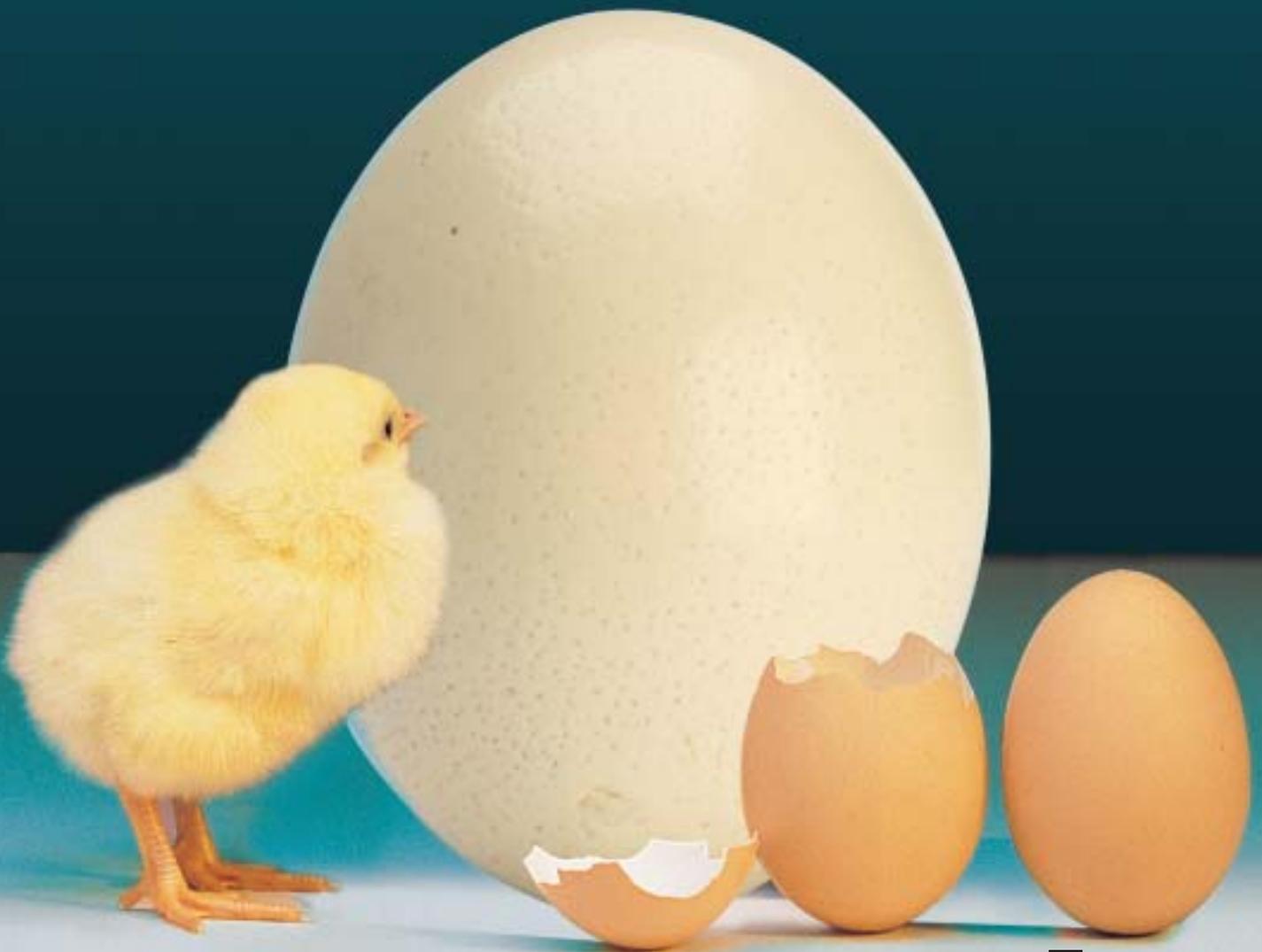


**Virukill**<sup>®</sup>

**A BREAKTHROUGH IN POULTRY DISEASE CONTROL**



**ICA**  
INTERNATIONAL  
CHEMICALS  
(PTY) LTD

## Introduction

Millions of dollars are lost each year in Australia and New Zealand as a result of poultry diseases caused by viruses, bacteria and fungi. Yet, despite the prolific use of the best available vaccines and antibiotics, microbial diseases remain a constant problem to the poultry industry.

One of the major contributing factors is the unacceptably high levels of pathogenic micro-organisms (viruses, bacteria and fungi) which are carried over from one batch to the next. Once the population of these micro-organisms increase beyond acceptable levels, they are capable of breaking through the immunity of vaccinated birds. In many cases, the virus populations do not overpower the immune systems of the birds. Consequently they only manifest themselves through lower feed conversion ratios and poor weight gain.

Increasing virulence of pathogens places increasing demands on even the latest vaccine strains. There is also a growing level of public pressure to restrict the use of antibiotics to therapeutic rather than prophylactic use. Increasing animal hygiene levels will not only reduce the challenge on existing vaccines and prolong their useful life, but also reduce the erosion of available antibiotic resources for both animal and human use.

## So what is the solution?

The solution can be found in a holistic approach including a balance between stringent hygiene practises and moderate vaccination/medication. The value of hygiene is often underestimated with current industry practices.

Currently, disinfection in the poultry industry is the least understood and least studied aspect of animal health. The majority of the industry does not pay enough attention to the hygiene part of this holistic formula, and have further compounded the problem by trying to correct the resulting imbalance with vaccines and medication.

By re-focusing on hygiene, and especially disinfection, the poultry industry can re-establish a balance between the external (disinfection) and internal (vaccination) defence strategies needed to produce consistently healthy birds. To reduce the disease challenge in the environment inhabited by the birds, all viruses, bacteria and fungi levels must be minimised. These pathogens are found on all the surfaces of poultry houses and can be difficult to kill if not treated with the correct disinfectant. Until now no disinfectant could accomplish this task effectively. With the introduction of Virukill's technology this has changed. No other disinfectant can match Virukill's effectiveness in disinfecting surfaces such as floors, walls, roofs and equipment. The difference in efficacy between Virukill and other disinfectants is significant. Virukill empowers the poultry industry to achieve a superior level of hygiene.

## What is Virukill?

Virukill represents a revolutionary approach to animal hygiene that has advanced the art of disinfection into a new era. Scientists at ICA Laboratories have developed and patented Virukill with two simple objectives.

### Virukill Properties

- Contains a novel and patented quaternary ammonium compound synthesis.
  - Excellent biodegradability and hence low environmental impact.
  - Truly non-corrosive and does not oxidise.
  - Non-toxic at recommended rates.
- The concentrate has a very low toxicity, LD<sub>50</sub> >4000mg/kg, less than table salt.
  - High surfactant content with excellent wetting and penetrating abilities.
- Highly active in the presence of organic matter, including hard water and heavy soiling.
  - Not pH-dependant and works at a wide range of temperatures.

## What is so special about Virukill?

Virukill is a unique product. Many existing disinfectants claim to have some of Virukill's impressive properties, none of them can match Virukill's breakthrough technology. Here are a few reasons:

- Glutaraldehyde causes rhinitis, conjunctivitis, dermatitis and asthma.....Virukill does not.
- Glutaraldehyde loses its efficacy at low temperatures and low pH levels.... Virukill does not.
- Glutaraldehyde is inactivated by ammonia and proteins and are environmental hazards...Virukill is not.
- Quaternary ammonium compounds do not effectively inactivate non-enveloped viruses...Virukill does.
- Quaternary ammonium compounds have little sporecidal efficacy ...Virukill does.
- Potassium Peroxymonosulfate compounds are sensitive to high temperature because they oxidise, and they cause corrosion to equipment...Virukill does not.
- Potassium Peroxymonosulfate compounds need high concentration levels (1000ppm) to effectively work in animals drinking water ...Virukill does not.
- Phenolic compounds cannot be sprayed directly onto animals...Virukill can.
- Most disinfectants marketed world-wide are not fully tested...Virukill is, and its R&D budget constitutes one of its

## How effective is Virukill in killing poultry pathogens?

Virukill is active against all groups of pathogens (viruses, bacteria, fungi and mycoplasma family groups) at various concentrations. It even works against algae.

