Contribution to epidemiologic knowledge on rabbit dermatomycosis in Northern Italy

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ABSTRACT: The study has examined the data coming from 40 rabbit farms in Northern Italy to determine the damaging health effects that dermatomycosis may cause to the rabbit farms hit by it, and estimate the zoonotic risks for those working in this field. The purpose of this study was to investigate the roles of *Trichopyton mentagrophytes* and of *Microsporum canis* as causative agents, to quantify the pathology in the farms hit by them, and to determine the concentration of dermatophyte spores in the air. During inspections, data on the farms and on the animals was collected to determine the potential risk factors. A single etiological agent, *T. mentagrophytes*, was isolated. Lesions were limited in 17.5% of the farms (<1% of rabbits affected), moderate in 37.5% (1-10% of rabbits affected), high in 30% (10-50% of rabbits affected) and very high in 15% of the farms (>50% of rabbits affected). The worst-hit by this infection were the fattening units. Farms showed a correlation between air spore concentration and the rate of clinical lesions (p=0.002). Spore concentration was nil in 7.5% of the farms, low in 27.5% (1-50 CFU/m^3), high in 42.5% (51-500 CFU/m^3), and very high in 22.5% (>500 CFU/m^3). As highlighted by the study, the severity of dermatomycosis is associated to the type of ventilation and to the farm's hygiene standards. As this study shows, the entity of this phenomenon in tandem with high counts of fungal spores in the air represent a zoonotic risk that compromises animal welfare, implying direct and indirect costs for the farms affected, and calling for more rigorous prophylactic measures.

Key words: Dermatomycosis, *Trichophyton mentagrophytes*, Rabbit.

INTRODUCTION – Dermatophytose infection is widespread in rabbitries, with the prevalence of infected farms ranging from 64% to 87% (Cafarchia *et al*., 2010; Torres-Rodríguez *et al*., 1992). Rabbit dermatophytosis is caused by *T. mentagrophytes*, and less frequently by *M. canis* (Cabañes *et al*., 1997; Cafarchia *et al*., 2010; Torres-Rodríguez *et al*., 1992). Dermatophytes usually cause circular, scaly, erythematous, alopecic areas which, in severe forms, can extend to multiple body sites, but clinical signs can be absent, because their appearance is influenced by predisposing factors (Cafarchia *et al*., 2010). The disease compromises animal welfare and affects the performance of growing rabbits. It also has public-health implications, as dermatophytes commonly isolated in rabbits can infect people professionally exposed, including slaughterhouse workers. The disease is acquired by contact with infected animals, fomites or by air spore exposure; the air spore concentration, conditioned by

several factors, including microclimatic conditions and ventilation system, represents a risk factor for human infection. The aim of this study was to collect data to evaluate the risks that dermatomycosis poses to animal health and to assess the risks of zoonotic transmission for those working in the field. The main goals were to evaluate the role of *T. mentagrophytes* and *M. canis* as the causative agents of dermatomycosis in rabbitries in Northern Italy, to assess the diffusion of this infection in the farms affected, and to determine the concentration of dermatophyte spores in the air. Additionally, at the time of the visit, data on the farm and on the animals grown there was collected to determine the potential risk factors.

MATERIALS AND METHODS – Farm selection. The study, conducted in the May-July 2012 period, examined 40 rabbit farms in Northern Italy presenting clinical dermatomycosis. Selection was based on the information obtained from veterinarians and technicians. Assessing the spread of dermatomycosis in single farms. At each rabbitry, using casual systematic sampling, 60 cages were selected and all of the rabbits in the cage were examined. An animal was considered positive if skin lesions showed signs of dermatomycosis. Skin lesions were classified based on severity, with a score ranging from 1 to 3. The number of animals tested at each rabbit farm varied, depending on the type of cage, on the units (maternity, replacement or fattening units), testing a minimum of 313 to a maximum of 480 animals. Identification of fungal species**.** Identification of the fungal strain involved taking 5-6 samples of rabbit fur from each farm, obtained by brushing rabbits with lesions associated with dermatomycosis. Sterile brushes were used. They were subsequently reused to distribute skin scrapings on the Mycobiotic Agar plates (Oxoid). Following a 7-10 day incubation at room temperature, fungal species were then identified, based on the macro and microscopic characteristics of the colonies (St-Germain and Summerbell,1996). Dermatophyte spore concentration in the air. Air samples were collected at each rabbit farm using SAS Super 100® (PBI International) along with Mycobiotic Agar plates (Oxoid). The samples from each farm were obtained from each central part of corridors, at the height of the rabbit cages. The average air intake volumes, generally 20 litres, can be reduced or increased, depending on the hygienic conditions and on the severity of the mycotic lesions. Culture plates were then incubated at room temperature in the laboratory for 7 days. Macro and microscopic examination followed and a dermatophyte colony count was made, expressed as CFU/m^3 of air. The farm's concentration of dermatophytes in the air was represented by the average number of CFU/m^3 obtained from each corridor. Epidemiological data. Data from each breeding farm was collected. Information included: the type of animal being tested (does, replacement females or fattening rabbits), the commercial origins of breeders, the type of ventilation, the methods to remove manure, and the type of feed distribution. Moreover, each farm was assessed in terms of hygienic standards, generally classified as excellent, sufficient and insufficient. Any use of antifungal treatments and active principles were also reported. The data, recorded on specific forms, was then transferred onto a spreadsheet and processed. Statistical analysis. A linear regression model was used to evaluate the relationship between the distribution of the concentration of spores in the air and the spread or severity of the disease. The Chi-square test was used to study the correlation between dermatomycosis and the qualitative variables detected.

