



Dominique

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**WATER:
Just a Drop
Can *Kill You***

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Special To PSDiver

Water – Just a Drop Can Kill You

Mark Phillips

Maybe Global Warming is becoming more of a reality than we thought. Maybe we as aware and intelligent people are starting to pay more attention to the cause and effect of things. Maybe we are noticing a planetary cycle that has always existed but we were not able to recognize it before now. Regardless of which statement you hold to be true, it is hot and keeps getting hotter.

Our firefighters are working more than ever to control more frequent and larger wildfires. Urban firefighters are learning that they have to monitor themselves and each other for heat related injuries. Incident Command is learning to put a much higher priority on rehabbing crews.

Police Officers are sometimes torn between overheating in a bulletproof vest and having to deal with questionable individuals while unprotected. Squad

cars and ambulances are overheating. Air conditioners once thought to be accessories are not able to keep up with the extreme heat.

Let's face it, it is hot and we know it. Protect yourself from heat injuries, stay hydrated. We know that.

Since we are experiencing such extreme temperatures our local water ways – even those that are tidal or flowing - are being affected. They are warming up and some shallower waters are getting hot.

As PSDivers we have more issues to deal with. Do we allow our divers to dive in jeans and a t-shirt so they do not overheat on shore? Or do we have them suit up in an encapsulated dry suit shell and supply them with drinking

water until they are through with their dive rotation and can undress? With limited personnel or equipment, that may be a real decision for a lot of us. We know our local waters. We know what is safe.... Right?

But – there is always a but isn't there?

As the temperature rises and maintains, the microorganisms that live in that water will likely flourish and multiply. Warm water can be home to a very large number of

NOAA's National Weather Service

Heat Index

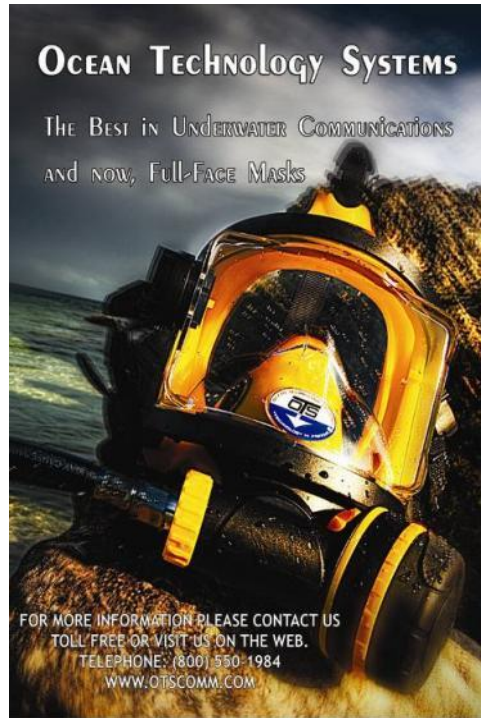
Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution
 Extreme Caution
 Danger
 Extreme Danger

microorganisms that we cannot see with the naked eye - nasty creatures that can cause our divers any number of ailments from stomach cramps to *rapid death*. As divers we work in water and we expose ourselves to these creatures through a variety of routes of transmission. These exposures can come from ingestion of the water, dermal contact either by contact with skin or mucus membranes or through inhalation.



How can this be? Contact with skin we get. Mucus contact with water – think about how many times you wipe your nose when you are in the water. Ingestion though, that never happens because your regulator is never left dangling in the water, right? Oh, you use full face masks. And you ALWAYS adhere to mask on BEFORE you enter the water and mask off when you EXIT the water? OR does it sometimes find itself dangling in the water too? When it does, the air coming into the mask has the ability to atomize, causing you to breath in water droplets.

But, we know that. We have droned on and on about how our divers can be contaminated and how they need

proper PPE for protection. The point has been hammered home a number of times.

What we did not discuss is what is going to get you and what it will do to you. We keep pretending that we are aware of our risks and that "it will never happen here". We tell ourselves that we have to do the job because no one else will and justify our risk when in fact, the best course of action may be to do nothing but wait for a body to float and hope we can find it.

