

Cleaning and Disinfecting: How to Utilize Today's Technologies to Make it Effectively Work on Your Farm

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Thank you and I greatly appreciate the opportunity to speak with you today. As I was starting my presentation I really struggled to find a key point to drive home to everyone on cleaning and disinfecting that you already haven't heard. As I was thinking about it the one thing that kept coming to mind was 'change' and how we have leaned on new technologies in almost every aspect of animal farming. We have changed our ventilation, feeders, drinkers, how we measure water sanitation, ammonia, CO, CO₂, lighting and numerous other things that have greatly improved our efficiencies in animal farming. However I still believe we have yet to change and adopt some new and great technologies in cleaning and disinfecting that could greatly improve our overall biosecurity program.

Change is difficult and change is hard. It is very easy to continue to do the same things over and over that feels comfortable and what we are used to doing. On the cleaning and disinfecting side we always seem to do the same thing over and over but expect different results after we do them. That *is* the definition of insanity. As a former college football coach, I would always tell my incoming freshman. I know you are used to doing things a certain way, I know you think what you used to do was right and that gave you the opportunity to play Division I football. However if you cannot come into this room and take 'constructive criticism' and understand that what I am going to be telling you is trying to make you better and accept those things that need changing. You will only do things at the status quo and never be a great football player.

There have been a lot of great talks in the past about overall biosecurity programs from Dr. Helen at Hybrid or Don McIntyre at Diamond V. What I want to concentrate on today is the cleaning and disinfecting aspect of that overall biosecurity program and using the advanced technologies in current products that will allow you to do a much better job.

It all starts with a simple concept that ensuring good flock health starts with healthy poults in a healthy and clean environment. In order to accomplish the goal of a healthy and clean environment I believe you need to follow one rule. Inspect what you expect. I heard this quote from a talk Dr. Heeder at Zoetis gave at the ITF meetings in March and it really stuck with me. If you are not personally doing the cleaning and disinfecting job you need to inspect what you expect. Have goals and a specific protocol in place for your C&D program. Have a check list for the growers to follow so they know they are doing everything that is expected. Routinely check to make sure these protocols and steps are being met. If they are not being met what are the consequences. The consequences are up to you as a company but you need to have some and make sure you follow through with them if the protocol is not being followed. Something like this reminds me of my kids. I am blessed to have four great kids, ages 8, 5, 4 and 2. So you can imagine how crazy it gets at our house. If we do not have consequences laid out and

if we do not follow up on those consequences when they misbehave you will see things get out of control very quickly!

The basic steps to a cleaning and disinfecting procedure include removing excess organic matter (litter, left over feed etc), applying a detergent, washing the detergent, letting the surface dry, applying a disinfectant, setting up the building and then applying a secondary disinfectant if necessary.

The one step in all of the process that always seems to get overlooked is the cleaning part of your program. A good sound cleaning program should come first and be a part of any C&D program. The goal of proper cleaning is to physically remove organic and inorganic dirt that should allow for an 80 to 85% reduction in micro-organism's in your building. Doing this will allow the disinfectant to work better and reduce the remaining pathogens left after cleaning. It is very important to understand that cleaning and disinfecting are TWO separate processes and ideas. Be very careful with products that claim they are 'cleaners, sanitizers and disinfectants'. That is not realistic. Disinfectants can only take so much organic matter before being neutralized. That is why the cleaning process is so important.

So as part of that cleaning process why should you use a detergent? There are a number of reasons. There are only so many times a year a turkey building has a chance to get cleaned. Doing this will allow you to break the cycle and reduce the pathogen load in your building and environment. It is important to understand that these pathogens (bacteria and viruses) protect themselves with an organic barrier know as a 'biofilm'. This protective barrier allows bacteria and viruses to remain unharmed by disinfection alone and they will continue reproducing. Using a good detergent will help break down those barriers making it easier to truly reduce the pathogen load in your building.

