

*Utilizing 21st Century Technology to
Maximize Poultry Productivity and Health*

Research & Development

**Significantly Reducing Ammonia
and Pathogens within Broiler,
Breeder and Hatchery sites**

resulting in:

Increased Hatchability

Increased Livability

Increased Bird Weight

Increased Uniformity

Reduced Food Conversion Ratios

DOCUMENT NO: PR 62011

CONTACT: Arthur V. Martin
EMAIL: martina@sc.rr.com

DATE: 7/14/16

Distribution subject to copyright

Disclaimers

The information contained in this document is the proprietary and exclusive property of Global Infection Control Consultants LLC except as otherwise indicated. No part of this document, in whole or in part, may be reproduced, stored, transmitted, or used for design purposes without the prior written permission of Global Infection Control Consultants LLC.

The information contained in this document is subject to change without notice.

The information in this document is provided for informational purposes only. Global Infection Control Consultants LLC specifically disclaims all warranties, express or limited, including, but not limited, to the implied warranties of merchantability and fitness for a particular purpose, except as provided for in a separate agreement.

Privacy Information

This document may contain information of a sensitive nature. This information should not be given to persons other than those who are involved in the Global Infection Control Consultants LLC.

Table of Contents

1	Executive Summary	
1.1	Summary	4-6
1.2	Customer Profile	6
2	Problem	
2.1	Context	7
2.2	Objectives	7
2.3	Finding a Partner	8
3	Solution	
3.1	Process	8
	a. Broiler House Process	
	b. Breeder House Process	8
	c. Hatchery Process	9
3.2	Using the Solution to solve the Problem	9
3.3	Technologies and Delivery Method	9
3.4	Key Components (a, b, c)	9-10
3.5	Financial Resources and Partners	10
4	Evaluation	
4.1	Results and Benefits (Hatchery, Breeder, Broiler)	11-15
4.2	Lessons Learned	16
4.3	H5N1 - Avian Flu	17
4.4	Publishing	18
4.5	Dosage Table	19
5	Path-Away® Lab Findings	20-28
6	References	29-30

*Implementing
Technology to
Improve
Productivity*

1. Executive Summary

1.1 Summary

GLOSSARY

Breeder

Breeds and raises poultry and fowl to improve strain and develop show stock: Selects and pairs birds for breeding or breeds birds by artificial insemination.

Broiler

young chicken suitable for broiling

This research and development project was conducted to see if the weight of poultry could be naturally increased during a growth cycle without any ill effects and reduce feed conversion ratios by reducing significantly the amounts of Ammonia, Bacteria and Viruses in the air and water within this test farm, located in a Southern United States of America location. This effort was funded by Global Infection Control LLC. This company represents in excess of 40 years of experience in the fields of Environmental and Mechanical engineering, pathogen control and cellular biology. Proprietary ultraviolet light units and electronic systems were developed and installed. Litter was treated with Path-Away® Anti-Pathogenic Solution. Two 40 GPM ultraviolet light water units were installed, one per well. This process of raising poultry is called *The Path-Away® and The M3 System®*.

Our approach was to carefully measure weights of ten randomly selected birds from each house for a total of forty birds on the same day and time at four day intervals. We did not want to stress the birds any more than necessary so these birds were taken as the farmer made his normal walk through in each chicken house. Great care was taken to make sure that two birds were taken from different locations that were at least 60 feet apart. This way we made our sampling as random as possible.

We felt that many people would say that a sampling of 40 birds total every 4 days is not enough. That would have been very true if we were raising chickens the old way. One of the great differences in raising poultry utilizing *The Path-Away® and The M3 System®* is that there is such a higher increase in uniformity of size among all the birds. Out of 100,000 birds the rate of uniformity was as high as 98% and evisceration problems were totally eliminated. This is verifiable as the normal percentage of birds that go to salvage in the processing plant is 4% to 6%.

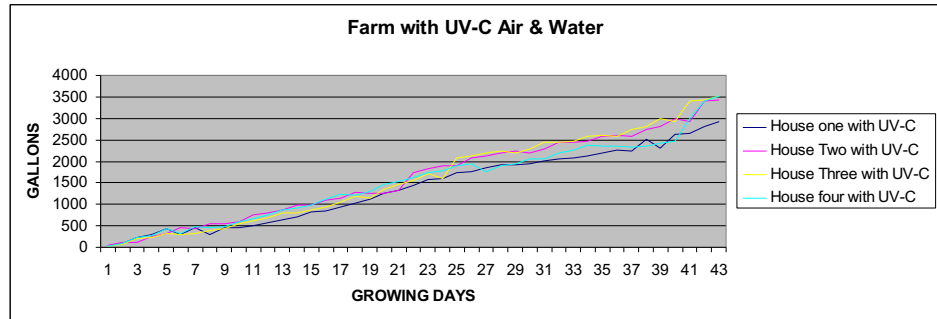
The number of birds from the test farm that go to salvage is consistently – ZERO.

Darkling Beetles

Even when using various chemicals like Tempo, Darkling Beetles eat 500 lbs. of food per house per cycle. Found by the Millions in poultry houses.

Water consumption for houses was recorded daily. All data was imported into Excel spread sheets and charts made.

Fig.1 below shows no deviation in water consumption during feed change occurring in days 31 thru 35 this equates to 3/10 to 4/10 lb free weight gain per bird per house!



Enzymes

A protein molecule produced by living organisms able to catalyze, or facilitate, a specific chemical reaction involving other substances without itself being destroyed or changed in any way.

