SEARCH FOR KEY HEALTH AND WELFARE INDICATORS FOR MEAT RABBIT PRODUCTION AND DEFINITION OF A SCORE METHOD OF EVALUATION

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ABSTRACT

The aim of this study is to define parameters related to health and welfare of animals even in industrial farms with intensive husbandry. Therefore, we tried to increase the knowledge on rabbit welfare by the use of correct tools for monitoring the different aspects of rabbit industrial farming, in order to improve the efficiency of farms and the productive performances of animals. Our study is based firstly on the characterization of health, management, environmental and physiological parameters and, secondly, on the definition of protocols to assess welfare of rabbits. All the entered values are then utilized for a score system to establish health and welfare conditions in industrial farms.

Key words: Welfare indicators, Monitoring, Health and zootechnical parameters, Score system.

INTRODUCTION

In the European Union (EU), the welfare of rabbit mostly depends on different breeding systems, since specific directives have not yet been produced. In general, the trend in the EU is to guarantee for all the zootechnical species, a sort of "charter of fundamental rights" with special attention to species-specific needs. Accordingly, the definition of rabbit welfare and protection rules by community laws is foreseen. Indeed, the Council of Europe has been studying and drawing up regulations on that for some years, and the AHAW panel of EFSA has been recently charged of preparing an Opinion on "*The Impact of the current housing and husbandry systems on the health and welfare of farmed domestic rabbits* (EFSA-Q-2004-023)". In Italy, where rabbit production is roughly equal to 100,000,000 rabbits/year, few investigations have been conducted to study the impact of husbandry on rabbit welfare. Nevertheless, our rabbit productive system makes pressure with the aim of improving welfare of animals, while avoiding any economic damage for the farmers. The aim of this study was to identify the elements and parameters which could prove the possibility to produce in the respect of health and welfare of animals even in industrial farms with intensive husbandry. Therefore, we tried to define the correct tools for monitoring the different aspects of rabbit industrial farming, in order to improve the efficiency of farms and the productive performances of animals. Our study was based firstly on the characterization of health, managerial, environmental and physiological parameters (Cerioli *et al*., 2006) and, secondly, on the elaboration of protocols to assess rabbit welfare. All the registered values were then utilized to define a score system, which can be proposed and used in order to establish health and welfare conditions in industrial farms.

MATERIALS AND METHODS

Animals and farms

The study was conduced between 2004 and 2007 in 8 industrial farms located in the Po valley (Northern Italy). They were classical industrial farms (closed shed with natural or forced ventilation),

plain air or semi-plain air units and farm with non-conventional cages. The animals were mostly commercial hybrids. For each farm it was filled an anamnestic schedule reporting the structural (dimension and shape of shed, ventilation, litter, etc), managerial (insemination, weaning, vaccination, treatments, etc), material (size and type of cage, nest, feeding, etc.) and zootechnical characteristics. The farms were visited monthly and during each inspection a series of specific parameters were investigated in order to define the sanitary, immunological and environmental situation. In addition to the programmed sampling and records, any other event and remarkable abnormality (i.e. mortality or clinical signs) were immediately and properly investigated.

Health situation records

Necropsy was performed on at least 3 animals for each productive category (lactating, weaning, fattening, breeders) showing sanitary problems i.e. dead in the 24 hours before, ill, underweight, culled. Organ samples were then submitted to virological, bacteriological and parasitological investigations according to the lesions detected. Virologic examination was carried out both by negative staining electron microscopy and by sandwich ELISA for the detection of group A rotavirus. Bacteriological examination was performed using standard and routine methods for isolation of *Clostridium spp., E. coli, Pasteurella multocida, Staphylococcus aureus.* Part of caecum was used for the detection of *Cl. spiroforme* by Gram staining. The isolated strains of *E. coli* were further characterized: biotype and serotype definition and PCR determination of the EAE gene. The health status of rabbits was assessed by: a) taking 15 vaginal swabs from does (5 nulliparous, 5 primiparous and 5 multiparous) and 22 nasal and rectal swabs from the same 15 does, 3 post-weaned (35 days of age) and 4 growing rabbits (60 days of age); b) taking 10 coat samples (from ear and head) for each productive category (35 and 60 day old and does). Isolation of fungi was attempted by using two selective media: Dermatphyte Selective Medium (DTM) and Sabouraud incubated for 5 days at room temperature; c) observing the presence of sore hocks and mastitis in does at different productive status (10 primiparous, 10 multiparous, 10 empty). Parasitological examination was conducted in order to determine the environmental impact of parasites in the farm. A pool of faeces in both productive compartments (maternity and fattening) was taken from litter, each composed by 3 samples taken in different areas of the building(s).

