

Virkon® S

**Powerful Broad Spectrum
Virucidal Disinfectant**



Kills over 500 strains of disease-causing pathogens rapidly, in real farm conditions



Redefining the chemistry of biosecurity.

When Virkon® S was launched in 1986, it was the most advanced farm disinfectant for its time. It was one of the first oxidative disinfectants to be used on the farm and continues to lead the way in pig biosecurity, having been deployed successfully against 500 disease-causing organisms.

For over 30 years, Virkon® S has set new benchmarks in many important aspects of biosecurity, from improved handling and operator safety profiles, to proven on-farm efficacy and application flexibility. Add to this the excellent stability and long shelf life of the powder-based

formulation, and it is easy to see why governments the world over keep stocks of Virkon® S for emergency disease-control purposes.

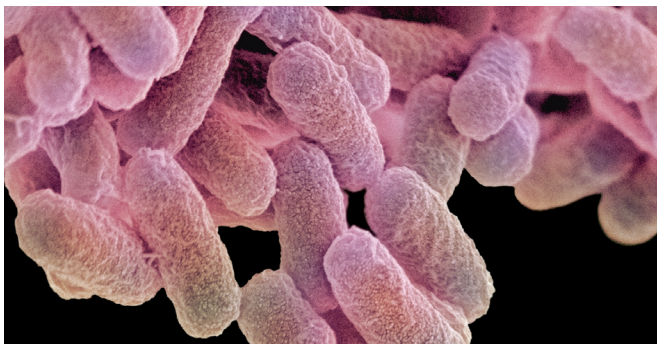
Virkon® S was originally developed to specifically address the practical biosecurity requirements of modern-day farming and livestock production. The powerful capabilities of peroxygen-based chemistry in the formulation of Virkon® S provide a broad spectrum of efficacy with specific focus against viral disease-causing organisms.

New design. Same unrivalled science.

The Virkon® range of disinfection products now have a dynamic new look to match their biosecurity disinfecting power. Look out for the new enhanced pack designs from your local supplier.

Visit virkon.com for more details.








Industry-leading chemistry recognised by governments worldwide.

Virkon® S is a scientific breakthrough with performance characteristics that have defined biosecurity standards. Not surprisingly, Virkon® S is the choice of the Food and Agriculture Organization of the United Nations and governments worldwide to secure biosecurity and strengthen emergency disease control (EDC) contingency planning. The Australian and New Zealand governments' AUSVETPLAN is probably the best-regarded EDC reference source. Virkon® S continues to be the only branded disinfectant referred to in the 2008 AUSVETPLAN, stating that "Virkon® S is a modern disinfectant with outstanding virucidal properties."

It is proven:

-  To kill over 500 strains of viruses, bacteria, and fungi
-  Against Foot and Mouth Disease virus (FMDv), Porcine Reproductive and Respiratory Syndrome virus (PRRSv), Porcine Circovirus type 2 (PCV2), Porcine Epidemic Diarrhoea virus (PEDv), African Swine Fever virus (ASFv), *Salmonella* and *Campylobacter*
-  To be powerful, fast acting, flexible, multipurpose biosecurity disinfectant



Proven chemistry. Proven results.

Independently proven broad spectrum efficacy.

As part of our commitment to evolving chemistry, safety, and stewardship, we have heavily invested in performance and safety testing. And, Virkon® S has a significant number of studies supporting approved label claims against the OIE listed diseases, including Foot and Mouth Disease (FMD), Classical Swine Fever (CSF), Aujeszky's Disease (AD), Transmissible Gastroenteritis (TGE), and African Swine Fever (ASF). Virkon® S is also UK DEFRA Approved for Foot and Mouth Disease (FMD), Swine Vesicular Disease (SVD), and General Orders (GO)*

For *Salmonella*, studies confirm that Virkon® S is highly active against the most prevalent strains responsible for food poisoning. The broad spectrum efficacy of Virkon® S has been independently proven against:



- Over 100 strains of viruses in 22 viral families
- Over 400 strains of bacteria
- Over 60 strains of fungi

These studies were conducted using a wide range of contact times, temperatures, and organic challenge levels.

