Usage of "Feed Back" as an ecologically safe and effective means for preventing rotoviral infection of piglets

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Abstract. Diseases of the gastrointestinal tract in newborn piglets cause enormous economic damage to countries where pig breeding is intensively developed. The high pathogenicity of the causative agents of these diseases, their resistance in the external environment, the ability to persist in the host organism leads to the rapid spread of these diseases. In our work in a pig farm, the effectiveness of the use of "Feed Back" (reverse feeding) for the prevention of rotavirus infection in suckling pigs was assessed. "Feed Back" or reverse feeding is feeding pregnant sows and replacement pigs material for re-infecting animals with infectious agents necessary for us: clostridiosis, colibacillosis and rotavirus infection with the subsequent transmission of colostral immunity to piglets. The purpose of this method is to enhance the action of the vaccines used and develop colostral immunity to those diseases against which vaccines are not used.

1 Introduction

The causative agents of gastrointestinal diseases are infectious agents of various nature: viral (coronavirus, rotavirus and enteroviral gastroenteritis); bacterial (dysentery, salmonellosis, colibacillosis, etc.); fungal (candidiasis) and parasitic (balantidiosis, eimeriosis and cryptosporidiosis). [1, 3, 4, 9]

The resistance of the virus in the external environment leads to long-term disadvantage of pig farms for this infection. At the same time, rodents and humans can be active or passive distributors of rotavirus infection. In a dysfunctional herd, most sows show antibodies against rotavirus in blood serum, colostrum, and mammary secretions. [2, 4, 5, 6, 7]

In addition to coronaviruses, this group of pathogens includes porcine rotavirus [8, 10].

In this regard, the study of preventive and recreational measures for rotavirus infection is relevant.

The aim of the study is to test the effectiveness of the Feed Back method in preventing rotavirus infection in suckling pigs.

Objectives:

1. To study the methodology for preparing material for the feedback.

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2. To analyze the effectiveness of using the feedback.
3. To develop a treatment regimen for piglets with clinical signs of pigs RV after feeding the feedback.

2 Methods

For the first time in the conditions of our pig farm we used the “Feed Back” method (reverse feeding) for the prevention of rotavirus infection in suckling pigs, vomiting and dehydration of the piglet's body.

The disease begins with the onset of vomiting after feeding. In 12-24 hours after infection of the pigs, we observed that the piglets became inactive, depressed, they develop anorexia.

Subsequently, diarrheal syndrome was recorded in sick piglets, known to the attendants as "milk diarrhea", "white diarrhea" or "diarrhea of three-week-old piglets". This feature is especially manifested with high milk production of the sow. Fecal masses are liquefied, yellow - white and white. Diarrhea symptoms last from several hours to several days. [3, 7]

Rotarovirus enteritis is characterized by normal body temperature. In piglets 10-21 days of age, as a result of the antibodies present in the body, enteritis usually proceeds easily, after two days of diarrhea, they recover. Piglet mortality at this age is small.

In piglets infected at 3-6 weeks of age, feces are watery, yellow or yellow-green in color, mixed with mucus in the form of floating flakes; the disease proceeds with severe dehydration, when sick piglets in the course of the disease lose up to 30% of their body weight and die. Anorexia in piglets lasts 24-72 hours, after which the piglets' appetite is restored. Symptoms in piglets persist for 4-6 days, but feces may be yellow for 7-14 days.

The reason for the study was the manifestation of the clinical signs described above in piglets. But in our case, these signs were observed in piglets of 3-8 days of age (Figure 1).

Fig. 1. Piglets with rotavirus infection.

We differentiated rotavirus infection of pigs from the following diseases:
1. Viral gastroenteritis

2. Diseases of the gastrointestinal tract of bacterial etiology (salmonellosis, colibacillosis, dysentery, proliferative enteropathy, clostridiosis).

To make an accurate diagnosis, we performed an autopsy with the selection of material for further research in the laboratory using the polymerase chain reaction method.