Major results of this natural process were increased bird weight by ½ LB in a shorter period of time (1 to 2 days) within a cycle (42 to 44 days). Food Conversion Ratios were estimated to be reduced from 1.85 to 1.67 averages. Bacteria and Viruses in the air and water were eliminated. Ammonia was also greatly reduced in poultry houses. Neighbors thought this farmer had stopped raising chickens because they couldn't smell ammonia. The birds were drinking on the average 1,400 more gallons of water per cycle per house. Reduced mortality and culling and increased profits for farmer and Integrated Producer.

Evisceration

The removal of the internal organs during processing.

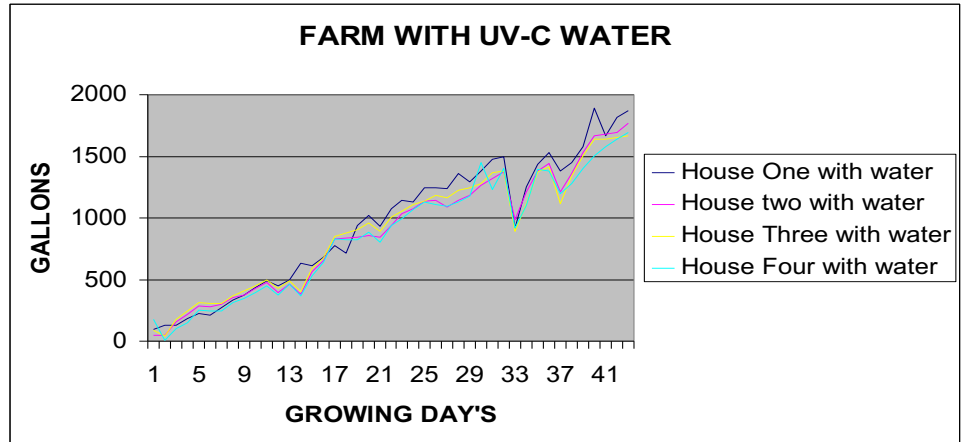
Food Conversion

A ratio of food intake to body weight gain; more generally, the total weight of all feed fed to a lot of poultry divided by the total weight gain of the poultry lot. The units of weight and the time interval over which they are measured must be the same. The better the conversion, the lower the ratio.

Hatchability

The percentage of fertilized eggs that actually hatch when artificially incubated.

Fig. 2 below shows water consumption in a Poultry Farms with UVC Water & No UVC Air. Water consumption of the birds shows a reduction during the feed change that occurs in days 31- 35.



In Fig. 2 above, the resulting loss of water consumption equates to 3/10 to 4/10 lb weight loss per bird per house. The data in Fig. 2 is from a brand new four house farm and represents the water consumption of the very first cycle of birds in a brand new farm!

Due to these exceptional results a decision was made to implement similar UVC/Path-Away® products into a Breeder Farm to naturally inoculate the eggs. The results were an increase in hatchability of 8% & 12% in two respective cycles. Another major benefit was that the eggs treated with this process had a 90% increase in livability during the first seven critical days of the birds life on the Broiler Farms. A complete separate system of UVC/Path-Away® M3® System was proposed for Hatcheries. This was developed to remove Aspergillus Niger, and this UVC design killed all other bacteria and viruses present.

Conclusion – This complete process when in place will reduce the spread of pathogens from Breeder farm to Hatchery and Hatchery back to Broiler farm and thus eliminate the seven day livability concern. This system now has a patent pending; is called the Path-Away® M3 System®. The present hatchability rate country wide is 80% - 85%. With The Path-Away® and M3 System® process installed in the Breeder farms and Hatcheries, hatchability rates would increase between 90 to 94%. Livability has increased in the first seven critical days by 90%.

**Integrated
Producer**

A farming system that produces high quality [food](#) and other products by using natural resources and regulating mechanisms to replace polluting inputs and to secure [sustainable farming](#). Emphasis is placed on a holistic systems approach involving the entire farm as the basic unit, on the central role of [agro-ecosystems](#), on balanced nutrient cycles, and on the welfare of all species in [animal husbandry](#)...

1.2 Customer Profile

The location of this research was conducted on an 18 year old farm. This farmer has been raising chickens for 30 plus years and is licensed to raise broilers for one of the top five poultry producers in the USA. This farmer has consistently placed in the top 5% in a group of 30 farms. With the help and assistance provided by management we were able to identify key issues and goals and these are to maintain sustainability economically, environmentally and socially. With *The Path-Away® and M3 System®* we met all of these goals and offered a substantial ROI. This farmer also completed four brand new houses and these were not treated with UVC or the Path-Away® M3 System® methodology and were used for comparison purposes.

2. Problem

2.1 Context

Reasons behind this project involve the large amount of ammonia in the chicken houses for the workers as well as poultry and their suffering. "Airborne ammonia is a respiratory irritant and can combine with other air pollutants to form fine particulate matter that can cause respiratory disease." Because of high counts of ammonia present in chicken houses (62-100 ppm), birds start to go blind when parts per million exceeds 58. Pecking orders are established and the birds that can't see well or are blind are kept away from food and water. For these smaller or blind birds sometimes death or culling results.

2.2 Objectives

Through research, we identified problems in Broiler farms, Breeder farms and Hatcheries prior to poultry being delivered to production facilities; and then developed natural solutions for these problems so these solutions such as the Path-Away® M3 System® will be readily accepted by any company and not interfere with their methods and processes already established. With constant evaluation of the UVC products, placement of these became paramount so that UVC treated air was evenly dispersed throughout the houses.

Quats.

