

WATER HYGIENE: ANALYSIS AND TROUBLE-SHOOTING

Water hygiene is taken for granted by many swine producers and is not normally considered a source of problems in production units. In contrast, the poultry industry places a lot of emphasis on water hygiene and takes the steps necessary to ensure high quality water for birds. This is done with the knowledge that birds are very sensitive to water contamination, which can be very detrimental to performance (i.e., growth rate, feed efficiency, egg output, and mortality). Slime algae and/or coliform bacterial contamination of water results in reduced immunity in birds, increasing susceptibility to disease. It is quite possible that organic water contaminants act in a similar way in pigs.

To be acceptable, water should be pollutant free, low in total dissolved solids (TDS) and coliform bacteria, and low in nitrate, nitrite, and minerals (Table 1).

Table 1. Water Quality Parameters ^a

| Contaminant | Safe Upper Limit of Concentration, mg/L |
|------------------------------|--|
| Total dissolved solids (TDS) | <3000 ppm |
| Coliform bacteria | <50/ml |
| Arsenic | 0.2 |
| Boron | Not established |
| Cadmium | 0.05 |
| Chromium | 1.0 |
| Cobalt | 1.0 |
| Copper | 0.5 |
| Fluoride | 2.0 |
| Iron | Not established |
| Lead | 0.1 |
| Mercury | 0.01 |
| Nickel | 1.0 |
| Nitrate | 440 |
| Nitrite | 33 |
| Selenium | Not established |
| Sulfate | Not established |
| Vanadium | 0.1 |
| Zinc | 25 |

^a Recommended by the National Academy of Sciences

To determine the quality of water in a facility, samples must be taken and sent to a laboratory for analysis. When taking samples, use sterile containers such as urine sample cups from doctor or veterinary offices. Get a sample from the well casing and take samples at the pig drinker(s) and at other natural break points in a barn (i.e., at water meters, medicators, and spigots). By following this sampling procedure, it becomes easier to determine where the contamination is occurring and the appropriate course of action. Make sure

water is allowed to flow for ~30 seconds prior to taking a sample. Also, nipple waterers and spigots should be flamed to kill external bacteria just prior to sampling. The point is to try and be as sterile as possible when taking samples. Water must be analyzed at a certified laboratory within 24 hours of collection to get accurate coliform counts. Contact the Akey technical staff for a list of qualified laboratories.

When analyzing potential water hygiene problems, there are several points to consider. First, organisms (coliforms and/or slime algae) growing in wells and water lines may challenge pigs immunologically and increase susceptibility to over-colonization with opportunistic *E. coli* and other bacteria. Second, many medications contain a lactose carrier to improve handling and solubility in water. Sugar acts as a growth medium for bacteria, so more problems with water hygiene are seen in facilities where water medication is used and water lines are not cleaned routinely. Third, bacterial growth is greatest when there is no (or low) water flow in a system, such as between groups of pigs and the first week postweaning. Fourth, build up of contaminants is often highest at the waterer where pigs drink.

Possible non-hygienic contaminants of water include bacteria, which can be controlled by changing the pH of water, and slime algae, which must be cleaned out of water lines with acid. To clean water lines between groups of pigs, consider using citric acid. As soon as all pigs are out of a room, flood water lines with citric acid (1.25 lb/gallon of stock solution) colored with food coloring using a water medicator. The food coloring is an easily recognized sign that treated water has reached each nipple in a room. Let acidified water stand in lines overnight. Flush with clean water the next day, starting with the nipple waterers in the back of the room and working toward the inlet end. The first time lines are cleaned, a large amount of solid material is likely to be released. Take care that nipples are not clogged with this material. NOTE: Citric acid will strip rust from the inside of galvanized pipes, causing continual plugging problems in nipple waterers. Most producers switch to PVC pipe because of these problems.

Some popular disinfectants used to treat water include chlorine and hydrogen peroxide. Chlorine is generally one of the cheapest and most effective chemicals used to control bacteria and other water contaminants. Chlorinate water after it comes out of the well, as chlorinating hard water in wells may cause a precipitate to form that will line the insides of the well and/or reservoir, resulting in problems later. In most cases, 3 to 5 ppm chlorine should be adequate to keep interior water pipe surfaces clean, and at this level, drinking activity of pigs will not be affected. Chlorine can be added through a water medicator; however, most farms put in stand-alone systems for this purpose. It is important to remember that chlorine may react with some medications in the water medicator, rendering them inactive. Some chlorine sources include Clorox (5%), Sanicide™ (stable aqueous chlorine dioxide), and sodium hypochlorite. Over time, chlorine may make rubber and plastic gaskets, seals or O-rings hard and inflexible. Depending on source, chlorine may be toxic if not handled properly.

Hydrogen peroxide (35 or 20% solution) is also effective at reducing water contamination by bacteria and/or algae. Hydrogen peroxide is a preferred disinfectant if hard water is present on a farm. This disinfectant will not affect integrity of rubber or plastic components in water lines or drinkers. However, it may pose a challenge with hauling, depending on concentration. Hydrogen peroxide is also flammable and must be handled with extreme care.

Submitting water samples to a laboratory for analysis should be part of a regular maintenance schedule. It is usually done once per year or every other year, depending on results. Farms using city water are not immune from contamination, which can occur after water enters a facility (i.e., through pig drinkers). Water hygiene and regular water line cleaning should be a routine part of sow, nursery, and grow-finish management protocols. By giving priority to this segment of facility management, we should expect to see better, more consistent animal performance.