Objective and internationally respected institutes and researchers have extensively tested Virukill. These include:

- The South African Bureau of Standards (SABS)
- The Department of Tropical Diseases at the University of Pretoria (Onderstepoort)
- The Department of Poultry Diseases at the University of Pretoria (Onderstepoort)
- Agricultural Research Council (ARC), Irene
- University of the Free State.

All tests were certified and conducted using internationally accepted codes of good laboratory practice (GLP). In summary, most bacteria and fungi were tested using a 1% (1:100) or 0,5% (1:200) Virukill dilution ratio with 10 minutes exposure time and organic loads of 1% skim milk plus 300 ppm water hardness. Skim milk was used because it has a strong inhibitory influence on chemical compounds and is ideal, when combined with hard water, for simulating field conditions.

Most viruses were tested using 1% (1:100) Virukill dilution ratio with 20 minutes exposure time and organic loads of 1% skim milk plus 300 ppm water hardness. A minimum 4 log reduction in pathogen population was needed for the dilution ratio to be qualified as effective.

VIRUKILL IS EFFECTIVE AGAINST POULTRY VIRUSES, BACTERIA, FUNGI AND MYCOPLASMA FAMILY GROUPS				
VIRUSES EXAMPLES		EXAMPLES OF BACTERIA		FUNGI, YEAST AND MYCOPLASMA EXAMPLES
FAMILY GROUP	PATHOGEN EXAMPLE			
Birnaviridae	Gumboro (IBD)	<i>Acinetobacter anitratus</i>	<i>Ornithobacterium rhinotracheale</i>	
		<i>Bacillus subtilis</i> spores	<i>Pasteurella multocida</i>	
Caliciviridae	Feline calicivirus	<i>Bacillus subtilis</i> vegetative	<i>Pasteurella volantium</i>	<i>Aspergillus niger</i>
Coronaviridae	Infectious bronchitis	<i>Bordatella</i> spp.	<i>Proteus vulgaris</i>	<i>Candida albicans</i>
Herpesviridae	Infectious Lyringotracheitis	<i>Clostridium</i> spp.	<i>Pseudomonas aeruginosa</i>	<i>Mycoplasma</i> spp.
	Marek's Disease	<i>Corynebacterium</i> spp.	<i>Salmonella typhimurium</i>	<i>Penicillium brevicompactum</i>
Orthomyxoviridae	Avian influenza	<i>Escherichia coli</i>	<i>Shigella sonnei</i>	<i>Saccharomyces carlsbergensis</i>
Paramyxoviridae	Newcastle Disease	<i>Haemophilus</i>	<i>Staphylococcus aureus</i>	<i>Trichophyton mentagrophytes</i>
Parvovirus*	Canine parvovirus	<i>paragallinarum</i>	<i>Streptococcus faecium</i>	
Poxviridae	Avian pox	<i>Klebsiella pneumoniae</i>	<i>Vibrio</i> spp.	
Togaviridae	Equine viral arteritis	<i>Lactobacillus fermentum</i>		

\*Needs 2% (1:50) VIRUKILL for full disinfection

## How do I apply the Virukill program?

The VIRUKILL program is divided into 4 broad categories of applications.

- 1 Washing at : 1:500 dilution
- 2 Disinfection at : 1:100 dilution
- 3 Spraying or fogging at : 1:100 dilution
- 4 Water dosing at : 1:10 000 dilution



## Why should you be using Virukill?

Good hygiene sets the foundation for success, but the problem on farm, is how to implement these principles practically. In summary, animal hygiene centres on three main principles:

- 1) Eradication of pathogens in the animal quarters before animal occupation.
- 2) Exclusion of pathogens once the animals occupy their quarters.
- 3) Suppression of the pathogens which evade the attempts to eradicate and exclude.

With strict adherence to these three basic principles, farmers are better able to manage their risk. To date, no single product on the market has catered for the complete implementation of these hygiene principles in a practical way. But that is all about to change. After much innovation and thorough research, scientists at ICA Laboratories have created Virukill. This product will, for the first time ever, empower the farmer to put the holistic theory of hygiene into practice and improve their risk management in a cost effective and practical way.

## Can Virukill be used for washing surfaces?

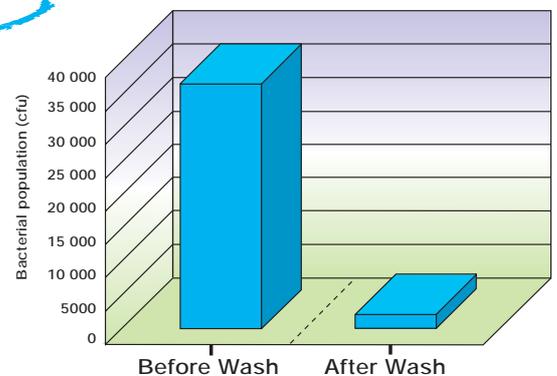
"...washing with Virukill reduced pathogen loads by well over 90%..."

The main purpose of washing houses before disinfection is to remove organic material. This is a critical step in good clear out. However, if you wash with soap and water, this creates two problems. Firstly many of the soap washes are detrimental to the performance of the final disinfection if the soap is not FULLY rinsed off before disinfection, as they will neutralise the subsequent disinfection. Secondly, surfaces such as walls and floors are usually contaminated with pathogens before washing. Soap washes will remove some of these pathogens but will not kill them. These pathogens often get splash dispersed and run off into inaccessible places providing a source of pathogens to initiate disease later.

### What is your solution?

Due to Virukill's unique surfactant, penetrative and detergent abilities, it has the most outstanding ability to wash walls, floors and other surfaces. Unlike other standard detergents used for surface washing before final disinfection, the Virukill wash at a 1:500 dilution is able to reduce the bacterial load on these surfaces by as much as 90% or more, and that is BEFORE you even start the final disinfection stage. Using Virukill to do your washing, takes care of these potential hazards.

Effect of Virukill wash at 1:500



## How effective is Virukill as a disinfectant of surfaces?

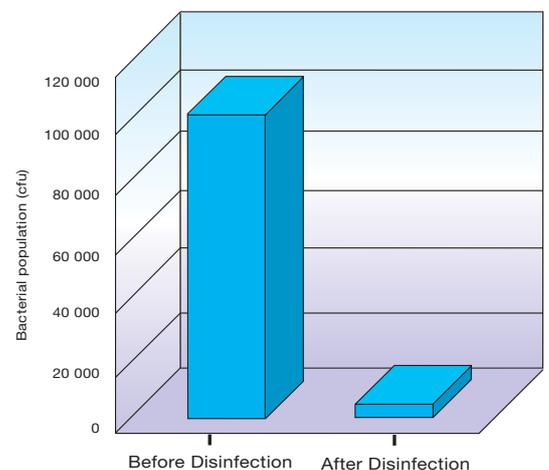
"...disinfection with Virukill decreased bacteria by over 98%..."

Numerous tests have been conducted on surfaces such as walls, floors and equipment. Washing and disinfecting with Virukill has been proven to significantly decrease pathogen counts. In various independent tests conducted by the Agriculture Research Council (Irene) and the University of Pretoria, the Virukill disinfection programs of floors and walls were found to be far more effective than the popular 2% glutaraldehyde disinfection programs.

In a fully controlled and standardised test, researchers compared the efficacy of Virukill against other disinfectants, such as potassium peroxydisulfate. The data showed Virukill to be over 100% more effective in disinfecting the same surfaces. In all the tests, Virukill was so effective that it decreased the pathogen loads on the wall and floor surfaces by over 98%.

Virukill is a simple to use, economical and effective surface disinfectant that has no unpleasant smells, no complicated dilutions and is non-corrosive.

