VIRKON®S.

10 REASONS TO PUT VIRKON®S AT THE HEART OF POULTRY FARM BIOSECURITY.

1. Virkon®S is the 'breakthrough' formulation that has re-defined on farm biosecurity and leads the way forward in Emergency Disease Control measures
2. Approved by Governments worldwide to combat major diseases such as Avian Influenza, Newcastle Disease and more
3. The only branded disinfectant referred to in the prestigious AUSVETPLAN as, "Virkon®S is a modern disinfectant with outstanding virucidal properties"
4. The 'Gold Standard' footdip disinfectant – Virkon®S kills pathogens ten times faster than the nearest competitor, even at low temperatures and in the presence of organic challenge[3,4]
5. Proven to kill on the farm as well as in the laboratory – independently proven in field trials to be highly effective against the most serious threat to livestock – the viruses
6. No need to rotate Virkon®S – independently proven to reduce the potential infectivity of resistant Salmonella super-strains
7. The superior operator safety profile ensures that Virkon®S is convenient for users and can be misted in the presence of animals
8. Environmental profile – Virkon®S has been formulated to include ingredients that have been carefully selected for their ability to degrade naturally within the environment
9. Easy to transport and store – Virkon®S can be transported conveniently and rapidly by rail, sea and air with no additional spend requirements for transport or storage
10. Biosecurity in a single pack – a highly convenient multi-purpose biosecurity system all in one pack for, surfaces, equipment, vehicles, aerial disinfection and water delivery systems.

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DUPONT® *The miracles of science™*

Virkon®
the science to kill pathogens

VirkS/Poultry/09.11

VIRKON®S.

DEFINING BIOSECURITY ON POULTRY FARMS FOR OVER 25 YEARS.

DUPONT® *The miracles of science™*

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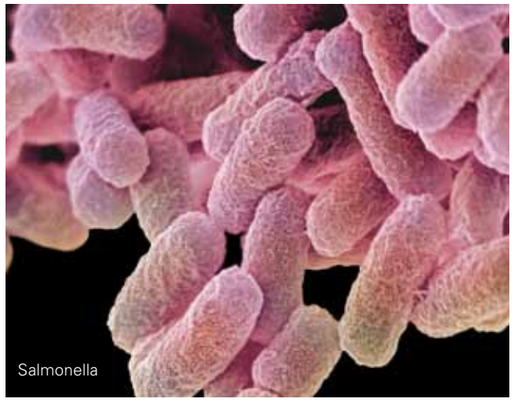
THE BREAKTHROUGH FORMULATION – DEFINING BIOSECURITY FOR OVER 25 YEARS.


Salmonella

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 poultry biosecurity, having been deployed successfully against 500 disease-causing pathogens.

For over 25 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 by Antec International to specifically address the practical biosecurity requirements of modern-day farming and livestock production. Having correctly identified that viruses would become the greatest threat to livestock health, Virkon®S' formulation utilised the powerful capabilities of peroxygen-based chemistry to provide a new broad spectrum of efficacy with specific focus against viral disease-causing pathogens.

Virkon®S led the way in poultry biosecurity as a broad spectrum virucidal disinfectant, and in recognition of this ground-breaking technology, DuPont acquired Antec in 2003.

SELECTED BY GOVERNMENTS WORLDWIDE.

Virkon®S is a scientific breakthrough with performance characteristics that have defined biosecurity standards. Not surprisingly, Virkon®S is selected by the United Nation's Food and Agriculture Organization 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."

- **Proven to kill over 500 strains of viruses, bacteria and fungi**
- **Proven against Newcastle Disease, Avian Influenza, Salmonella and Campylobacter**
- **Powerful, fast acting, flexible, multi-purpose biosecurity**

DEFINING BIOSECURITY FOR OVER 25 YEARS

A BODY OF SCIENTIFIC EVIDENCE.

INDEPENDENTLY PROVEN BROAD SPECTRUM EFFICACY.

Having invested millions of pounds in performance and safety testing, Virkon®S has a significant number of studies supporting approved label claims against the OIE List A Diseases, including; exotic Newcastle Disease and Highly Pathogenic Avian Influenza (Fowl Plague).

For Salmonella, studies confirm that Virkon®S is highly active against five prevalent strains responsible for food poisoning.

The broad spectrum efficacy of Virkon®S has been independently proven against:

- **Over 100 strains of virus in 22 viral families,**
- **over 400 strains of bacteria,**
- **over 60 strains of fungi,**

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.

PROVEN TO KILL ON FARM AS WELL AS IN THE LABORATORY.

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.

In field studies carried out by the United States Department of Agriculture (USDA) Centres for Epidemiology and Animal Health, the researchers confirmed that Virkon®S was 100% effective in eradicating exotic Newcastle Disease virus and concluded that the need for costly sentinel bird placement was eliminated.[1]

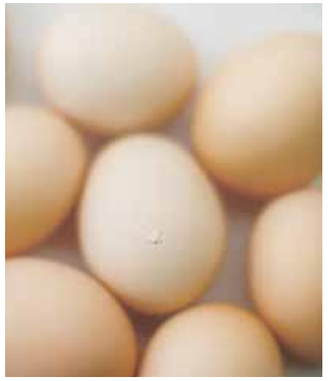
THE FOOTDIP GOLD STANDARD, FOR RAPID SPEED OF KILL.

