CONTROLLING E. COLI IN THE WEANED PIG

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ABSTRACT

Clinical expression of disease associated with post weaning E. coli depends on the interplay of several factors. These include the dose of pathogen, a genetically susceptible pig population, diet composition, weight and age of weaned pig, environmental management, presence of confounding pathogens, and general farm management practices. Reducing the dose of E. coli exposure using sanitation procedures between groups is one of the most important means of controlling expression of disease associated with this bacterial infection.

INTRODUCTION

Nursery pig enteric disease continues to be prevalent in the modern swine industry. Adapting health improvement technologies such as segregated early weaning and all-in/all-out production schemes have not eliminated nursery enteric disease concerns. This enteric disease is predominantly associated with post weaning Escherichia coli (E. coli) infections. Clinical disease associated with post weaning E. coli is the classical representation of a multi factor caused disease and is the biological sum of a number of production system inputs. These inputs include presence and dose of pathogen, a genetically susceptible pig population, diet composition, weight and age of weaned pig, environmental management, presence of confounding pathogens, and general farm management practices (Madec and Josse, 1983; Madec et. al, 2000; Vannier et. al., 1983). Thus, controlling the expression of E. coli associated enteric disease of nursery pigs depends on managing these many interrelated challenges.

A large, epidemiological study designed to determine the relative risk of several factors associated with nursery pig enteric disease indicated that feeding management (33.6 odds ratio) in the first week after weaning and hygiene status (7.8 odds ratio) were two of the most important risk factors associated with decreased amounts of enteric disease in the nursery (Madec et. al., 1998). Since the impact of feeding management practices have been reviewed elsewhere, this paper will focus on reviewing hygiene procedures that are associated with decreased amounts of enteric disease in nursery pigs.

SANITATION PRACTICES

We continue to observe transmission of organisms that can survive relatively easily in the environment, such as E. coli and Salmonella. We attribute this to several factors that include the training of personnel on the importance of proper cleaning procedures. Operating the power washer is usually one of the lowest status and lowest paid positions on farms. Therefore, unmotivated and untrained personnel are many times depended on for this critical health control task. In some farms we have encouraged management to set up monitoring programs to ensure facilities are free of organic matter, dry, and warm before placement. These allow for easy identification of training needs and have resulted in greater motivation of staff since management is paying more attention to their aspect of the operation. A recent report by Irwin (2003) illustrates the importance that integrating sanitation protocols and personnel training can have on improving nursery performance.

The primary objective of hygiene practices is lowering the dose of infectious pathogens that can be transmitted from the environment. It has been well documented that animal performance is increased in "clean vs. dirty" environments and cleanliness is probably responsible for a large percentage of the growth performance benefits from all-in/all-out production (Klasing et. al, 1988; Amass et. al, 2001). Also, because the young pig is more susceptible to infections from enteric organisms, sanitation is especially critical for nursery facilities. Fortunately, most swine pathogens only survive for a brief amount of time outside the host in the absence of organic materials or moisture. However, recent reports indicate that environmental contamination is an important contributor of Salmonella infection. From one study in North Carolina, 27% (7/26) of drag samples obtained from all/in-all/out fully slatted finishing floors just prior to placement of pigs were found to be positive for salmonella (Davies et. al., 1999).

A survey of nursery hygiene practices on 129 French farms indicated several practices associated with decreased residual contamination (Madec et. al., 1999). These practices included damping of the rooms immediately after the removal of the pigs. The researchers hypothesized that damping prevented dying of the fecal matter and increased the ease and thoroughness of cleaning. Use of a detergent also was suggested as associated with decreasing residual contamination. However, in another study evaluating the impact of detergent the researchers were unable to detect any impact and residual contamination after thorough washing (Kihlstrom et. al., 2001). This indicates that using a detergent may be useful to improve the ease of cleaning. However, the detergents may not have much impact on the final amount of residual contamination if cleaning procedures are thorough.

As supported by several other studies, the study by Madec et. al. (1999) indicated that thorough cleaning of organic matter resulted in less residual contamination (Amass et. al., 2000, 2001; Kihlstrom et. al, 2001). Additionally, greater distances between the surface of the slurry and the floor were associated with less residual contamination. The authors attributed this risk factor to splash back and recontamination during the cleaning process. Finally, factors associated with disinfectant usage were important. These included proper dilution and application of disinfectant. An evaluation of disinfectant ability to reduce

infectivity of porcine circovirus type 2 (PCV2) indicates that commonly available disinfectants vary widely in their ability to neutralize the virus (Royer et. al., 2001).

While boot baths are widely implemented on swine farms there appears to be little scientific literature supporting their usage. A recent study by Dr. Amass from Purdue indicates that disinfecting boots was ineffective at reducing bacterial load of boots if the fecal matter had not been removed before disinfecting (Amass et. al., 2000). She indicated that removal of fecal matter alone without disinfecting was responsible for a large proportion of bacterial load on the boots. A follow up study indicated that regardless of whether boots were cleaned with water first and then placed in a VirkonS bath for 30 seconds, or cleaned in a VirkonS boot bath, both methods resulted in rapid disinfection of boots. As with the previous study cleaning of the boots with scrubbing was an essential step of the process. Just stepping into the boot bath was not effective. Methods to evaluate cleaning protocols for residual contamination have been recently evaluated (Kelly et. al, 2001). Implications of this research indicate that subjective visual assessment of cleaning procedures is currently the most effective and practical method of evaluating the thoroughness of hygiene practices.

Further research by Amass et. al. (2003) provides practical information on the ability of production staff to transfer infectious organisms across groups of pigs. Using an enterotoxigenic E. coli challenge model to evaluate biosecurity procedures, they found that changing outerwear and hand washing did not prevent transfer of E. coli between groups of pigs. However, a complete change of clothing and showering did prevent transmission. This is in contrast to previous work with TGE virus and PRRS virus indicating that hand washing and changing outerwear was sufficient to prevent transmission (Amass et. al., 2000; Otake et. al., 2002). This information also can be interpreted to indicate that pathogens such as E. coli are more difficult to clean from the environment compared to TGE or PRRS virus.

CONCLUSIONS

Controlling E. coli in the weaned pig is a multi factor process. Lowering the dose of exposure is one step in this multi factor process. All/in-all/out and multi-site production systems have facilitated the ability to clean facilities between groups of pigs and limit the doses of pathogens such as E. coli. Recent research has illustrated key principles to further our understanding in carrying out sanitation protocols to minimize the impact of E. coli associated enteric disease.

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