

Control of the PED virus requires an intelligent biosecurity strategy

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Porcine Epidemic Diarrhoea (PED) is a production disease that only affects pigs; it has no implications for human health. PED started in Europe in the 1970s, then moved throughout Southeast Asia and China. The first US case was reported in Ohio in April 2013, and subsequently it spread to Mexico and Canada.

The importance of this disease resides in the worrying economic losses that it can cause to the porcine industry, i.e. the US industry lost more than five million pigs in less than one year.

PED is caused by a virus which belongs to the Coronaviridae family, but it is genetically different from transmissible gastroenteritis virus, which is also belonging to Coronaviridae family.

Severe dehydration

PED virus causes severe diarrhoea and dehydration, and it is mainly transmitted via the oral-faecal route. Up to 100% morbidity is seen, and there is between 80-100% mortality in young piglets during an outbreak, with productive parameters of the whole herd affected.

A commercially available vaccine, whose effectiveness has been objectively demonstrated, does not exist so producers can not afford to ignore biosecurity at this time, and extra precautions should be taken to help prevent the spread of the PED virus.

This virus can survive for more than 28 days in faecal material and more than 13 days in water. In addition, it is important to mention that it is highly infective. Under experimental conditions it has been demonstrated that PED disease can be produced by the dilution of 1ml of faecal material infected by PED virus in 100,000 litres of water.

Infected animals may excrete PED virus in their faeces for 5-9 days. The excretion of the virus has also been demonstrated by the nasal route. As an example, an animal 2-3 days old can excrete 10^9 viruses per ml of faeces. This means that 100ml of faecal material will contain 100×10^9 viruses. If it is

	OX-Virin dose	Contact time for reduction >4 Log ₁₀ TCID50
Temperature: 4°C	0.5% (1:200)	60 minutes
	1% (1:100)	1 minute
Temperature: 20°C	0.5% (1:200)	60 minutes
	1% (1:100)	1 minute

Table 1. The time necessary to guarantee a reduction of more than 4 Log₁₀ TCID50 under different conditions.

assumed that a medium biosecurity protocol shows 99.999% of effectiveness, presumably 10^6 viruses will still remain viable.

Biosecurity plays a vital role in preventing the dispersion of the PED virus both between and within farms. But, in order to stop the spread of this disease, it is important to identify gaps in biosecurity and implement corrective measures to optimise the biosecurity strategy.

Furthermore, it is essential to ensure that anyone or anything arriving at the farm does not bring in infective materials. This means that animals, people, equipment, materials and vehicles have to be rigorously controlled.

In order to establish an intelligent biosecurity strategy to prevent the spread of PED virus, it is necessary to develop a specific work protocol that includes the use of a disinfectant product which biocidal effectiveness has been demonstrated against the PED virus.

It is important to take into account that the PED virus thrives in cold weather. A lot of the disinfectant products regularly used in farming facilities contain aldehydes as active ingredients. Aldehydes do not work well under 10°C.

Therefore, it is essential to test the biocidal products against PED virus not only at room temperature, but also at freezing temperatures.

Objective

The main objective of this work was to demonstrate that an intelligent biosecurity strategy based on the use of 100% biodegradable disinfectant products, is effective to prevent the dispersion of the PED

virus both between and within farms.

Firstly, the effectiveness of the ecological disinfectant product OX-Virin (liquid biocide) was tested at different conditions against PED virus at laboratory scale.

From the results obtained, a specific work protocol was developed in order to guarantee PED virus control even under hard conditions.

OX-Virin is an elite wide spectrum 100% biodegradable biocidal product. The main active ingredients are specific peroxyacetic molecules, which have been stabilised by the inclusion of the exclusive OX-VI Core.

OX-S4 is a disinfectant and protector product in powder form which contains an exclusive mixture of OX-Virin and innovative inert components.

Thanks to its composition, the use of OX-S4 assures high absorbency as well as a disinfecting and deodorising effect.

Laboratory trials

The biocidal (bactericidal, fungicidal and virucidal) activity of OX-Virin has been tested in external accredited laboratories according to the European Standards: UNE-EN 1276, 1650, 13697, 1656, 1657, 14675, 14476. Regarding the virucidal activity of OX-Virin:

- According to the European Standard UNE-EN 14675, OX-Virin showed general virucidal activity under extremely dirty conditions at concentration of 0.5%.

- Moreover, the virucidal activity of OX-Virin against specific human and animal viruses on surfaces has been demonstrated according to the European Standard UNE-EN 14476 under dirty conditions. At con-

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centration of 0.5%, OX-Virin reached a reduction superior to 4 log₁₀ TCID₅₀.