We accept risk based on our current knowledge and do what we do. There is hope that we will CONTINUE to learn more and recognize more and greater risks and modify our risk assessments.

Coliform is the name given to a whole group of bacteria which can occur in water. Divided into two groups and measured in cells in 100ml of water. The two groups are identified as Total coliform and Fecal coliform. Fecal coliform is the more serious group and the one we are most concerned with.

What follows can be verified with independent research and you are encouraged to do so.

Every now and then we hear about or read about flesh eating bacteria. We gross out at the thought, feel bad for the poor soul who got it and



marvel at how fast the doctors amputated a leg, arm or other body part. It is really an infection that is caused by bacteria called Streptococcus Pyogenes. The infection is known as necrotizing fasciitis.

Necrotizing fasciitis, even gangrene, can be caused by more than one type of bacteria. Streptococcus iniae is a pathogen found in freshwater fish that can cause infection in humans through injuries received by handling the fish. Streptococcus Pyogenes is mostly found in warm salt water and seems to be most reported near or on coastal areas.

It can be fatal. At its worst, to stop it from spreading, almost immediate amputation of an effected limb is performed. Redness and swelling caused by cellulitis is a



Extensive tissue damage caused by nectrotizing fasciitis
Photo: <http://pyogenesgonewild.com/>

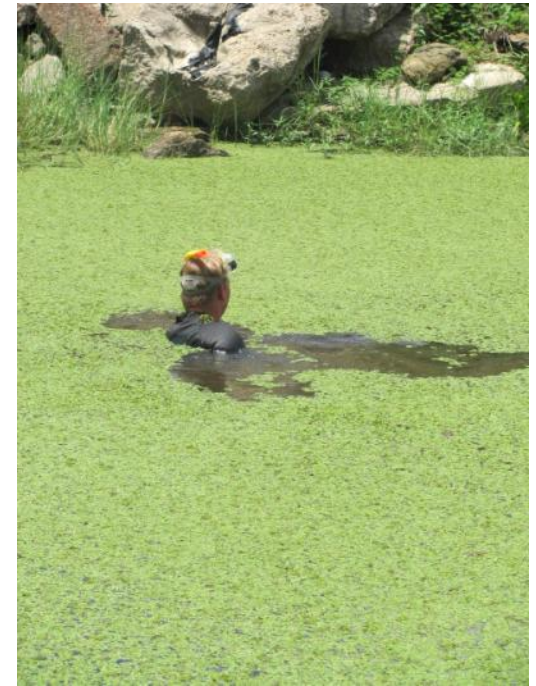
sign of infection. It can enter your body through any break in the skin. ANY break.

Because the list of signs and symptoms of the vast number of organisms is somewhat similar, consider that ANYTIME within 2 to 48 hours after a dive you experience swelling, redness, tenderness, itching or pussing of a wound, headaches, unusual muscle soreness, skin blistering, fever or chills, vomiting or diarrhea, a change in taste or smell, bleeding from the ears or eyes, hallucinations – you need to seek immediate medical help.

How will your agency treat you? Will you be able to file for medical coverage under your workman's comp or will you be told it took too long for you to file and be denied? 48 hours after you dive you come down with wild symptoms – will YOU think to relate it to a possible exposure in the water?

A bug that literally eats your flesh that is super aggressive and hard to stop. *What could be worse?*

Naegleria Fowleri ... Come On Down!



[Naegleria floweri](#) is an amoeba that can enter your body through the mucus membranes in your nasal passages. It will travel along nerve fibers until it reaches your brain and then begins to eat it. Those same general symptoms apply to this bug and after they start death can occur within 7 to 14 days after the exposure.

