Sent: Saturday, December 07, 2002 12:38 PM
Subject: SUSPECTED VIRAL PATHOGENS OF THE FUTURE

Dear Aquathin Dealer OnLine, Splash NewsBulletin and Allergic Reaction NewsBulletin Members;

By now I am sure you've read about the several cruise ships and the hundreds of travelers recently sickened by a viral outbreak. The quick read article below by Dr. Reynolds concerns the elusive virus....and the potential for future outbreaks. I have specifically set in bold her opening statement and closing statements. Your Patented Aquathin Process removes disease causing water borne microorganisms (plenty of tests in the Master Catalogue). As well, many Dealers and their "municipal water" residential Customers are focusing on POE (Total Home) protection with our AquaShield.

Specifically in Kelly's closing statement, she mentions preventive medicine in the form of multi-barrier. That's the patented Aquathin Process and no one does it better ! I love my Aquathin.

Warmest regards to all,

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Emerging Issues: Suspected Viral Pathogens of the Future

by Kelly A. Reynolds, MSPH, Ph.D.

Here's some food for thought. In approximately half of all waterborne disease outbreaks, a causative agent -- or culpable microorganism -- is never found.

For some outbreaks, illnesses are recognized too late for proper sampling and investigation. For many outbreaks, howeve

causative agent is identified even after careful, thorough and timely survey and testing. The latter situation leads research to believe there's still a large portion of waterborne disease occurring for which the causative agent is either undetectable unrecognized. Recent history has proven that, even with our advanced scientific methodologies of pathogen detection, microbial agents of significant morbidity and mortality -- i.e., causing disease or death -- continue to emerge (i.e., *Cryptosporidium*, *Helicobacter pylori*). Therefore, by looking into the future, scientists strive to predict the inevitable emergence of the next waterborne pathogen.

A virus' elusive nature

Based on the difficulties in detecting viral pathogens, and the epidemiology and symptoms of disease in cases on unknov etiology, it's thought a significant portion of unidentified agents in waterborne outbreaks is due to viral agents. Viruses te to survive longer in the environment than most enteric -- or intestinal -- bacteria, including the bacterial indicators used te evaluate water quality, i.e., coliforms. Survival depends on numerous physical, chemical and microbial factors, although feasible for viruses to survive for days in aquatic environments and longer when associated with fecal matter or other protective material. In general, viruses have a very low infectious dose, meaning as few as one to 10 organisms can initia infection and disease. Their prolonged survival and small size make them especially adept at movement through aquatic soil environments. Methods for isolation of viruses from large volumes of water have poor recovery efficiency and resea under way to improve methods for monitoring viruses in the environment.

Viruses are obligate intracellular parasites, meaning they need a host cell to multiply and initiate disease. They don't gro the environment or outside of a host cell, a condition that makes them particularly difficult to culture in the laboratory. Although many enteric viruses grow in laboratory cell cultures, such as poliovirus and hepatitis A virus, others aren't yet culturable. Detection of non-culturable agents may be accomplished by microscopy or serology -- studying properties ba on reactions with various serums. If genetically characterized, agents may be detected via molecular methodologies (i.e., human caliciviruses). Still, other viruses are vaguely recognized as potential human pathogens and require further evalua These viruses include torovirus, coronavirus, picobirnavirus, picotrirnavirus and pestivirus. Could one of these agents be responsible for a portion of the waterborne outbreaks of unknown etiology, or disease origin? What populations, if any, a affected? With little or no information about the incidence, transmission, survival and/or transport of these recently recognized pathogens, such questions are difficult to answer.

Are they a threat?

Little is known about the torovi-ruses, coronaviruses, picobirnaviruses, picotrirnaviruses and pestiviruses and very little emphasis has been placed on these suspected waterborne pathogens in regard to research dollars or recognition from pub health and regulatory agencies. What we do know is summarized below.