After during a clinical examination, the corpses of pigs with signs of gastrointestinal diseases were exposed to an anatomical autopsy.

It is convenient to open the corpses of pigs in the dorsal position with the removal of the organs of the oral cavity, neck, thoracic, abdominal and pelvic cavities in a single organ complex, in which anatomical connections are preserved between bodies. This method is called the total evisceration (extraction) method; it has been used in veterinary practice for a very long time as a method by G.V. Shor.

Fig. 2. Dehydrated corpse of a dead pig.

The stomach is full of coagulated milk, and the caecum and colon contain yellow, gray or dark green. The walls of the small intestine are thinned, reddened and filled with gas, the vasculature is filled with blood and shows signs of inflammation (Figure 3).

Fig. 3. Blind and colon with signs of inflammation.

An autopsy revealed the following changes:

Changes in the gastrointestinal tract are limited to the small intestine, where there is a decrease in the number and degradation of intestinal villi. This can be seen even with the "naked eye" of 1-14 day old pigs. Food is usually found in the stomach.

On the liver, punctate hemorrhages are noted, dystrophy is noted, the liver is flabby, crawls away when pressed, and is enlarged. On the heart and in all lobes of the lung, punctate hemorrhages are noted. Regional mesenteric lymph nodes are reduced in volume and have a brown color.

Based on clinical signs, autopsy and laboratory data, it was decided to test the effectiveness of using Feed Back to prevent rotavirus infection in suckling pigs.

Feed Back or vice versa Feeding is the feeding of pregnant sows and gilts with material for re-infecting animals with infectious agents necessary for us: clostridiosis, colibacillosis and rotavirus infection with the subsequent transfer of colostral immunity to piglets.

The purpose of this method is to enhance the action of the vaccines used and to develop colostral immunity those diseases for which vaccines are not used.

Material for feeding was taken from suckling pigs up to 8 days old with clinical signs of clostridiosis, colibacillosis and rotavirus infection.

The piglets from which the material for feeding is taken were not treated with antibacterial drugs, because when the antibiotic affects the pathogen, it dies and the material for Feedback becomes useless.

"Feed Back" consists of 2 parts:

1. Feces from piglets with signs of gastrointestinal diseases.
2. Piglets' intestines with signs of gastrointestinal diseases.

The total amount of Feedback for both replacement and pregnant sows will be equal - 10 grams per head. This is a mass of feces from piglets with signs of gastrointestinal diseases + intestines from pigs with signs of the gastrointestinal tract.

The ratio of feces to intestines in the feedback should be 1: 1, i.e. 5 grams of feces and 5 grams of intestines. In case of a lack of feces, it is possible to compensate them with the intestines.

Basic rules for preparing feedback that will help make the material as effective as possible:

1. The material should be as fresh as possible.
2. We do not use material from piglets treated with antibacterial drugs for preparing feedback.
3. The duration of the manifestation of clinical signs of gastrointestinal diseases in piglets should not exceed 2 days.
4. Feces should be free of foreign matter (powdered veterinary drugs, powders, disinfectants and detergents, etc.).
5. The resulting material must be frozen before feeding, but re-freezing in case of an error in calculating the required amount of material is not allowed. In case of an error and an excess amount of material is thawed, it is necessary to use all the thawed material to prepare the feedback.
6. Dissolve the prepared feedback with water at the rate of 100 ml per 1 sow. The water used to dilute the material should be at room temperature. Do not use hot or cold water.
7. For the best feed-back consumption, it is necessary to distribute it during feeding by adding the required amount of the feed-back solution (100 ml per head) to the individual feeders with feed.
8. The material must be fed on the day of preparation (on the day of defrosting). Everything that was thawed - everything was fed!
9. For better solubility of the material, it must be passed through a meat grinder. It is best to carry out this procedure with a slightly melted material, because fresh material does

not go through the meat grinder well, leaving large areas of the intestine and the meat grinder becomes clogged.

