ANIMAL SCIENCE PRODUCTS® INCORPORATED

PKA®

pH Water Treatment

Acidification with PKA Reduces Bacteria as it Cleans Water Systems

Summary: PKA powdered acid is the strongest, most concentrated dry acid for animal water and food applications. The acid strength makes PKA unmatched as an efficient cleaner and mineral de-scaler in water systems, and its dry nature ensures handling safety as farmers use their own water to rehydrate it. Beyond PKA's most popular function, to dissolve and purge minerals and biofilm from water pipes or cool cell pads, PKA can easily acidify water pH to a level that inhibits pathogenic bacteria, a move toward freedom from antibiotics.

Figure 1. Images before and after using PKA to dissolve encrusted mineral deposits and associated biofilm.

Before (left panel)- endoscope photo prior to PKA cleaning shows the irregularly surfaced drinking water pipe with accumulated debris inside. Mineral blockages contribute to reduced water flow rates and biofilm capable of harboring microbial contamination.

After (right panel)- endoscope photo after cleaning with PKA at pH 3 to dissolve mineral accumulation and dislodge biofilm. PKA was allowed a contact time of at least 8-hours before high-pressure flushing to purge loosened debris. Drinker nipple is clearly visible.

Dissolving minerals and biofilm in drinking water systems

Regardless of whether PKA is dissolved directly in a drinking water tank or delivered into the drinking water as a liquid premix through a proportioning pump, it is the ideal solution for cleaning mineral deposits and organic debris from livestock drinking water systems.

The photos in figure 1 were taken using an endoscope to look inside drinking water pipes. They illustrate the most common function of PKA; eliminating mineral and biofilm that accumulates in drinking water systems. The images show PKA effectively cleaning the mineral scale and biofilm build-up contaminating a drinking water system. In addition to the mineral deposits reducing the water flow rate and blocking drinkers, animals consuming this water will be exposed to an increased microbial load. Removing accumulated bio-film layers and dissolving mineral deposits using PKA improves water flow and decreases microbial challenges. PKA is approved by the U.S. National Sanitation Foundation (NSF) for pH adjustment, corrosion, and scale control.

Figure 2. Evaporative cool cell pads blocked with mineral scale during routine use. Photos were taken before (left) and after (right) using the recommended PKA cleaning steps (pH 3) to reduce the mineralization.

Cool cell pads before cleaning with PKA

Cool cell pads after cleaning with PKA

Reducing mineral blockage from evaporative cool cell pads

The mineral deposits that commonly block evaporative cool cell pads offer another example of how PKA's mineral dissolving power can be put to work. Farmers often wish to remove accumulated mineral scale from cool cell pads to improve airflow and animal cooling efficiency. PKA's strong mineral dissolving power is an effective tool for maintaining cool cell pads free from the mineral accumulation that restricts airflow, reduces animal comfort and diminishes performance. The images in figure 2 help to visualize cool cell pads cleaned with PKA.

