Short Communications

Outbreak of *Klebsiella oxytoca* enterocolitis on a rabbit farm in Hungary

Z. Német, O. Szenci, A. Horváth, L. Makrai, T. Kis, B. Tóth, I. Biksi

THE genus *Klebsiella*, a member of the family Enterobacteriaceae, includes ubiquitous bacteria found both in the environment and in animals (Murray and others 2003). As opportunistic pathogens they can cause pneumonia and urogenital infections in human beings, rodents, carnivores and ungulates, mastitis in ruminants, and septicaemia in a number of species (Quinn and others 1994, Boucher and Nouaille 2002). Enteritis and diarrhoea due to villous atrophy associated with *Klebsiella* species infection has been reported in newborn pigs (Brown and others 2008). Knowledge about the importance of *Klebsiella* species infections in domestic rabbits is limited, although *Klebsiella pneumoniae* has been reported to be associated with haemorrhagic enteritis and septicaemia in Italy and France (Boucher and Nouaille 1999, 2002, Coletti and others 2001). *Klebsiella oxytoca* may cause urinary tract infections in human beings and it has been described as a cause of antibiotic-associated haemorrhagic colitis and diarrhoea (Högenauer and others 2006, Hoffmann and others 2010), as well as a cause of septicaemia in human infants (Reiss and others 2000). This short communication describes an outbreak of disease associated with *K oxytoca* among farmed rabbits in Hungary.

In January 2010, a rabbit breeding farm with 1500 Hycole does located in north-east Hungary requested investigation due to an increase in neonatal mortality. The average mortality increased from approximately 5 to 6 to 12 to 20 per cent; peak mortality occurred at around three weeks of age. Most of the litters were affected; suckling rabbits with the best body condition seemed to be more prone to succumbing. The does of affected litters had been purchased from a farm in south-east Hungary, where the authors had also identified similar, although less severe, neonatal mortality (Z. Német, O. Szenci, A. Horváth, L. Makrai, T. Kis, B. Tóth, I. Biksi, unpublished observations).

On postmortem examination of suckling rabbits, characteristic findings were haemorrhagic enterocolitis (Fig 1), accumulation of serous fluid in the thoracic cavity, and a pale and enlarged liver. Histopathological examination revealed acute diffuse haemorrhagic enterocolitis, liver dystrophy (moderate diffuse fat infiltration, multifocal periacinal hepatocellular degeneration with haemorrhages, and occasional granulocytic infiltration in the sinusoids) and septicaemia. Samples from the spleen, liver, blood and bone marrow were streaked on to five per cent sheep blood agar plates. The plates were incubated at 37°C for 24 hours under aerobic conditions. In most cases, white-grey, mucoid, shiny, non-haemolytic colonies 2 to 3 mm in diameter were detected on plates inoculated with material from at least one, up to all, of the examined organs. Pure cultures were prepared from the primary cultures, and isolates were identified on the basis of morphological, biochemical and cultural characteristics using standard methods (Quinn and others 1994), as a member of the family Enterobacteriaceae (Gram-negative non-motile rods, growth in aerobic and anaerobic environments, catalase-positive, oxidase-negative, oxidative fermentative test: fermentative with gas production). Genus and species identification were based on metabolic fingerprinting using the BIOLOG system (Biolog). The isolates were able to utilise a total of 60 carbon sources out of the 95 examined as a sole carbon source. On the basis of this metabolic fingerprint, MicroLog3 software (version 4.20.05) identified the isolates as *K oxytoca* (probability 100 per cent, similarity 0.516, distance 7.67).

The clinical findings and pathological changes in the suckling rabbits were characteristic of klebsiellosis, as described in detail by Boucher and Nouaille (2002). Klebsiellosis in suckling rabbits is usually caused by *K pneumoniae*. The development of klebsiellosis usually requires predisposing factors; these have been reported to include previous antibacterial treatment (Boucher and Nouaille 1999, 2002, Coletti and others 2001), immunocompromised state of the does (Boucher and Nouaille 2002) and the use of certain disinfectants (Reiss and others 2000).

The initiating cause of infection in the present case was not determined with certainty, but the authors suspect that compromised immune status of the does may have played an important role. On the farm where the does originated, more than 10 suckling rabbits were left in the nests, and the does weaned on average 9.5 rabbits per litter, which exceeds the optimal production level for this breed (8 to 8.5 rabbits weaned per doe). The farm of origin was located approximately 350 km from the case farm; therefore, long-distance transportation of the does may have also contributed to

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Z. Német, DVM,
O. Szenci, DVM, PhD, DSc, DiplECBHM,
A. Horváth, DVM,
I. Biksi, DVM, PhD, DiplECPHM,
Large Animal Clinic, Faculty of Veterinary Sciences, Szent István University, Dóra major, Üllö, H-2225, Hungary
L. Makrai, DVM, PhD,
Department of Microbiology and Infectious Diseases, Faculty of Veterinary Sciences, Szent István University, Hungária körút 23-25, Budapest, H-1149 Hungary
T. Kis, DVM,
SCG Bt, Hold utca 23, Szabadszállás, H-6080, Hungary
B. Tóth, DVM, MS,
Department of Medicine and Epidemiology, School of Veterinary Medicine, University of California, Davis, One Shields Avenue, CA 95616, USA

Dr Toth is currently at Department of Veterinary Clinical Sciences, Purdue University, 625 Harrison Street, West Lafayette, IN-47906, USA

E-mail for correspondence: nemet.zoltan@aotk.szie.hu

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FIG 1: Intestine of a rabbit showing haemorrhagic enterocolitis associated with *Klebsiella oxytoca* infection

the development of the disease. Moreover, the farm of origin also used in-water tiamulin medication to prevent *Staphylococcus aureus* infection in suckling rabbits. This treatment had been used for an extended period of time, with suspected suboptimal doses on several occasions. Previous studies in Italy and France have suggested that this form of tiamulin treatment may play a role in the development of klebsiellosis (Boucher and Nouaille 1999, 2002, Coletti and others 2001). In human medicine, *K oxytoca* is one of the most important causes of antibiotic-associated haemorrhagic colitis (Högenauer and others 2006, Hoffmann and others 2010). It has been documented previously that the use of a glutaraldehyde-based disinfectant at suboptimal concentrations may also contribute to the overgrowth of *K oxytoca* and related clinical disease (Reiss and others 2000). Interestingly, glutaraldehyde was the main disinfectant used on the rabbit farm, although the working concentration of the disinfectant could not be determined with certainty in this study.

Klebsiella species are ubiquitous on farms, although klebsiellosis is a relatively rare finding in domestic rabbit populations. When certain predisposing factors are present, the disease can manifest clinically, and can lead to significant economic losses. In rabbits, this has previously been shown only with *K pneumoniae;* the present study provides evidence that *K oxytoca* strains can also be in the cause of clinical klebsiellosis on rabbit farms.

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