9.The material must be fed at 10 and 13 weeks of gestation for 2 days.

10. It is best to collect feces from piglets with toilet paper, because it will dissolve well in water.

It is very important that the feeding material is "useful", ie. contained pathogens necessary for us.

It is also necessary to understand that the material can be both useful and “harmful”. The word “harmful” refers to the content of non-target pathogens in the feeding material, such as salmonellosis and dysentery (Dysenteria suum), which can be transmitted with feces collected for preparation of the material.

To exclude non-target pathogens in the material and identify “useful” material must be laboratory tested for each batch. To do this, each time you prepare material (feces and intestines) for the fit tank, take a part of the material for laboratory research.

All material collected during the week for laboratory research is collected in 1 sample, mixed and sent to the laboratory. If confirmed in the material salmonella or dysentery, the material is disposed of.

In case of negative results of laboratory tests for pathogens "useful" for us (colibacillosis, clostridiosis and rotavirus infection of pigs), the material is also disposed of. All laboratory tests, both for pathogens necessary for pathogens and for "harmful" pathogens, are carried out by PCR (polymerase chain reaction).

Table 1. Test report.

Start of the trial:	End of the trial:
Name and address of the Customer:	
Age group of animals:	Suckling pigs, 3 days
Animal vaccination information:	Unspecified
Description of samples and quantity:	Feedback, 1 sample
Date and time of sampling:	
Place of sampling:	
Reason for sampling:	eg monitoring
Name of the person who took the samples:	
Test method:	Polymerase chain reaction
Sample storage conditions:	Csealed container in a freezer at t -18 / -12 ° C
Date and time of sample delivery :	
Sample delivery conditions:	In a thermocontainer with ice packs at t +5 ° C

Table 2. PCR results.

Sample / pool sequence number	**Sample information**	**Indicator (pathogen genome determination)**	**Method**	**Ct value**	**Result of genome presence**
1	feedback (sample 1) from suckling pigs 3 days old	PBC	Instructions for using the test systems for detecting rotavirus by PCR	32,6	**Found**
		Brachyspira hd.	Use of the test system for detecting the causative agent of	absent	not found

			swine dysentery by PCR		
		Salmonella spp	Instructions for using the test system for the detection of the causative agent of salmonellosis by PCR	absent	not found
		E.coli EAE (general)	Instructions for using the test system for detecting Escherichia coli pathogen EAE gene (general) by PCR	absent	not found
		Clost.perfringens	Instructions for using the test system to identify the pathogen Clostridium difficile and Clostridium perfringense by PCR	absent	not found
		Lawsonia int.	use of a test system for detecting the causative agent of Lawsoniosis by PCR	absent	not found

For the research, groups were formed:
1. Control - did not use FeedBack.
2. Experienced - used FeedBack.

Table 3. Experiment scheme.

Groups of animals	Number of heads, pregnant sows	Experimental conditions
Group 1 experimental	148	Used "Feed Back"
Group 2 control	154	Did not use "Feed Back"

It should also be noted that both the control and experimental groups were vaccinated during pregnancy against clostridiosis and colibacillosis.

The control group consisted of 154 pregnant sows, and experienced out of 148 pregnant sows. All animals, both the control and the experimental group, were clinically healthy and in good condition. All procedures for feeding feedback were carried out in accordance with the specifics described above in the text. The preparation of production facilities for the settlement of animals was carried out in compliance with all veterinary and sanitary rules. It is obligatory to place animals according to the "Empty-busy" principle.

3 Results

To check the effectiveness of the experiment, it was customary to evaluate the results on the following indicators:

1. The number of sows (heads) in the group in which the offspring had piglets with clinical signs of gastrointestinal diseases in relation to the total number of sows in the group, %.

2. The number of sows (heads) in the group in which the offspring had repeated manifestations of gastrointestinal diseases in relation to the total number of sows in the group, i.e. at the first manifestation of gastrointestinal diseases, the piglets were treated with an antibacterial drug of the penicillin series, but a few days after the disappearance of the signs of gastrointestinal diseases, they appeared again.