What kind of chemical or product should I use to help clean my building? There are two different types of cleaners on the market. Alkaline (high pH) or Acid (low pH) cleaners. Alkaline cleaners are the best to use for every time cleaning. Acid cleaners should only be used for 'special' cleaning purposes or as a one-time rotation to your alkaline cleaner. So why are alkaline cleaners better? First, animal manure is acidic. Alkaline products will neutralize those deposits and make them easier to remove. Alkaline products also remove fat, protein and feed deposits much better. These are all the main properties you are trying to remove and clean from your building. Alkaline cleaners are also less corrosive on equipment and much more user friendly on people and vehicles or common areas that need cleaned then acid based cleaners. Acid products should be used to remove scale or mineral build up. Scale is very alkaline and so an acid product will neutralize the scale and remove it more effectively. Acid products are also good for rotating if you want to remove alkaline deposits that have occurred from continuous use of those cleaners. Some use a 5:1 (alkaline to acid) rotation as part of their program. Acid cleaners are also good for descaling your drinkers with an acid foaming cleaner which I will discuss later.

The graphical representation of cleaning consists of four things; contact time, cleaning time, water consumption and energy consumption it takes to get a surface clean. When you use a foaming type detergent it shifts that paradigm and increases the contact time which then decreases the cleaning time, water consumption and energy consumption it takes to get a surface clean. When you use a sticky foam

or gel type product if shifts that paradigm even further by taking less cleaning time, water, and energy consumption to get a surface clean. This is why I believe using foam or gel type detergent is by far the best way to get your building truly clean. The foam will physically lift the organic material of the surface making it much easier to remove through washing. So what is foam? Foam consists of 90% air generated from a foaming wand and pressure, 9.8% water and .2% chemical. When finding good characteristics of a foaming product it's all about 'seeing is believing'. Find products that create a sticky foam or gel (viscosity) that will allow for long contact time on surfaces. It is important to find products that will stay wet and not dry and are easy to rinse, meaning it does not create more foam or gel after being applied while being rinsed or washed off the surface. The product should be food grade and have multiple applications. Most importantly the product should reduce water usage, decrease the time it takes to clean a surface, decrease energy consumption and get the surface cleaner allowing the disinfectant to work more effectively. Labor for C&D programs consists of 85% of the total cost. Most growers claim that using a foaming detergent saves up to 30 to 50% of the time it takes to clean. In 60 minutes with a pressure washer that discharges 150 gallons per hour, 75 gallons of water may be saved. In today's economic times those are huge money savings that could save your company a lot of money. It also will have a huge environmental impact using less water and product.

When applying a foaming product high pressure is the key to success. Low pressure was thought in the past to generate more foam but using low pressure with garden hose applicators is unrealistic for your needs. High pressure foamers allow you to cover the surface area required in larger buildings. It will also allow for more consistent foam. We have found that you need between 700 to 1,000 pounds of pressure to effectively apply foaming products in large scale buildings but 1,500 to 2,000 pounds of pressure works the best. We have been able to incorporate this with a piece of equipment we call the Handy Foamer. The Handy Foamer will connect to any pressure washer hose with a quick coupler and allow for easier application. There is also a back pack that you can put your product in allowing for instant product once the foamer is hooked up. The Handy Foamer also comes with 1 oz, 4 oz and 6 oz tips that screw into the foamer that will dilute the product as desired taking the guessing and 'glud' method away. You know exactly how much product you are using. You can hook up the foamer to any pressure washer system or use your tank sprayer and allow your tractor to generate the pressure.

Each person has to find their niche on how they prefer to apply the product. The whole goal for applying product this way will allow you to get dirty, built up surfaces cleaner and do it more effectively. The key is to make sure you have enough contact time that allows the product to work but also make sure and wash the product off before it begins to dry. If the detergent dries it will not hurt anything but you may just need to reapply the detergent to loosen it back up and make it easier to wash off. That is why finding products that allow for long, constant contact time before drying is very important. It gives you much more flexibility with your program.

I have had customers in the past use strong foaming acid products to take off the scale or mineral build up that generates over time in your drinker cups. You can simply apply the acid product through the Handy Foamer, let the product sit overnight, reapply the product the next morning and then wash off the drinkers. This has shown to do a good job of eliminating that scale build up and keeping your drinker cups cleaner. It is important to stay on top of this because doing this procedure one time will

not take care of years' worth of scale build up. I love this ad that stats 'Behind a great disinfectant, stands a great cleaner'. That is very true and that is why cleaning IS the most important part of your C&D program.

