

PATHOGENS

Pathogens. As of March 2020, they're making headlines all around the world. But when it comes to storm water, pathogens are pollutants, but are not commonly discussed. If you were reading our newsletter a couple years ago, you remember our *Understanding Pollutants* series, and how we devoted 12 issues of our newsletter to learning about some common pollutants. This month's edition is on microbe pollutants that are on the TMDL and 303(d) lists of impairments, some potential sources, and how you can prevent pathogen pollution.

So, what are pathogens? The term "pathogen" comes from two Greek words: *pathos*, meaning "suffering," and *genus*, meaning "origin." Thus, pathogens are literally microorganisms that are the "origin of suffering" - or, as we might say, they can cause disease. Pathogens include some types of bacteria, viruses, protozoans, fungi, and other microbes.



bacteria or viruses. And since many pathogens follow the fecal-oral route of infection, fecal coliform bacteria are used to indicate the presence of sewage or fecal matter in the water column, which could be a potential source of pathogens.

Fecal coliform bacteria include a handful of bacteria genera, such as: *Escherichia*, *Enterobacter*, *Klebsiella*, and *Citrobacter*.

But, let's clarify that statement a little further. A **pathogen** is a microorganism that has the *potential* to cause disease. An **infection** is the invasion and multiplication of pathogenic microbes in an individual or population. A **disease** is when the infection causes damage to the individual's vital functions or systems. **An infection does not always result in a disease.** And we must make a distinction between non-infectious microorganisms and infectious pathogens. Keep in mind that while all pathogens are infectious microorganisms, very few microorganisms are infectious pathogens. Some estimate that as little as 1% of bacterial species are pathogenic. Many microbes such as viruses are pathogenic to some species but not others. And as anyone who has eaten yogurt, cheese, sauerkraut, or kombucha knows, some microorganisms are perfectly safe to ingest and actually help the body maintain a healthy microbiota or bacterial flora.

Interestingly, many of the microbes that storm water professionals refer to as "pathogens" are actually not necessarily pathogens, but **indicator organisms**. It's tremendously difficult to count and identify all species of microorganisms in a sample and determine which are pathogenic, so scientists utilize indicator organisms - harmless bacteria that indicate the potential presence of pathogenic

You probably recognize the sometimes-pathogenic *Escherichia coli*, or *E. coli*, for its common association with food poisoning (remember the fecal-oral contamination route?). If you request a Total Fecal Coliform analysis (SM 9223B) from your storm water laboratory, you will get one of two results: either a unquantified present/absent report, or a Most Probable Number (MPN) report which provides essentially an educated guess on the amount of fecal coliform bacteria are present per 100ml of water sampled. If fecal coliform bacteria are detected in a water column, it likely indicates the water has come into contact with fecal material, either through raw sewage, wild animal or bird feces, or pet and livestock feces.

Strictly speaking, fecal coliform bacteria are "opportunistic pathogens," which means that given the right circumstances and environments they can be pathogenic, but generally they are harmless. So, referring to the 303(d) list of biological impairments as "pathogens" is not always true. Enteric viruses are pathogenic, as are some serotypes of fecal coliform bacteria such as *E. coli* O157:H7. So despite the title of this month's article, a more appropriate term for these potential pollutants could be "**biohazards**," which refers to the CDC's classification system that ranks biological substances and microorganisms on a scale that ranges from non-infectious to

highly infectious.

Let's tie this all together. When we're talking about the 303(d) and TMDL impairment lists, it isn't a question of whether a microbe is pathogenic or not. Rather, it's a question of whether a particular water body is impaired for a particular microbe. Most of the microbes listed on the 303(d) and TMDL lists are fecal coliform bacteria, which are not necessarily pathogenic, and are easy to test for in an analytical laboratory. However, there are a few water bodies in California which are impaired for *enteroviruses*, which are pathogenic viruses that infect the gastrointestinal tract. As we're seeing with the COVID-19 situation, viruses are pretty hard to analyze for, and not every laboratory is equipped to perform those tests. But since we know that fecal coliform bacteria are *indicator organisms*, in the unlikely case that you need to sample for enteroviruses, you can use the SM 2993B fecal coliform analytical test as an indicator for the potential presence of enteroviruses.