On the other hand, the virucidal activity of OX-Virin against specific viruses of interest in animal health and food safety has been demonstrated in independent studies. For example, DEFRA (Department for Environment, Food and Rural Affairs), has approved the use of OX-Virin at 0.25-0.5%.

Taking into account the great importance of PED virus, specific efficacy tests have been carried out following these characteristics:

- Infectious titer (medium value): PED virus 10⁹ TCID₅₀/ml.
- Biocidal product: OX-Virin.
- Dosage of biocidal product: 0.5% and 1%.
- Contact time (minutes): 1 and 60.
- Temperature (°C): 4 and 20.

● Interfering substance: extremely dirty conditions (10g/l Bovine Serum Albumin combined with 10g/l Yeast Extract). These conditions simulate the possible impact that would cause the presence of organic matter during the applications of the tested disinfectant.

According to the European Standard UNE-EN 14476, in order to consider that the tested biocidal product shows virucidal activity, it is necessary to guarantee the reduction of more than 4 Log₁₀ TCID₅₀. Table 1 shows the time necessary to guarantee a reduction of more than 4 Log₁₀ TCID₅₀ under different conditions.

OX-Virin at the dosage of 1% after one minute of contact time was effective against PED virus under extremely dirty conditions, even at low temperature (4°C).

Intelligent strategy

Taking into account that biosecurity is an essential tool in order to prevent and control PED virus, the next intelligent biosecurity strategy has been recommended. This work protocol involves the use of the 100% biodegradable biocidal product OX-Virin according to the specific results obtained with this product against PED virus at laboratory.

● Control the access of vehicles, animals and people to farm facilities:

The access of vehicles, animals and people to farm facilities must be restricted. Everything/everyone that enters to the farm is increasing the possibility of the entrance of micro-organisms.

In the cases where the access of vehicles is unavoidable, before the entrance, the wheels and the external part of vehicles will be disinfected using OX-Virin at 1%. It is recommended also the disinfection of critical inner parts of vehicles (steering wheel, pedals, etc).

People entering on foot must pass through foot baths containing a 1% OX-Virin solution in order to disinfect footwear. It is recommended that the residual of active ingredients (hydrogen peroxide/peracetic acid) is periodically verified using reactive colorimetric strips. People must wear disposable overalls or use specific work clothes from the farm that will be disinfected after their use.

The entrance of personal effects must be avoided. If it is unavoidable, before the access to the farm their disinfection with OX-Virin at 1% will be carried out.

Due to the fact that laboratory trials guarantee the efficacy of OX-Virin at 1% after just one minute even under extremely dirty conditions, the use of this product on foot baths and vehicles disinfection is recommended.

● Cleaning and disinfection of farm facilities in depopulation:

In order to carry out an intelligent biosecurity strategy, cleaning operations before the disinfection process are a key point. Before applying the disinfectant, it is advisable to establish a rigorous cleaning process that assures the elimination of organic matter.

The use of alkaline detergent may facilitate this task. In order to prevent the adverse phenomenon of dilution of disinfectant product, it is important to avoid the presence of a high quantity of water originating from the cleaning process when the disinfection process begins.

The rigorous disinfection of farm facilities with OX-Virin at 1% is recommended. The

disinfectant solution must be applied on surfaces, environment, equipments and materials.

Do not forget the disinfection of loading/uploading points. Due to the 100% biodegradable nature of OX-Virin, no toxic subproducts will be formed.

● Cleaning and disinfection in the presence of animals:

In order to facilitate the sanitising activities in the presence of animals, the product OX-S4 can be applied. OX-S4 is a powder form product that contains OX-Virin and can be used directly on animal skin and also on surfaces at a dose of 50-150g/m². This product can be applied by hand but the use of powder sprinklers is recommended.

In order to implement a complete biosecurity work protocol, it is also significant to remember the importance of guaranteeing an effective water treatment and an efficient pest control.

The success of an intelligent biosecurity strategy lies in all people related to the farm being involved in the biosecurity program and knowing the importance of its compliance.

Biosecurity applied according to an intelligent strategy is not an expense; it is a very profitable opportunity of improvement in the short, medium and long term. A well performed intelligent biosecurity strategy assures the return on investment.

Conclusions

Nowadays, the development of optimised biosecurity strategies that consider the use of biocidal products tested specifically against PED virus, is the main tool in order to guarantee the prevention and control of this production disease.

Taking into account the great importance of PED virus in economic terms, whether there has been a serious outbreak in their country or not, pig producers across the world need to be vigilant.

Intelligent prevention is always more convenient, economically speaking, than the cure. ■