WEF's Q&As for Assistance in Discussions with the Public or Media Regarding the WERF Report:

"Examination of Reactivation and Regrowth of Fecal Coliforms in Centrifuge Dewatered, Anaerobically Digested Sludges"

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What is the issue here?

A recent research project based on a small sampling of wastewater treatment plants indicated that fecal coliform bacteria may reactivate during certain biosolids treatment processes.

Why is this important?

The concentration of fecal coliform bacteria is used as an indicator of the average amounts of bacterial and viral pathogens in biosolids treated by biological processes. Some wastewater treatment facilities test for the presence of these indicator organisms to assure compliance with the U.S. EPA federal regulations that govern biosolids use and disposal (Title 40 of the *Code of Federal Regulations*, Part 503). Testing for fecal coliforms is one of three options available to wastewater agencies to demonstrate compliance with the Class B pathogen requirements of these regulations.

Who conducted the research?

The research was sponsored by the Water Environment Research Foundation (WERF) and conducted by scientists at the District of Columbia Water and Sewer Authority and Bucknell University.

Where was it conducted?

This initial research phase collected samples from seven out of 16,000 U.S. wastewater treatment plants. Samples from four of those plants indicated possible bacterial reactivation, while three did not. All of the facilities at which testing was performed used anaerobic digestion followed by dewatering using high-solids centrifuges for solids processing. While many plants use anaerobic digestion, there are numerous alternative means of dewatering, such as belt filter presses and standard centrifuges

How do wastewater treatment plant processes kill pathogens in wastewater treatment solids?
There are five approved processes to significantly reduce pathogens in sewage sludge. They include aerobic and anaerobic digestion, air drying, composting, and lime stabilization. These forms of treatment are designed to kill disease-causing microscopic organisms (pathogens). Biosolids treated using these processes are considered to be Class B with respect to pathogen destruction. While Class B biosolids may contain some pathogens, restrictions on crop harvesting, animal grazing, and public access ensure pathogen exposure is further reduced by environmental factors.

There are six approved processes for demonstrating Class A pathogen reduction. These processes further reduce pathogens and therefore no additional treatment or site restrictions are required by the regulations to protect public health and the environment.

What, according to the study, appears to be happening in this treatment process?
The WERF research, while limited in scope, suggests a potential that high-solids centrifuge dewatering following anaerobic digestion, can, in some instances, result in the reactivation of fecal coliform bacteria. The study did not determine the mechanisms for any reactivation or regrowth.

How is compliance with the current pathogen requirements of federal regulations determined?
Each of the following processes are options under Part 503 for Class B biosolids testing. The WERF investigators, however, used a competitive polymerase chain reaction (cPCR) method that looked at DNA mapping to explain the regrowth–reactivation phenomenon.

The Part 503 regulations (Subpart D) provide three options or alternatives for facilities to demonstrate compliance with Class B pathogen requirements:

Alternative 1: Test for fecal coliform density as an indicator for all pathogens to demonstrate the biosolids meet the regulatory limits.

Alternative 2: Treat the biosolids in one of the five EPA-approved Processes to Significantly Reduce Pathogens (PSRP).

Alternative 3: Treat the biosolids in a process equivalent to one of the PSRPs, as determined by the permitting authority.

Monitoring after treatment is not required if Alternative 2 is selected; the biosolids are considered in compliance with the regulations if the biosolids are treated according to the specifications provided in Appendix B of Part 503.

Regardless of the Class B option chosen, the Part 503 regulations also include mandatory site restrictions that prevent crop harvesting, animal grazing, and public access for a certain period of time, all of which are designed to ensure additional protection of public health and the environment.

How do we know that the EPA-approved processes for treating biosolids are safe?

During the development of the 40 *CFR* Part 503 Regulation for the Use or Disposal of Sewage Sludge (Biosolids) (1993), U.S. EPA reviewed extensive data throughout the world, including findings from thousands of field trials and laboratory experiments, on the human health and environmental impacts from the use or disposal of biosolids. Field trials on biosolids have been conducted in the United States and other countries for at least 40 years. Some biosolids sites have undergone repeated application of biosolids for nearly 30 years. Information gathered from monitoring these field trials and biosolids sites indicates no environmental degradation or human health effects when used in accordance with federal criteria.

In addition, the National Academy of Sciences has reviewed current practices, public health concerns, and regulatory standards and concluded that "the use of these materials in the production of crops for human consumption, when practiced in accordance with existing federal guidelines and regulations, presents negligible risk to the consumer, to crop production, and to the environment." In addition, an epidemiological study of the health of farm families using biosolids found that the use of biosolids is safe.

Doesn't this study confirm the claims of health problems that have been heard over the years?

No. This is a preliminary study focused on a small number of treatment plants. EPA continues to believe that the pathogen requirements and operational standards of Subpart D of the 40 *CFR* Part 503 regulations are protective of public health. More than four decades of scientific research and the excellent health histories of the personnel who work at wastewater treatment plants, who land apply biosolids, and of the farmers who use biosolids underscore the safety of biosolids when managed in accordance with federal regulations.

What happens to the fecal coliform levels in biosolids during storage?

Studies conducted on stored biosolids indicate there is significant fecal coliform "die off" during prolonged storage. Many treatment plants store biosolids for long periods before land application.

Did the study provide any insight on possible mitigation or control strategies?

The study results provide some insight into possible control strategies. For example, a multi-stage thermophilic process was able to completely destroy the fecal coliforms and *Escherichia coli*, suggesting that reactors in series or in more general terms, reactor hydraulics, may be an important factor. The researchers also suggest some simple chemical additions to the sludge cake, such as a low-dose of lime, could be used to control reactivation and regrowth. They also note that longer-term storage could be a strategy to reduce fecal coliforms to desired levels.

Will utilities or municipalities need to modify their existing biosolids management practices?

It is important to remember that this study was conducted only at facilities that use anaerobic digestion followed by high-solids centrifugation. Plants that do use these processes will be closely monitoring the findings of this ongoing research as part of their commitment to public health protection through safe biosolids management practices. The next phase of the study will provide additional insights. Some potential modifications, identified by the researchers, such as longer storage times or lime stabilization, can be accomplished by many treatment plants without

significant expense. Other process changes could result in major expenses for new equipment or facilities.

Why is WERF releasing this study?
The Water Environment Research Foundation is dedicated to advancing science and technology regarding water quality issues as they affect water resources, the atmosphere, the land, and quality of life.

WERF subscribers are utilities and municipalities, environmental engineering and consulting firms, government agencies, equipment manufacturers, and industrial organizations, all with a common interest in promoting research and development in water quality science and technology.

Is more research being conducted?
Additional research is currently being conducted by WERF to better define the conditions under which these increases in fecal coliform are likely to occur, the extent of this phenomenon, and options for wastewater treatment facilities to consider if bacterial concentration increases are observed.

What does WEF plan to do in response to the study?
The Water Environment Federation is assembling a task force of scientists and engineers with a wide variety of backgrounds and perspectives to provide a consensus-based evaluation of the implications of the WERF study for public health protection, effective operational practices, and monitoring and testing. The findings of the task force will be available by the end of August 2006. WEF, along with WERF, and EPA remain committed to continuing research on issues related to biosolids management and the development and dissemination of best practices based on the results of this research.