Quaternary ammonium cations, also known as **quats**, are positively charged polyatomic ions of the structure NR_4^+ with R being alkyl groups. Unlike the ammonium ion NH_4^+ itself and primary, secondary, or tertiary ammonium cations, the quaternary ammonium cations are permanently charged, independent of the pH of their solution. Quaternary ammonium cations are synthesized by complete alkylation of ammonia or other amines. For possible synthesis route, see amines.

2.3 Finding the Right Partner

We were selected because of our thorough knowledge of products and their applications. In addition, we are able to quickly adapt and make product modifications to fit any clients' needs. We also have introduced new products such as Path-Away® Anti-Pathogenic Solution that offered natural solutions for surface disinfection without the use of harmful chemicals or alcohol.

3. Solution

3.1.a Broiler House Process

Houses were pre wired (electricity) and eyebolts installed to hold the UVC units. Prior to the poultry delivery all houses are treated Path-Away® to reduce ammonia contents in the litter two days prior to delivery. Cool cell water is treated with Path-Away® Anti-Pathogenic Solution to prevent any bacteria or virus coming through the cool cells. Path-Away® Anti-Pathogenic Solution was sprayed on interior walls and litter. Birds are then delivered and the UVC units are lowered into position and turned on, running 24/7 and for the complete cycle for those farms with high counts of ammonia.

3.1.b Breeder House Process

Enough UVC units were installed over the conveyor belts and positioned so that 95% to 98% of the egg receives enough natural inoculation to kill Aspergillus Niger as the belt is moving. The dosage required is 330,000 $\mu W/cm^2$ and is more than sufficient to kill any other virus or bacteria in the air near the eggs and on the surfaces of the eggs. Path-Away® Anti-Pathogenic Solution is sprayed on belts during down time. A UVC unit is installed over the A coil to prevent mold growth and another UVC unit is installed in the cooler storage area to kill any pathogen in the air. A simple method needs to be added so that 100% of the egg can be exposed and the appropriate amount of natural inoculation received.

Sustainability

The implied preference would be for systems to be productive indefinitely, or be "sustainable." For example, "[sustainable agriculture](#)" would develop agricultural systems to last indefinitely.

Ultraviolet Light

(UV) light is [electromagnetic radiation](#) with a [wavelength](#) shorter than that of [visible light](#), but longer than soft [X-rays](#). It is so named because the spectrum consists of electromagnetic waves with frequencies higher than those that humans identify as the color [violet](#).

UV light is typically found as part of the radiation received by the Earth from the Sun. Most humans are aware of the effects of UV through the painful condition of [sunburn](#). The UV spectrum has

3.1.c Hatchery Process

Within the Hatchery observed the *Aspergillus Niger* was the largest problem resulting in poor hatchability and poor 7 day livability in the Broiler houses. Pathogens either come from Breeder farms or develop at the Hatchery. UVC units needed to be installed in all the AC units and enough UVC Air scrubbers - Heavy Duty installed in the Hatchery Hall and a UVC unit installed per blower vent in the incubators. They are also treated with *The Path-Away® and M3 System™*.

Sustainable UVC activities need to be employed so pathogens are reduced to a minimum or are eliminated in all three areas mentioned. Corrosive and harsh chemicals such as Quats are used in the hatchery and these need to be replaced with products that far less toxic like *Path-Away® Anti-Pathogenic Solution* to keep surfaces free of pathogens and less toxicity absorbed by eggs, this increases hatchability and livability.

3.2 Using the Solution to Solve the Problem

Designing and developing products to deliver enough UVC and use non toxic chemicals in these areas was constant. All engineers and scientists involved put forth time, energy, effort and financial assistance. When such a complete solution is installed, Integrated Producers will negate the continuous cycle of spreading pathogens between Breeder farms to Hatchery & Hatchery to Broiler farms.

3.3 Technologies and Delivery Method

The use of UVC germicidal lamps has been around for 60 some years. These systems are being used for sterilization and disinfection of surfaces and air in hundreds of hospitals across the USA. Systems are in use around the world for disinfecting municipal and potable water. Food processing facilities use germicidal lamps for bacteria reduction in their packaging facilities to increase product shelf life.

Our research showed that airborne pathogens with different thresholds to UVC exist in our three areas of study - Broiler farms, Breeder farms and Hatcheries. It was necessary to develop separate UVC systems for each location. Key components were built and designed for each location.

many other effects, including both beneficial and damaging changes to human health.

3.4.a Key Components in Broiler Farm – 4 houses

UV Air Scrubber	3 to 6 units per house
Path-Away®	384 gallons per year
Water Purifiers	2 - 40 GPM units (1per well)

Path-Away® is a broad spectrum antimicrobial compound synthesized from naturally occurring substances. Path-Away® is an extremely potent and effective broad spectrum bactericide, fungicide, antiviral and anti-parasitic compound. Path-Away® is environmentally safe with a low toxicity to man and animals.

3.4.b Key Components in Breeder Farm – 2 houses

UVC Units	2 Modified units per belt
UVC - HVAC	1 unit per house
UV Air Scrubber	1 unit per storage
Path-Away®	14 gallons per year

**Path-Away®
Process**

A combination of products & processes that is as close to nature as possible. When used in combination they are Biodegradable Environmentally Safe methods to effectively remove Pathogens, Bacteria Ammonia and Not touching poultry at all. A patent pending process.

3.4.c Key Components per Hatchery Hall

UV Air Scrubbers	1 unit per air handler
UVC - HVAC	1 unit per Incubator
	12 incubators per hall
Path-Away®	140 gallons per year
Coil Cleaners	2 CC units

Typical four halls in a Hatchery

3.5 Financial resources and partners

Research and development provided by Global Infection Control Consultants LLC. Product development provided by Global Infection Control Consultants LLC.