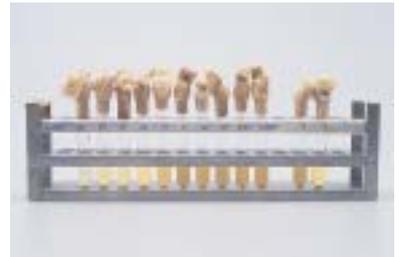
VIRUKILL 1:100 (1%) floor disinfection



# How different is Virukill to all other QAC's?

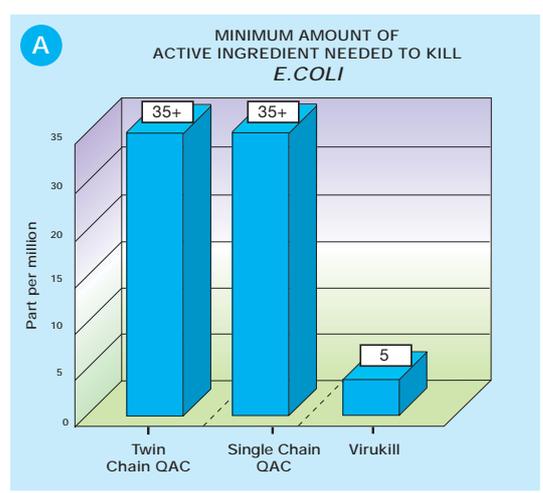
Virukill utilises unique and patented technology. Unlike other QAC's, Virukill demonstrates superior ability to kill micro-organisms under field conditions.

Minimum Inhibition Concentration (MIC) tests were conducted to compare Virukill's effectiveness against other QAC formulations. MIC tests are conducted using increasing dilutions of the test material that is then spiked with a bacterial cocktail. After incubation those that turn cloudy have bacterial growth and the lowest concentration that stays clear is deemed to be the Minimum Inhibition Concentration (MIC). MIC tests are particularly useful in comparing the potency of the actual chemistry of various compounds since the effect of all other factors (time, etc...) are minimised. In these trials, over 1 million bacteria cells were exposed to the various QAC compounds for 18 hours to test for the lowest required concentration of each compound needed to completely eradicate the bacteria.

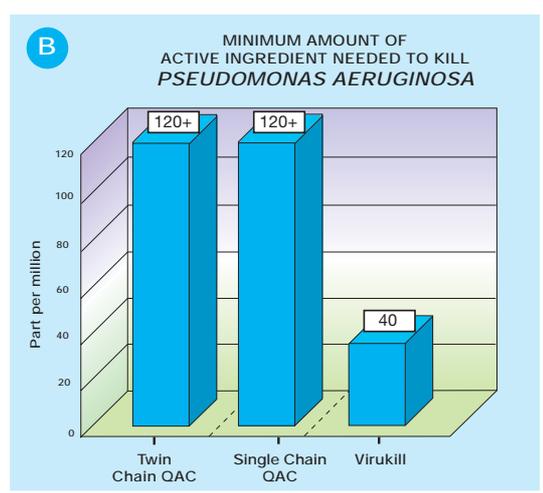


Virukill substantially outperformed all other QAC's (and combinations thereof... see graph A, B, C & D).

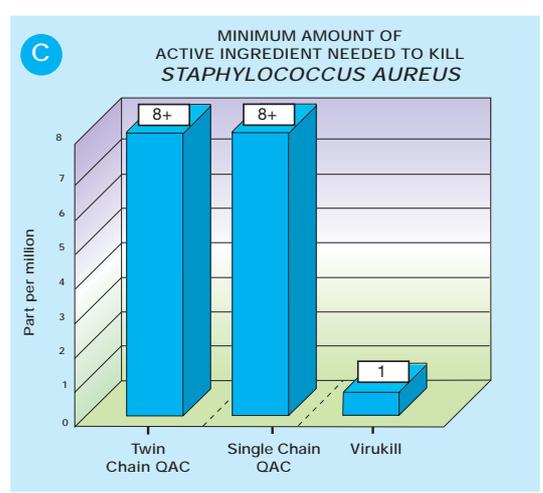
Many other comparison tests and trials have clearly illustrated Virukill's superior anti-microbial chemistry when compared to existing generic QAC chemistry.



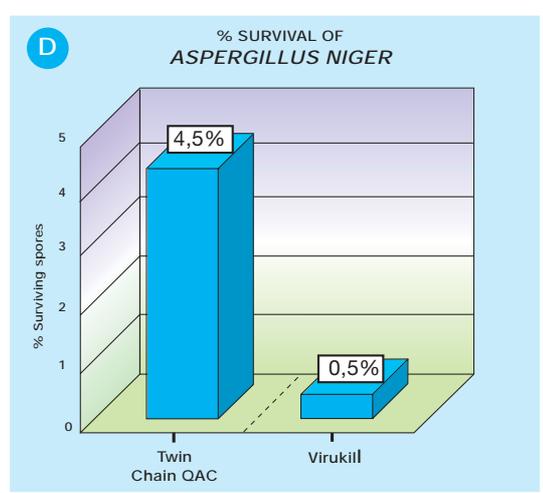
Over 7 x more effective



Over 3 x more effective



Over 8 x more effective



Over 9 x more effective

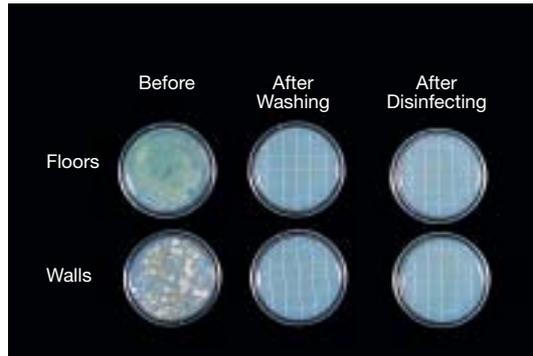


## How can you measure the efficacy of disinfection?

Poultry houses are primarily disinfected to kill viruses, but also kill bacteria and fungi. Bacteria can be used as an indicator of viral load, and are an effective measure of disinfectant efficacy. This has been widely used in science and there are many well documented examples of this. In principle, if you reduce the bacterial load in a house by 90%, you can assume, that you have done the same in reducing the virus load.

The only way you can determine the reduction of the bacterial load is to take a reading of the bacterial load **before** disinfection and compare it to your reading **after** disinfection. The difference in the reading, is also a measure of the % reduction of viruses. It is important to note that the standardisation of the timing of the swabbing after disinfection is important if consistency is to be attained (usually 1 hour after application or longer if surfaces are not yet dry).

The minimum acceptable percentage decrease in virus load is 95%, with 99.9% being the ideal goal. Any less would be an unacceptable compromise of your hygiene standards.

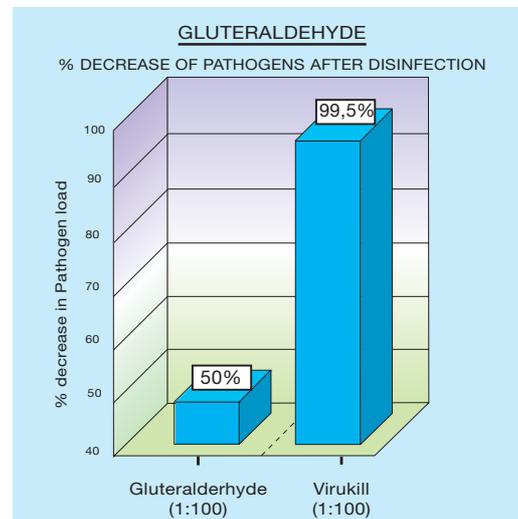
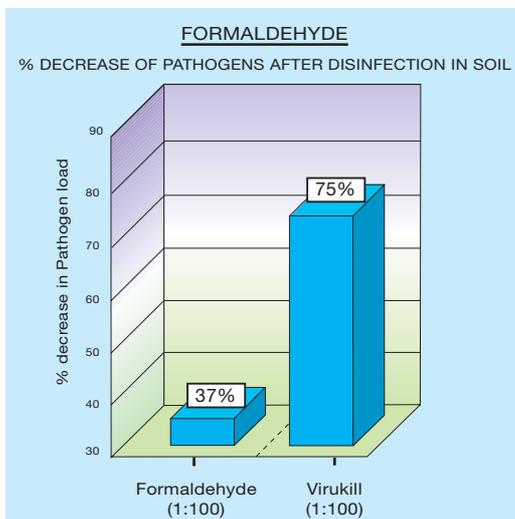


