

Managing Water Quality for Successful Flocks

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Water Supplies are Dynamic

- Can change from season to season
- Influenced by droughts and floods
- Influenced by agriculture, industry and septic systems
- Influenced by well depth and placement
- Influenced by the rock and soil it passes through
- Influenced by usage level
- Surface water supplies most vulnerable
- Contaminants are both good and bad
 - Low levels may be fine but higher levels a problem
 - Combinations of certain contaminants can create problems

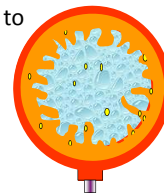
Factors That Can Affect Quality

- Microbes-bacteria, fungus, mold, etc.
- Biofilm
- pH
- Mineral content
- Water sanitation
 - Between flocks
 - During flock



The Biofilm Slime: Source of Challenges

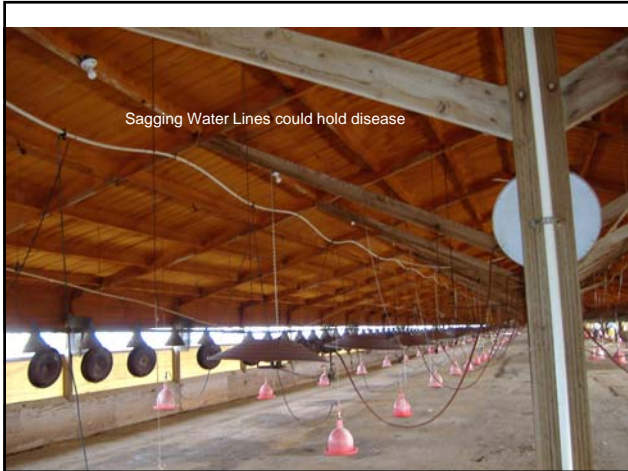
- Poor line sanitation → biofilm
- Biofilm lives on very little nutrients
- Can cause health challenges, flock after flock
- Harbors disease agents like *E coli* and *Bordetella*
- Once established is 10-1000x harder to remove and clean line
- Can return in 2-3 days after cleaning
 - When we do a poor job of cleaning
 - When we don't keep water sanitized
 - When we add food supply



What influences Bio-films?

- Natural contaminants
 - Iron, manganese, sulfur
- Vitamins
- Electrolytes
- Organic acids
- Kool-aid, jello, sugar water
- Vaccines and vaccine stabilizers
- Probiotics and Antibiotics
- Does producer clean lines after product use?
- How often is water sanitation sacrificed so water can be delivery route for products?





I used to believe that a water sample was a good tool

Farm	CFU/ml
A-- At source	2,700
A-- At end of line	26,600
B-- At source (community)	203,000
B-- At end of line	2,340,000
C-- At source (community)	600
C-- At end of line	282,000
D-- At source	0
D-- At end of line	4,775,000

Swabbing water system on turkey farms revealed same challenges found in sick poults

Standpipes, drinkers, hoses, lines, etc. can all be disease hiding places

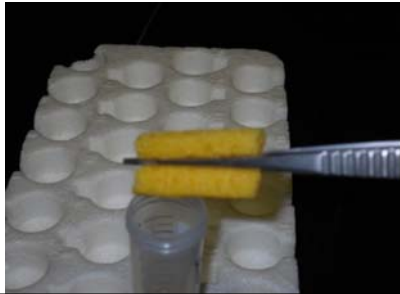
Sample location	Micro-organisms
Standpipe	<i>Pseudomonas aeruginosa</i> <i>Pseudomonas</i> sp.
Nipple drinker	<i>Klebsiella pneumoniae</i>
Nipple drinker	<i>Chryseobacterium</i> sp.

Water and Swab Sample Results

- Currently monitoring water sanitation on U of A commercial broiler farm
- Pulling drip samples from end of line
- Also swabbing lines through hose bib

Line Swab Procedure

- Sterile 1" Sponge in 50 ml BPD



Line Swab Procedure

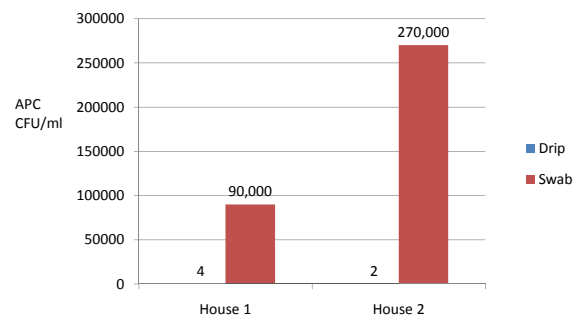
- Thoroughly clean opening with 91 % alcohol
- Use sterile tongs, forceps or tweezers 6-8 " long
- Remove sponge



Testing Line Swab Procedure



Comparison of Drip Versus Swab Samples for Evaluating Water Lines



What is the Key for Success with Water Quality?