3. Safety of piglets in a group, %.

4. Average daily weight gain, grams.

This criterion must be assessed because with diarrhea, piglets become severely dehydrated and lose weight.

Table 4. Evaluation criteria.

№	Indicator	Control group	Experimental group
1	The number of sows in the group, which had piglets in the offspring with clinical signs of gastrointestinal diseases in relation to the total number of sows in the group,%	17,5	7,4
2	The number of sows in the group in which the offspring had repeated manifestations of gastrointestinal diseases in relation to the total number of sows in the group,%	5,8	1,3
3	Safety of piglets in the group,%.	88,3	92,1
4	Average daily weight gain, grams \ head	267	304

Considering the indicators given in Table 4, we can say the following:

1. The number of sows in the control group, whose offspring had piglets with signs of gastrointestinal diseases, was 11.1% more in relation to the experimental group.

2. Repeated cases of gastrointestinal tract disease in the experimental group were 4.5% less than in the control group.

3. The safety in the experimental group was higher by 3.8% in relation to the control group

4. Average daily weight gain in the control group was 37 grams / head lower than in the experimental group.

It should also be noted that both the control and experimental groups were vaccinated during pregnancy against clostridiosis and colibacillosis.

The control group consisted of 154 pregnant sows, and experienced out of 148 pregnant sows. All animals, both the control and the experimental group, were clinically healthy and in good condition. All procedures for feeding feedback were carried out in accordance with the specifics described above in the text. The preparation of production facilities for the settlement of animals was carried out in compliance with all veterinary and sanitary rules. It is obligatory to place animals according to the "Empty-busy" principle.

4 Discussion

The vaccine does not protect the body from the virus and infection by 100%.

In our case, you can say the same thing, because in essence, "Feed Back" is a live vaccine.

During the experiment, in the experimental group, which consisted of 148 pigs (148 nests of piglets), 8 nests of piglets with signs of rotavirus infection were identified, which makes up 5.4% of the total number of piglets' nests in the experimental group.

For the treatment of these nests, injectable, prolonged-release drugs of the penicillin series were used. The drug was injected intramuscularly into the upper third of the neck using “the Eco-Matic” injector. The dosage according to the instructions to the drug was 1 mg of the drug per 10 kg of fat.

Since at the time of the disease the weight of the pigs was about 2.5 kg, the dosage of the drug for treatment was 0.3 ml / head. The effectiveness of the treatment was found to be 100%. The safety of these nests until weaning was 100%.

5 Conclusion

As with most viral diseases, the best control measures are based on preventing infection or building good immunity.

Treatment for rotavirus enteritis is palliative. If an acute outbreak occurs in dairy pigs, it is necessary to:

1) use broad-spectrum antibiotics to prevent bacterial overgrowth;
2) there must be sufficient fresh water;
3) weaning, if possible;
4) good sanitation

Having milk in the intestines significantly reduces the osmotic diarrhea that develops. Therefore, readily fermentable foods are contraindicated. Glucose is passively absorbed even in the affected intestine; or you can give glucose and an aqueous solution orally as a source of energy to increase the time for epithelial regeneration.

In weaning pigs, the diet should be carefully studied and the addition of large grains (oats) is beneficial in many situations.

Adequate heating and ventilation is essential for large swine populations, especially in intensive housing.

Virus particle concentration reaches extremely high fecal titers in severely affected pigs, therefore reducing the infectious dose through good sanitation is very important.

Many management considerations have been proposed as a means of preventing disease. In the farrowing house, recommendations include:

1) using multiparous sows, which are more likely to release neutralizing antibodies when breastfeeding;

2) ensuring a break in the continuous farrowing system to ensure proper sanitation and prevent fecal congestion masses;

3) exposure from pregnant gilts and sows to faecal material from the farrowing room or nursery (this procedure is associated with the risk of induction of viral abortion and is done at least 3-4 times a few weeks before farrowing);

4) Maintaining a closed herd and eliminating the movement of animals (and people) inside. The fact that strains of rotavirus can infect multiple species may have a large impact on transmission, but more research is needed.