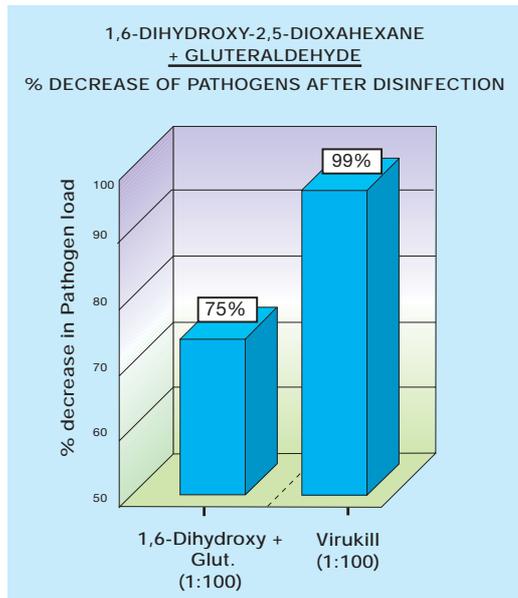
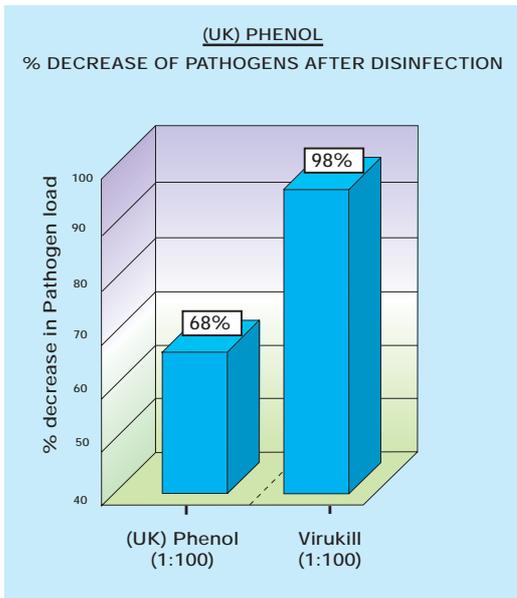
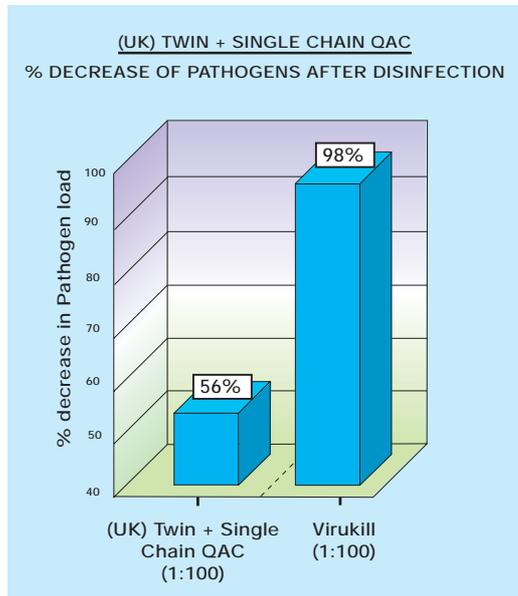
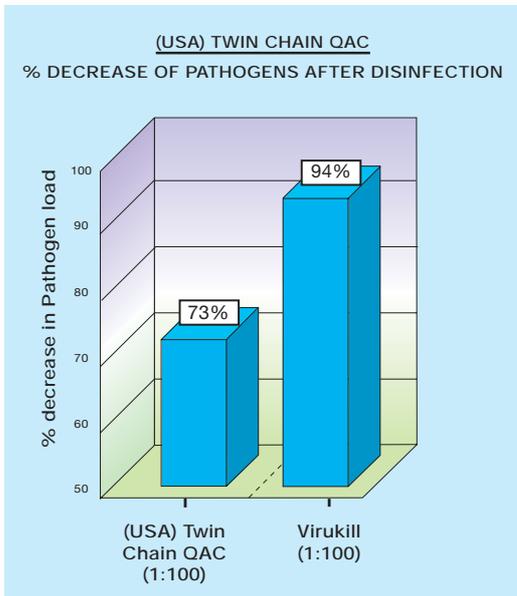
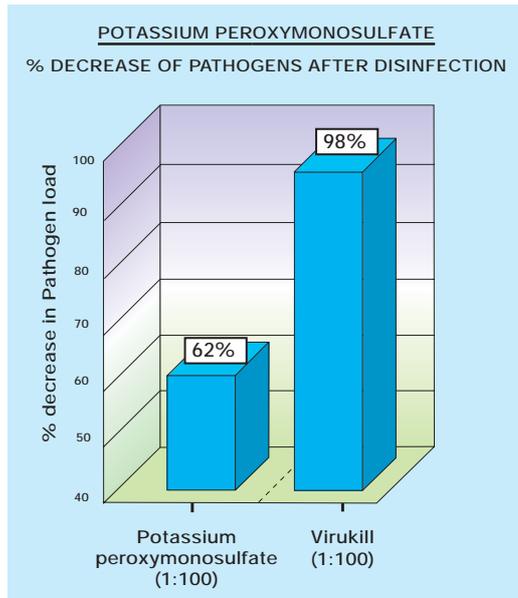
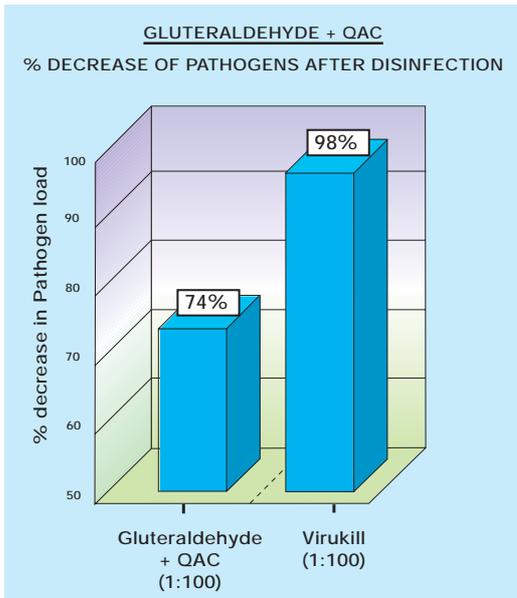
## How does Virukill compare to other disinfectants?

Disinfectants make up one of the smallest contributing costs to the production of chickens...and yet, disinfectants are one of the major contributors to lowering the overall risk profile of a flock. The total cost of disinfection is less than 0.2% of the value of the flock, yet bad disinfection resulting from bad application and inferior disinfectants, is the major contributor (over 50%) to the overall disease risk profile of poultry. In addition to this the labour component of the disinfection process makes up over 2/3 of the total disinfection costs, and the disinfectant only makes up less than 1/3 of the overall cost of disinfection.

The main aim of disinfection is to kill viruses. Many millions of viruses can be found on floors and walls of poultry houses. A 10% improvement in the disinfection process could mean a further reduction of millions of viruses! Therefore, every extra percentage decrease in virus load that can be achieved before the re-stocking of poultry houses, is a major contributing factor towards better protection.

The following results serve to illustrate the potency of Virukill when compared to the other common disinfectants. All of these trials were conducted independently by farmers, veterinarians and university staff. In all of the trials, including those not presented in this pamphlet, with no exceptions, Virukill substantially outperformed all other disinfectants (each graph represents a graphic summary of each separate trial).





## How does Virukill compare to other popular disinfectants?

In our own comparison trials, Virukill proved to be superior to all other disinfectants tested. To confirm this, we asked the Department of Poultry Diseases at the University of Pretoria to conduct a comparison trial that would be fully standardised, thoroughly monitored and comprehensively examined to determine the most effective disinfectant of surfaces. Walls and floors of a chicken house were inoculated with *Staphylococcus* sp, *E.coli* and *Pseudomonas* sp. The following day, the four different pens were disinfected as follows:

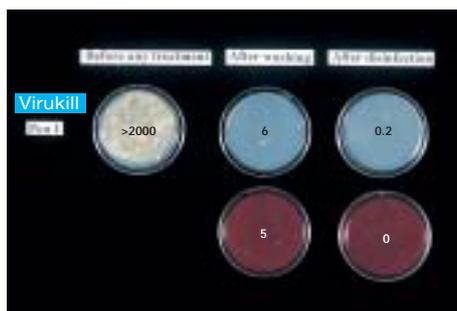
	PEN 1 VIRUKILL (Label Rates)	PEN 2 Soap + Gluteraldehyde	PEN 3 Potassium peroxymonosulfate
Wash	1:500 VIRUKILL dilution, applied at 1000 ml/m <sup>2</sup>	Use standard liquid soap, applied at 1000 ml/m <sup>2</sup>	1:200 dilution, applied at 1000 ml/m <sup>2</sup> (Triple label volume)
Rinse	1:10 000 VIRUKILL dilution, applied at 1000ml/m <sup>2</sup>	Water	Water
Disinfect	1:100 VIRUKILL dilution, applied at 300 ml/m <sup>2</sup>	1:50 Gluteraldehyde, applied at 300 ml/m <sup>2</sup>	1:100 dilution, applied at 300 ml/m <sup>2</sup> (Double label rate)

Data was collected before the wash, after the wash and after the disinfection using 3 different methods; 5 contact plates containing nutrient agar and 5 contact plates containing MacConkey agar were applied at random on the surfaces of the floors and walls of each pen. The surfaces of the contact plates (25 cm<sup>2</sup>) were incubated overnight and the colonies counted. To further supplement the data, sterile swabs were also taken off the walls and floors of each pen.