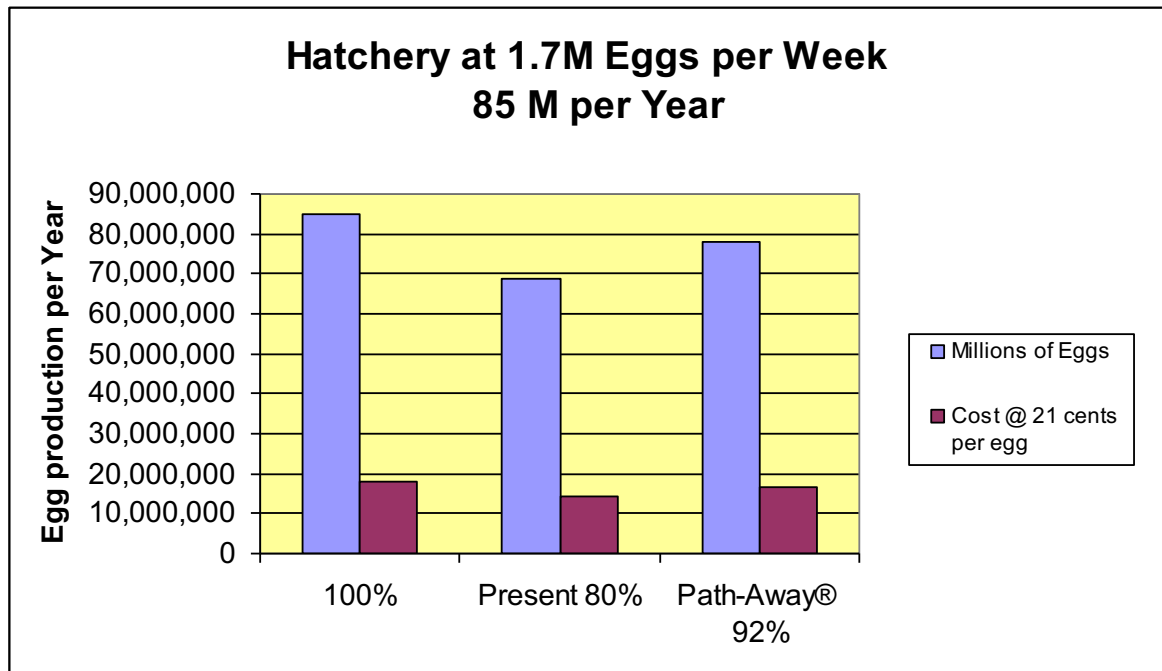
Additional sources of funding were provided by Global Infection Control Consultants LLC.

4. Evaluation

4.1 Results and Benefits

HATCHERY PROFITS:

Using the yearly egg production of the hatchery visited, of 1.7 million eggs over a 50 week year, we are using our average increase in hatchability with The Path-Away® M3 System® of 12%. For one facility, would receive a return on investment of \$2,092,000 from costs of \$50,000 in the first year. For verification purposes this equates to the cost of an egg at 21 cents each.



Path-Away® Hatchery Sample: Fig. 3 above shows an increase of 12% hatchability over the present method that equals an increase of over 10,000,000 eggs per year per hatchery. Net profit or ROI of \$2,092,000 first year. If this system was implemented in all hatcheries an ROI of \$89,956,000 could be obtained in the first year of implementation.

BREEDER PROFITS:

Using the weekly egg production of the average breeder farm of 62,000 eggs and over a 32 week year, we are using our average increase in livability with The Path-Away®M3 System® of 8%. Multiplying these figures by the price of 9 cents per egg paid to the breeder this is net profit of \$9,084 first year from an investment of \$5,200. The chart below depicts the seven day livability of birds treated from one broiler farm the Path-Away® M3 System® Vs eggs from non treated Path-Away® M3 System® farms.

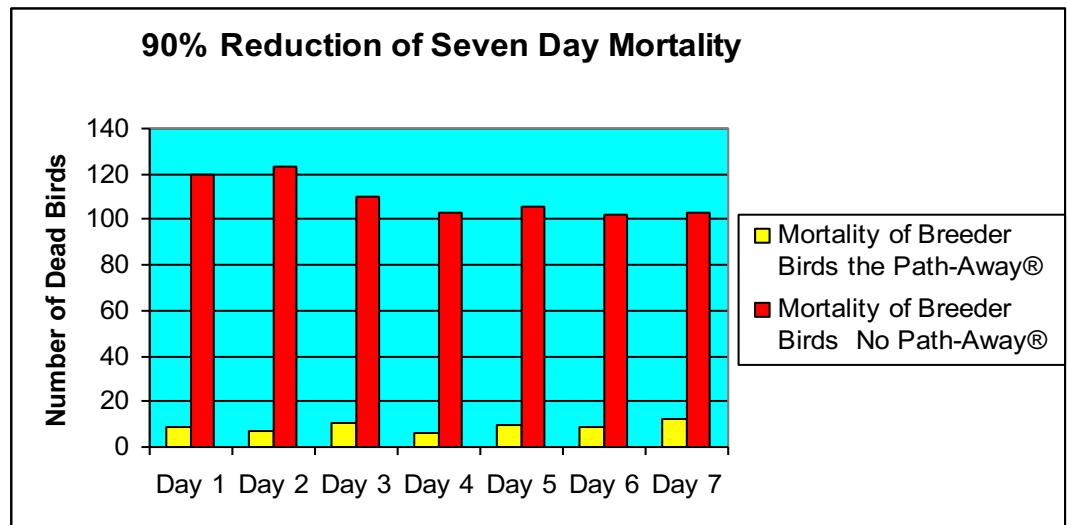


Fig.4 shows the differences in livability of birds that came from Path-Away® M3 System® treated Breeder Farm.

