The importance of water quality for pigs

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Even the most progressive producers overlook the importance of water quality on the performance and well being of their pigs. Although a water test may indicate that the quality of water on a farm is within acceptable limits, accumulation of algae, bacteria, rust, and other contaminants in water pipes could result in poor water quality in the drinker.

Most pig producers routinely wash waterers and flush water lines – but this may not be enough, These practices do not remove the source of the quality problems inside the pipes. A growing number of pig producers have adopted a water system flushing procedure that chemically 'shocks' and removes the sources of water quality problems inside the pipes.

Table 1. A procedure for shocking water lines with organic acids and detergent in commercial pig production units.

- **Step 1:** Raise the water lines to approximately 3ft off the ground.
- **Step 2:** Turn off the water service from the source and drain the entrained water from the lines by opening the ends of the lines.
- **Step 3:** Shock solution recipe: Add three ounces of liquid dishwashing detergent and three ounces of blue food colour to one gallon of a concentrated solution (65-85%) of organic acids and mix thoroughly.*
- **Step 4:** Open the water regulators to the 'Flush' mode to accelerate the shock solution through the water line.
- **Step 5:** With a medication metering pump, dispense the shock solution though the water line – including the hoses used to fill the drinkers – at a rate of one ounce per gallon.
- **Step 6:** Turn off the regulators and then close the ends of the water lines.**
- **Step 7:** Allow the shock solution to remain in the water line and drinkers for approximately 12 hours.
- **Step 8:** Flush the shock solution from the water line, including the drinker filling hoses.
- **Step 9:** Prepare a solution of Activate US WD Max***, a proprietary blend of organic acids from Novus International for drinking water applications, according to directions, and flush the water line. Do not add blue food colour to this solution.
- **Step 10:** Measure the pH of the water at the end of the water line. It should be less than 3.5, the optimum pH for Activate WS WD Max to have a maximum sanitising effect.

* The shock solution will be dark blue. Once it has travelled through the entire water line, a light blue solution will be observed coming out of the end of the water line. Once this occurs, allow 2.5 gallons of water to flow out of the water line to ensure that undiluted shock solution is present in the entire water line. If bell drinkers are used, it is essential that undiluted shock solution flows into the bell drinker. This may require emptying the drinkers several time before the blue shock solution is observed. When the shock solution appears, allow the shock solution to fill the drinkers to the lip to sanitise the drinkers.

** When using the regulator set on 'Flush' the procedure can damage the diaphragm if the regulator is not turned off before closing the drain valves at the end of the water line.

***Activate US WD Max is different from other organic acid blends because it includes Alimet methionine analog feed supplement.

As in all types of livestock, water is essential for pigs. Marcia Shannon, a swine specialist at the University of Missouri estimates that growing-finishing pigs will consume 4-6kg of water for every kg of feed. Gestating sows typically consume 10-20 litres of water per day. Water intake is even higher for lactating sows – 20-40 litres per day. Without adequate amounts of water, pig growth and reproduction suffer.

However, it is not just the supply of adequate water, but also the supply of quality water.

Quality standards

According to several studies, water sources in many parts of the world – particularly in rural areas – do not meet international quality standards. In some cases, analysis of water samples indicate that the concentrations of water contaminants – bacteria, pesticides, heavy metals, rust, and toxins – are well below established limits.

However, even on farms with good quality water, problems can occur at the drinker or water bowl in pig pens because these contaminants accumulate inside the water supply pipes.

Kathleen Parrott, an extension specialist at Virginia Polytechnic Institute and State University, points out that water contamination by potentially harmful bacteria is relatively common. Health problems linked to drinking contaminated water include gastroenteritis, diarrhoea, salmonellosis, listeriosis, giardiasis, typhoid, cholera, and hepatitis.

Not all bacteria in drinking water are pathogenic. For example, iron bacteria are a major nuisance in many well-water supplies (iron bacteria should not be confused with iron dissolved in water that causes red water and stains on clothing and plumbing fixtures). Iron bacteria do not cause disease, but do form a reddish-brown slime that coats the inside of pipes, fouls pumps, and clogs waterers.

Algae are another type of micro-organism that contaminates water supplies. Some algae produce compounds which are toxic to pigs. In extreme cases, algae produced compounds cause offensive flavours –

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described as 'muddy' or 'plastic' – in pork.

Because bacteria and algae contaminated water cause disease, or in some cases depress the pig's immune system, pig herd performance suffers. In addition, some non-pathogenic bacteria and algae impart an offensive odour or taste to the water, which in turn results in water refusal, leading to a drop in feed intake and poor pig performance.

A major contributing factor to the presence and intensity of bacteria or algae contamination in drinking water is the amount of dissolved nutrients – specifically phosphorus and nitrogen – in the water. These nutrients facilitate the growth of bacteria and algae through a biological process known as eutrophication.