Coronaviruses: Coronaviruses are well known causes of the common cold in humans (responsible for up to 30 percent o human infections) and respiratory infections in pigs, cats, dogs, mice and chickens. They're also the cause of diarrhea in animals and have been found in the feces of humans with diarrhea, using high-powered microscopy. Coronaviruses are e identified based on their distinctive corona-like (halo) appearance. Although first identified in 1965, little is known abou role in human disease. Adding to the uncertainty is the fact that coronaviruses have been detected in the feces of apparen healthy individuals. Higher prevalence rates have been observed in lower socioeconomic populations and in those with p personal hygiene.

Toroviruses: All toroviruses identified so far cause enteric infections and are thought to be transmitted by the fecal-oral r Toroviruses have long been recognized as pathogens of cattle and horses but have only recently been associated with gastroenteritis in children and adults. In a study of over 2,500 children throughout the United States with diarrhea, the majority were infected with rotavirus (32 percent) while toroviruses are the third most common agent (3 percent).[1] Toroviruses were the second most commonly isolated agent in hospitalized cases and have been associated with persister symptoms.

Picobirnaviruses, picotrirnaviruses: Picobirnaviruses are also known pathogens of animals, including chickens and rabb and have been detected in fecal specimens from humans in developing nations and immunocompromised populations in United States. Picobirnaviruses were found in 14.6 percent of HIV positive patients with diarrhea but not in the general population.[2] Others have found similar prevalence rates in patients with or without symptoms of intestinal disorder.[3] Mos recently, 35 percent of children with diarrhea in Canada tested positive for the viruses, compared to 14.5 percent of healt children.[4] A potential co-infectant in persons suffering from cryptosporidiosis, picobirnaviruses is a possible public healt concern. Like picobirnaviruses, picotrirnaviruses were originally detected in the stools of HIV-infected patients; howeve they differ from the picobirnaviruses in size, genomic composition and general morphology. Picotrirnaviruses are known infect animals, in particular mammals. This group of viruses is probably the most obscure, with almost no data available.

Pestiviruses: Pestiviruses are known to infect cows, pigs and sheep wherein they can cause diarrhea, congenital defects a reproductive failures. They've also been identified in 23 percent of Arizona Indian children under the age of 2 with symp of diarrhea, compared to only 3 percent in healthy populations.[5] Even higher prevalence rates (30-50 percent) were found studies of children and adults from Arizona, Maryland and Peru.[6] These viruses are relatively common contaminants of laboratory cell cultures and have raised concern over their presence in reagents used for human vaccine development.[7]

Unanswered questions

While none of the aforementioned viruses have been documented as the cause of a waterborne disease, they've been implicated as causative or cohabiting agents in patients with gastroenteritis. Little is known about their prevalence in drir water and wastewater, or their susceptibility to conventional water treatment processes. Can we assume that all viruses -- those currently identified and those yet to be discovered -- are respondent to approved treatment methods? How can we account for the differing susceptibilities of immunocompromised individuals? The latter question is becoming more and relevant as the immunocompromised population steadily grows (now up to 25 percent of the U.S. population) because of or other factors.

Conclusion

Based on the limited number of microbes being looked at for research and/or regulatory control -- as well as continued u bacterial indicators that aren't useful for predicting risks of viral or protozoan pathogens as measures of water quality -- t public may be left largely unprotected against waterborne viral agents (see www.asmusa.org/pasrc/pdfs/waterreport.pdf).

Only time will tell if toroviruses, coronaviruses, picobirnaviruses, picotrirnaviruses, pestiviruses, or some other unidentified agent has an impact on human health. Is it necessary, however, to wait for the next major pathogen t emerge? Or, should the public take a more proactive approach in "preventative medicine" -- also known in water treatment as the multi-barrier approach?

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About the author

Dr. Kelly A. Reynolds is a research scientist at the University of Arizona with a focus on development of rapid methods f detecting human pathogenic viruses in drinking water. She holds a master of science degree in public health (MSPH) fro the University of South Florida and doctorate in microbiology from the University of Arizona. Reynolds also has been a member of the WC&P Technical Review Committee since 1997.