

# MOLECULAR BIOLOGY

## DETERMINING THE SOURCE OF FECAL COLIFORM BACTERIA

ADVANCED  
DIAGNOSTIC  
TOOLS

### MOLECULAR BIOLOGY LAB

Environmental Business Specialists recognizes the increasing importance of Molecular Biology in the scope of wastewater treatment. Many plants have fecal coliform limits which are impacted by non-human sources of fecal coliform bacteria. By identifying the source of fecal coliform contamination, the permit exceedances may be explained to the state.

### WHAT IS PCR

Polymerase chain reaction (PCR) is the process of exponentially amplifying a target section of DNA or RNA, known as a molecular marker, so that the presence or absence of the selected sequence can be detected. Molecular markers can identify a genus or species of organism, a gene of interest or just a section of a gene. A PCR reaction consists of 30-50 cycles during which copies of just the targeted sequence are synthesized. The number of copies is doubled in each cycle, which can equate to trillions of copies by the end of the complete reaction. Quantitative PCR (qPCR) uses fluorescence levels, which are measured at the end of each cycle, to determine the starting concentration of the target sequence present in a sample.



### USING qPCR FOR WASTEWATER STUDIES

In wastewater studies, we can monitor for different species of bacteria present in the treatment system and quantify the amount of DNA in a sample from those organisms. Once DNA has been extracted from a water sample, multiple markers can be quantified to categorize the types of bacteria present in that sample and throughout the treatment system.

If fecal indicator bacteria concentrations are too high in a system, studies can be designed to track and quantify potential sources of fecal contamination. We can use species specific markers to differentiate between bacteria that likely come from environmental sources (e.g. plant material) and those that are found in human or animal feces. qPCR can also be used to detect the presence of human pathogens to assess the risk to public health – another indicator of whether or not there is fecal contamination present.



For more information on our  
molecular laboratory capabilities, contact  
Environmental Business Specialists at  
[info@ebsbiowizard.com](mailto:info@ebsbiowizard.com) or 985-674-0660.

**EBS**  
ENVIRONMENTAL  
BUSINESS SPECIALISTS, LLC

Environmental Business Specialists, LLC  
1930 Surgi Drive, Mandeville, LA 70448  
[www.ebsbiowizard.com](http://www.ebsbiowizard.com)  
[info@ebsbiowizard.com](mailto:info@ebsbiowizard.com) • (985) 674-0660

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