According to the [Centers for Disease Control and Prevention](#), Naegleria can be found in warm freshwater places like lakes and rivers or even inadequately chlorinated swimming pools. It grows best at higher temperatures and is not found in salt water. Infections mainly occur during the summer months and are most likely to occur in the Southern States. Infections usually occur when it is hot from prolonged periods of time resulting in higher water temperatures and lower water levels. According to the CDC, you can reduce your risk of exposure by avoiding water related activities during times of higher water temperatures and low water levels. They also recommend avoid digging in or stirring up the sediment in



shallow, warm freshwater areas.

So what is your risk? Do those conditions apply? We know we do not work in the water column and spend most of our time in the sediment layer. To be fair, you need to know that in the ten years between 2002 and 2011 the CDC reported only 32 infections. Does that mean you are safe?

Perhaps flesh eating bacteria and brain sucking amoebas are just too much to think

about. After all, the risk of exposure is so low you believe it will never happen to you. So instead of discussing what will kill you, let's explore some of those things that will make life miserable. To that end, let's look at some things that will cause intense diarrhea, stomach cramps, vomiting, headaches, fever and more.

Giardia lamblia (Beaver Fever)

Giardia lamblia is a common parasite that causes gastrointestinal illness. Along with that come all the pre-

mentioned symptoms. The parasite lives in water and can be transmitted by most any media from one person to the next. It lives in the intestines and once "freed" can survive for weeks or months. [According to the CDC](#), anything that comes into contact with feces from infected humans or animals can be contaminated with the Giardia parasite. The parasite may be found in shallow water, especially in lakes, rivers, springs, ponds and streams.

Escherichia coli. (E. Coli)

E. coli is a bacteria that causes diarrhea. That is what we usually know it for, However, E. coli is not a single strain of bacteria. There are several.

They can also cause urinary track infections, pneumonia, and respiratory problems. Like the Giardia parasite, E. coli lives in the intestines.



even shaking someone's hand.

[Symptoms](#) can appear within 1 to 10 days and often begin with a mild stomach pain or non-bloody diarrhea. Some strains of E. coli can be life threatening. Exposure to E. coli can occur in most every way imaginable from contact or ingestion of water, eating unwashed food or

Salmonella

Salmonella is a bacteria and like E. coli, there are many strains. We usually think of it as something you get from eating raw eggs.

[According to the CDC](#)

salmonella is also commonly found on reptiles (including turtles), birds and ducks. They recommend you do not kiss the birds and that you should thoroughly wash your hands after touching them or their environment. We should assume there is a risk of exposure in water where water fowl are present.

Cholera

Cholera is an acute intestinal infection causing profuse watery diarrhea, vomiting, circulatory collapse and shock. Brackish and marine waters are a natural environment for the etiologic agents of cholera.

A person can get cholera by drinking water or eating food contaminated with the cholera bacterium. Large epidemics are often related to fecal contamination of water supplies or street vended foods. The disease is occasionally transmitted through eating raw or undercooked shellfish that are naturally contaminated.

E. coli is a type of fecal coliform bacteria that comes from human and animal waste. The Environmental Protection Agency uses E. coli measurements to determine whether fresh water is safe for recreation. Disease causing bacteria, viruses and protozoans may be present in water that has elevated levels of E. coli. Levels of E. coli can increase during flooding. E. coli is measured in number of colony forming units. The EPA water quality standard for E. coli bacteria is 394 colony forming units per 100 mL.

<http://www.lcra.org/water/quality/crwn/indicators.html>

Expect diarrhea and dehydration. That seems to be a theme doesn't it?

Hepatitis A Hepatitis A can be spread by eating or drinking food or water contaminated with the virus. This is more likely to occur in countries where Hepatitis A is common and in areas where there are poor sanitary conditions or poor personal hygiene. The food and drinks most likely to be contaminated are fruits, vegetables, shellfish, ice, and water. In the United States, chlorination of water kills Hepatitis A virus that enters the public water supply.