Do I need to test for pathogens? That depends on whether your facility has an industrial source of fecal contamination. Some industries that *may* have industrial sources of contamination might include:

- Animal feedlots (SIC Codes 02XX)
- Slaughterhouses and Meat Products (SIC Codes 2011-2015)
- Sewage or Wastewater Treatment Works (see IGP Attachment A, Category 9)

Even if your facility has industrial sources of fecal bacteria, remember that fecal bacteria is an indicator organism itself—so before you add Total Fecal Coliform to your list of sampling parameters, check to see if there is another activity indicator parameter that you can use. Fecal bacteria is so widespread and uncontrollable (bird poop, for example), that it's not very useful in determining if your facility is actually discharging fecal-contaminated storm water, or if it's just background pollution. For slaughterhouses and meat product facilities, a better test would be Biochemical Oxygen Demand (BOD), which will not only detect offal and fecal matter, but other organic pollutants such as blood. For animal feedlots, BOD would work as well, or Total Ammonia as N, which would target waste products such as urine and fecal material. Keep in mind that BOD and Ammonia both have NAL values, so they may not be as desirable as other indicator parameters without NALs.

However, this is assuming your facility's receiving water is not listed on the 303 (d) or TMDL lists as impaired for fecal bacteria or enteroviruses. If your facility has an industrial source of fecal bacteria or enteroviruses AND your receiving water is listed on the 303(d) list, **OR** if your receiving water has a TMDL impairment for fecal bacteria you'll need to include the appropriate analytical test(s) in your sampling parameters. Depending on the impairments listed in the 303(d) or TMDL lists, you might need to add a couple different sampling parameters (such as Total Fecal Coliform, E. coli, and Enterococci) - talk to your analytical laboratory to determine the best approach for your situation. ☔

Sources:

Mallard, Gail E. (1980). *Microorganisms in Stormwater—A Summary of Recent Investigations*. U.S. Geological Survey.

Wikipedia contributors. "Pathogen." Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 12 Mar. 2020. Web. 24 Mar. 2020.

National Research Council (US) Safe Drinking Water Committee. *Drinking Water and Health: Volume 1*. Washington (DC): National Academies Press (US); 1977. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK234161/>

Standard Methods Committee (2004). *Standard Method 9223, Enzyme Substrate Coliform Test*.

Microbiology Society. *Microbes and Disease*. Available from: <https://microbiologysociety.org/why-microbiology-matters/what-is-microbiology/microbes-and-the-human-body/microbes-and-disease.html>

"To Do List" for March

- ☔ Stay home and stay healthy!
- ☔ Review your SWPPP and make sure it's up-to-date. *The Industrial SWPPP Writing course* is free on FORGE until April 10.
- ☔ If it rains at your facility, you still may need to collect storm water samples. Talk to your supervisor, and look at the below letter from the State Public Health Officer.

Essential Critical Infrastructure?

In light of the current Covid-19 pandemic, many people are wondering how the Stay At Home directive affects the storm water industry. On March 19, 2020, Governor Newsom issued Executive Order N-33-20 directing all residents immediately to heed current State public health directives to stay home, except as needed to maintain continuity of operations of essential critical infrastructure sectors and additional sectors as the State Public Health Officer may designate as critical to protect health and well-being of all Californians.

How does this directive apply to your particular job? The State Public Health Officer has released a list detailing which jobs are considered "Essential Critical Infrastructure." Please review this list, but keep in mind—the directive to stay at home is for the protection of yourself and your immediate family. Looking at this list, it wouldn't be hard to justify most vocations as a necessary support to critical infrastructure. And your job very well could be! But be very careful, and make sure your work isn't compromising someone else who might be trying to protect their family's health.



