Isolation of *Salmonella* using pooled pen feces from 37 U.S. swine farms

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Summary

The purpose of this study was to culture the pooled pen feces of market weight pigs to determine the most common *Salmonella* serotypes being shed and to see if farms positive by culture were also positive by serology. Isolates were analyzed to determine if they had O-antigens capable of inducing an immune response detectable by the Danish Mix-ELISA. There were a total of 286 isolates of *Salmonella* recovered, 263 of which shared O-antigens with the Mix-ELISA.

Keywords

serology, culture, O-antigen, prevalence, *Salmonella* serotypes

Introduction

The control of *Salmonella* in the pork chain relies heavily on the epidemiology of the organism and the diagnostic tools used for monitoring. Although serology has been praised for its ability to predict infection and its cost effectiveness, bacteriology should not be overlooked as a useful epidemiological tool especially as support for serologic studies. The Danish-Mix-ELISA (O:1,4,5,6,7,12) uses purified lipopolysaccharide from both *S.* Typhimurium and *S.* Choleraesuis (8). The Mix-ELISA is able to detect any serotype that possesses at least one of these antigens. However there are serotypes that could infect pigs that do not express these O-antigens and thus could possibly escape detection. In Denmark, the use of O-antigens 1,4,5,6,7,12 was effective because approximately 90% of the isolated serotypes fell into this category (1). A similar study in the Netherlands found 89% of isolates to contain at least one of these O-antigens (11). We felt it was important to determine this aspect of effectiveness in the United States.

Materials and Methods

From August 1999 to August 2000, 1,332 pooled pen fecal (PPF) and serum samples were collected from 37 different herds (5). The PPF samples were approximately 25 (5 from five different places in the pen) and were cultured by two pre-enrichment steps and plating on XLD. Serotype antigenic formulas were determined by the Kauffmann-White scheme (10). Serum was analyzed by the Mix-ELISA as previously described (9). An OD% of 40 was used as a cut-off value for a positive sample.

Results

A total of 1,332 PPF samples were cultured producing 121 positive samples and 286 *Salmonella* isolates. Approximately 92% if the isolates contained O-antigens capable of inducing an antibody response detectable by the Mix-ELISA. Seven percent were variable dependent on phage conversion and 1% did not share any O-antigens with the Mix-ELISA. Of the 37 herds, 22 were positive based on PPF culture. There were three herds that were positive by PPF culture and negative by the Mix-ELISA; however, all three herds produced serotypes with O-antigens in common with the assay. Only one of the culture-positive farms had a serotype with no O-antigens in the Mix-ELISA as its sole isolate but this farm was still positive by serology.

Discussion/Conclusions

Serologic assays for *Salmonella* must contain antigens representative of the serotypes present in the target population. Bacteriologic surveys can support serology by confirming that the serotypes being shed are covered by the assay or suggest additional antigens be added to the Mix-ELISA. This study showed that of all the isolates recovered, greater than 90% shared O-antigens with the Mix-ELISA. This is in agreement with previous work by Baum et al. (2) which showed similar results in three herds. The most commonly isolated serotypes from swine as reported by NVSL, showed 91% were detectable by the Mix-ELISA (7). This information shows that the Mix-ELISA is capable of detecting the majority of *Salmonella* serotypes being shed by U.S. finishing pigs. There were, however, serotypes recovered that may not induce antibodies capable of inducing a positive Mix-ELISA test. This is important because farms may exist which contain only one serotype of this sort that may produce false negatives by serology. Only one of such farms was present in this study but it was still positive by serology. This could be due to cross reactivity or presence of an additional serotype not recovered by culture.

An OD% >40 was used as cut-off for a positive sample in this study based on previous work in Denmark. However, since the completion of this study, an OD% cut-off of 20% (9) and 30% (4) for this assay have been suggested. Bacteriologic herd prevalence of 55% was similar to work done in Minnesota (64%) in 2000 (3) but higher than a national survey (38%) conducted in 1995 (6).

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