K. Schäfer et al., Band 155, Heft 9, September 2013, 520–522
DOI 10.1024/0036-7281/a000503
Schweizer Archiv für Tierheilkunde

Possible influence of herd health management and hygiene on the in-herd prevalence of *Clostridium perfringens* type C in pig breeding farms

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Introduction

Necrotizing enteritis (NE) in pigs is caused by *Clostridium perfringens* type C. In non-vaccinated herds, it leads to high mortality rates in newborn piglets and thus significant economical losses (Songer und Uzal, 2005). Immunisation of sows during every pregnancy using *C. perfringens* type C toxoid vaccines is efficient in preventing NE, and is required to prevent further losses on farms which previously experienced an outbreak of NE (Springer und Selbitz, 1999; Luginbühl, 2002; Wollschlaeger et al., 2009). In Switzerland, NE has been diagnosed on a regular basis in the past (Gut et al., 2002; Luginbühl, 2002; Jäggi et al., 2009). Outbreaks in breeding herds raised the concern about spread of the pathogen through translocation of pigs from once affected to unaffected breeding herds (Wollschlaeger et al., 2009). As a spore-forming bacterium, *C. perfringens* can persist in the environment for prolonged periods of time (Songer und Uzal, 2005), however, exact data about the life span of such spores in the environment of a pig farm are not available. We recently reported the detection of *C. perfringens* type C in faecal samples of piglets, sows and from the floor of pens in Swiss pig breeding farms 2 to 4 years after an NE outbreak and subsequent disease free period upon vaccination of sows (Schäfer et al., 2012). This short communication summarizes herd health management data obtained on these farms and correlates these to in-herd detection levels of *C. perfringens* type C.

Breeding farms, questionnaire and personal inspection

Four breeding farms participated in the study, all of which bred and raised replacement gilts and sold part of them to other breeding farms. Farms A, B and C had previously experienced an outbreak of NE and since then had implemented a vaccination program (Schäfer et al., 2012). A commercially available combination vaccine containing inactivated *Escherichia coli* of the serotypes F4, F5 and F6 and *C. perfringens* type C-β-toxoid was used on all farms (Schäfer et al., 2012). Immunisation of gilts was done 6–7 weeks and 2–3 weeks and boostering of sows 2–3 weeks before farrowing on all farms. Farm D experienced an acute outbreak and vaccination was implemented immediately after diagnosis of NE (Schäfer et al., 2012). Detailed information concerning the farms and the results of the bacteriological investigations are described in the paper of Schäfer et al. (2012). Additionally, we recorded information about general hygiene, the farrowing facility and herd health management of each farm and performed an inspection of the farm with special emphasis on the farrowing facilities at each sampling time.

Results and Discussion

The results of the questionnaire and the personal inspection are shown in Table 1. Hygienic measures for personnel and visitors entering the barn, such as changing of clothes and shoes and washing of hands, were properly performed on all 4 farms. Farms A to C performed an all-in all-out replacement per farrowing compartment, on farm D all-in all-out was performed whenever possible, but not consistently. Cleaning and disinfection protocols were similar on all farms; the disinfectants were used according to the manufacturer's recommendations. Nevertheless, because information about the susceptibility of clostridial spores to disinfection and resistance is lacking (Maillard, 2011), the sporicidal efficacy of the disinfection procedures remains undetermined. Upon personal inspection, the pens on farms A and C appeared clean during all visits, whereas the pens on farms B and D appeared moist and moderately dirty. Nonetheless aisles and sows were dry and clean on all farms. Correspondingly, our results showed that farms A and C had the lowest in-herd prevalence of *C. perfringens* type C (Schäfer et al., 2012). The difference in the prevalence of those 2 farms might be due to the varying length of time between outbreak and sampling (2 vs. 4 years). In contrast, higher prevalence of the pathogen was detected on farm B, where inconsistent management in terms of hygiene in the farrowing compartment was evident (Schäfer et al., 2012). On farm D, which experienced an acute outbreak

Table 1: Regular hygiene measures and description of farrowing facilities.

	Farm A	Farm B	Farm C	Farm D
Last NE Outbreak*	2008	2006	2006	2011
Prevalence of *C. perfringens* type C in piglets (in 2010/11; farm D: 2012)*	(11/100) 11 %	(19/100) 19 %	(0/100) 0 %	(31/100) 31 %
Cleaning and disinfection of boxes				
Frequency	Before each replacement on all farms			
Soaking of floor before cleaning	With water on all farms			
Cleaning	high-pressure hot water	high-pressure cold water	Steaming	high-pressure cold water
Disinfection	Neopredisan** (Vital AG)	Neopredisan** (Vital AG)	Megades*** (Allfarm)	Germicidan**** (Anti-Germ)
Farrowing facility				
Compartments	2	3	2	3
Pens per compartment	5	6	16 and 20	10, 10 and 4
Washing of sows before placement in nursery pens	yes Stalldes-03 (Halag Chemie AG)	yes Water	no	yes Water
Frequency of mucking out and interspersing	2–3 x per day	2 x per day	1 x per day	2–3 x per day
Pens dry, clean	yes	no	yes	no
Grinding of piglet teeth	yes	no	no	not consistently

*(Schäfer et al., 2012); **4-Chlor-M-Kresol, organic acids; ***Alkyldimethylbenzylammoniumchloride, Glutaraldehyde; ****Glutaraldehyde, Quaternary ammonium compounds

of NE with a high prevalence of *C. perfringens* type C at the time of the outbreak (Tab. 1), the implementation of vaccination and the consequent cleaning and disinfection directly following the outbreak resulted in a significant reduction of the in-herd prevalence of *C. perfringens* type C (Schäfer et al., 2012). Although we did not directly quantify *C. perfringens* type C, its lower in-herd prevalence indicates lower numbers of the pathogen on a farm.

Conclusion

Currently available diagnostic methods are not sensitive enough to guarantee freedom of *C. perfringens* type C in once affected pig breeding herds. Therefore, animals from these herds have to be considered as potential carriers of the pathogen and vaccination against *C. perfringens* type C should be continued to prevent re-occurrence of the disease. Although limited to the investigation of 4 farms over a period of up to 5 years, our results suggest that a combination of continuous vaccination of sows and proper hygiene and herd health management can markedly reduce the prevalence of *C. perfringens* type C in a pig herd. This does not completely eliminate the risk of spread of the pathogen through translocation of potential carrier animals (for example replacement gilts), however reduces the risk of accidental spread of *C. perfringens* type C through movement of contaminated personnel or equipment. Therefore, after outbreaks of NE on pig breeding farms, control of the cleaning and disinfection programs in addition to implementing a strict and continuous vaccination program is recommended.

Acknowledgements

The authors thank the farmers for their collaboration and the Swiss Porcine Health Service and the Specialization Committee, Vetsuisse Faculty, University of Bern, for their financial support.

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Received: 5 November 2012
Accepted: 8 May 2013