On both the walls and the floors, the VIRUKILL disinfection was far superior to the others.

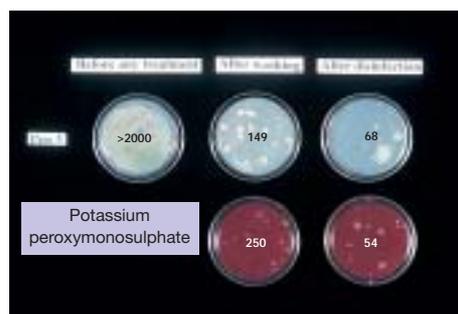
### EFFICACY OF EACH DISINFECTANT PROGRAM FROM START TO FINISH

Virukill dramatically reduced bacteria from >2000 to 0.2!

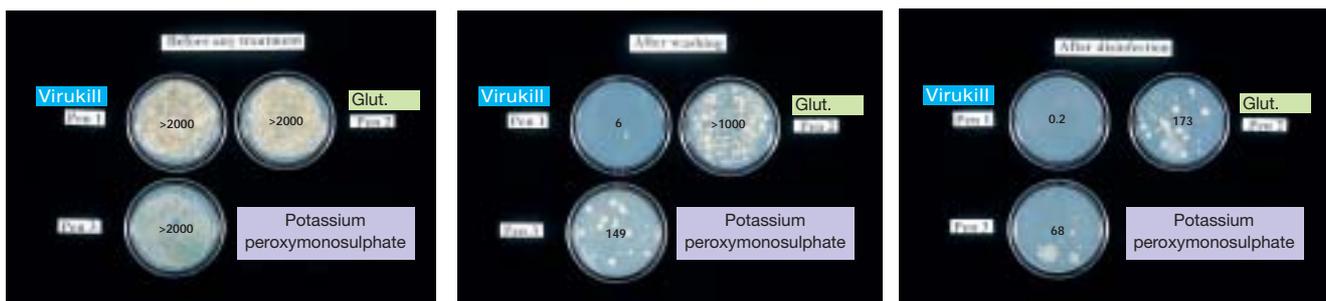


The Gluteraldehyde only reduced bacteria from >2000 to 173 or 64

The potassium peroxymonosulfate product only reduced bacteria from >2000 to 68 or 54



COMPARISONS (average) OF EFFICACIES BETWEEN THE DIFFERENT DISINFECTANTS AT EACH TREATMENT STAGE



All 3 pens started at similar high bacteria counts

After washing Virukill was more than 70 times better!

After disinfection Virukill was more than 70 times better!

**Average bacteria colonies found on the floor of each pen tested with Virukill, Gluteraldehyde and Potassium peroxy-monosulphate using 3 different methods of evaluation.**

	Nutrient agar contact plates			MacConkey agar contact plates			Sterile Swabs collection (OD*)		
	Start	After wash	After disinfection	Start	After wash	After disinfection	Start	After wash	After disinfection
Virukill	>2000	6	0.2	>2000	5	0	0.407	0.046	0.006
Glut.	>2000	>1000	173	>2000	>1000	64	0.355	0.153	0.043
Potassium peroxy-monosulphate	>2000	149	68	>2000	250	54	0.477	0.107	0.011

\*OD - Optical Density

"...in all testing methods and at all stages, Virukill disinfections were over 100% more effective ..."

**✓ How safe is Virukill compared to commonly used disinfectants?**

Glutaraldehyde and formaldehyde have been the target of several local and overseas OH&S reviews in the last few years. This has mostly been due to their hazardous toxicity profile and numerous reports of workers having adverse side effects when working with these compounds.

The most significant concerns were that formaldehyde is now considered by the Australian NOHSC to be in carcinogen category 2. This means it is a probable human carcinogen (cancer causing) for which there is sufficient evidence to provide a strong presumption that human exposure might result in the development of cancer, especially respiratory cancers. Formaldehyde has been shown to enter the body primarily through inhalation and causes irritation of the eyes and respiratory tract. It also causes skin irritation and even dermatitis. Formaldehyde enhances sensitisation to inhaled allergens, which is thought to be the cause of formaldehyde-induced asthma. Use of formaldehyde in indoor locations such as poultry houses magnifies this risk.

People that are exposed to glutaraldehyde may become sensitised to it and get a skin rash, inflammation or asthmatic condition, and in some individuals this reaction can be extremely severe. Glutaraldehyde can be absorbed through the skin and via inhalation. Symptoms of exposure are headache, nausea, eczema, hand-rashes, eye irritation and light-headedness, with reports of palpitations and tachycardia in Western Australia. Significant increases in nose and throat related problems have been noted in workers handling glutaraldehyde. Although glutaraldehyde has not been classified as a carcinogen, recent studies have indicated that it is mutagenic in bacterial assays and mammalian cells.

With increasing consideration for worker safety and duty of care, Virukill offers an effective alternative to glutaraldehyde and formaldehyde.

A simple measure of toxicity is the oral LD<sub>50</sub> - this is a measure of the dose required to kill 50% of a population of laboratory animals. Formaldehyde and glutaraldehyde are over 5 and 22 times more toxic than Virukill respectively.

## How can you get the most from your Virukill?

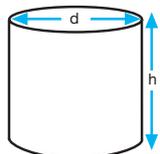
There are three principles that are important to the overall efficacy of the Virukill disinfection program. In summary these are:

- 1) The efficacy of Virukill is as much a function of TIME as it is of CONCENTRATION - the longer the Virukill solution stays wet on the surface that you are disinfecting, the more pathogens will be killed. Therefore it is important to ensure that conditions which promote evaporation are minimised. This can be achieved by increasing the humidity, lowering air movement and applying during the cooler times of the day.
- 2) Although Virukill is very tolerant to organic matter (soil, dirt, etc...), it is best to remove these inhibiting factors with a Virukill surface wash, before applying the final disinfection program.
- 3) Always complete a wash or disinfection of a house in the same session. Going back a few hours or days later will risk moving pathogens from the "dirty" area to the "clean" area. To get the best results start your wash and disinfection from the upwind end of the house. In that way, airborne pathogens are constantly being blown away from your "clean" area.

The main aim of a disinfection program, is to keep the overall pathogen load (viruses, bacteria, fungi and Mycoplasma) as low as possible, for as long as possible. Under ideal conditions, bacteria can multiply themselves every 30 minutes, which means that in 24 hours a single cell could produce 281 474 976 710 656 offspring!! The Virukill program centres on drastically reducing the pathogen load with the Wash and Disinfection applications. A double-barrelled approach.

## How can I calculate how much Virukill to add to my tank?

Cylindrical Tanks:

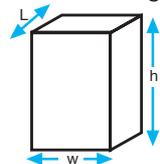


1. Measure the diameter and height of tank
2. Insert figures into following equation

$$(2 \times 3.14 \times \text{diameter}) \times \text{Height} = \text{Volume in m}^3$$

3. Multiply the Volume by 1000 to give an answer in litres

Square or Rectangular Tanks:



1. Measure the height, length and width of the tank
2. Insert measurements into formula

$$\text{Height} \times \text{Width} \times \text{Length} = \text{Volume in m}^3$$

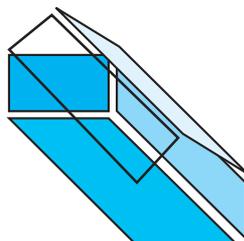
3. Multiply the volume by 1000 to give answer in litres

This guide will give you a rough volume of a tank, for more accurate information contact the supplier.