Formulated broad spectrum killing power.

Formulated to overcome the problems of limited spectrum and limited activity exhibited by other disinfectants, Virkon® S achieves deactivation and destruction of the target organism through a broad spectrum, non-selective range of oxidation reactions. Unlike other disinfectant chemistries, such as aldehydes, Virkon® S does not exert a specific toxicological effect on the target organism and is proven to kill pathogens in seconds.



Performs in the laboratory. Performs on the farm.

Proven on-farm efficacy offers producers reassurance and the knowledge that the product they are using will be effective in real farm conditions, where low temperatures and high levels of organic challenge can present serious problems to other disinfectants. Live pig transport is an important vector of PRRS virus into farms and within pig flows.

The Swine Disease Eradication Center, University of Minnesota, published important results aimed at helping producers reduce the risk of spreading highly infective PRRS virus by live animal transport.¹ In a study performed on a full-size pig trailer under practical constraints to match field conditions, the researchers selected 1% Virkon® S as the study disinfectant due to its proven broad spectrum virucidal activity, including against PRRS virus. Their results were excellent, producing “good inactivation of PRRS virus within the target time when cold water was used and disinfection applied by foaming.” This work, coupled with the known broad spectrum of activity of Virkon® S, confirmed that it is the disinfectant of choice for transport biosecurity. These wide-ranging, real-world biosecurity challenges demonstrate the broad spectrum proven efficacy of Virkon® S against both viruses and bacteria. Virkon® S has been proven time and again to meet the toughest biosecurity challenges better than any of its competitors and provides the key to combating the effects of viruses and bacteria in livestock production.

*Virkon® S is UK DEFRA Approved at the dilution rates of 1:1300 for FMD, 1:100 for SVD, and 1:80 for GO.



Excellent control of food-poisoning pathogens to EN test standards.


With the stringent EU legislation on *Salmonella* and *Campylobacter* control in full force across the swine industry, Virkon® S has been re-evaluated at Wageningen University in the Netherlands to specifically address the EU legislation. The EN 1656 *Salmonella* and *Campylobacter* studies confirmed that Virkon® S achieved excellent dilution rates of 1:100 and 1:200 against the most prevalent *Salmonella* strains responsible for food poisoning; these include *S. enteritidis*, *S. typhimurium*, *S. virchow*, *S. infantis*, and *S. hadar*, and *Campylobacter jejuni*. Additionally, similar data is now available for *Staphylococcus aureus* (pig MRSA).



The gold standard boot dip disinfectant – for rapid speed of kill.

Independent field trials have demonstrated the impracticality of many types of disinfectants for boot dips due to slow kill rates. Researchers at Indiana's Purdue University in the US compared the performance of disinfectants from six leading classes,² and only the QAC disinfectant provided adequate boot dip disinfection but required an impractical five-minute soak after boot cleaning. However, when Virkon® S was evaluated under similar circumstances, effective disinfection was achieved after boot cleaning in just 30 seconds.³ The study confirmed that Virkon® S achieves excellent speed of kill at low temperatures and in the presence of organic challenge.





Operational benefits. Because Virkon® S simply offers more.

No need for rotation.

Independent studies have demonstrated that Virkon® S is less likely to lead to the development of acquired resistance when compared with certain other disinfectant chemistries, consequently removing the need for disinfectant rotation.^{4,5}

Superior operator safety.

Extensive investment has been made to assess the safety of Virkon® S users. The assessment demonstrates that Virkon® S is not corrosive to skin and does not cause sensitisation. A typical in-use dilution of 1:100 (1%) has been shown to be non-irritating to skin and eyes, and is not a sensitising agent.