RESULTS AND CONCLUSIONS – Dermatomycosis diffusion in rabbit farms. In 17.5% of the farms, the spread of this disease was limited (<1% of the animals affected), moderate in 37.5% of the cases (1-10% of the animals affected), high in 30% of the farms (10-50% of the animals affected) and very high in 15% (>50% of the animals affected). Identification of the species of fungi causing dermatomycosis. Overall, 202 samples of fur were analysed from 40 rabbit farms. Of these samples, 93% resulted positive for *T. mentagrophytes,* but not for *M. Canis.* All the 40 farms resulted positive with at least 2 positive samples. Determining the concentration of dermatophyte spores in the air. Air sampling isolated *T. mentagrophytes* from 37 farms. Spore concentration varied from little CFU/m^3 to more than 4,000 CFU/m^3 of sampled air. Air sampling did not detect dermatophyte spores in three rabbit farms that tested positive for *T. mentagrophytes* in the culture test. The concentration of spores in the air was nil in 7.5% of the farms, low in 27.5% (1-50 CFU/m^3), high in 42.5% (51-500 CFU/m^3) and very high in 22.5% (>500 CFU/m^3). In farms with a low concentration of fungal spores in the air, but also in a farm with 1200 CFU/m^3 (farm's average) air sampling tested negative in some corridors, indicating a heterogeneous distribution of dermatophyte spores in the air of the farm building. The linear regression model suggests a significant relationship exists (p=0.002) between the investigated variables, "animals with fungal lesions" and "CFU/m^3". Epidemiological data. A statistical analysis has come up with the following statistically significant associations: 1) between the type of rabbit farming (unit) and the presence or absence of mycosis (P<0.001): the "fattening" unit has greater risks of contracting the disease; 2) between the percentage of mycosis positive and the type of ventilation (P<0.001): the difference refers to the "Mixed" type (it includes natural ventilation) that has a greater proportion of positives; 3) between the presence of mycosis and the level of hygiene (P<0.001): a greater number of positives was recorded in farms with less hygienic conditions; 4) between the presence of mycosis and the commercial origin of the breeders (P<0.001).
Study results confirm the relevance of dermatomycosis in intensive rabbit farming, underlining the high levels of infection on farms which have notable repercussions on animal welfare. Moreover the counts of dermatophyte spores in the air represent a zoonotic risk. Furthermore, *T. mentagrophytes* is shown to be the main etiologic agent. Dermatomycosis should be considered a multifactorial disease, conditioned, among other things, by management. The quantification of direct and indirect costs triggered by this infection ought to spur rabbit producers to seek better practices of prophylaxis.

REFERENCES – **Cabañes**, F.J., Abarca, L., Bragulat, R., 1997. Dermatophytes isolated from domestic animals in Barcelona, Spain. Mycopathologia 137:107-113. **Cafarchia**, C., Camarda, A., Coccioli, C., Figueredo, L.A., Circella, E., Danesi, P., Capelli, G., Otranto, D., 2010. Epidemiology and risk factors for dermatophytoses in rabbit farms. Med. Mycol. 48:975-80. **St-Germain**, G., Summerbell, R., 1996. Identifying filamentous fungi. A clinical laboratory handbook. Star Publishing Company (Belmont, CA). **Torres-Rodríguez**, J.M., Dronda, M.A., Rossell, J., Madrenys, N., 1992. Incidence of dermatophytoses in rabbit farms in Catalonia, Spain, and its repercussion on human health. Eur. J. Epidemiol. 8:326-329.