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Causes of mortality in breeding rabbits

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ABSTRACT

In this study we determined mortality in breeding rabbits on 505 commercial farms in Spain during 2006–2014. We obtained our information by carrying out 3278 visits to 490 doe farms (127 also with males), and 877 visits to farms with males, including 132 visits to 15 artificial insemination (AI) centres. The median size of the farms was 769 does (minimum to maximum: 80–9000 does) and 44 males (minimum to maximum: 10–800 males). AI was used on 85% of the 490 doe farms. Females were serviced at 11 days postpartum on 75% of the farms. The mean Monthly Mortality Risk (MMR%) and 95% Binomial confidence interval (CI) in does were 2.82 (2.71–2.93%), and 1.87 (1.41–2.33%) in bucks, over a population of 2,641,709 females and 90,316 males at risk, in the course of the 9-year study; during the 42-day cycle, MMR% was 3.78 (3.67–3.89%). There were 9547 cohorts of females; 41.5% of the does were pregnant and lactating simultaneously, 28.1% only lactating, 17.4% only pregnant and 13% empty and not lactating. The MMR% of does during the last week of pregnancy was 7.05 (6.63–7.47%) and 4.26 (3.90–4.62%) during the 1st week of lactation. Our diagnoses were based on the macroscopic post-mortem examinations performed by a veterinarian on 2065 female rabbits found dead and 368 moribund-euthanized does. In the total 2433 on-farm necropsies on does and 55 males, we found alterations of the respiratory tract compatible with death in 0.70 (0.64–0.76%) MMR% in does, 0.88 (0.56–1.20%) in bucks; and digestive tract in 0.31 (0.27–0.35%) enteritis-diarrhoea, 0.11 (0.09–0.13%) mucoid enteropathy in does and 0.34 (0.14–0.54%) and 0.07 (0–0.16%) in males, respectively. Other primary causes of death were septicaemia, MMR% 0.23 (0.20–0.26%) in does, and 0.10 (0–0.22%) in males, viral haemorrhagic disease 0.22 (0.19–0.25%) in does, and 0.17 (0.03–0.31%) in bucks, metritis, pyometra, or both, 0.21 (0.19–0.25%), and uterine torsion, 0.20 (0.18–0.22%); 1.2 (1.01–1.39%) in the last week of pregnancy. The median age of 2087/2433 necropsied does was 2 parities (minimum to maximum: 1–34 parities) and the mean 3.9. Some changes in housing, feeding and management, to improve breeding rabbit health, are highlighted.

1. Introduction

On commercial farms housing the European rabbit (*Oryctolagus cuniculus*), mortality risks, causes of death and risk factors are variables of interest, (1) from the health and welfare perspective (Broom and Fraser, 2015), (2) because the greater our knowledge the better we can diagnose rabbit diseases, enhance their prevention or choose a suitable treatment for a rabbit population, (3) from the financial perspective, in particular with regard to longevity; this quality might be improved by work in the genetic field (Larzul et al., 2014) and very possibly by the contribution of non-genetic factors (Sánchez et al., 2004), (4) if females recover their health, the viability of kits and weaned rabbits might also be improved, (5) the health of adult rabbits affects human health, either due to the risk of zoonosis, deteriorated meat quality or in relation to rabbits as experimental animals and lastly (6) rabbit health has an impact on the environment, including sanitary interactions with wild rabbits (Rouco et al., 2006).

The mean Monthly Mortality Risk (MMR) of female rabbits in Spain was 3.0% and 3.2% in 2006 and 2008, respectively, as well as 5.5–7% does culled monthly (Rosell and González, 2009). Regarding causes of disease and mortality in adult rabbits raised for meat, there are papers with information based on on-farm necropsies, for instance Lund (1951). Other studies have been carried out in laboratories, using live or dead specimens coming from farms; e.g., those by Maire (1989). Using necropsy-based studies, these authors described several diseases in adult rabbits, expressed in proportional risks. Studies on digestive disorders of adult rab-

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bits have been reviewed (Mack, 1962). Information has also been obtained from experimental facilities (Hinton, 1977), small hobby farms (Hoop et al., 1993), pet rabbits (Varga, 2014) or from various sources, as in the case of Marlier et al. (2003). All of this information serves to reduce the gap in our knowledge of causes of on-farm deaths in breeding rabbits (does and males). During 1989–1995 and 1996–2005, we evaluated basic aspects of culling and mortality in breeding rabbits, on 321 and 130 commercial farms, respectively, in Spain (Rosell and de la Fuente, 2009); our studies and the resulting information formed part of our work on rabbitries, related to the Medicine of Production, Veterinary Forensics, and the Monitoring and Surveillance of several health events (Hoinville et al., 2013). Our challenge was to contribute to the rabbit disease prevention framework, as a part of Quality Assurance, and to the definition of a sustainable farm model (Fortun-Lamothe et al., 2009).

Our aims were to (1) estimate Monthly Mortality Risk (MMR) in breeding rabbits on commercial farms, (2) describe the MMR in function of the physiological status, and (3) describe causes of mortality in females and males.