BROILER PROFITS & BENEFITS:

Elimination of Tempo type products for rats and mice \$3,000 per year.

Position of **UV Air Scrubber** saves \$12,000 of propane gas during winter months.

Elimination of \$3,000 loss in insulation due to vermin.

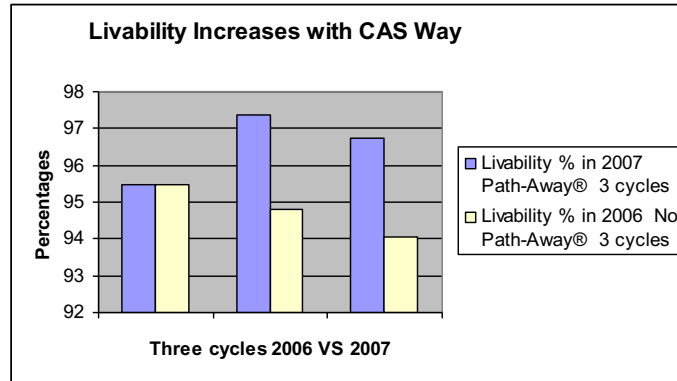


Fig. 5 above

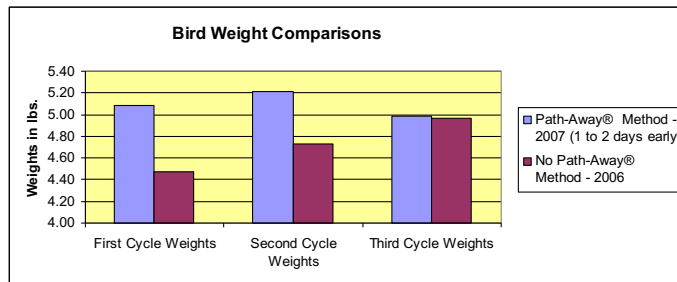


Fig. 6 above = Weight Gains profits equals \$3,000 to \$7,000 per four house farm 1 year. Food conversions ratios reduced from 1.85 to 1.69

Six different people experienced in poultry reported that the uniformity of birds sizes in the Path-Away® M3 System® treated houses were between 95% and 98% uniform in size. This resulted in **no Path-Away® M3 System®** birds out of a 100,000 plus going to salvage. This is normally 4% to 6% of a production day (400,00 birds). There was also a 5% increase in giblets (hearts, necks, liver) production. Ammonia reductions in Path-Away® M3System® houses were reduced from 68PPM to 12PPM.

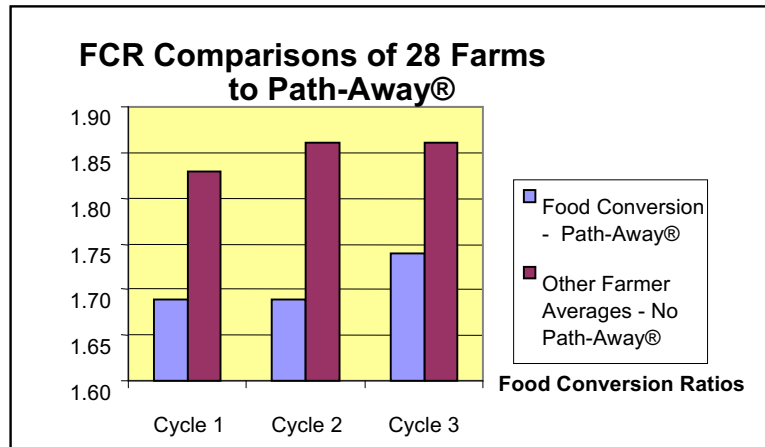
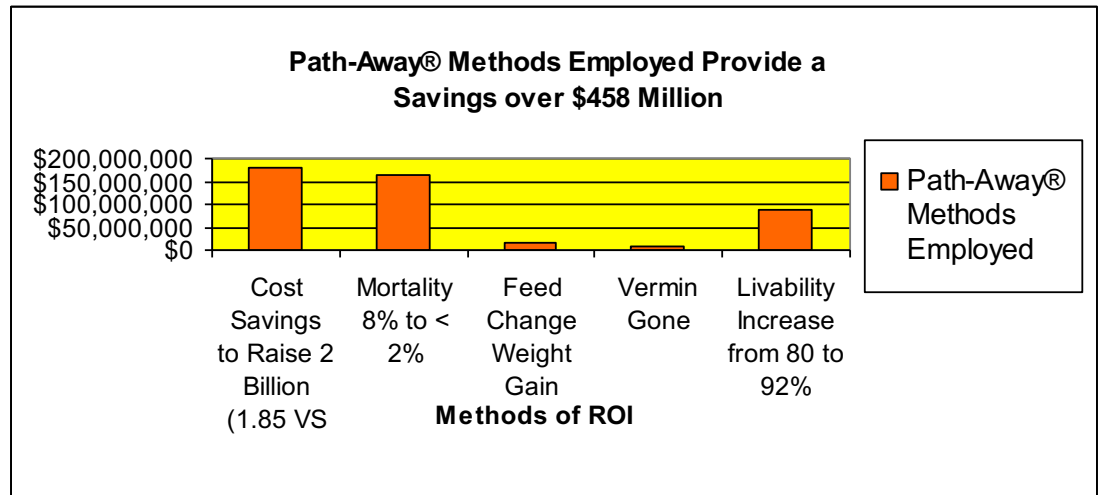


Fig. 7 above shows food conversion ratio comparisons

Objectives were surpassed as the benefits received when implemented in all three aspects are astounding when considering that we are actually raising a bird that gains more weight and eats less food as digestion is greatly improved.