A good water sanitation program



Water Systems Must Be Cleaned Right! But what does that involve?



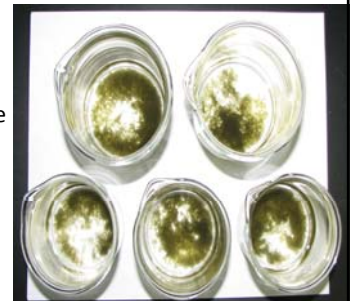
Line cleaned with acid

Line cleaned with 3% ProxyClean

Thorough cleaning essential
but if harsh cleaners damage equipment
what are our best choices??

Objective

- Evaluate products using water that simulates worse case scenario in drinker systems-algae water



Bacteria Results

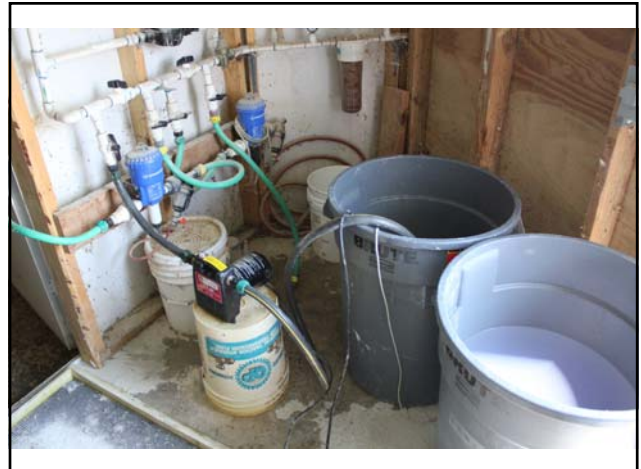
Treatment	Pre (Log 10)	Post 4 H (Log 10)	Post 24 H (Log 10)
Control	6.08	5.99	6.43
Bleach 3%	5.82	2.92	2.91
Hydroline 1%	6.03	4.13	3.57
Hydroline 2%	5.61	3.89	<1
Hydroline 3%	5.69	3.85	<1

Bacteria Results

Treatment	Pre (Log 10)	Post 4 H (Log 10)	Post 24 H (Log 10)
Control	6.08	5.99	6.43
ProxyClean 1%	6.22	4.09	2.50
ProxyClean 2%	5.86	3.58	<1
ProxyClean 3%	5.73	2.66	<1
SWG Biocide	5.68	3.62	2.23

Line Cleaning

- Proper concentration is essential for effectiveness
- Special pumps
 - Quick Mix, Mix Right
- Submersible pumps
- Holding tanks





Even Proxyclean has its limits in tough situations

Product	Pre Bacteria	48 Hours later
Proxyclean 3%	155,000	530
Proxyclean 3%	579,000	43,000
Proxyclean 3%	603,000	10,200
Proxyclean 3%	164,000	23,3000

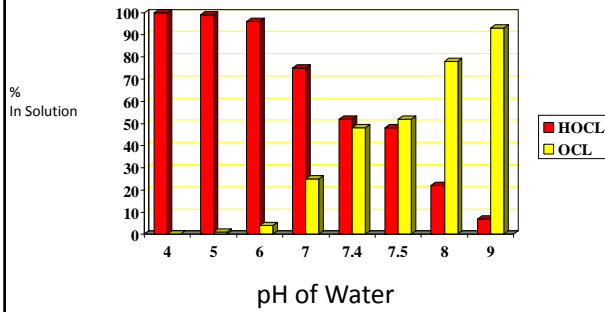
Flush with sanitized water!!

**BOTTOM LINE: BIOFILM IS A REAL
CHALLENGE THAT CAN ADAPT AND
SURVIVE TOUGH CONDITIONS, DON'T
GIVE IT THE OPPORTUNITY**

Effect of pH on Water Quality

- pH scale measures how acidic or basic
- pH change of one indicates ten fold change
 - pH of 6 ten times more acidic than pH of 7
- pH of less than 6.5, corrosive water
- pH < 5.9, poor performance
- pH > 8.0
 - Reduction in chlorine effect (chloric ions,)
- Chlorine most effective in pH 4.0 - 7.0

How pH Affects Chlorine
Ratio of Hypochlorous Acid to Chloric Ion



What Form is Your Chlorine?

