Electrolyzed water effective as chemical cleaner, study finds

By Ahmed ElAmin

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Scientific tests confirm that electrolyzed oxidizing water can replace the chemicals used for cleaning equipment in the food industry.

The market for electrolyzed oxidizing water is currently small due to the difficulties and expense involved in the process. However, manufacturers of the electrolysis machines needed for the process sell it as a safer less harsh way of keeping food factories free of infectious pathogens. Chemicals can corrode or damage the equipment used in food factories.

In research published last week, scientists at Penn State University say electrolyzed water technology can be used as a replacement for the chemicals used to clean and disinfect milking equipment.

"It is not as expensive as the detergents, and can be made with just a little bit of salt and water," stated Ali Demirci, associate professor of agricultural and biological engineering at Penn State and leader of the team doing the study.

The findings are published in the December 2005 issue of Transactions of the American Society of Agricultural Engineers.

Most US farms use some form of mechanized system to milk cows. The set-up is usually made up of a rubber-lined suction cup that milks the cow and a series of pipes that transfers the milk to a central refrigerating tank.

At day's end, the whole system is cleaned in a four-step process. First the pipes are rinsed with warm water to remove the milk. Then they are flushed with a chlorinated detergent at a high temperature to remove soils such as fat and protein deposits. A weak acid is used to neutralize the detergent and remove mineral deposits.

The pipes then have to be sanitized with an approved sanitizing agent before they can be used again.

The Pen State scientists decided to test clean the milk pipes using electrolyzed oxidizing water, as other researchers had shown its effectiveness in cleaning fresh produce and eggs.

Electrolyzed oxidizing water is created when electric current flowing through two electrodes – immersed in a weak salt solution and separated by a membrane – produces an alkaline and an acidic solution.

To test how the new cleaning agent measured up to conventional detergent, the researchers flushed warm milk laden with bacteria down a series of pipes set up to mimic the system on a farm, and they compared the cleaning power of both in turns.

The results showed that in between 7.5 to 10 minutes, the electrolyzed oxidizing water was as effective in removing organic matter from the pipes, as conventional treatments.

"The alkaline detergent and acidic rinse in conventional systems of cleaning can be replaced with this water," Demirci stated.

Last week, US company EAU Technologies reported it has made inroads in bringing its electrolysed water technology to market as a replacement for chemical cleaners.

EAU Technologies, which provides what it calls "green chemistry'' to the food processing, agriculture and consumer products industries, said it has received its first order for its Perfect Essential Oxygen products, from Elken Sdn Bhd, a Malaysian direct marketing company.

Elken will use the stabilised oxygen technology for a range of dietary supplements.

EAU said its electrolyzed oxidative water technology can replace many of the traditional methods in the processing sector now used to clean, disinfect, hydrate and moisturise foods The non-toxic water cuts down on existing bacteria, virus and mold proliferation.

The water eliminates pathogens in processing plants by treating not only surface contamination without toxicity but also the plant and animal foods directly.

EAU has been testing the water production technology companies such as Tyson Foods, Whole Foods Market and Super Saver and Water Sciences.

EAU is petitioning the Food and Drug Administration for approval to use its disinfecting products along the entire food chain process for fruits and vegetables.

Tests of the company's Primacide branded fluids indicate that the products can extend shelf life by reducing or eliminating decay-causing bacteria on the fruits and vegetables, EAU stated.

Primacide is manufactured primarily from normal tap water and is non-toxic to humans and animals. Primacide A is a disinfecting fluid that kills a large variety of bacteria, viruses, molds and spores within seconds of contact.

Primacide B is an emulsifier and cleaning fluid with some anti-microbial properties. Primacide C is stabilised acidic water that can be used in consumer products or other applications as a high level disinfectant, and where a long shelf life is required.

Primacide A is capable of replacing chlorinated water now used in poultry processing at volumes approaching 50,000 gallons per hour, the company stated. It is up to 80 times more effective at killing pathogens than chlorinated water, without the toxicity, the company claimed.

"The fluid is also extremely cost-effective when compared to antimicrobials such as trisodium phosphate (TSP), among others," EAU stated.

Trisodium phosphate, acidified sodium chlorite and quaternary ammoniums are used to pre-disinfect chicken carcasses prior to the chiller wash.

The company manufactures generators for water electrolysis. The generators use a combination of cell technology, salt and electricity to alter the molecular structure of water, creating a non-toxic oxidized antimicrobial solution capable of killing many pathogens in less than a minute.

The stabilised electrolysed water is non-toxic, inexpensive to produce, and can be used in multiple applications due to its various inherent sanitizing
characteristics, the company claims. EAU sells or leases the generators to companies.

The high oxidation of the water first damages bacteria cell walls, allowing infiltration by water. The microbe reaches capacity, causing an osmotic, or hydration, overload. The acidic fluid and water floods the cell faster than the cell can expel it, literally causing the cell to burst.

Standard toxic chemicals can create strains of pathogens that become resistant over time, because the cell can expel or neutralise the chemical before it can kill it, thereby causing the overall efficacy of chemical cleaners and disinfectants to be significantly reduced.