**Integrated Producers Profits – Over \$400 Million
when implemented in Broiler, Breeder and Hatcheries.**

Fig.8 below shows profits from implementing the Path-Away® M3 System®.



Key Areas of Profit in raising 2 Billion Birds Annually

Reduction in Food Conversion Ratios from 1.85 to 1.69 or lower = \$180 Million

Mortality reduction from 8% to <2% = \$163 Million

Feed Change normal losses were 3/10 to 4/10 lb now reversed = \$17.6 Million

Hatchability Increase from 80% to 92 % = \$89,956,000 Million (**denotes ROI 1st year**)

4.2 Lessons learned

There have been many extremely valuable lessons learned. What is very important to understand is that people, no matter what they do, are reluctant to change. Having a farmer that has been very successful doing things his way for 20 years was very skeptical about UVC and the Path-Away® M3 System™. Just like the farmer, management of the Integrated Producer was skeptical. "Somebody tried this UVC thing before and it was a flop. The combination of UVC and the Path-Away® M3 System® brings poultry production to levels unheard of in the past through normal methods and materials.

This process was a work in progress and to this day it still is a work in progress. We watched the results from our initial tests (one house) and they proved very beneficial. With repeated successes on the same house the skeptical farmer is now a believer. This farmer purchased the equipment and additional testing continued in four houses. Our comparisons show three complete cycles and you will also note that a high food conversion ratio of 1.74 occurred in Fig. 7. This was because of very high seven day mortality rates and further research into Breeder farms and Hatcheries.

Because of the strict regulations of raising poultry in any integrated producers; the Path-Away® M3 System® was designed so that the poultry are not touched at all and no chemicals were introduced that are toxic or harmful. We in turn introduced products that are natural, green and eliminate toxic chemicals used to reduce Darkling Beetles, rats and mice in the poultry houses.

By starting with the less expensive vermin solution we can help the broiler farmers save \$3,000 for chemicals and \$3,000 for insulation in the first year. It is also possible for this system to pay for itself in the first year when we include the savings of natural gas (\$10,000 to \$12,000) used for winter heating. In addition, the farmer can receive \$3,000 to \$7,000 additional income due to weight increase over a year period.

4.3 H5N1 – Avian Flu, UVC and other Solutions

Through our constant research we have found the following to be true about the Avian Flu. It can be killed with a sufficient dosage of UVC. In addition, Path-Away® Anti-Pathogenic Solution is highly effective at extremely low concentrations on several strains of Avian Encephalitis as well as numerous other Flu strains.

The minimum dosage of UVC for 100% kill is 6,600 $\mu\text{W}/\text{cm}^2$ and we even suggest that if such a drastic condition existed, use a dosage of up to 10,000 $\mu\text{W}/\text{cm}^2$. This is where overkill would be greatly appreciated. Path-Away® Anti-Pathogenic Solution is applied at a 5% concentration level.

We spent many evenings addressing the Avian flu as it pertains to Americas' poultry industry. Research showed that the largest area of penetration of H5N1 or any other variant, if airborne, would be through the chicken house cool cells. Our solution of Path-Away® prevents bacteria build up on the cells and also eliminates H5N1 weather in air or water. When Path-Away® Anti-Pathogenic Solution is micro vaporized it acts as a catalyst that attacks the cytoplasmic membrane of mephitic pathogens. It inhibits the uptake of amino acids thus curtailing cellular respiration causing the rupture of the cell wall and leakage of low molecular weight cellular contents.

Please remember research has found that H5N1 can be carried by rats, beetles and mice. It has also been detected in water and fecal matter. So with the proper time and exposure to UVC, Path-Away® these pathogens can be killed in air, water and surfaces.

4.4 Publishing

This is the first publication of this study performed during April 2009 through May 2010.

4.5 Dosage Chart - UV energy Needed for 100% Kill

Bacteria	$\mu\text{Ws}/\text{cm}^2$	Molds	$\mu\text{Ws}/\text{cm}^2$
Bacillus anthracis - Anthrax	8,700	Aspergillus flavus	99,000
Bacillus magaterium sp. (spores)	5,200	Aspergillus niger	330,000
Bacillus magaterium sp. (veg.)	2,500	Mucor racemosus	35,200
Bacillus paratyphusus	6,100	Oospora lactis	11,000
Bacillus subtilis	11,000	Penicillium digitatum	88,000
Ebertelia typhosa	4,100	Rhisopus nigricans	220,000
Escherichia coli	6,600	Virus	$\mu\text{Ws}/\text{cm}^2$
Leptospiracanicola - infectious Jaundice	6,000	Bacteriophage - E. Coli	6,600
Legionella pneumophila -Legiooaires Disease	3,800	Infectious Hepatitis	8,000
Mycobacterium tuberculosis	10,000	Influenza	6,600
Salmonella enteritidis	7,600	Poliovirus-Poliomyelitis	6,600
Salmonela paratyphi - Enteric fever	6,100	Yeast	$\mu\text{Ws}/\text{cm}^2$
Salmonella typhosa - Typhoid fever	4,100	Brewers yeast	6,600
Staphylococcus aerius (incl. MRSA)	6,600	Common yeast cake	13,200

The Avian Flu is a Corona Virus, a form of Influenza requiring 6,600 $\mu\text{Ws}/\text{cm}^2$ for 100% kill.