Effective low-temperature performance.

The ability of a disinfectant to work well at low temperatures contributes to the value of its use on a daily basis. It is well established that the efficacy of disinfectants can decrease as temperature decreases. Further, it has been shown that formaldehyde exhibits reduced biocide performance when the temperature is lowered. Conversely, Virkon® S maintains activity against various viruses at 4°C.

Easy to transport and store.

Virkon® S can be transported conveniently and rapidly by rail, sea, and air. It is not classified as “dangerous for transport,” reducing the cost of shipment and negating the requirement to manage staff qualified in the shipment of dangerous goods. Due to the complexities and restrictions surrounding shipment of dangerous goods, shipment times can be prolonged.

The powder formulation of Virkon® S simplifies storage thanks to its stability. So it can be stored for long periods, making it ideal for stockpiling in bulk.





Environmental profile.

The Virkon® S oxygen-based chemistry contains simple inorganic salts and organic acids. The active ingredient decomposes by a variety of routes within the environment, in soil and in water, breaking down to form the naturally occurring substances potassium salts and oxygen. The major organic components are classified as readily biodegradable, according to OECD and EU test methods.

Virkon® S is not considered persistent in the environment, according to the standard European process for the classification and labelling of chemical preparations. Independent studies have shown that diluted Virkon® S should not, when used as directed, pose any threat to sewage treatment facilities.⁶

Aerial misting in the presence of animals.

During respiratory disease outbreaks, or where such a risk exists, Virkon® S can be applied as an aerial disinfectant when the animals are present, to lower environmental pathogen load, reducing the potential for cross-contamination.⁷

Biosecurity in a single pack.

Virkon® S offers farmers a convenient, multipurpose biosecurity system all in one pack for a wide range of applications:

- Surfaces
- Equipment
- Vehicles
- Aerial disinfection
- Water delivery systems

Supporting the reduction of antibiotic use.

Governments worldwide are seeking reductions in the use of livestock antibiotics to limit the development of antibiotic resistance, which can pass to the human population. Targeted legislation to reduce the use of prophylactic antibiotics in the food chain is now becoming a reality. So it's critical that producers take steps to improve their biosecurity measures.



With proven efficacy in a wide range of real-world biosecurity challenges against both viruses and bacteria, Virkon® S has proven key to combating the effects of viruses and bacteria in livestock production. As a disinfectant of choice for governments worldwide, Virkon® S leads the way forward in biosecurity best-practice programmes.



Application & Use Guidance

Surface and Equipment Disinfection

Surface Disinfection	Dilution Rate	Application
Routine disinfection for all surfaces, earth, wood, and concrete	1:100 (10 grams of Virkon® S to every 1 litre of water)	Using a pressure washer or other mechanical sprayer, apply Virkon® S solution at an application rate of 300ml/m ² .

Surface Application Usage Chart

To estimate the total surface area to be disinfected, including walls and ceilings, multiply the total floor area by 2.5.*

Surface Area to be Disinfected	Volume of Water Required	Dilution Rate	
		Routine Disinfection and UK DEFRA 'General Orders' 1:100 (1%)	1:200 (0.5%)
		Quantity of Virkon® S to be added	
50m ²	15 litres	150g	75g
100m ²	30 litres	300g	150g
500m ²	150 litres	1.5kg	750g
1000m ²	300 litres	3kg	1.5kg
2500m ²	750 litres	7.5kg	3.75kg

1. Decide on the volume of disinfectant solution required at the appropriate dilution rate.
2. Measure out the appropriate quantity of Virkon® S powder to achieve the desired dilution rate.
3. Add the Virkon® S powder to the water and stir until fully dissolved (which can take longer in cooler water).
4. Using a pressure washer or other mechanical sprayer, apply Virkon® S solution at an application rate of 300ml/m².
5. All surfaces should be cleaned and allowed to dry prior to disinfection.