## How do I work out the dilution rates for Virukill ?

Ratio	PPM Virukill	% Virukill	ml Virukill/100L	Use
1:10 000	100	0.01	10	Rinse
1:500	2000	0.2	200	Wash
1:100	10 000	1	1000	Disinfect
1:50	20 000	2	2000	Foot-dips

## How can I calculate the surface area of my poultry house?



- End
- Floor
- Wall
- Roof

Area (m<sup>2</sup>) = Length (m) x width (m)

Area of poultry house = (1x floor) + (2 x wall) + (2 x end) + (2 x 1/2 roof\*)

\*Roof - assuming standard pitched roof

## Why should I continuously dose my drinking water?

"...Virukill is so safe it can be given to day-old chicks ..."

What is the point of disinfecting all surfaces and equipment if you do not bother disinfecting the drinking water of the animals? Water goes everywhere and is the perfect conduit for pathogens often going undetected by unsuspecting farmers. Often, the animals' drinking system becomes the loop-hole in the farmers bio-security plans. Water pipes rapidly accumulate algae and pathogens in their inner tubing. These pathogens reproduce and slowly re-release themselves into the drinking water. Furthermore, if animals share water sources, one diseased animal can contaminate all the others via the drinking water, turning a manageable problem into an epidemic.

Dosing with **Virukill** completely takes care of these problems, and is economical and totally non-toxic and safe. **Virukill** is so safe that it can be given to day-old chicks, and yet it is so potent that at dosing levels as low as 20 millilitres of **Virukill** per 1000 litres of water (1:50000), it controls 1000 virus particles per millilitre of water after 24 hour exposure!!

In an extensive trial conducted at the University of Pretoria, chickens were challenged on three occasions with a virulent Newcastle Disease (NCD) virus via the drinking water. All the chicken groups drinking from water treated with **Virukill** showed *no symptoms* at all and showed no increase in their NCD antibody titres for the *full duration* of their life span. Many of the chicken groups drinking from the untreated water died, and those who survived showed high obvious NCD symptoms and very high NCD antibody titres. The scientists involved in this trial were so impressed that they concluded in their report, "...It is significant that none of the challenged chickens receiving **Virukill** in their drinking water showed any signs of NCD after three challenges with virulent NCD virus."

They then went on to add, "...**Virukill** will have similar effects on the control of other upper respiratory tract pathogens...". In another extensive trial, animal drinking water treated with 100 parts per million of **Virukill** (1:10000), showed a remarkable 84% reduction in pathogen load over the full 6 week growth period when compared to the untreated water.

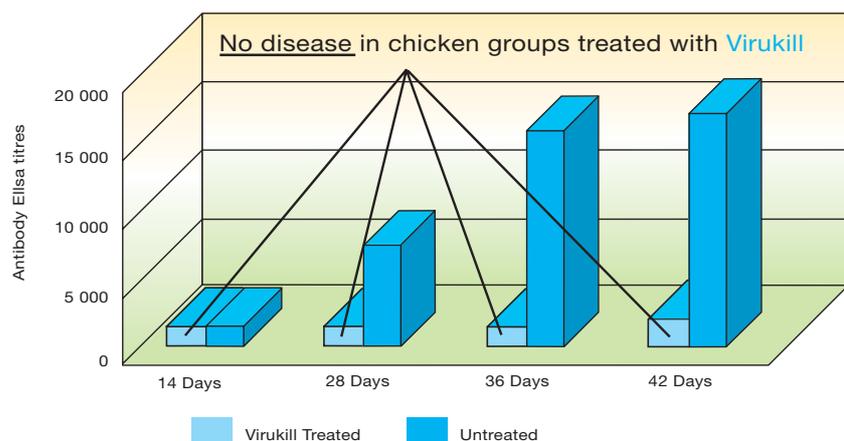
Clearly, all animals should have their drinking water constantly dosed with **Virukill**...it is affordable and it is the cheapest insurance policy a farmer can ever purchase.

"...many of the chickens drinking from the untreated water died ..."

### SOME OF THE OTHER DISEASES YOU CAN CONTROL

- ▼ Gumboro
- ▼ Infectious bronchitis
- ▼ Avian influenza (ostriches)
- ▼ Infectious coryza
- ▼ E. coli
- ▼ Salmonella

### Newcastle Disease Elisa titres



"...Virukill will also dramatically reduce clogging problems in your water system caused by algae ..."

## Why should I regularly fog my chickens with Virukill?

Independent trials have conclusively shown the economical advantages of regularly fogging or spraying animals with **Virukill**.

For example, both layer chickens and broiler chickens show clear benefits from 3-5 **Virukill** fog/sprays a week. These benefits extend to one or more of the important parameters of animal growth:

- Lower mortality rates
- Better feed conversions
- Better weight
- Less risk of epidemic outbreak
- Better productivity
- Better containment of disease outbreak
- Less and more effective use of antibiotics
- Quicker turn-around time in houses
- Better quality of slaughtered meat

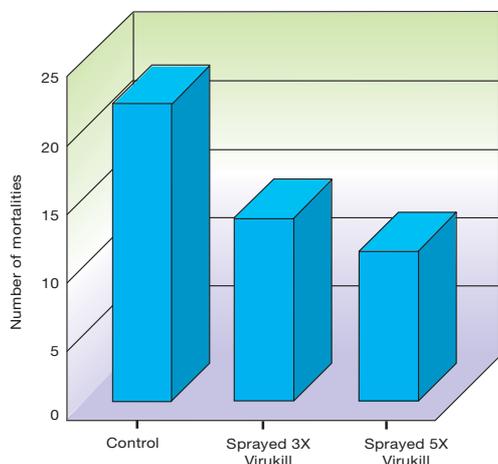
Veterinary scientist world-wide have always maintained that proper ongoing hygiene programs decreased pathogen loads and consequently decreased animal stress levels...and animals growing with less stress are inherently going to be more productive. **Virukill** makes all this theory possible, practical and economically viable. For example, in an extensive and independent trial conducted at the University of Pretoria, Department of Poultry Diseases (Onderstepoort), different groups of broiler were directly fogged 3 or 5 times a week over their full live cycle.

The mortalities were then divided into 2 categories after the post-mortems; Disease-causing death or Non-Disease causing death. A final overall percentage mortality of 14,5% was recorded for the control pen. This pen was not fogged with **Virukill** during the full growth cycle. In the pens that were fogged with **Virukill**, either 3 or 5 times per week, overall mortalities were found to be 30% less for both treatments...and these dramatic results occurred during a growth cycle where there was no major disease outbreaks !! The researchers concluded, "...if these results are achieved in a full scale house containing 30000 chickens, the use of 1% **Virukill** fogged onto the chickens could result in 1200 fewer mortalities during the growth cycle." What is even more impressive, is that when the mortalities were divided into Disease-causing deaths vs Non-Disease-causing deaths (such as flip-overs), the groups not fogged with **Virukill** showed 64% more mortalities due to disease-causing agents.

The benefits of regularly fogging or spraying your animals with **Virukill** are obvious and economical...try it and see for yourself.

"...groups not fogged with virukill had 64% more mortalities caused by diseases..."

Mortalities caused by diseases



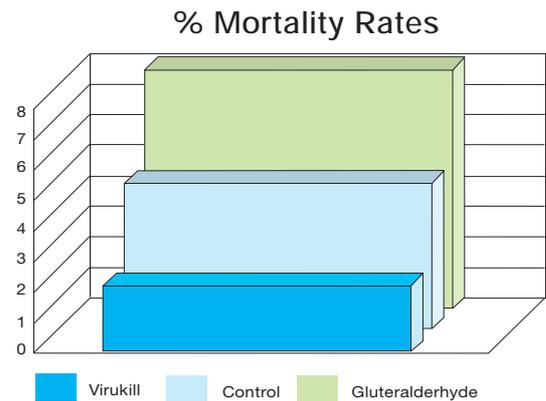
## How effective is the Total Virukill program and does it pay?