5. Path-Away® Lab Findings

Path-Away® is a broad spectrum antimicrobial compound synthesized from naturally occurring substances. Path-Away® is an extremely potent and effective broad spectrum bactericide, fungicide, antiviral and anti-parasitic compound. Path-Away® is environmentally safe with a low toxicity to man and animals.

Studies indicate that the antimicrobial activity of Path-Away® is in the cyto-plasmic membrane where the uptake of amino acids is prevented and disorganization of the cytoplasmic membrane and leakage of low molecular weight cellular contents occurs. Path-Away® is biodegradable according to the "Standard Test Methods for Determining the Anaerobic Biodegradation Potential of Organic Chemicals", ASTM Standards, Section 11, Water and Environmental Technology, Procedure E 1196-2, pp. 879-901,1993.

Path-Away® (as a natural extractive) is listed as GRAS (Generally Recognized as Safe) under the Code of Federal Regulations as 21 CFR 182.20. Path-Away® has been tested for safety in both human and animal, including the environment. Path-Away® is considered non-toxic and a non-irritant at dilutions up to 5%. Path-Away® is also considered non-corrosive.

Path-Away® extract is a powerful anti-microbial that acts against a large number of pathogenic BACTERIA, FUNGI AND VIRUSES and is presently the natural prophylactic with the broadest spectrum action against diseases that attack animals. Path-Away® extract is a powerful fungicide that acts against fungi of the following genera: *Aspergillus*, *Penicillium*, *Trichophyton*, *Fusarium*, *Pullularia*, *Microsporus Candida*, *Epidermophyton*.

Path-Away® extract is a powerful bactericide that acts against GRAM-POSITIVE and GRAM-NEGATIVE bacteria, such as: *Escherichia coli*, *Salmonella*, *Staphylococcus*, *Corynebacterium*, *Klebsiella*, *Clostridium*, *Diplococcus*, *Proteus*, *Shigella*, *Erwinia*, *Bacillus*, *Mycobacterium*, *Brucella*, *Brevibacterium*, *Listeria*, *Pasteurella*, and also against protozoa such as *biperias* (except *b. tenella*).

Path-Away® extract has excellent action against the following viruses: Avian Infectious Bronchitis, Avian Smallpox, Avian Encephalomyelitis, Marek's Disease, Aphthous Fever, New Castle, Vesicular Swine Disease, African swine fever.

Bacteria	Fungi & Yeasts	Gram Positive
Aerobacter aerogenes	Acremonium sp.	Bacillus subtilis
Alcalingenes faecalis	Alternaria sp.	Bacillus rnegatherium
Brucella intermedia	Arthrinium sp.	Bacillus cereus
Brucella abortus	Ascospores sp.	Bacillus cereus var. mycoides
Brucella melitensis	Aspergillus niger	Clostridium botulinum
Brucella suis	Aspergillus fumigatus	Clostridium tetani
Cloaca cloacae	Aureobasidium sp.	Corynebacterium acnes
Escherichia coli	Basidiospores	Corynebactenum diphtheriae
Escherichia coli	Beauveria sp.	Corynebacterium diphtheriae
Escherichia coli	Bipolaris sp.	Corynebacterium diphtheriae
Haemophilus influenzae	Botrytis sp.	Corynebacterium minutissium
Klebsiella edwardsii	Calcarisporium sp.	Diplococcus pneumoniae
Klebsiella aerogenes	Candida albicans	Lactobacillus arabinosus
Klebseilla pneumoniae	Cercospora sp.	Lactobacillus arabinosus
Legionella pneumoniae	Chaetomium sp.	Lactobacillus casei

Loefflerella mallei	Chromelosporium sp.	Listeria monocytogenes
Loefflerella pseudomallei	Cladosporium sp.	Mycobacterium tuberculosis
Moraxella duplex	Curvularia sp.	Mycobacterium smegmatis
Moraxella glucidolytica	Drechslera group	Mycobacterium phlei
Neisseria catarrhalis	Epicoccum sp.	Sarcina lutea
Pseudomonas capacia	Epidermophyton floccosum	Sarcina ureae
Pasteurella septica	Exiophiala sp.	Staphylococcus aureas
Pasteurella pseudotuberculosis	Fusariella sp.	Staphylococcus aureas
Proteus vulgaris	Fusarium sp.	Staphylococcus aureas
Proteus mirabilis	Geotrichum sp.	Staphylococcus aureas
Pseudomonas aeruginosa	Keratinomyces ajelloi	Staphylococcus aureas
Pseudomonas aeruginosa	Lasiodiplodia theobromae	Staphylococcus aureas
Pseudomonas fluorescens	Memnoniella sp.	Staphylococcus albus
Salmonella choleraesuis	Microstroma sp.	Staphylococcus albus
Salmonella enteritidis	Monilia albicans	Streptococcus agalactiae
Salmonella gallinarum	Mucor sp.	Streptococcus haemoyticus A

Salmonella typhimurium	Myrothecium sp.	Streptococcus faecalis
Salmonella typhi	Nigrospora sp.	Streptococcus faecalis
Salmonella paratyphi A	Nodulisporium sp.	Streptococcus pyogenes
Salmonella paratyphi B	Oidium sp.	Streptococcus viridans
Salmonella pullorum	Paecilomyces sp.	
Serratia marcescens	Penicillium sp.	
Shigella flexneri	Periconia sp.	
Shigella sonnei	Saccharomyces cerevisiae	
Shigella dysenteriae	Trichophyton mentagrophytes	
Vibrio cholerae	Trichophyton rubrum	
Vibrio eltor	Trichophyton tonsurans	