*This calculation is a guide based upon UK conversion rates, and reflects usage in buildings with semi porous surfaces. Please check your country-/regional-specific requirements.

Application & Use Guidance

Equipment Disinfection

Equipment Disinfection	Dilution Rate	Application
Routine cleaning and disinfection of movable equipment	1:100 (10 grams of Virkon® S to every 1 litre of water)	Using a brush or pressure washer, wash all equipment in Virkon® S solution until visibly clean.

Disinfectant Boot Dips: Preparation and Use

Disinfection	Dilution Rate	Application
Routine disinfection of footwear	1:100 (10 grams of Virkon® S to every 1 litre of water)	Replace solution once it has either become soiled or after a period of 4–5 days.

Water System Disinfectant

Terminal and continuous disinfection — all water systems can potentially contain some viral and bacterial contamination, especially header tanks where dust and debris can accumulate. Disinfection will clean the system and eliminate viruses, bacteria, and fungal growth.

Water System Disinfection	Dilution Rate	Application
Terminal disinfection (between production cycles)	1:100 (1%)	Isolate header tank at the mains and drain off to drinker points farthest from tank. Clean out any gross soiling and debris. Refill with water and add the appropriate amount of Virkon® S powder, thoroughly stir and leave for 10 minutes. Release to fill the water system to all drinking points and leave for a minimum of 4 hours before draining the water system and all drinking points. Flush the system with clean water until the water is visibly clean.
Continuous disinfection	1:1000 (0.1%)	Dose header tank as required or apply through water system dosing equipment.



Virkon® S Water Disinfection Usage Table

Litres of Water to be Disinfected	Dilution Rate		
	Routine Terminal 1:200	High Disease Risk Terminal 1:100	Continuous Water Disinfection 1:1000
	Quantity of Virkon® S to be added		
100 litres	500g	1 kg	100g
250 litres	1.25kg	2.5kg	250g
500 litres	2.5kg	5kg	500g
1000 litres	5kg	10kg	1kg

Aerial Disinfection

Misting/Aerial Spraying, Cold and Thermal Fogging

To assist the control of organisms that may be introduced into a building during the set up procedure, and to disinfect inaccessible areas of the building and the air, use either a fine mist sprayer or thermal fogging machine to apply Virkon® S disinfectant solution evenly. Aerial disinfection may also help control any contamination introduced to the building surfaces by airborne particulate matter present within the environment.

Equipment Disinfection	Dilution Rate	Application
Misting / Aerial Spray	1:200	Using either a pressure washer or knapsack sprayer on its finest mist setting, apply 20ml of Virkon® S solution per m ³ of air space.*
Cold Fogging	1:100	Use a mechanical mister to apply the Virkon® S solution at a rate of 40ml per m ³ of air space.
Thermal Fogging	1:25 (4%) solution of Virkon® S in an 90:10 water: Virkon® S Fog Enhancer mixture	Using a suitable thermal fogging machine, apply the prepared solution at 10ml per m ³ of air space.

* Equivalent to approximately 1 litre of Virkon® S solution per 20m² of floor space. The calculations in this table are a guide based upon UK conversion rates, and reflects usage in buildings with semi-porous surfaces. Please check your country/regional specific requirements.

Aerial Disinfection in the Presence of Livestock

- Virkon® S can be misted in the presence of pigs at a dilution rate of 1:200 (0.5%)
- A cold fogger or mister should be used.
- Always read the Virkon® S label to ensure regulatory compliance.

Proven Broad Spectrum Efficacy.

