Treating Bacterial Problems in Water

Bacterial Contamination (coliforms & E.coli) (max – 0)

When contamination of your drinking water source occurs, check the well, water equipment and distribution system for the source. Tolerance for these bacteria is zero (0) in domestic water and <10 coliform in livestock and poultry water. High coliform counts means contamination from sewage treatment, poorly designed septic fields, animal waste, crop residue or industrial waste.

It is important when testing water for bacterial contamination, not just to see if coliforms are present but to get a count (MPN) of bacteria present. A count of 1 or 2 may be due only to contamination of the sample during sampling or testing and not from the water source. Retesting would be necessary to confirm that bacteria really are present. It is therefore important to be extremely careful when handling the sample bottles during collection and in lab, not to introduce contaminants.

High bacterial load in water leads to increased problems with livestock which in turn will affect growth, production efficiencies and overall health. If you add a little extra stress, the stomach can quickly become colonized with these undesirable pathogens.

When coliforms are present in the water source, an effort must be made to insure the water is treated to reduce bacteria levels prior to being made available to livestock. There are a number of reasons bacteria flourish in water and eliminating any bacterial problems involves interfering in these processes.

Biofilm

As water sets in the water system, a biofilm will form inside pipes and equipment where microorganisms can develop. Hard water deposits also provide good hiding places for microorganisms like bacteria and viruses. Low water flow will lead to biofilm formation and bacteria contamination risk. Large water tanks with low water flow are a problem especially with poultry where the ends of low pressure nipple drinker lines need special attention. The slow water flow and the warm temperatures in these barns give an ideal environment for biofilm development and bacterial growth. Bacteria from these polluted water lines will lead to a decrease in feed intake and a reduction in the effectiveness of water additives like vaccines or medications.

Sanitizing Water -Treating Water Micro-organisms

Water sanitation will decrease pathogen load, improve feed digestion and animal performance. When a mild bacterial problem occurs like bacterial contamination in a new well, shock chlorination can be used as a quick treatment to rid the well of bacteria that have entered the water system during installation. In problem wells, inject strong chlorine (Cl) solution into the well between flocks and flush through all pipes and tanks in the

water system. This procedure should eliminate the bacterial problem throughout the whole system.

If an ongoing bacterial problem exists, continuous chlorination of the water may have to be delivered using a "chlorinator" where the water comes into the pump house or barn, Chlorine is an effective sanitizer when water pH is below 7. The pH of the water determines how much liquid Cl will dissociate into hypochlorous acid (which kills bacteria immediately) or hypochlorite ion (kills bacteria only after prolonged contact). The correct combination of pH and Cl level is needed to be effective. The higher the pH, the greater the amount of Cl is required to achieve the desired affect.

As Cl must get to all drinkers to be effective, insure there is 2-3 ppm free Cl in the water at the end drinker. This means flushing the whole system with a dosage of 1-5 mg/l Cl in the water. Biofilm formed in drinker lines will reduce Cl levels as Cl reacts with microorganisms. Water intake will decrease when the water Cl level is in excess, but once the water is exposed to air, the dissolved Cl quickly dissipates.

Iodine can be used similar to Cl as their chemical properties are similar. Since vaccines and medications are incompatible with disinfectants, Cl must be removed from the water at least 48 hours prior to treatment.

Oxidizers as Santizers

Chlorine, bromine, hydrogen peroxide, peroxyacetic acid and ozone are strong oxidizers which literally burn up viruses, bacteria and other organic material present, leaving water microbiologically safe.

Cl in the form of chlorine dioxide is an affective bactericide and viricide. It also is superior in the removal of iron (Fe) and manganese (Mn) and is not affected by pH. Ozone is an affective bactericide, viracide and chemical oxidant. Ozone reacts with Fe and Mn enhancing the ability to remove by filtration. Ozone acts independent of pH and can inactivate Cl. Ozone is a point of contact sanitizer with no residual affect. Hydrogen peroxide (H2O2) works well as a sanitizer but pH and alkalinity have a major role in the effectiveness of this sanitizer. Peroxide will deteriorate in storage over time. It is a strong oxidant with no lasting residual affects.

Ultra-violet light can also be used to disinfect water in the water system. Ultra violet light radiation is not effective with cloudy water and requires frequent cleaning if water cloudiness is a problem.

Acidifiers as Sanitizers

When bacteria in water is a problem, sanitize lines using organic acids to decrease pH, creating a less favorable or lethal environment for microorganisms. Acidifiers like citric, acetic or proprionic acids are very affective. Their use means filling the water system for at least 48 hours, then flushing the whole system (usually done between flocks).

A continuous low level disinfectant level of organic acid (1-2 ppm) can be delivered to the drinker system throughout the flock without deleterious affects to the bird or production. The acid acts in the water and the whole gastro-intestinal (GI) tract of poultry. In poultry, the upper digestive tract of the crop and gizzard are the main affected areas. Organic acids are bactericidal to E. coli and Salmonella in the crop and will decrease anaerobic bacteria in the cecum. The crop is the most relevant site where bacteria, molds and yeast levels can be drastically reduced. Organic acids are non-corrosive, user friendly, have accelerated initial action due to free acid, have extended efficacy due to acid salts and are broader spectrum because of different acids and their salts.

Acids in a disassociated form proceed by passing through the membrane wall of the bacteria. Inside the bacterial cell they will produce H+ ions. The bacteria's pH will decrease and DNA and protein synthesis will be disrupted thus, making the bacteria unable to replicate. Action is through decreased bacterial pH and surrounding media pH. There is some evidence that feed passage decreases when acidifiers are used.

The following are recommendations for weekly water line sanitation during the growing cycle:

Table Reference: #1

Additive	**Ammonia**	**Citric Acid**	**35%H_20_2**	**Household Bleach Cl**	**Vinegar Acetic Acid**	**Iodine 18.05%**
pH – optimum	< 7.2	> 7.2				
Meter rate	1 oz/128 oz water	1 oz/128 oz water	1 oz/128 oz water	1 oz/128 oz water	1 oz/128 oz water	1 oz/128 oz water
Solution mix	6 oz clear Household Ammonia/ Gal. water	1 pack Citric acid/ Gal. water	½-3/4 oz/ Gal. water	5-6 oz/ Gal. water	6 oz white Household Vinegar/ 64 oz water	2 oz iodine Complex Disinfectant/ Gal stock soln.

** Use with rubber seated drinkers

Checking Sanitation Effectiveness

1. Proper sanitation can be evaluated by measuring the Oxidation Reduction Potential (ORP) of the water. ORP measures in millivolts (mV) the oxidation level in the water. An in-line or hand held ORP probe can be used. E. coli is killed in seconds with an ORP reading of 650 mV, but Listeria, Salmonella, yeasts and molds require 750mV or higher. ORP can be measured anywhere in the water system.

2. Check for the presence of biofilm in drinker lines. Chlorine gets tied up by microorganisms in this biofilm. By testing incoming water and the water at the end of the

drinker line, any difference in either the Cl level or the ORP level would indicate biofilm presence in the drinker line.

Remember that treating water for bacteria is a costly addition to production costs and should be carried out when a problem has been identified. This identification is done through testing the water source for bacteria. All water sources used for livestock should be tested for mineral and bacterial content every six months. Where there is an identified water source bacterial problem, testing should be done quarterly. Water that cannot be treated at the source (as with surface water shallow wells, ponds, lakes, etc.) must have a water treatment system used in-line to eliminate any bacterial problem before the water is delivered to the facility. To check the sanitation systems effectiveness, test in barn water for contamination.

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