Preventing a potential animal carrier from entering the herd applies to rotavirus as well as other infectious diseases.

Possible successful vaccination of calf rotavirus diarrhea using a modified live vaccine obtained from a tissue-adapted strain of bovine rotavirus and administered orally to newborns.

Porcine rotavirus is difficult to adapt to tissue culture. All deformations indicated in this way were far from pathogenic. Several pathogenic strains of rotavirus also emerge, which

differ antigenically and with which serological cross-neutralization does not occur, implying a possible sequential infection of one animal with these different strains.

Current trends towards restriction of freedom, isolation of pigs are produced by herds with unique bacterial and viral flora.

Therefore, an ubiquitous organism that was not recognized as pathogenic a few years ago can be pathogenic when introduced into the herd today.

It is important to note that mild pathogens that have been ignored or hidden in the past can lead to significant economic losses in modern pig farms that rely on efficiency and maximum production potential for profit.

Rotavirus infections are capable of causes diarrhea in various animals, including pigs. The lack of information that was present at the beginning will be supplemented in the future as research continues. Until that time, the importance of making a correct diagnosis and applying modern management cannot be overstated.

All clinically healthy pigs are immunized with the vaccine according to the instructions for use. The farm carries out a full range of veterinary and sanitary measures, which includes measures to prevent the introduction of the pathogen into other safe farms, strict control over the recruitment of the herd with animals from other farms is carried out.

When eliminating the disease, specialists should pay special attention to full balanced feeding of pregnant and lactating sows, and for newborn piglets to create the conditions provided for by the technology of keeping.

When carrying out activities, it is necessary to: reduce the use of single sows for farrowing; plan farrowing in such a way as to avoid overcrowding in lactating sows and newborn piglets; carry out a thorough mechanical cleaning and disinfection of the farrowing rooms using chlorine-containing preparations and formaldehyde solution; to prevent the accumulation of bacterial infection, use oral antibiotics; take measures to reduce the effect of stress on piglets, use oxytocin to stimulate the milk flow reflex.

Good results in the elimination of infection are provided by changing farrowing sites, carrying out farrowing in summer camps, rehabilitating premises, operating maternity wards in accordance with the principle of "everything is free - everything is occupied" and a number of other measures.

The farm is declared free from rotavirus enteritis of pigs 3 weeks after the last case of death of piglets, recovery of sick animals or their delivery to slaughter. And also carrying out the whole complex of final health-improving measures with disinfection [2,6].

The FeedBack method was most effective for use in pig farms where there are problems with swine rotavirus infection, clostridiosis and colibacillosis.

Also, the use of this method will reduce the cost of vaccines and antibacterial drugs.

The Feed Back technique was used on pregnant sows to prevent the pigs RV in suckling pigs. The material for use was a homogenesis of piglet intestine and feces, with a confirmed RV, which was prepared on site in a production environment. The terms of using the feedback are for 10 and 13 weeks of gestation within 2 days.

According to the results of the study, it can be seen that all the studied indicators in the experimental group significantly exceed the indicators in the control group. The number of sows in the control group, which had piglets in the offspring with signs of gastrointestinal diseases, was 11.1% more in relation to the experimental group. Repeated cases of manifestation of gastrointestinal tract disease in the experimental group were 4.5% less than in the control group. The safety in the experimental group was higher by 3.8% in relation to the control group. The average daily weight gain in the control group was 37 grams / head lower than in the experimental group.

When using penicillin drugs in all 8 nests with signs of pigs RV, there was a positive dynamics in recovery after the first injection of the drug. The weight gain in these nests, at

the time of weaning, did not differ from the weight gain in the remaining nests of the experimental group. The efficiency of using penicillins was 100%.

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