Virucidal Activity Data

Pig Disease / Related Condition	Virus Family	Dilution Rate	Contact time (mins)
African Swine Fever (ASF) Strain Ba71V	<i>Asfarviridae</i>	1:100	15 seconds
		1:200	30 seconds
		1:500	5
		1:800	10
		1:1000	60
African Swine Fever Netherlands '86 isolate	<i>Asfarviridae</i>	1:250	30
African Swine Fever LIL20/1 isolate	<i>Asfarviridae</i>	1:800	30
Aujeszky's disease (AD)	<i>Herpesviridae</i>	1:100	1
Classical Swine Fever (CSF)/Hog Cholera	<i>Flaviviridae</i>	1:150	30
Foot and Mouth Disease (FMD) (DEFRA approval) Foot and Mouth Disease (FMD)	<i>Picornaviridae</i>	1:1300	30
		1:200	30 seconds
Porcine epidemic diarrhoea (PED) Porcine epidemic diarrhoea (PED)	<i>Coronaviridae</i>	1:600	10
		1:200	1
Porcine Reproductive and Respiratory Syndrome (PRRS)	<i>Arterivirus</i>	1:600	10
		1:200	1
Porcine Rotavirus	<i>Reoviridae</i>	1:600	10
Post Weaning Multisystemic Wasting Syndrome (PMWS) Porcine Dermatitis and Necropathy Syndrome (PDNS) Porcine Circovirus type 2 (PCV2)	<i>Circoviridae</i>	1:200	10
Seneca Valley virus (SVv)	<i>Picornaviridae</i>	1:105	10
Swine Influenza (SI) H1N1	<i>Orthomyxoviridae</i>	1:200	1
Swine Vesicular Disease (SVD) (DEFRA approval)	<i>Picornaviridae</i>	1:100	30
Transmissible Gastroenteritis (TGE)	<i>Coronaviridae</i>	1:100	10
Vesicular Stomatitis (VS)	<i>Rhabdoviridae</i>	1:200	10

Fungicidal Activity Data

Pig Disease / Related Condition	Pathogen	Dilution Rate	Contact time (mins)
Aspergillosis	<i>Aspergillus niger</i>	1:25	30
Dermatophytosis	<i>Trichophyton mentagrophytes</i>	1:50	10
		1:67	30
Gastro-oesophageal ulcers	<i>Candida albicans</i>	1:100	10

The specified uses and registered claims for Virkon® S may vary from country to country. Please contact LANXESS directly to verify country-specific approved usages. See page 14 for contact details.

Bactericidal Activity Data

Pig Disease / Related Condition	Pathogen	Dilution Rate	Contact time (mins)
Abortions	<i>Brucella abortus</i>	1:100	10
Abortion, foetal loss, endometritis, mastitis	<i>Klebsiella pneumoniae</i>	1:100	10
Abortion septicaemia, encephalitis, food poisoning — humans	<i>Listeria monocytogenes</i>	1:100	10
Atrophic Rhinitis	<i>Bordetella bronchiseptica</i>	1:100	10
Botryomycosis	<i>Staphylococcus aureus</i>	1:100	0.5
Dermatitis	<i>Dermatophilus congolensis</i>	1:100	10
Diarrhoea, oedema	<i>Escherichia coli</i>	1:200	5
Enterocolitis, septicaemia, food poisoning — humans	<i>Salmonella typhimurium</i> DT104	1:200	30
Enzootic pneumoniae	<i>Mycoplasma hyopneumoniae</i>	1:200	1
Food poisoning — humans	<i>Bacillus cereus</i>	1:100	10
Food poisoning — humans	<i>Campylobacter coli</i>	1:100	5
	<i>Campylobacter jejuni</i>	1:100	5
	<i>Campylobacter jejuni</i>	1:200	30
	<i>Campylobacter pyloridis</i>	1:100	10
Food poisoning — humans	<i>Escherichia coli</i> O157:H7	1:100	5
Food poisoning — humans	<i>Salmonella choleraesuis</i>	1:100	10
	<i>Salmonella enteritidis</i> PT4	1:100	5
	<i>Salmonella enteritidis</i>	1:200	30
	<i>Salmonella hadar</i>	1:200	30
	<i>Salmonella infantis</i>	1:200	30
	<i>Salmonella thomasville</i>	1:200	30
	<i>Salmonella virchow</i>	1:200	30
Greasy pig disease	<i>Staphylococcus hyicus</i>	1:100	10
	<i>Staphylococcus hyicus</i>	1:200	30
Human infections	<i>Staphylococcus aureus</i> (pig MRSA)	1:100	30
Necrotizing enterocolitis	<i>Clostridium perfringens</i>	1:100	10
Pneumonia, Atrophic Rhinitis	<i>Pasteurella multocida</i>	1:100	10
Polyserositis	<i>Mycoplasma hyorhinis</i>	1:800	5
Porcine Pleuropneumonia	<i>Actinobacillus pleuropneumoniae</i> (<i>Haemophilus pleuropneumoniae</i>)	1:200	1
Respiratory infection	<i>Pseudomonas aeruginosa</i>	1:200	5
Secondary infections, co-infections with PCV2	<i>Proteus mirabilis</i>	1:100	5
Swine erysipelas	<i>Erysipelothrix rhusiopathiae</i>	1:100	10
Septicaemia, meningitis, arthritis, bronchopneumonia	<i>Streptococcus suis</i>	1:400	30
Septicaemia, respiratory disease	<i>Haemophilus somnus</i>	1:100	10
Swine dysentery	<i>Brachyspira hyodysenteriae</i>	1:3333	10
Swine proliferative enteritis	<i>Lawsonia intracellularis</i>	1:100	30
Swine enteritis related infections	<i>Pasteurella haemolytica</i>	1:100	10
Various infections — humans	<i>E.coli</i> ESBL strain	1:100	10
Various infections — humans	<i>Klebsiella pneumoniae</i> ESBL strain	1:100	10