- Hypochlorous acid is 80-300 times more effective as a sanitizer than chloric ion

If using chlorine as your sanitizer, use a second injector, lower the pH to below 7 and get a significant boost in your water sanitation

Effect of pH on Bacterial Growth

pH	E. coli	Salmonella	Clostridium
6.4	++++	++++	++++
6.0	+++	+++	++++
5.8	++	++	++++
5.4	+	+	+++
5.0	-	+	++
4.5	-	-	+
4.0	-	-	-

Roney et al., Alabama: The more "+" the better the bacteria grows

NEVER!!
Mix bleach and acids in the same stock solution container

Growers have told me a green cloud chased them out of their medication rooms



Challenges with Chlorine

- Turkey company faithfully uses gas chlorination and acidification
- Overall positive results
- Except.. One area of producers
 - Concrete water holding tanks
 - Spring sources, some well, some rural water
 - Consistent E. coli outbreaks around 3 weeks of age
 - Medication became necessary- problems difficult/impossible to control
 - Flocks going to market with 80% livability

One solution

- After reviewing the situation, realized gas chlorine and acidification with the frequent medication breaks not working
- Concrete tanks had algae- biofilm build-up
- Decided water flow during brood too slow
- Chlorine residual not adequate/losing its strength
- Switched flocks to Proxyclean-30 ml/ l is stock solution, then run 1:128
- Run Proxyclean during brood
- No more E coli breaks
- Flocks settling 90% livability
- Proxyclean is expensive but disease can be even more expensive

Hydrogen Peroxide

- Effective oxidizer
- Target- 25-50 ppm residual in drinking water
- Good for sanitizing pond or river water because it controls taste issues and no chlorine by-products
- Can be dangerous to store and handle, flammable
- Effectiveness deteriorates with storage
- Not as good at oxidizing iron and manganese
- Stabilized products like Proxy Clean last longer in stock solutions

Does Bleach Add Sodium and Chloride?

Water	Sodium (ppm)	Chloride (ppm)
Distilled Water, plain	.21	2.76
Stock solution 4 oz/gallon	357	1844
Stock solution 8 oz/gallon	369	2357
Stock solution 12 oz/gallon	351	2499
1:128- 4 oz/gallon stock	12	29.5
1:128- 8 oz/gallon stock	20	42.1
1:128- 12 oz/gallon stock	30	89.1

ProxyClean Stock Solutions How Long Does It Remain Active?

	2 oz/gal	4 oz/gal	6 oz/gal
Initial (ppm)	10	25	≥100
24 hours (ppm)	25	25	50
48 hours (ppm)	10	25	25
5 days (ppm)	10	5	10

Bacteria Present in Water Lines

Product	APC cfu/ml
Control	41,000 to 3,550,000
Proxyclean 4 oz stock	2 to 990
Proxyclean 6 oz stock	13 to 35
Hydroline 4 oz stock	10 to 3200
Hydroline 6 oz stock	2 to 98
Cid 2000 2 oz stock	27,000
Cid 2000 4 oz stock	0 to 186

My birds have a slight snick . .

- I want to run some iodine as an expectorant, should I stop chlorinating?

My birds have a slight snick . .

- I want to run some iodine as an expectorant, should I stop chlorinating?
- Chlorine and iodine work well together
 - If chlorinating use second pump to inject iodine
 - May not get a chlorine reading when running both

What mixes?

- Basic products- Add ammonia
 - Sulfa drugs
 - Penicillin (basic to neutral)
- Acidic products- Add citric acid
 - Tetracycline-citric synergistic
 - Erythromycin
 - Vitamins
 - Amprolium
 - HyD works well with PWT but not citric

Lessons Learned Water Basics

- Water is a very important NUTRIENT!!!
- Water can be complex to understand and solve issues
- Water programs must be managed 24/365, even when facilities are empty
- Keep it simple
- More is not always better with water treatments
- The birds will tell you if your water program is right
- Be the guinea pig, taste the water
- Test water supplies twice yearly (Hot and Cold seasons)
- Use swabs to check weak points in system

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