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PREVALENCE RATE OF PORCINE ROTAVIRUS IN DANISH SWINE HERDS

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Abstract

The prevalence rate of rotavirus in swine herds in Denmark was examined. 28 intensive breeding herds were tested and rotavirus was detected in 18 herds, i.e. 64.2 %. Of the 638 fecal samples examined, 221 were positive (34.6 %). The age distribution showed that rotavirus occurred with highest frequency (approx. 60 %) in four week-old piglets. Rotavirus infection in neonatal piglets predominantly occurred in litters born by gilts. Production systems had influence on the occurrence of rotavirus. In traditional farrowing pens with loose sows, the prevalence rate was lower (28.3 %) than in more restrictive farrowing pens with tethered sows and perforated flooring (43.3 %). The most marked by difference occurred after the first two weeks when prevalence rate in piglets in restrictive farrowing pens rose distinctly over pigs in traditional pens (72.5 % and 42.3 %, respectively). The weaning age had distinct influence upon rotavirus shedding. Piglets weaned at two weeks had much higher prevalence rate (66.2 %) than piglets weaned at 4-5 weeks of age (24.1 %).

During the last decade, rotaviruses have been incriminated as a cause of diarrhoea in piglets and it has been shown that these viruses are widespread in swine herds (Askaa and Bloch, 1981; Corthier *et al.*, 1980).

The present investigation was started in 1981 as a screening of herds participating in the so-called field testing of production systems within the Swine sector. This is an interdisciplinary scheme with the task of describing and evaluating new production systems. Within each herd, two different production systems are tested, thus eliminating the management factor. A large number of parameters are registered including diseases in the sows and the litters.

Materials and Methods

In 28 large, intensive breeding herds, a total of

638 fecal samples were obtained from litters, including both diarrhoeic and non-diarrhoeic piglets. Samples were obtained from piglets during the whole suckling period, i.e. from birth to six weeks of age. To study the relationship, if any, between rotavirus infection and environmental factors, samples were obtained both from restrictive types of farrowing pens (tethered sows, no straw, perforated flooring) and from more traditional pens (loose sows, straw bedding, concrete floor). Also, feces were obtained from different weaner units, including buildings for pigs weaned at two weeks (in battery cages) compared with more traditional weaning at 4-5 weeks in climate-controlled units (mini pens or flat deck pens). During each farm visit, fecal samples were obtained from a representative number of litters. Most litters were only examined once.

Demonstration of rotavirus in the samples was done by the ELISA technique (State Veterinary Ins-

titute for Virus Research, Lindholm and Department of Veterinary Virology and Immunology, Royal Veterinary and Agricultural University). Further, all samples were studied bacteriologically and parasitologically.

Results

In the present work, the term prevalence rate is used to describe the frequency of rotavirus shedding in the examined litters.

Rotavirus was detected in 221 of the 638 samples (34.6%). Of the 28 herds, 18 were infected (64.2%). Among these herds, several had problems with enteric disease, including neonatal scouring, diarrhoea at three weeks and post-weaning diarrhoea. However, rotavirus was also detected in herds without disease problems. Rotavirus was isolated in 78% of herds with high frequency of preweaning diarrhoea, and in 60% of the herds without problems with enteric disease.

The occurrence of rotavirus was slightly higher in diarrhoeic stools (38%) than in normal stools (30%).

Certain differences were found in suckling and weaned piglets.

Suckling piglets

The overall prevalence rate was 31.6%. However, age groups differed considerably (table 1). The lowest prevalence rate was seen in neonatal piglets. After the first two weeks, the isolation rates rose to a peak of 60% positive litters at four weeks of age.

The parity of the dam proved significant in this age distribution. Thus, piglets born by gilts had higher prevalence rates during the first week of life than piglets born by older sows (37.5% and 3.0%, respectively). The overall prevalence rate was higher in the litters from gilts than in those from sows, but less markedly (39% and 29%, respectively).

Table 1. — Prevalence rate of porcine rotavirus in suckling piglets. Age distribution.

Age at	Prevalence rate %
1	23.0
2	28.9
3	42.4
4	59.1
5	47.1
6	33.3
Total	31.6

Farrowing pens

Overall prevalence rates were much lower in traditional pens with loose sows on concrete floor with straw (28.3%) than in the more restrictive types of pens with tethered sows and perforated flooring (43.3%). When isolation rates among age groups were compared within these two pen types, certain differences were evident (table 2). Until the age of two weeks there was no difference in virus shedding in the two systems. After this age, the prevalence in piglets in restrictive pens rose distinctly over pigs in traditional pens, both with a peak at four weeks (72 and 42%, respectively).

The occurrence of preweaning diarrhoea was approximately similar in the two systems.