Yes; Washing surfaces, disinfecting surfaces, constantly dosing drinking water and fogging/spraying animals regularly with Virukill makes a lot of sense. Many of our trials and experiences show clear economic and risk management benefits. To illustrate the point, a trial conducted with the Agricultural Research Council at Irene, compared the Virukill program on chicken broilers against:

- 1) A Control group with no disinfection.
- 2) A Group treated with a popular 2% Gluteraldehyde. Here are some of the results of the trial which represent the general trends:

TREATMENT	FEED CONVERSION	DISEASE MORTALITY
Gluteraldehyde	2,18	8%
VIRUKILL	1,92	2.3%
Control	2,01	5%

....and in this trial, only 0,27 Litres more VIRUKILL was used than Gluteraldehyde !! If one extrapolates this to a full production house of 30000 chickens, only 9 litres more of Virukill would have be used...and these 9 litres could be paid for with a saving of less than 100 mortalities or a 0,01% improvement in the feed conversion ratio.



If the trends from this trial were extrapolated to a scenario where a full production house of 30000 chickens had been used, there would be:

A total feed saving of.....

**OVER 2 TONS !!**

A mortality decrease of....

**OVER 1000 BIRDS !!**

" ...the overall pathogen load was 60% less in the Virukill treatments..."

## Will Virukill effect the vaccines that I use on my animals?

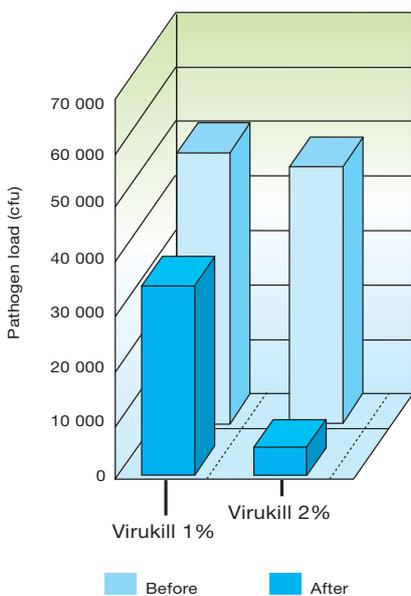
Concern that certain disinfectants (sprayed directly onto animals) could cause a residual accumulation which could in turn adversely effect the functionability of vaccines, was taken seriously by ICA Laboratories. We commissioned the University of Pretoria to do thorough and extensive tests on the application of Virukill on both Broilers and Layers to investigate any possible negative effects the product may have on a range of vaccines and antibody titres. These tests conclusively showed that Virukill's unique mode of operation has no negative impact on vaccines or antibody titres. The tests also confirmed the fact that Virukill leaves no residual activity on the animals skin/feathers which could in any way effect vaccines. However, as a precautionary measure, strick guidelines have been laid down to cover all eventualities. In summary, all Virukill spraying, fogging and water dosing must be stopped 24 hours before applications of vaccines and only re-commenced 24 hours after the vaccine has been applied.

# Can Virukill help disinfect chickens internally?

Our initial trials show very promising results. At the University of Pretoria, Department of Poultry Diseases (Onderstepoort), chickens were fogged daily with a fine mist of 2-4 millilitres per chicken of a 1% or 2% or 4% dilution of Virukill. These chickens were then swabbed deep inside their lower throats each day to measure pathogen population counts. Results showed a dramatic reduction in pathogens, over the full trial period. At a 2% Virukill dilution rate, a 70% pathogen reduction was achieved in the inside of the throat over the full trial period !! What was even more surprising was the fact that the 4% Virukill application (which was 4 times the recommend application dose of Virukill) had no adverse effect on the chickens. To confirm these clinical results, the researches removed the trachea of the chickens and examined them under an Electron Microscope. The photographs clearly show no damage to the mucous membrane even at the 4% Virukill dilution. Further more the Electron Microscope provided more evidence of lower pathogen counts inside the throat.

" ...Virukill gave a 70% reduction in the pathogen load inside the throat..."

The researches commented in their report, "...when using the Electron Microscope on these samples, it could be seen that the numbers of bacteria were lower on the treated chickens than in the untreated chickens". The upper respiratory tract and the lower throat play host to some of the most dangerous pathogens in animals. The ability to sanitize this area by fogging Virukill onto your animals, has obvious advantages and implications....and adds another bonus to implementing the Virukill program.



THROAT pathogen count Before and After



Surface of back of the tongue x 1000 magnification. Large number of red shaped bacteria can be seen. The large oval shaped object (at bottom) is a red blood cell.



Cilia inside of trachea x 500 magnification. After 4% Virukill application the cilia is undamaged.



Surface of the larynx x 2000 magnification. A large number of rod-shaped bacteria are seen. The large, flat round objects (at bottom) are red blood cells from blood that slipped onto the larynx during post mortem.



Surface of the larynx x 2000 magnification. No bacteria can be seen except for one or two cilli shaped bacteria.



## How does the Virukill program affect animal productivity?

Tests done on chicken layers treated with the Virukill program revealed some interesting results. Usually, benefits from spraying layers, manifest themselves in lower mortalities, or better feed conversion ratios, or better control of disease outbreaks... but all of our latest trials reveal a whole new phenomenon....namely, higher egg productions. Under no circumstances, at this stage, are we claiming improved egg production in chicken layers due to regular (3 times a week) spraying with a 1% Virukill solution. What we are claiming however, is that chickens sprayed between 3 to 5 times a week (with a 1% Virukill dilution) conclusively benefit from lower pathogen loads and reduced stress levels, resulting in important positive rewards for the farmers. We believe that even one spray a week, although not ideal, will show clear benefits to animals.

In a fully controlled experiment at the University of Pretoria, Department of Poultry Diseases (Onderstepoort), researchers set out to test whether spraying 18 week old chicken layers with a 1% Virukill concentration, had any negative effects on the layers and their egg production. The results clearly showed that, as expected, there were no adverse effects on the layers. The data however surprisingly showed an increase in egg productions on all the groups sprayed with Virukill, when compared to the control groups. The report concluded, "...it was noted that consistently higher numbers of eggs were obtained from the chickens sprayed with Virukill." These differences could only be attributed to the Virukill spraying, since all the other factors such as housing, water, light, feed and the housing facilities, were standardised and controlled. Here are some of the results:

Results of Layer egg production over a 21 day period.				
	3x VIRUKILL per week	3x WATER per week	5x VIRUKILL per week	5x WATER per week
Date of first egg	18/11	18/11	19/11	18/11
Total number of eggs	333	234	346	289
Avg no of eggs/ per chicken/ per day.	0.396	0.279	0.412	0.289
Highest production % per day	65	50	83	63

"...spraying with Virukill enhanced egg production ..."

Are you concerned that the 1% Virukill solution could slow down the decomposition rate of the animals excrement?

We tested this at a full 1% Virukill drench and are pleased to report that Virukill will in no way effect the decomposition rate of animal excrement

These results were unexpected, so 3 months later a more comprehensive test was repeated with all parameters carefully controlled, monitored and standardised. The chicken layers were divided randomly into unsprayed control groups and groups sprayed with a 15-20 millilitres solution of 1% Virukill per chicken. The trial was conducted over a full 7 week period. The report concluded, "...spraying of layers with 1% dilution of Virukill enhanced egg production. This enhanced egg production could not be attributed to the effects of environmental conditions such as availability of light, feed or drinking water." The data generated from this repeat-test once again showed clear trends towards increases in egg production as a result of the application of the Virukill spray program.

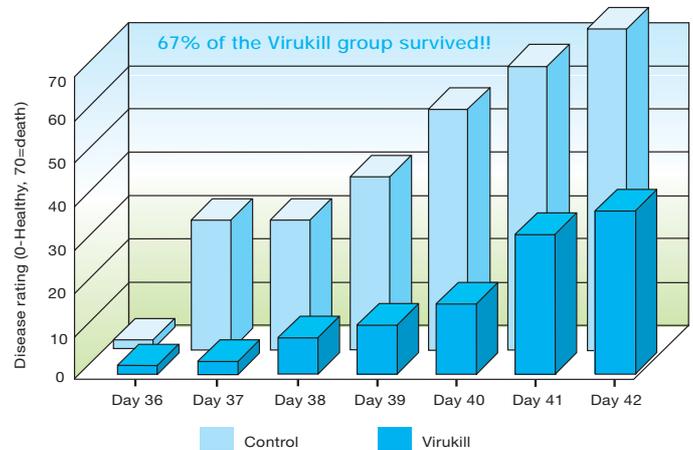
In the Western Cape, a commercial trial on 60 000 chicken layers showed a 26% decrease in mortalities in the 30 000 layers treated with Virukill, compared to the controlled group, within 11 weeks of application.