Additional Organisms

Giardia lamblia	Influenza A2 Virus
Entamoeba histolytica	Helicobacter pylori
Chlamydia trachomatis	Campylobacter jejuni
	Herpes simplex virus type 1

Updated Fungal List

List updated

January, 2012

Peziza sp.	Stachybotrys sp.	Ulocladium sp.
Phoma sp.	Stachybotrys chartarum atra	Ustilago sp.
Pithomyces sp.	Stemphylium sp.	Verticillium sp.
Polythrincium sp.	Taeniolella sp.	Wallemia sebi
Rhizopus sp.	Tetraploa sp.	Zygomycetes
Schizophyllum commune	Torula sp.	Zygosporium sp.
Scopulariopsis sp.	Tricholcladium sp.	
Spegazzina sp.	Trichoderma sp.	
Sporothrix sp.	Trichosporon sp.	
Sporotrichum sp.	Tritirachium sp.	

Properties and efficacy as a disinfectant.

In regard to Path-Away® liquid significant progress has been made in our evaluation of this product as a disinfectant. Numerous studies have been conducted and a brief statement of the methodology with results follows. In excess of 400 structures with contamination of various origin and species were abated. These structures ranged from a single family home, to office complexes, industrial facilities and medical facilities including hospitals, day surgery centers and a dialysis clinic. It should be noted that these facilities were in numerous climate regions including tropical and sub tropical. As indicated by the data, there is great potential for the development of this product as a disinfectant. This is based on the following: (1) the toxicological data indicates that this product and the active ingredient possess very low toxicity. This is important because most disinfectants that are currently used in either animal or human environments have moderate to high toxicity and extreme care must be exercised when these products are used. The lack of any significant toxicological properties of Path-Away® is also impressive when one views the efficacy data where extremely small concentrations of the product can be used with marked beneficial results. (2) In view of the reports discussed, the wide spectrum of activity that Path-Away® offers (antiviral, antibacterial, both gram- and gram+, antimycotic and antiprotozoan) will undoubtedly aid in its acceptability. (3) The fact that this product has a very pleasant aroma will aid in the overall acceptability. When used in the laboratory, comments pertaining to the "fresh" smell have been numerous. This may be considered a subtle point however we feel that it is important.

Materials and Methods.

Path-Away® liquid can be obtained from Global Infection Control Consultants LLC., a Bluffton, South Carolina USA based company through its principal, Arthur V. Martin. This SOLUTION is of rather high viscosity with a slight yellow color. The product is transparent with no detectable sediment. Preparation of various dilutions of the stock SOLUTION (100%) indicated that the SOLUTION is readily and completely water soluble. The aroma was pleasant.

Summary and conclusions.

It is readily apparent that Path-Away® at a concentration of 0.125 oz/gallon exhibits marked antibacterial activity in distilled water. The disinfectant has proven itself to be bactericidal, since the survival time of the organisms used in this study was relatively short. Both Salmonella and S. aureus were slightly more resistant than the E. coli isolate used. Of perhaps more importance is the impression that is apparent from the data shown in the list it was effective against. The presence of an extremely high content of protein (2.5% egg white) did not change the activity of Path-Away® disinfectant toward the three bacterial species used. There was no detectable change in the activity of this disinfectant toward the E. coli or Salmonella. A slight increase (from 5 to 10 minutes) to kill all the Staphylococcus was measured, however due to this small magnitude of increase, this is of questionable significance.

Addendum: April 2010

Path-Away® is currently undergoing testing at a premier laboratory facility in the United States for its efficacy against *Mycobacterium tuberculosis*. Initial tests are extremely encouraging. Current efficacy tests using *Mycobacterium smegmatis*, the normal test bacterium in Tuberculosis research has indicated efficacy at levels as low as 0.20. Research is currently ongoing.

More Information

For more information about Path-Away® products and services, call Arthur V. Martin, BS, MS, MSME, ICP at 843-705-3956.

To access information using the World Wide Web, go to: www.globalinfectioncontrol.com

For more information, call:

Arthur Martin at +843-705-3956 or e-mail at amartin@giccllc.com

© 2016 Arthur V. Martin. All rights reserved. This research and product development study is for informational purposes only. Global Infection Control Consultants, LLC makes no warranties, express or implied, in this summary.

6. References

The following is a list of readily available reference materials discussing ultraviolet light. It is not intended to be a complete list of references.

Available on the Web:

Aerobiological Engineering

The Pennsylvania State University

Graduate School of Architectural Engineering & Department of Biology

<http://www.arche.psu.edu/iec/abe/>

Additional Integrated Poultry Producers websites

<http://www.thepoultrysite.com/>

<http://www.pilgrimspride.com/>

<http://www.tyson.com/>

<http://www.perdue.com/>

<http://www.waynefarmllc.com/>

<http://www.sandersonfarms.com/>

<http://www.mountaire.com>

<http://www.houseofraeford.com/>

<http://www.keystonefoods.com/>

<http://www.kochfoods.com/>

<http://www.fosterfarms.com/>

Available in the Public Library:

Britannica

Volume 12, page 118

Ultraviolet radiation...because of its bactericidal capabilities at wavelengths of 260 – 280 nm, UV is useful as both a research tool and a sterilizing technique.

Encyclopedia Americana

Deluxe Library Edition 1993

Volume 27, page 353d

A very important attribute of UV rays...is their ability to kill bacteria. For this reason UV lamps are used in hospital operating theaters, children's nurseries, and in several manufacturing processes where sterile air is necessary.

McGraw Hill Encyclopedia of Science & Technology

Volume 19, pages 20, 21, 22

Discussion of Ultraviolet radiation, with charts showing UV's ability to sterilize.