Weaned piglets

The overall rate of virus shedding in the stools of weaned piglets was 33.7%. Age at weaning had a distinct influence upon prevalence rates. Thus, piglets weaned at two weeks and transferred to

Table 2. — Prevalence rate of porcine rotavirus in suckling piglets. Age distribution in relation to farrowing pen.

Age (weeks)	Traditional Pen	Restrictive Pen
1	23.3	20.3
2	29.2	28.6
3	27.6	44.4
4	42.1	72.0
5	16.6	63.3
Total	42.3	72.5

battery cages had much higher prevalence rate (66.2%) than piglets weaned at 4-5 weeks in flat deck pen systems (average 24.1%). As shown in table 3, the high excretion rate of virus was maintained through the period of four weeks where the piglets were kept in the cages. Diarrhoea occurred frequently in the battery cages, with up to 60-70% of the piglets scouring at any given time. Growth rates were poor during the stay in these battery systems and many piglets became stunted. Pathogenic bacteria were seldom isolated from the piglets. In particular, *E. coli* did not appear to be generally involved.

In periods, diarrhoea occurred with lower frequency, and growth rates were acceptable. Rotavirus was detected with approximately the same frequency during these periods as during the diarrhoeic periods.

Discussion

The data presented here have revealed that Rotavirus infections are widespread in Danish sow herds. The prevalence appears to be higher in intensively managed herds, with tethered sows, early weaning, etc. than in more traditional herds management systems.

Rotavirus is considered as an important ethiological factor in diarrhoea of early weaned and in three-week-old piglets (Bohl, 1979; Lecce and King, 1980). Some authors claim that the virus is involved in the ethiology of post-weaning diarrhoea in older pigs (Bohl *et al.*, 1978; Lecce *et al.*, 1982). The present report has confirmed that early weaned piglets in battery cages had a very high rate of infection, and that it was associated with a high rate of diarrhoea. On the other hand, approximately 30% of the infections in the present material appeared to be subclinical which is in keeping with results obtained by other authors.

Experimental virus inoculation in colostrum-deprived piglets regularly results in diarrhoea and a

subsequent high fecal excretion of the virus. The infection may spread to colostrum-fed littermates in which the infection often is subclinical (Askaa and Svensmark, to be published). Whether this subclinical infection will ultimately result in diarrhoea, depends upon a number of factors, including the degree of immunity, the mass of infection and environmental and management factors. Piglets weaned at 2-3 weeks are deprived of colostrum antibody protection at an age when their own ability to synthesize antibody has not been fully developed. This may result in virus multiplication in the enteric epithelium and shedding of virus in the stools. Since the piglets are densely stocked in the battery cages, the spread of infections is usually massive and may cause severe morbidity as revealed in the present paper.

Sows undergoing subclinical virus infection maintain high levels of colostrum antibodies (Corthier and Franz, 1981; Hess and Bachmann, 1981). This may explain why the piglets in the restrictive farrowing pens have much higher prevalence rates than piglets in more traditional farrowing systems. In the traditional farrowing pens, the sows are loose and have more access to fecal material than do tethered sows, and accordingly they undergo repeated booster infections. The protection of the piglets by the milk is hereby prolonged.

Piglets born by gilts had higher infection rates than piglets from older sows, especially during the first week of life. This may be explained by the fact that generally gilts have lower colostrum antibody level. In herds, where a large proportion of the breeding animals are gilts, the general herd immunity is low, and rotavirus infection may act epidemic with high morbidity. As rotavirus has higher mortality in the neonatal piglets than in older age groups, the course of the infection will be more severe in these herds.

In intensive breeding units, the production patterns usually involve rather strict segregation in separate units for dry sows, lactating sows, wea-

Table 3. — Prevalence rate of porcine rotavirus in weaned piglets.

Age (weeks)	Weaned at	
	2 weeks	4-5 weeks
3	60.3	...
4	69.8	...
5	59.1	13.2
6	86.8	25.0
7	...	35.3
8	...	7.7
Total	66.2	24.1

ners, fatteners, etc... Further, the hygienic standard is generally high, and the dams have no access to fecal contaminated material during the production cycle. All these factors tend to diminish infectious contacts and thus the antibody production of the sows. Herd immunity is therefore low, and infectious diseases, inclusive rotavirus infection may

occur with relatively high morbidity under these intensive production systems.

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Question

From Dr. C. La Bonnardiere to Dr. B. Svensmark.

How many colostrum deprived piglets infected with rotavirus died? What percentage?

Answer

About 50% mortality.

Question

From Dr. Vannier to Dr. Svensmark.

When you compared the rotaviral prevalence between the two types of pens, were there different management conditions in the farrowing house? In other words, was discontinuous or continuous management applied?

Answer

No, the two types of farrowing pens had the same management system, as there were both farrowing types in each individual herd. The dams were farrowing in groups and the farrowing houses were emptied, cleaned and disinfected before the dams were moved to the farrowing pens. So discontinuous management was applied.