Cryptosporidium

Cryptosporidium is a microorganism that burrows into the intestines and is transmitted to others through feces contamination in water. It can survive for days even in a properly chlorinated pool. [According to the CDC](#), Crypt can be spread by wallowing recreational water contaminated with Crypto. ?? You share the water—and the germs in it—with every person who enters the pool. This means that just one



person with diarrhea can easily contaminate the water. Swallowing even a small amount of pool water that has been contaminated with the Crypto germ can make you sick. Recreational water is water from swimming pools, hot tubs, fountains, lakes, rivers, springs, ponds, or streams that can be contaminated with sewage or feces from humans or animals.

Typhoid fever

Salmonella typhi lives only in humans and is a bacteria carried in contaminated water and food that can cause typhoid fever. You can get typhoid if you come into contact with someone who has it or from sewage contaminated water.

Hopefully you are starting to see a bigger picture of risk. But consider what has been presented. Each of the diseases or infections were usually associated with water and feces. Since we know we are not going

During the summers of 2006 and 2007, the Lower Basin of the Charles River experienced a bloom of toxin-producing photosynthetic **cyanobacteria**, also known as blue-green algae. These bacteria produce toxins which can be harmful to both humans and wild and domesticated animals. Exposure to toxins can occur through skin contact or ingestion. Unfortunately, toxins persist in the water and may pose the greatest threat after the bacteria has died off when there may no longer be visual evidence of the bloom.

Symptoms associated with **cyanobacteria** contact are: diarrhea, upset stomach, vomiting, cramps, skin rashes, flu-like symptoms, allergy symptoms such as hay fever and asthma, and eye and ear irritation. Ingestion of water containing high concentrations of cyanotoxins or continued ingestion over time is suspected to cause severe liver disease, liver cancer, neurological impairment and in some cases death

<http://crwa.org/projects/METwMyRWA/phosedu.html>

to dive in a sewer, we already eliminate that risk.

Right?

We will still argue against exposure or downplay the potential risk because we just don't want to believe it will happen to us. But consider the water you dive in. When water accumulates from rain or melted snow and runs into the lake, pond, bayou or river that water is carrying everything it touches along with it. This will include everything from pesticides to microscopic feces particles from every animal or human that left a package on the ground. You have to agree that the chance of exposure increases after a rain.

What about a flood? When water builds so rapidly that it cannot run off and covers areas not intended to be underwater? When floods overwhelm the sewer systems and they back up, where does that water go? When septic tank systems are flooded and overwhelmed, where does that run off to? You have to

Dangerous levels of E. coli found in waterways - Communities lack repair funds; more toxic overflows expected

http://www.organicconsumers.org/articles/article_21047.cfm

June 14, 2010 By Steve Neavling Detroit Free Press

More than 3.5 billion gallons of raw and partially treated sewage and industrial waste were dumped into metro Detroit lakes, rivers and streams because of heavy rains during the past month, leading to beach closures and high levels of contamination at the start of the swimming season.

Since May 7, more than 5 inches of rain has fallen on the area, overwhelming outdated sewage systems that dump a toxic cocktail of rainwater, fertilizers, human and industrial waste, chemicals, parasites and other pollutants into waterways when the retention basins become full.

The sewage discharges were among the largest in the past 25 years for a one-month period, according to a Free Press review of sewage records.

Levels of E. coli skyrocketed in rivers and lakes in Macomb, Wayne and St. Clair counties, prompting the closure of at least 10 beaches. Two of them, New Baltimore Park Beach and St. Clair Shores Memorial Park Beach, each had levels more than 1,000 times what is considered safe.

Sewage and storm water, containing a toxic cocktail of bacteria, parasites, viruses and chemicals that can make people ill, are the prime cause of beach closures and bans on fishing, swimming and canoeing.

A Free Press report in January revealed that Detroit's sewer system, which serves most of southeast Michigan, overflows when even a little rain falls.

agree that the chance of exposure increases during a flood.

What about public pools where we do confined water training or ponds and lakes? If we agree now that the bacteria and nasty creatures come from feces in the water, what do we think about the parents who let their children swim in diapers? They are doing nothing wrong, not really. They are simply enjoying the water, same as you. One dirty diaper is all it takes.