26% LESS mortalities with Virukill treatment

## How can Virukill help me fight a disease outbreak?

Our comprehensive and controlled trials have conclusively shown that constantly dosing the animals drinking water and regular fogging/spraying of animals each week with **Virukill**, gives the farmer that added protection 24 hours a day. The **Virukill** program is particularly effective at times when there is a build-up in disease pressures. Sometimes however, the disease pressure is so high, that despite all the preventative measures and vaccines, a farmer still experiences a disease outbreak amongst his animals. It is during this very stressful situation (for both farmer and animal) that **Virukill's** unique properties could once again help. This **Virukill** application is coined as "The Booster Effect". Two preliminary trials were conducted at the University of Pretoria, Department of Poultry Diseases (Onderstepoort), to evaluate the efficacy of the **Virukill** Booster effect, in slowing down the spread of an infectious disease and the subsequent mortality rates. In these trials, surprisingly results showed that the **Virukill** disinfection program can have a dramatic effect on the impact of an epidemic disease outbreak.

### Influence of Virukill over a Virulent Newcastle Epidemic



All of the trials were carried out in the isolator facilities of the Department at different times, and both trials confirmed the same results. For example, in the one trial, two separate groups of 35 days old (non-vaccinated) healthy chickens were tested as follows;

In both groups, 1/3 of the group was infected via the eye drop route with a large dose of virulent Newcastle disease virus ( $10^5$  EID<sub>50</sub>/ml). All the chickens in each group remained in constant contact with the infected chickens throughout the experiment, to simulate field conditions for epidemic outbreaks. Once clinical signs of the Newcastle disease were seen, one of the groups was treated as follows: The dosing of the drinking water was carefully increased from 1:10000 **Virukill** dilution rate, to 1:100 **Virukill** dilution ratio for 48 hours, after which it was immediately reduced back down to a constant 1:10000 dilution ratio. All the chickens in that group were also immediately fogged daily with a very fine 4% **Virukill** solution at a rate of 3-4 ml per chicken. The control group was not sprayed and did not have their water dosed with **Virukill**. The results showed that by the 42nd day, 73% of the chickens in the control group had died, while only 33% had died in the **Virukill** group. However, in the **Virukill** group, all of the chickens which died were the ones who had been directly infected. Incredibly, *all of the other chickens* in the **Virukill** group survived, despite the fact that they had not been vaccinated and were in constant contact with the infected ones....and not only did they survive....they only showed very mild clinical signs of the disease.

The researchers concluded in their reports, "...that although these were only pilot experiments...these findings are highly significant."

If a susceptible flock is infected with a infectious disease in the last 1 or 2 weeks of their life cycle, the farmer could loose most of his production by the day of slaughter. If on the other hand, the farmer increases the intensity of his **Virukill** program at the first clinical signs of the disease, for a limited time period, some of the loses could be reduced. These two trials only serves as an indication of the possible **Virukill** applications which will be fully developed in the future. This program will be investigated more thoroughly so that specific recommendations for these applications can be suggested.





## Constant dosing of drinking water:

- Drinking water can either introduce disease agents into the animals quarters or it can help spread disease agents inside the animals quarters. Make sure your animals drinking water is constantly treated with **Virukill** at a 1:10000 dilution ratio (10 millilitres **Virukill** in 100 litres water).
- **Virukill** can either be constantly dosed into the water systems using a proportional dosing pump, or it can be added proportionately to a header tank each time it is filled up.
- In between each production cycle, the water system (or drinking troughs) should be rinsed out with a 1:500 **Virukill** dilution ratio (200 millilitres **Virukill** in 100 litres water). Allow the **Virukill** dilution to fill up the drinking system (or drinking troughs). Leave for 1 hours, and then allow the solution to drain out through the drinker lines (or pour out of drinking troughs). Then, flush the whole system with the normal constant dosing of 1:10000 **Virukill** dilution ratio (10 millilitres **Virukill** in 100 litres water).

## Washing animal quarters and equipment:

Washing animal quarters can only begin after complete removal of all organic soiling, litter, faeces, residual feed, dust, loose debris, and removable equipment from the animal quarters.

- Proper washing of all surfaces with **Virukill** at a 1:500 dilution ratio (200 millilitres **Virukill** per 100 litres water), is essential to achieve the best results from the subsequent disinfection.
- At a low pressure, apply the above 1:500 **Virukill** dilution at a rate of 1 litres per square metre of surface area. Ensure coverage of all air inlets, fan boxes, partitions, feeders and drinkers. Allow the dilution to soak for 60 minutes.
- With water, flush out all the surfaces with a high pressure washer (6-8 bar). This water should be dosed with a **Virukill** 1:10000 dilution ratio (10 millilitres **Virukill** in 100 litres water) for best effect...you can use the drinking water that is constantly dosed with **Virukill** for this purpose.
- For movable equipment, use a soak tank to wash for best effect.

## Disinfecting surfaces:

- After washing, apply at a low pressure, a 1:100 **Virukill** dilution ratio (1 litre **Virukill** per 100 litres water) at a rate of 300 millilitres per square metre of surface area. Apply first to the roof, then work your way down the walls to the floors. Try and keep the solution on the surfaces wet for as long as possible (at least 30 minutes).
- For disinfection of surfaces in all other animal quarters (except poultry), use a 1:50 **Virukill** dilution ratio (2 litres **Virukill** per 100 litres water).
- Disinfection must be done 24 hours before animal re-stocking. On completion of disinfection, close all doors and place foot dips at entrances.

## Pre-entry fog:

Fogging (cold or thermal) with **Virukill** in order to disinfect inaccessible areas in the animals quarters before re-stocking, is highly recommend and effective.

- For Cold fogging: Prepare a 1:33 **Virukill** dilution ratio (3 litres **Virukill** per 100 litres water). Apply this solution at a rate of 12 litres per 1000 cubic metres.
- For Thermal fogging: Use 3 litres **Virukill** per 1000 cubic metre. Dilute the 3 litres of **Virukill** in 2-4 litres of water and add a standard approved dispersal fog agent designed to retard evaporation.

## Continuous protection:

Fogging or Spraying with **Virukill** can help prevent, reduce and retard the spread of disease outbreaks.

- For all animal quarters: For aerial disinfection of the atmosphere with a mist or fog, use a cold fogger, or an existing plumbed-in fogging system, or a spray machine delivering a fine mist. Apply a 1:200 **Virukill** dilution ratio (0,5 litres **Virukill** per 100 litres water) at a rate of 2-4 litres per 100 square metres. Apply 1-4 times a day depending on the pathogen load, disease risk and the weather.
- For broiler chickens: Spray in the air with a cold-fogger using a 1:100 **Virukill** dilution ratio (1 litre **Virukill** per 100 litres water), at a rate of 2-4 litres per 100 square metres. Start with day-old chicks. The longer you keep the fog airborne around the chicken, the better. Apply 1-2 times a day depending on the pathogen load, disease risk and the weather.
- For layer chickens: Spraying should preferably be done with a spraying machine, but a cold fogger can also be used. Use a 1:100 **Virukill** dilution ratio (1 litre **Virukill** per 100 litres water). If spraying, apply the solution at a rate of 10 millilitre per layer. If using a fogger, apply the solution at a rate of 1 millilitre per layer. In cold weather, reduce the spray volume by half (no reduction if fogging). Apply once a day, 3 - 5 times a week. Increase to twice a day in periods of disease risk.

## Bio-security:

- Foot-dips: Use a 1:50 **Virukill** dilution ratio (2 litres **Virukill** per 100 litres water), and replenish every 2-3 days. Replace when it start to look dirty.
- Vehicle spray: Use a 1:100 **Virukill** dilution ratio (1 litre **Virukill** per 100 litres water).



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