waiting for slaughtering. In most commercial abattoirs, this area is placed outside and is equipped at least with a roof to protect the rabbits against sunlight and rainfall. Only very few abattoirs are provided with an enclosed area equipped with forced ventilation and water-misting sprays as a control strategy for adverse environmental conditions. Lairing the rabbits prior to slaughter at the abattoir for few hours can contribute to the mild the effect of transportation on animal welfare. The great changes in environmental conditions during the *ante mortem* period may greatly increase stress levels, so an adaptation period is necessary to minimize consequences and return to the

normal physiological pattern. Maria *et al.* (2005) found that 3 hours of lairage could be insufficient for the complete adaptation of the rabbits to the stress, while holding the rabbits after transportation for 6 h led to lower corticosterone level.

Ongoing legislation on rabbit transport at the European level

Several regulations dealing with the protection of animals during transport have been adopted since 1977 by the European Union (Table 3). In these documents several points are addressed, and specific attention is paid to long journeys. Few indications are specifically devoted to domestic rabbits (e.g. no recommendations on space requirements are given) and these refer to the need that "suitable food and water shall be available in adequate quantities, save in the case of a journey lasting less than 12 hours disregarding loading and unloading time." However, there are general provisions to prevent suffering that would be applicable to rabbits. One of these provisions is particularly relevant for the transport of young rabbits who "shall not be considered fit for transport if they are new-born mammals in which the navel has not completely healed." In fact, it is a common practice to move young breeders 24-48 hours after parturition from selection centres to commercial breeder farms, but actually no scientific data are available on the time in which the navel has completely healed. The EFSA Scientific Subcommittee on Animal Welfare has recently adopted a scientific report for the European Commission also including the dissertation of animal welfare in rabbits (EFSA-Q-2003-094). The main concerns are deal with the following: i) shape of the crates which should allow the rabbits to stand in a natural position; ii) space allowance of a minimum of 0.06 m² per capita; iii) adequate ventilation should

Table 3. Animal welfare during transport: regulations and scientific reports adopted by the European Union and recommendations adopted by the Council of Europe.

	Directives (D) or Regulations (R)
European Regulations:	
International transport of animals	D 77/489/ECC
International transport of animals	D 81/389/ECC
Protection of animals during transport	D 90/425/ECC
Protection of animals during transport	D 91/426/ECC
Protection of animals during transport	D 91/628/EC
Protection of animals during transport	D 93/119/EC
Protection of animals during transport	D 95/29/EC
Criteria for staging points	R 97/1255/EC
Protection of animals during transport	R 98/411/EC
Protection of animals during transport	D 99/575/EC
Protection of animals during transport	R 2005/1/EC
Council of Europe recommendations:	
European convention for the protection of animals during international transport	ETS 65
Scientific reports of European Union:	
Transport of farm animals	VI/3404/92 – EN
Standards for the microclimate inside animal transport road vehicles	SANCO/B3/AW/ R13/1999
Standards for the microclimate inside animal transport road vehicles	EFSA-Q-2003-085
The welfare of animals during transport	EFSA-Q-2003-094

be provided during transport to maintain the inside crate temperature within the range 10-20°C; iv) journey duration should not exceed the range of 8-12h.

Moreover, in some member states there are general provisions on stocking densities that would be applicable to rabbits. In England there is the Statutory Instrument 1997 n. 1480 “The Welfare of Animals (Transport) Order 1997”, which, in article 4, deals with transport of poultry and domestic birds and rabbits.

Conclusions

This review discussed how rabbit welfare could be negatively affected by housing, management and transport systems. Some physiological and behavioural indicators may be used in order to define the animals’ reaction towards specified stressors. Thus rabbit welfare may be improved according to changes in husbandry and pre-slaughter handling systems when these are shown

to be inadequate to the rabbits' biological needs. A general improvement of the welfare of rabbits should take into account all the critical agents acting on animals in the whole productive chain, including housing, management, pre-slaughter phases and relationship with human beings.

The development of non-invasive methods for measuring stress-indicating variables have been provided for in addition to classical descriptive behavioural observations, allowing an evaluation of stress by multiple criteria under different housing conditions and management procedures. These behavioural and physiological measurements

provide valuable information on how rabbit housing, handling, and transportation can be improved in the near future. It is also important to emphasise that animal welfare is becoming an increasingly important societal issue in the EU. It is clear that the consumer quality definition of animal-origin food also includes views and perceptions regarding the accordance of food production with good farming and pre-slaughter practices, with greater respect for the environment and for the welfare of animals. In this way, a move towards animal friendly and environmentally sustainable production systems can make it possible to obtain products of greater value.

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