Immunological situation records

Ten fattening rabbits, respectively 35 and 60-day old, and 10 restocking females, 100 and 120-day old, respectively, were tested to quantify anti-myxomatosis (MYXO) and anti-Rabbit Haemorrhagic Disease (RHD) antibodies. The serological tests used for RHD and MYXO antibodies are both competitive ELISAs. The technical procedure and the steps for performing such methods are described elsewhere in details (Capucci and Lavazza, 2004; Lavazza *et al.*, 2004; Botti *et al*., 2007). The restocking females and 10 does were also tested for antibodies anti-*Encephalitozoon cunicoli* using a commercial *Carbon Immuno Assay* (CIA test, Testman, Uppsala, Sweden).

Environmental condition records

Air temperature, relative humidity and concentrations of ammonia were repeatedly determined in the 8 farms. Air temperature and relative humidity were measured by a thermo hygrometer with a probe (PBI International-HI 9065). Concentration of ammonia was measured using a Chip Measuring System (CMS) by Dräger and the range adopted was between 2 and 50 ppm. The determination of environmental parameters, both in the fattening and maternity sections, was primarily done in 3 different areas in the middle passage (at the beginning, in the centre and at the end) of each unit. In case of adverse conditions, i.e. poor ventilation and high concentration of ammonia, additional measurements were performed. Environmental swabs were taken to determine the total bacterial and fungal count, by using an intru-ment (SAS, PBI international) which aspirates a planned volume of air (50 l for bacterial and 20 l for fungal count respectively). The air flow was then directed on two selective media Tryptic Glucose Yeast Agar in the Plate Count Agar (PLA) method, incubated at 37°C for 48 h and Sabouraud incu-bated at room temperature for 5 days. The values were expressed in colony forming units (UFC)/m^2. Samples were taken in the same place where concentration of ammonia was measured and again more samples were added in particular situations (i.e. high density, introduction of new animals etc.).

Productive parameter records

Productive parameters were elaborated by a data processing system, which provides data referred to the whole productive cycle and arranged in accordance with the dates of mating. It covers the whole life of animals from coupling of does till the end of the productive cycle corresponding to the slaughter of growing rabbits. The productive performances were divided in maternity and fattening sections and the mean values were calculated to establish the score values.

RESULTS AND DISCUSSION

The housing, managerial and zootechnical characteristics of each farm were listed and reported in the anamnestic schedule filled in at the beginning of the study. Such set of data defined the "basal" situation existing in each farm unit and the level of "quality" of rabbit husbandry was assessed using a score system (Table 1).