After you wash down it is very important to let your building dry before applying your disinfectant. Water creates a barrier that could prevent the disinfectant from reaching the surface where the bacteria and virus lie. Wet surfaces will also dilute down your disinfectant even further. 1 mm of water on 360 sq. ft. of floor space equals 1 gallon of water. If you dilute the disinfectant at 1/3 of an ounce per gallon in reality the disinfectant is diluted to 1/6 of an ounce per gallon in this scenario. Also it is a good idea to let the surface dry just in case your detergents and disinfectants don't match pH ranges. It is important to apply low pH detergents with low pH disinfectants and vice versa. If you apply a high pH detergent and then apply a low pH disinfectant on a wet surface the two could neutralize each other making the disinfectant not as effective. If you have to apply the disinfectant to a wet surface it is a good idea to double the dilution rate from your recommended dilution.

The goal of any disinfecting program should be to reduce the number of pathogens, ideally with a log 4 reduction meaning 99.99% reduction. I believe that with a good cleaning program and today's advanced disinfectants this is possible. The trends in disinfection products have certainly changed over the years. HBTAs Phenols are banned in Europe because they are considered toxic and have very poor biodegradability. Phenols are also less efficacious because they do not kill naked viruses and are not sporicidal. Formaldehyde has been labeled as a human carcinogen and has strong application limitations for the end user. QAC (Quaternaryammonia) products don't kill naked viruses and are not effective on fungi or bacteria spores. Oxidizers known as 'quick kill' disinfectants are great for certain type of applications and are very effective against all pathogens. However these products have their limitations as well. The industry is definitely trending towards synergistic combination products like QAC / Gluteraldehyde combinations. These types of products are a virucide, bactericide, sporicide and a fungicide meaning they are broad spectrum. There are three main EPA approved Glut / QAC products on the market. Glutex GQ1 which consists of 2.5% QAC and 14% Glut, Synergize which consists of 26% QAC and 7% Glut and Virocid which consists of 17% single chain QAC, 7.5% twin chain QAC (which gives this product a 5th generation QAC compared to a 2nd generation QAC in the other products), 10.7% Glut and 14.5% Alcohol. Glutex has 16.5% total active ingredients and a 1:256 use dilution, Synergize has 33% total active ingredients and a 1:256 use dilution and Virocid has 49.7% total active ingredients and a 1:400 use dilution. The synergistic mode of action of these products is for the alcohol (if the product has Alcohol) to remove the lipids from the cell wall, the QAC will penetrate the cell wall and drag the Glut in with them which the Glut will then 'kill' the cell nucleus. If the product has a 5th generation QAC the product will be more efficacious, work better in the presence of organic matter and have better foaming capabilities.

Cid Lines recently compared its Glut/QAC product with a Phenol type disinfectant against many different types of bacteria. The study concluded that Virocid had a Phenol coefficient of 13.9 meaning Virocid was 13.9 times as effective as Phenol products. Cid Lines also did a recent study against certain bacteria that showed it takes at least one minute of contact time to kill any bacteria and can have a residual effective of up to one hour. Residual activity is defined by how much time the pathogen or bug will not

reappear because of the disinfectants activity. It is all dependent on how long the disinfectant stays wet and stays active. Once a disinfectant dries or runs off the surface it loses its activity. Once it loses its activity its residual effect is negated. Anyone who tells you that a disinfectant will give you days or weeks of residual is not being truthful. That is why I believe like detergents you should foam on your disinfectants.

Again the phrase 'seeing is believing' really applies to this type of application as well. Foaming on your disinfectant allows you to physically see areas you have and have not covered, the foam allows the disinfectant to have more contact time which gives it more likely to kill the pathogens on the surface you are covering, it allows the disinfectant to stay wet longer and you use less product which saves you money. You can apply the disinfectant with the same Handy Foamer equipment you used to apply the detergent. All the same rules and equipment apply for this application as well. The nice thing about the foamer equipment is again it gives you specific rates you can dilute the product so you know exactly how much product you are using and if you are using the product at the proper dilutions. You can see that after 20 minutes of applying the disinfectant there is still product on the surface allowing the product to truly work effectively.