Independent field trials have demonstrated the impracticality of many types of disinfectants for footdips, due to slow kill rates. Researchers at Indiana's Purdue University in the US compared the performance of disinfectants from six leading classes[4] and only the QAC disinfectant provided adequate footdip 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[5]. The study confirmed that Virkon®S achieves excellent speed of kill at low temperatures and in the presence of organic challenge.

NOT ALL DISINFECTANTS ARE THE SAME.

Big investments have been made in performance, safety testing and international product registrations and, as a result, Virkon®S has extensive data file evidence demonstrating efficacy against more than 100 strains of virus in 22 viral families; over 400 strains of bacteria and over 60 strains of fungi, all at a variety of contact times, temperatures and organic challenge levels. This wealth of evidence ensures that Virkon®S offers poultry producers outstanding efficacy and proven performance.



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 poultry industry, Virkon®S has been re-evaluated at Wageningen University in The Netherlands to specifically address the EU legislation. The latest 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; S. enteritidis, S. typhimurium, S. virchow, S. infantis and S. hadar, and Campylobacter jejuni.

DEFINING BIOSECURITY FOR OVER 25 YEARS

VIRKON®S OFFERS SIGNIFICANT OPERATIONAL BENEFITS.

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[2,3].

SUPERIOR OPERATOR SAFETY.

Extensive investment has been made assessing the safety of Virkon®S to 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.

PROVEN ACTIVITY AT LOW TEMPERATURES.

The ability of a disinfectant to work well at low temperature contributes to the value of its use on a daily basis. Temperature is a major factor. It is well established that the efficacy of disinfectants can decrease as temperature decreases and it has been shown that formaldehyde exhibits reduced biocidal performance when the temperature is lowered. The reduced action of phenolic disinfectants on Avian Influenza virus at low temperatures has also been demonstrated. Conversely, the activity of Virkon®S against various viruses at 4°C is maintained.

EASY TO TRANSPORT AND STORE.

Virkon®S can be transported conveniently and rapidly by rail, sea and air as it is not classified as 'Dangerous for Transport', reducing the cost of shipment and negating the requirement to operate 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 and because the powder is so stable it can be stored for long periods, making it ideal for stockpiling in bulk.

BIOSECURITY IN A SINGLE PACK.

Virkon®S offers poultry producers a highly convenient multi-purpose biosecurity system all in one pack for a wide range of applications:

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

ENVIRONMENTAL PROFILE.

The Virkon®S oxygen-based chemistry contains simple organic salts and organic acids and the active ingredient decomposes by a variety of routes within the environment, in soil and 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 tests.

Virkon®S is not classified as R53* and is not 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.

Spraying a fine disinfectant mist in poultry housing can help reduce cross infection and prevent secondary infection during outbreaks of respiratory and other diseases. Virkon®S can be misted in the presence of poultry at a dilution rate of 1:200 (0.5%). It is always important to read the Virkon®S label in order to ensure regulatory compliance.

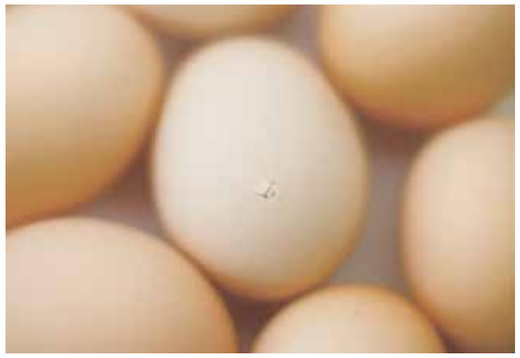
*May cause long term adverse effects in the aquatic environment.

DEFINING BIOSECURITY FOR OVER 25 YEARS

SUPPORTING THE REDUCTION OF ANTIBIOTICS.

Governments worldwide are seeking reductions in the use of livestock antibiotics to limit the development of antibiotic resistance passing into the human population. Targeted legislation to reduce the use of prophylactic antibiotics in the food chain is now becoming a reality with the result that producers are taking 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 meets the toughest biosecurity challenges better than its competitors and provides the 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%)	UK DEFRA Diseases of Poultry Orders 1:280
		Quantity of Virkon®S to be added		
50m^2	15 litres	150g	75g	54g
100m^2	30 litres	300g	150g	107g
500m^2	150 litres	1.5kg	750g	536g
1000m^2	300 litres	3kg	1.5kg	1.071kg
2500m^2	750 litres	7.5kg	3.75kg	2.68kg

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 thoroughly to dissolve.
4. Using a pressure washer or other mechanical sprayer, apply Virkon®S solution at an application rate of 300ml/m^2

*This calculation is based on UK conversion rates. Please check your country/regional specific requirements.