Things we can do to reduce our risk of exposure

We must acknowledge that no one diving system is perfect. We must acknowledge that despite our best efforts, we will be exposed to something sooner or later. We must also acknowledge that we are still going to accept risk based on the hope that nothing bad is going to happen. If we lived in a state of fear and thought all the water we are exposed to was going to make us deathly sick or kill us, we would never go near the water much less

work in it. So let's use some common sense.

Those who dive in waters without any protection at all are going to be at greatest risk. Your first goals should include obtaining FFMS and dry suits with dry hoods. Until then, consider not diving if you have an open wound. Leave your mask on while you are **diving** in the water and do not clear it while you are in the water. Either use a really good mask clear product or dive with a foggy mask. Keep your regulator in your mouth as you enter the water and keep it lip sealed at all times. Do not remove it until you are out of the water AND have been rinsed off with clean water. Rinse the regulator and your mask in a disinfecting solution before using them again. After being rinsed or decontaminated, you should have a designated place to store your wet equipment so that it does not cross contaminate other gear.



If you dive with medium protection loosely defined as wet suit and Full Face Mask, your first goals should include obtaining dry suits with dry hoods, gas switch blocks and pony bottles. When you prepare to dive, your FFM must be in place before you enter the water and not removed until you have exited the water AND been rinsed with clean water. After being rinsed or decontaminated, you should have a designated place to store your wet equipment so that it does not cross contaminate other gear.

If you are diving in FULL protective gear, you are diving with an encapsulated dry suit and dry hood OR a dry suit and helmet. You will have both surface supplied air and a bail out bottle of air that is routed to a gas switch block. Your mask or helmet will go on before you enter the water and will not come off until you have exited the water and been decontaminated. After being rinsed or



NEW DUI DRYSUIT DESIGNED FOR CONTAMINATED EXTREME OPERATIONS

DUI's CXO drysuit is designed to be more than just a drysuit to keep you safer in contaminated water conditions; it's part of a completely encapsulating SYSTEM.

decontaminated, you should have a designated place to store your wet equipment so that it does not cross contaminate other gear.

Some of the most common mistakes we seen to make include letting our regulators hang down into the water before we use them. Or taking our mask off to talk and letting them drop or dangle in the water before we put them on.

If we are going to be serious about accepting risk, we need to do everything we can do that is within our means to reduce our own risk.

Managing your regulator or FFM and keeping them out of the water seems like such a simple thing to do yet those bad habits are hard to break. To help you get started, try to imagine what road kill might taste like right off the pavement. When your regulator or FFM touches the water, the microscopic bits of nasty in the water come with it when you put in in your mouth or on your face. If that contains feces or a decomposing body, you get to ingest or inhale it. So decide what is worse: eating putrid fresh road kill or licking a turd. Put THAT picture in your

mind and maybe you will keep better control of your regulator or FFM.

We should also have at our disposal clear, clean water, hydrogen peroxide, rubbing alcohol, hand sanitizer, Band-Aids, antibiotic ointments and any other supplies necessary to treat a cut, puncture or any break in the skin. Some dive teams require their divers to forgo shaving 24 hours before a planned dive and 48 hours after.

Our bodies produce antibodies that help defend against infection. When we talk about our immune system, we are not discussing a single organ. It is a system that is dependent on numerous parts functioning properly as well as appropriate nutrients and care. The idea that you can "boost your immunity" with any number of "As Seen on TV" products is a fallacy. Scientifically, there is no evidence that links lifestyle and enhanced immunity.

That does not mean that we cannot do anything to increase our odds. Oddly enough the recommended method for improving your overall health is to quit smoking, exercise regularly, maintain a healthy weight, eat well, drink alcohol in moderation, if you drink at all, sleep well, wash your hands often and have regular medical checkups and screening tests that are appropriate for you. This covers all those things every diet plan, every workout guru and every self-improvement book tells you. It is our job to maintain our own bodies and immune system.

**If you would like to
discuss this topic or any
other, join our
discussion group:
[CLICK HERE TO JOIN](#)**