<https://covid19.ca.gov/img/EssentialCriticalInfrastructureWorkers.pdf>

Please contact us if you have any questions ...

The Rain Events

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This is a message from the State Water Resources Control Board

Updated as of March 20, 2020

Compliance with Water Board Requirements During the Coronavirus 2019 (COVID-19) Emergency

The State Water Resources Control Board and the nine California Regional Water Quality Control Boards (the Water Boards) are continuing their efforts to protect public health, safety, and the environment consistent with all federal, state, and local public health directives and guidelines related to COVID-19.

Please be aware that timely compliance by the regulated community with all Water Board orders and other requirements (including regulations, permits, contractual obligations, primacy delegations, and funding conditions) is generally considered to be an essential function during the COVID-19 response. As a result, the Water Boards consider compliance with board-established orders and other requirements to be within the essential activities, essential governmental functions, or comparable exceptions to shelter-in-place directives provided by local public health officials.

If there is a specific Water Board order or requirement that cannot be timely met because it would be inconsistent with current governmental directives or guidelines related to COVID-19, the entity responsible for compliance with the Water Board order or requirement must notify the applicable Water Board immediately. The notification shall be via electronic mail to the applicable Water Board using the appropriate email address identified below, and shall include:

- the specific Water Board order, regulation, permit, or other requirement that cannot be timely met,
- the inconsistent COVID-19 directive or guideline,
- an explanation of why the responsible entity cannot timely meet the Water Board order or requirement, and
- any action that the entity will take in lieu of complying with the specific Water Board order or requirement.

Water Board staff will do their best to respond within 24/48 hours.

Please note that more specific directions for certain types of Water Board orders and other requirements may also be provided.

Contacts for the Water Boards

State Water Board – Stormwater – stormwater@waterboards.ca.gov

Colorado River Basin Water Board – r7_stormwater@waterboards.ca.gov

North Coast Water Board – r1_stormwater@waterboards.ca.gov

Santa Ana Water Board – r8_stormwater@waterboards.ca.gov

San Francisco Bay Water Board – r2stormwater@waterboards.ca.gov

San Diego Water Board – r9_stormwater@waterboards.ca.gov

Central Coast Water Board – r3_stormwater@waterboards.ca.gov

Los Angeles Water Board – r4_stormwater@waterboards.ca.gov

Central Valley Water Board (Redding) – r5r_stormwater@waterboards.ca.gov

Central Valley Water Board (Sacramento)

– r5s_stormwater@waterboards.ca.gov

Central Valley Water Board (Fresno) – r5f_stormwater@waterboards.ca.gov

Lahontan Water Board (South Lake Tahoe)

– r6a_stormwater@waterboards.ca.gov

Lahontan Water Board (Victorville) – r6b_stormwater@waterboards.ca.gov

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Storm Water Contest...

Each month, we invite our readers to participate in a contest to test their knowledge of the Industrial General Permit and show their storm water compliance program. We enter all submittals to our monthly newsletter question into a drawing and one person is selected at random to receive a \$25 gift card. Last Month's question was:

Are Level 2 Dischargers eligible to return to Baseline status?

Congratulations, Jamie Johnson, you're correct! Jamie answered that **Level 2 Dischargers can return to Baseline, but only under specific conditions.** Specifically, they must have chosen the Industrial Activity BMP Demonstration (in Section XII.D.2.a of the Industrial General Permit), implemented all the BMPs in their Action Plan and Technical Report, and have obtained results from four consecutive QSEs that indicate no additional NAL exceedances for that parameter. Jamie gets a \$25 gift card to Jamba Juice!

Storm Water Contest...

WHERE CAN THE LIST OF TOTAL MAXIMUM DAILY LOADS (TMDLS) BE FOUND IN THE INDUSTRIAL GENERAL PERMIT?

We need industrial storm water sleuths to help us with this month's question. Submit your answers by Friday, April 17th. Email your answer to jteravskis@wgr-sw.com. One winner will be selected by a random drawing to receive a \$25 gift card to Doordash so that you can support your local restaurants!



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