DEFINING BIOSECURITY FOR OVER 25 YEARS

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 FOOTDIPS 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	1:200 to 1:100	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 volume of Virkon®S powder, thoroughly stir and leave for 10 minutes. Flush system through to all drain-off points and leave for a further 50 minutes before draining system and refilling with clean water.
Continuous disinfection	1:1000	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		
	Terminal 1:200	Cleanout 1:100	Continuous Water Disinfection 1:1000
	Quantity of Virkon®S to be added		
100 litres	500g	1kg	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 control organisms that can be introduced into a building during the setting 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.

Equipment Disinfection	Dilution Rate	Application
Misting / Aerial Spray	1:200	Using either a pressure washer or knapsack sprayer on its finest mist setting, apply 1 litre of Virkon®S solution per 10m² of floor space.
Cold Fogging	1:100	Use a mechanical mister to apply the Virkon®S solution at a rate of 1 litre per 10m² of floor space.
Thermal Fogging	1:25 (4%) solution of Virkon®S in an 85:15 water Virkon®S Fog Enhancer mixture	Using a thermal fogging machine, apply the prepared solution at 1 litre per 40m² of floor space.

AERIAL DISINFECTION IN THE PRESENCE OF LIVESTOCK.

- Virkon®S can be misted in the presence of livestock or poultry 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.

DEFINING BIOSECURITY FOR OVER 25 YEARS

PROVEN BROAD SPECTRUM EFFICACY.

VIRUCIDAL ACTIVITY DATA.

Poultry Disease/Related Condition	Virus Family	Dilution Rate
Egg drop syndrome (EDS)	Adenoviridae	1:1000
Poultry enteritis mortality syndrome (PEMS)	Astroviridae	1:67
Infectious bursal disease (Gumboro)	Birnaviridae	1:250
Chicken anaemia virus (CAV)	Circoviridae	1:250
Infectious bronchitis	Coronaviridae	1:100
Marek's disease Turkey rhinotracheitis (TRT) Infectious laryngotracheitis (ILT)	Herpesviridae	1:200 1:200 1:100
Avian influenza H7N1 Avian influenza H5N1	Orthomyxoviridae	1:320 1:800
Newcastle disease (NDV)	Paramyxoviridae	1:280
Fowl pox	Poxviridae	1:100
Avian reovirus	Reoviridae	1:100
Myeloid leucosis	Retroviridae	1:200

FUNGICIDAL ACTIVITY DATA.

Poultry Disease/Related Condition	Pathogen	Dilution Rate
Aspergillosis (hatchery)	Aspergillus fumigatus	1:100
Aspergillosis	Aspergillus niger	1:100
Infections of the oesophagus and crop	Candida albicans	1:100
Dermatophytosis	Microsporum canis Trichophyton mentagrophytes	1:300 1:50 – 1:300

BACTERICIDAL ACTIVITY DATA.

Poultry Disease/Related Condition	Pathogen	Dilution Rate
Food poisoning - humans	Bacillus cereus	1:100
Coryza in turkeys	Bordetella avium	1:100
Spirochaetosis	Brachyspira pilosicoli Brachyspira hyodysenteriae	1:100 1:100
Food poisoning – humans	Campylobacter coli Campylobacter jejuni Campylobacter pyloridis	1:100 1:100 1:100
Psittacosis	Chlamydophila psittaci	1:100
Necrotic enteritis	Clostridium perfringens	1:100
Septicaemia, Arthritis in turkeys	Erysipelothrix rhusiopathiae	1:100
Enteritis	Escherichia coli	1:100 – 1:200
Food poisoning - humans	Escherichia coli O157:H7	1:100
Embryo mortality	Klebsiella pneumoniae	1:200
Food poisoning - humans, Septicaemia in poultry	Listeria monocytogenes	1:100
Chronic Respiratory Disease	Mycoplasma gallisepticum	1:100
Respiratory diseases	Ornithobacterium rhinotracheale (ORT)	1:100
Fowl Cholera	Pasteurella multocida	1:150
Secondary infections	Proteus mirabilis	1:200
Respiratory infection, Septicaemia	Pseudomonas aeruginosa	1:100
Paracolon infection in Turkeys	Salmonella arizona	1:100
Food poisoning - humans	Salmonella choleraesuis Salmonella enteritidis PT4 Salmonella hadar Salmonella infantis Salmonella thomasville	1:120 1:100 1:200 1:200 1:200
Septicaemia in Chickens, Food poisoning – humans	Salmonella typhimurium DT104	1:200
Food poisoning - humans	Salmonella virchow	1:200
Arthritis and septicaemia in turkeys, Omphalitis in chicks	Staphylococcus aureus	1:100
Septicaemia in poultry	Streptococcus zooepidemicus	1:100

The specified uses and registered claims for Virkon®S may vary from country to country.

Please contact DuPont directly to verify country specific approved usages.

DEFINING BIOSECURITY FOR OVER 25 YEARS

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DEFINING BIOSECURITY FOR OVER 25 YEARS