Table 1: Housing, management and zootechnical characteristics: score system

		Score		
	Parameters	0	1	2
Management & Husbandry	Farming-type	part-time	professional	
	Type of building:	converted	specific	
	Distance from other farms	<1 km	>1 km	
	" from slaugtherhouse	<1 km	>1 km	
	Cyclization	absent or intensive	semi-intensive	extensive
	Insemination	natural		artificial
	Feeding system	manual	automatic	
Prophylaxis & Therapy	Indirect-vaccinal	not done	RHDV or Myxo	RHDV and Myxo
	Direct-biosecurity	not done	partial	complete disinfection: every 6-12 months and all in all out once a year
	Antiparasitic treatment	not done	done	
	Pest and rat control	not done	done	
	Use of antibiotics	routine	occasional	cautious
Type of housing	Ventilation and heating	natural	forced longitudinal or transversal	water-cooling system
	Lighting	natural	artificial: not controlled	artificial: controlled
	Litter and manure storing and removal	permanent or semi-permanent concrete pit (removal every 3-4 months)	Concrete pit and scrapers or belt system (at least every month)	Concrete pit and scrapers (daily / weekly)
Cage	Breeders	≤40W x ≤60L x ≤30H	40-48W x 60-70L x 30-35H	≥48W x ≥70L x ≥35H
	Growing rabbits (4-10 weeks)	Bi-cellular cages (25-28W x 40-42L x 28-30H)	Double use (5-6 rabbits) 40-48W x 60-65L x 30-35H	Double use + nest (7-8 rabbit) 40-48W x 85-90L x 30-35H
				Colony cage 50-60W x 80-100L x 30-35H

About 30 inspections were made in each farm. All the accumulated results allowed to defining an evaluation score system that was fed with the data registered in a quarter for each class of parameters. In case of multiple controls for each parameter during the observation period, it was necessary to calculate the quarterly arithmetic mean. The final judgement was directly proportional to the score. In the following tables (Tables 2, 3, 4 and 5) parameters are divided by type, each with its importance, the suggested frequency of control, the score and other useful indications. From the analysis of the whole set of data, some results should be highlighted: 1) In asymptomatic "healthy" rabbits it was possible to isolate opportunistic and virulent pathogens from rectal and nasal (but not vaginal) swabs. 2) In the 8 farms different vaccination protocols were applied, so it was difficult to apply a score system to evaluate RHD and MYXO antibodies. The only possible variable is no or low immunological response to vaccination due to immunosuppression due to distress of rabbits. Therefore, background knowledge of the immunological situation and vaccination protocols adopted

in each farm is fundamental in order to assess the causes and to try to solve the problem. 3) The increase of the number of seropositive animals for antibodies anti-*E. cunicoli* at the second sampling (20 days after the first one) with medium/high titres (1.320 -1:1280) confirmed previous observations on the age of infection, i.e. around 100 days (Saviotti *et al*., 2000). 4) The concentration of ammonia, temperature level (T°C) and relative humidity were all influenced by the climatic conditions. The registered values of ammonia were higher during the seasonal changes since the sudden variation of temperature complicates the regulation of the ventilation system, which is a critical point for the quality of air. Moreover, concentration of ammonia was generally higher in fattening than in maternity compartments. 5) The values of total bacterial counts in environmental samples were usually directly correlated with the worsening of temperature, ammonia and humidity conditions.

Table 2: Health parameters: score system

Parameter	Importance	Sampling frequency	Score (divided in fattening and maternity)
Isolation of virus and bacteria and related antibiogram	high	every 3 months, in absence of any problems. Pointed samples when needed	Presence of pathogens (virus and bacteria) (es. *E. coli* O103, *Clostridium* spp. *Pasteurella multocida*, *Staphylococcus aureus* = 0 Pleomorphic bacterial flora = 1 No pathogens = 2
Nasal swab	high	every 3 months	Presence of *Bordetella* & *Pasteurella multocida* & *Staphylococcus aureus* >5% = 0 1-5% = 1 <1% = 2
Vaginal swab	medium	not systematic	To be done in case of reproductive failure and infertility If necessary = 0 If not necessary = 1
Rectal swab	high	every 3 months and every time "new breeders are introduced	Presence >10% pathogen bacteria = 0 Presence 5-10% pathogen bacteria = 1 Presence <5% pathogen bacteria = 2
Faeces sample	medium	every 3-6 months	Presence of parasites = 0 Absence of parasites = 1
Coat sample	low	every 6 months	Presence of fungi = 0 Absence of fungi = 1
Pododermatitis "Sore hocks"	high	at each visit: at least monthly	The final score corresponds to the mean value calculated after having controlled 10 primiparous, 10 pluriparous and 10 empty does respectively and having determined the arithmetic mean within each group. — Absence of lesions = 3 Simply thickening of the skin = 2 Relevant thickening of the skin at more than one leg = 1 Relevant and painful thickening, presence of bleeding ulcers = 0
Mastitis	high	at each visit: at least monthly	No lesions or signs = 3 Presence of one nodule at palpation = 2 Evidence of localized foci of mastitis = 1 Acute or chronic generalized mastitis = 0