There are some new rules and limitations for Glutaraldehyde and air exposure limits when using these products called Maximum Exposure Limit or MEL. That in 15 minutes of exposure time the ppm of Glutaraldehyde needs to be less than .05 ppm. Cid Lines recently did a study on this and it showed that at a 1:200 dilution (2x its label usage) it was at .019 ppm when spraying, .016 ppm when foaming and .04 when fogging. So Virocid complies very well with the MEL requirements even when fogging. This also points out that foaming had the least amount of ppms in the air. Meaning if the Glutaraldehyde is not in the air, it's on the surface disinfecting and you are getting more out of your product. Another reason why foaming is more effective than spraying.

Besides seeing a trend in the disinfecting world for Glut / QAC products there is also a trend for the PAA type products which is known as Peracetic Acid. These products take a combination of Hydrogen Peroxide and Acetic acid known as Peroxyacetic Acid when combined with Hydrogen Peroxide. It is important to always use stabilized hydrogen peroxide products because stabilized peroxides will release over a longer time when exposed to air / oxygen and stabilized peroxides are much safer to handle. The addition of the Peroxyacetic Acid (PAA) creates a powerful activated peroxygen compound which boosts the hydrogen peroxide oxidation potential 10 to 12 times making these products very effective and broad spectrum. It is also important to use PAA products that have buffering agents, corrosion inhibitors and surfactants. This allows for a more versatile product allowing for multiple types of applications and the surfactants help the products in the presence of organic matter.

These types of products are known as 'quick kill' disinfectants because unlike the traditional disinfectants that takes minutes of contact time these disinfectants can kill in seconds. The mode of action of these products is also different instantly rupturing the cell walls and interfering with the enzyme system and protein metabolism of the bacteria, virus or fungi. The best thing about these type of products is they are nearly 100% biodegradable breaking down into 3 natural elements CO₂, H₂O and O₂ after application making them very environmentally friendly.

Because of the 'quick kill' mode of action on these disinfectants these products are great for boot dips. It is important to renew these dips daily when using these products but this gives you a much more realistic dwell time in the actual dips to disinfect your boots. The other application we have seen a lot of success with is pad and floor acidification / disinfection. Because of the low pH in these products they work great for shock treatments on floor pads. We have seen success pushing back and controlling clostridium dermatitis using these products along with a litter amendment product like PLT or Klasp. It is important to know that for the best results both these products need to be applied directly on the floor and not directly on built up litter. Since these types of products have a different mode of action they are truly the best products to rotate with traditional disinfectants. I will speak later on rotation and if it is even truly necessary. These types of products do have some limitations and that is why they are not traditionally used in your repeated disinfectant scenarios. Since these products are a low pH product they should never be applied on copper, brass or aluminum surfaces. They tend to be more expensive than traditional disinfectants because the application rates are so much higher. These products do not work as well as Glut / QAC products in the presence of organic matter so to combat that higher application rates are used. Although these products are very environmentally friendly they are not as user friendly because of the low pH, oxidation power and strong vinegar smell when they are applied.

I am a HUGE fan of thermo fogging your disinfectants as a secondary disinfectant or in finishers when there is not a complete clean out and turnaround time is tight. There have been some misconceptions about fogging. Fogging is NOT burning smoke as it is more propelling a mist. The chemical only remains in the exhaust chamber for .005 to .1 seconds so there is no heat effect on the product at all. The foggers can propel the mist / product up to 250 feet so it does not take much time to disinfectant your buildings. On average to disinfectant a 20,000 sq. ft. building it will take around 45 minutes.

Fogging allows for areas to be covered that may have been missed and also allows for pathogens to be reduced that may have been brought in while setting up the barn after the initial disinfection. Fogging is typically done 1 or 2 days prior to poult placement or birds moving and before feed and water is placed in the building. Tests have been done that show fogging disinfectants alone can reduce pathogens in the building. Testing has also been done that shows fogging a Glut / QAC product was just as if not more effective than formaldehyde. I would always recommend fogging a Glut / QAC product because they are non-corrosive on the fogging equipment and generally do not need any fogging enhancer so there is no need to mix chemicals together. Having a Glut / QAC product that contains Alcohol will be a benefit when fogging because the Alcohol allows the mist to stay suspended and in the air longer allowing the disinfectant to work better. The best kind of fogging equipment I have seen out there is the Dramm K-22 O fogger. It is the easiest to handle and start and still has the power to fog and fill up the square footage you require. Like all equipment you need to make sure you handle them properly by cleaning the foggers after every use. If you do this the foggers should last for years.