Pathogen reduction without antibiotics

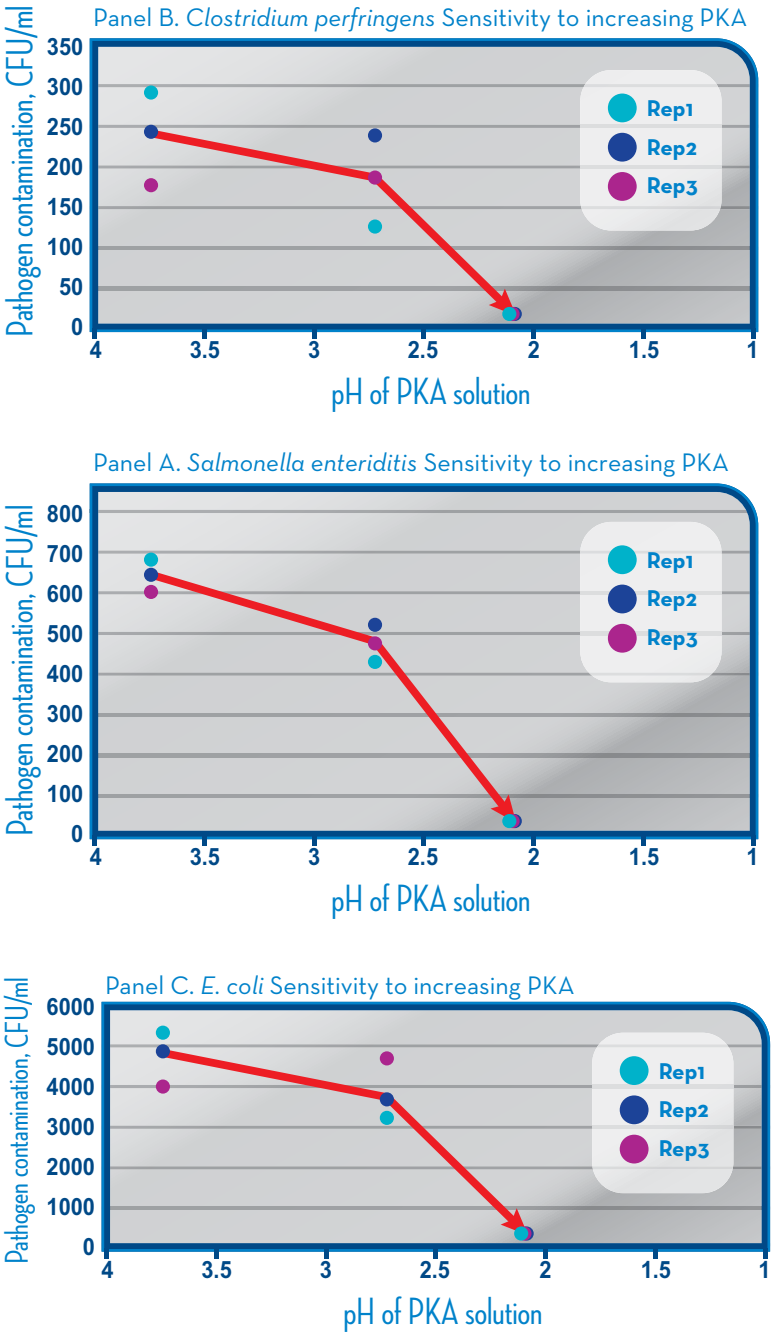
As a strong acid, PKA also inhibits pathogens in drinking water supplies. A research study tested the antimicrobial power of PKA against three prevalent livestock pathogens (*Salmonella enteriditis, Clostridium perfringens*, and *E. coli* O157:H7).

Methods: Highly pathogenic bacteria strains were cultured on plates containing different dilutions of PKA. Following incubation, the number of remaining live colonies were counted. The dilutions and plate counts were performed in triplicate.

Results: PKA, commonly used to purge mineral and organic deposits from drinking water systems, also inhibited bacteria in this study. The graphs in figure 3 detail each pathogen's sensitivity to pH reductions brought about by PKA. For each of the 3 pathogens, using PKA to reduce the pH from 3.70 to 2.76 exerted a clear reducing effect, and further acidifying to pH 2.16 fully eliminated the live bacteria.

Conclusions: PKA is a very effective water system cleaner, removing mineral deposits and organic debris by the action of the strong acid. Although other strong inorganic acids are hazardous liquids, PKA is safe to handle as a dry powder. It is the most powerful dry mineral acid available and is extremely water soluble. The exceptional solubility allows users to easily adjust their water pH to fit the conditions, whether they are dissolving mineral scale or reducing bacteria. Increasing the PKA concentration in this study accelerated the elimination of highly pathogenic bacteria. Effective acidification with PKA contributes to a cleaner, more sanitary water supply for livestock.

Figure 3. Acidifying water with PKA inhibits prevalent livestock pathogens (*Salmonella enteriditis, Clostridium perfringens*, and *E. coli* O157:H7).



Contaminating pathogens grown either in tripticase soy broth (*Salmonella and E. coli*) or fluid thioglycolate broth (*Clostridium*). The cultures were diluted in peptone water and inoculated on plates prepared with dilutions of PKA to pH 3.70 2.76, and 2.16. Following incubation, the number of remaining living colonies were counted. The dilutions and plate counts were performed in triplicate.

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