2. Material and methods

Animal Care and Use Committee approval was not obtained for this study because data were obtained from rabbits raised under commercial conditions, fulfilling European, Spanish and regional recommendations and laws on animal welfare and food safety. Moreover, in Spain rabbit producers follow the sanitary protocols provided by veterinarians of their organizations, related with immunoprophylaxis (e.g., myxomatosis and viral hemorrhagic disease or RHD), metaphylaxis (e.g., against respiratory and digestive disorders), and good practices for biosecurity (e.g., all-in-all-out production system, or the use of cages with footrests to prevent sore hocks).

2.1. Farms, batches and cohorts

From January 1st, 2006 to December 31st, 2014 we obtained our information by carrying out 3410 visits to 505 farms in Spain. We made 3278 visits to 490 doe farms and 877 visits to 142 male farms, including 132 visits to 15 artificial insemination (AI) centres (serving to other farms); the majority of the farms were for meat production. On each visit we asked the producers about their inventories of rabbits, mainly bucks and does, and dead rabbits on the day. All of these visits were made by the same trained veterinarian (Rosell). The objectives of the visits are also described in another study (Rosell and de la Fuente, 2013). Females were managed in a single- batch per farm (all the females were serviced on the same day), or more batches (up to 8 per farm). There were several cohorts of females on each farm, depending on the number of batches. For instance, on single-batch farms inseminated 15 days earlier and with diagnosis of pregnancy performed by abdominal palpation, there might be (a) females pregnant at their 1st service (10–15% of each batch, according to Coutelet, 2013), does at 1st pregnancy, from a 2nd service, and pregnant-only multiparous does, (b) females simultaneously lactating and pregnant, and (c) females only lactating, empty after the service; in this simplest case, there was 1 batch, there were 3 cohorts at risk, and occasionally a 4th one: females culled for rendering, for the abattoir, or both.

From this database we produced 4 files of the traits to be investigated, which were: (1) general characteristics of the 505 farms; this file included the number of cohorts of does at risk on each farm, (2) a database with the characteristics of each necropsied doe, including whether she was unassisted or euthanized, had aborted, the number of parities, the physiological status, and the apparent cause of disease or death, (3) traits of the farms with males at risk, (4) necropsies on males.

2.2. Rabbits and scores

We considered “young does” or “pre-breeding does” to be between 2.5 and 4.5 months old. Does that had been mated were considered to be at risk; males from 4.5 months old were considered to be at risk. We calculated mortality risk using 2 parameters: the Daily Mortality Risk (DMR), a basic measure in our study, and the Monthly Mortality Risk (MMR) both expressed in%. They were determined on 490 doe farms, housing 2,641,709 females, and 142 buck farms, housing 90,316 males during the 9-year period; we recorded the mortality risk with spontaneous deaths or moribund-euthanized does, observed on each visit. In this case, we carried out a descriptive study knowing the populations that were at risk. The DMR was mainly included in the study of the mortality throughout a 42-day cycle, with service (by mount or AI) on day 11 postpartum, on 75% doe farms (368 out of 490).

2.3. Statistical analysis

Data were gathered on each visit, and do not follow an optimally balanced design; half of the visits were emergencies, so our work on the farm could not be planned in advance, as we explained previously (Rosell et al., 2009). We estimated incidence risk from the observed mortality on each of the 3410 visits to 505 rabbit farms, and is described as binomial data, Daily Mortality Risk% (DMR%). The accumulated incidence risks for each disease or cause of death were per 100 does or males at risk. Monthly Mortality Risk was obtained multiplying DMR by 30.5. For each cause, we present the DMR or MMR with the 95% binomial confidence interval (CI).

2.4. Diagnostic workup with necropsy

Necropsies were included in our on-farm protocols and diagnostic workup. During the 9 years 2433 females and 55 males were found dead, or moribund and euthanized on-farm; these are believed to be the total mortalities on these farms. Information on the primary causes of mortality on farms in Spain was obtained from necropsies carried out by one veterinarian (Rosell). We necropsied only 2 frozen and defrosted doe carcasses, not included in the database. On our visits to farms, special attention was given to moribund rabbits, according to their clinical signs, or showing signs of pain. The necropsy protocols used were those described by Corpa (2009). We classified the causes of mortality, with only one apparent cause per dead rabbit (Rosell and de la Fuente, 2012). We sent samples to laboratories, to support the diagnosis of either of several necropsies, or the main diseases on the farms, both performed by the veterinary practitioner. Laboratory analyses were requested, e.g., to differentiate cases with septicemia or with viral haemorrhagic disease. Lung samples were also sent for histopathology; e.g., to diagnose interstitial pneumonia (López, 2012).

3. Results and discussion

3.1. Farm characteristics

The sample included data from 490 doe farms collected according to the availability of information on production, in the course of 3278 visits. The frequencies were as follows: 242 doe farms were visited during 1 year, 81 farms 2 years, 45 farms 3 years, and 122 rabbitries were visited during ≥4 years. With regard to the farms’ traits, the median of the population sampled over the 9-year period was 769 rabbit does and 44 bucks (Table 1). These