Rotating disinfectants is something that was necessary before broad spectrum disinfectants came on the market. Simply put, rotating is not necessary if you use broad spectrum disinfectants. This theory came from the days of using Iodine, Phenols or Quat products to disinfect. These types of products are not broad spectrum and do not kill naked viruses or spore bacteria. Leading to the theory that these would

be left after disinfecting and allow for resistance to those products to occur. Today's disinfectants don't work like antibiotics. For example Antibiotics work by using a key to open a lock. If the lock changes the antibiotic or key may not work anymore. Broad Spectrum disinfectants work by opening locks with a sledge hammer. So no matter if the lock changes the disinfectant is still going to open the door. So there is no chance for resistance.

As long as the disinfectant is broad spectrum (fungicide, bactericide, virucide and sporicide), verified independently (EPA), has a synergy of components and guaranteed composition you should not have to rotate the products. Also rotating can lead to logistics nightmares for companies switching from product to product and increasing the chances of human error and the product not working effectively. However if you are going to rotate, rotate wisely. Choose a product with a completely different mode of action than what you are currently using. For example if you use Virocid then you should rotate to Keno X5. I would recommend choosing 1 or 2 products depending on applications and sticking with them.

Understanding the true cost of disinfectants is also very important for the end user. Know the actual use dilution and cost so you can figure the cost per gallon of product used which is the true cost of the product. Growers do this all the time with antibiotics by figuring the price of a product or pack based on the grams of activity like comparing Oxytet 1400g and Oxytet 1772g or Pot Pen .5 BU and Pot Pen 1 BU products. However we rarely do this with disinfectants. For example if a disinfectant costs \$30 per gallon and the use dilution is 1:400. Divide 30 by 400 and the true cost is .075 cents per gallon. If a disinfectant costs \$20 per gallon and the use dilution is 1:256. Divide 20 by 256 and the true cost is .078 cents per gallon. Most would assume the \$20 per gallon product is the cheaper product but that is not necessarily the case. Also it is important to know how versatile the product is and if it can be applied with multiple applications and on all surfaces. Is the manufacturer ISO 9001 and GMP (Good Manufacturing Practices) certified and is there an expiration date on the product. Looking at all these aspects will tell you what kind of product you are getting and what the true cost of the product is.

It is always important to follow the precautions and directions for disposal on the products MSDS sheet. Always make sure you are wearing the proper PPE (personal protective equipment) and following the label usage and directions for whatever product you are using. These products are EPA approved and regulated so following label instructions should always be part of any company's protocol.

In summary I hope these tips helped you better understand the technologies available to you as a grower in cleaning and disinfecting and some tips on how to actually use these products properly.

Cleaning is the most important part of any C&D program and using a foaming product for cleaning will drastically improve the performance of that process. You will use less time, water, and energy while still getting the surface cleaner which will then allow the disinfectant to work more effectively. It is important to let the surface dry before applying the disinfectant because water can create a barrier for the remaining bacteria and virus from the disinfectant and wet surfaces will dilute the disinfectant down even more potentially making them ineffective. There is definitely a trend moving in the Glut / QAC combination type products for disinfecting with good reason. These products are effective in the presence of organic matter, non-corrosive, user friendly and broad spectrum so rotation is not

necessary. Foaming these disinfectants is also recommended because it will allow for more contact time on the surface, you can see what surfaces have been disinfected and you will use less products.

Remember once a disinfectant dries it loses its killing activity. Using PAA type products can also be effective since they are broad spectrum and good disinfectants as well. These products have more of a special application method like for pad acidification / disinfecting.

It important to remember that this is only one piece on the entire biosecurity program but I hope I helped bring some better understanding to the cleaning and disinfecting aspect of that program. Thank you.