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4. *Possible associations between Salmonella persistence in poultry houses and resistance to commonly used disinfectants and a putative role of mar*. K.O. Gradel et al./ Veterinary Microbiology 107 (2005) 127–138.
5. Randall, L. P., et al. 2007. *Commonly used farm disinfectants can select for mutant Salmonella enterica serovar typhimurium with decreased susceptibility to biocides and antibiotics without compromising virulence*. J. antimicrob. Chemother. 60, 1273–1280.
6. WRC, 1997. Study to determine the toxicity of the virucidal disinfectant Virkon® S to the waterflea (*Daphnia magna*), the earthworm (*Eisenia foetida*) and anaerobic sludge.
7. Aerial applications in the presence of animals are intended for the disinfection of inanimate contact surfaces and media, to reduce the potential for cross-contamination between animals. It is not intended to treat or prevent a medical condition through contact with the animal.



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The specified uses and registered claims for the product may vary from country to country. Please contact LANXESS to verify country-specific approved uses.

Use biocides safely. Always read the label and product information before use.





Powerful Broad Spectrum
Virucidal Disinfectant



10 reasons to put Virkon® S at the heart of pig farm biosecurity.

1. Virkon® S redefined farm biosecurity and leads the way forward in emergency disease control measures
2. Approved by governments worldwide to combat major diseases, such as FMD, PRRS, PED and more
3. The only branded disinfectant referred to in the 2008 AUSVETPLAN, Australia and New Zealand's emergency disease control plan
4. The gold standard boot dip disinfectant that kills pathogens 10 times faster than the nearest competitor, even at low temperatures and in the presence of organic challenge^{2,5}
5. Independently proven in field trials to be highly effective against the most serious threat to livestock: viruses
6. No need to rotate; proven to reduce the potential infectivity of resistant *Salmonella* superstrains
7. Superior operator safety profile; can be misted in the presence of animals
8. Formulated to include ingredients that have been carefully selected for their ability to degrade naturally within the environment
9. Easy to store and to transport by rail, sea, and air, with no additional spend requirements for storage or transport
10. Biosecurity in a single pack for surfaces, equipment, vehicles, aerial disinfection, and water delivery systems

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