Table 3: Immunological parameters: score system

Parameter	Importance	Sampling frequency	Score
MEV	High/ Medium	every 3 months	>90% vaccinated breeders with titres 1/40-1/160 2-4 week p.v. = 2 50-90% or titres 1/10-1/40 2-4 week p.v. = 1 <50% and no correlation with titres = 0
Myxomatosis	High/ Medium	every 3 months	>90% vaccinated breeders 2-4 week. p.v. = 2 50-90%. = 1 <50% = 0
E. cunicoli	High/ Medium	every 3 months	Prevalence in breeders at 100 days of age <10% = 2 10-50% = 1 >50% = 0

Table 4: Environmental parameters: score system

Parameter	Importance	Sampling frequency	Score
Temperature	High	every month	T°C = >18<21° during all the year but summer, when it must be 3-5° lower than external T° (30-35°) = 1 For other values out of range = 0
Relative humidity	High	every month	60-70% = 2 55-60% & 70-75% = 1 <55% & >75% = 0
Ammonia	High	every month	<10 ppm = 2 10-25 ppm = 1 > 25 ppm = 0
Total bacterial count	High	every month	< 100 ufc = 2 100-200 ufc = 1 >200 ufc = 0
Total fungal count	Medium*	every month	< 10 ufc = 2 10-20 ufc = 1 >20 ufc = 0

The main productive parameters may contribute to "qualify" and correctly evaluate productivity and economic efficiency of each farm. In fact, they represent the synthesis of a set of productive data, whose values are strictly related to health status and welfare of rabbits. On the other hand, animal status and condition heavily depend on the combination of other factors typical of industrial farming

(housing, structural, managerial, technical, environmental characteristics). Therefore, the registration of productive records may contribute to define the basic "normal" level of health and welfare of animals in each unit. The successive identification of any deviation from that level may be related to the occurrence of troubles and/or pathological events.

Table 5: Productive parameters: score system

Productivity indicators		value	score		value	score
Maternity	n° weaned/coupling	<4.5	= 0	% nest fertility	<55%	= 0
		4.6-5.0	= 1		55-60%	= 1
		5.1-5.5	= 2		61-70%	= 2
		>5.5	= 3		>70%	= 3
				% nest mortality	>25%	= 0
					18-25%	= 1
					10-17%	= 2
					<10%	= 3
Fattening	n° sold/coupling	<4.0	= 0	%fattening mortality	>40%	= 0
		4.1-4.5	= 1		25-40%	= 1
		4.6-5.0	= 2		10-25%	= 2
		>5.0	= 3		<10%	= 3
	kg sold/coupling	<9.5	= 0	AvWeight/sold	<2.5	= 0
		9.5-10.5	= 1		2.51-2.65	= 1
		10.6-11.5	= 2		2.66-2.75	= 2
		>11.5	= 3		>2.75	= 3

CONCLUSIONS

The main outcome of this study is the definition of a complete scheme of evaluation of the health status and welfare of rabbits in industrial rabbit farms through the identification and characterization of health, managerial, environmental and physiological parameters. These were then utilized to define a score system that could be used to assess the compatibility of the farm conditions and husbandry with the requirements of animals in terms of welfare and to give indication for its improvements. Such tool is easy to apply and can be used for surveillance and control of farm conditions and animal welfare and may be employed by both industrial farmers, who are deeply involved in improving the quality of their products, and public vet officers charged with the sanitary control of these animals.

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