Dr Slawek Tulaczy, an earth scientist at the University of California says common sources of the phosphorus, nitrogen, and other nutrients that drive eutrophication in water systems are leaks from septic tanks and landfills, seepage from crop irrigation, infiltration from industrial run-off, leachate from mines, and accidental spills.

The diverse sources introduce a complex mixture of organic and inorganic nutrients into the water supply, which can complicate characterisations of contaminant transport, fate, and effects on pigs and other livestock.

Production of bio-films

In a major study conducted several years ago by the US Geological Service at the Massachusetts Military Reservation near Cape Cod, researchers observed that excess phosphorus readily migrated from agricultural fertilisers, livestock manure, and sewage effluent and into surface and ground water.

In addition, they concluded that the phosphorus was a common cause of eutrophication. Over time, eutrophication can progress to a point where the bacteria or algae form a visible slime layer – or bio-film – on the inside surface of water pipes.

Pig growers find that water-borne bacteria and algae are difficult to kill. The cells of these micro-organisms are encased in a cell wall. Common disinfectants and sanitisers cannot penetrate or degrade the cell wall. Bio-films provide bacteria and algae with additional protection from chemical assaults.

According to Dr Pat Welch, a livestock production consultant, bio-film is generally present in all watering systems and the only good way to suppress mature bio-films is to aggressively 'shock' water lines with a good sanitising agent between flocks.

The aim of a water system shock treatment is to expose all interior surfaces of the drinking water system to a sanitising agent for a period of time to reduce the surface tension of the bio-film and dissolve mineral deposits that have accumulated in the water lines, and kill actively growing bacteria and algae.

Chemical	Effective concentration (ml or g per litre)
Acetic acid (vinegar), 5%	1,000
Ammonia (household)	125
Anthium dioxide, 5%	13
Buffered organic acids, 65-85%	1,000
Chloride, 6% bleach	125
Citric acid, 410 g/pk	250
Hydrogen peroxide, 50%	1,000
Sodium acid sulphate	125
Sodium chlorite, 0.2%	47
Virkon S	10

Table 2. Effective chemicals for water line shock treatments in pig production units.

A two-phase water-line shock procedure that uses organic acids and detergent followed by the addition of Activate US WD Max, a proprietary blend of organic acids from Novus International to the drinking water, is outlined in Table 1. Table 2 features a list of chemicals used in other water line shock treatments.

Welch cautions pig producers to exercise care when mixing organic acids to detergents. Also, some oxidisers used for shocking water lines are caustic and cause chemical burns on exposed skin or mucous membranes. He also emphasises that shock treatment chemicals that contain chloride can irritate the eyes and respiratory tracts of users.

If inhaled in sufficient quantities chlorine gas can be fatal. Welch advises workers to don personal protective equipment before using oxidisers to shock water lines.

Challenge for the future

More pig producers are discovering the value of water quality on the performance of newborn pigs, grower-finisher pigs, sows, and boars. Pig producers will likely find the task of maintaining high quality water supplies more challenging in the future. Higher temperatures – possibly due to global warming – decreased precipitation, and the reduced flow of surface and ground water could concentrate contaminants (nutrients) in drinking water. This will lead to faster, more widespread, and higher intensity eutrophication.

Higher environmental temperatures will also accelerate bacteria and algae growth in water lines. Therefore, the best defence is for pig producers to establish routine procedures – such as chemical shock treatments – to suppress the formation of bio-films and slime layers in their water supply lines. ■

How is the water quality in the pig pen?

Most pig producers know how to properly collect a representative sample of feed or ingredients. However, many are not trained in how to correctly obtain a drinking water sample for quality analysis. Water sampling is distinctly different from feed or ingredient sampling.

The key components of collecting a usable water sample are:

- Water samples for bacteria or algae tests must always be collected in a sterile container.
- Thoroughly wash hands with soap or wear a pair of disposable gloves to minimise the risk of contaminating the sample.
- Before collecting the sample, sterilise the inside and the end of the tap with a flame from a propane torch or a disposable butane lighter. Do not wipe the end of the tap after sterilisation.
- Do not collect a sample from a leaky tap; any tap that delivers softened, filtered or otherwise treated water, or from a hose attached to a tap.
- Run the water for two minutes to clear the lines and bring in fresh water.
- Open the sterile container being careful not to touch or contaminate the inside of the bottle or cap.
- Fill the container to the top with water without overflowing. Also, remember to not let the water flow over your hand as the water enters the bottle.
- Close the bottle immediately after collecting the water sample.
- Refrigerate the sample and transport it to the testing laboratory within 36 hours (six hours is ideal) preferably in an ice chest. Results from mailed water samples are not as reliable as results from hand-delivered samples. Note: Many laboratories will not accept water samples on a Friday or before a holiday.