

# TerranearPMC Safety Share

## Week of September 11, 2017 – After the Storm

First, Texas suffered the devastation of Harvey. And now Irma has come to Florida and is looking just as threatening. But while these storms bring immediate destruction, they will fade; however, another form of devastation is just days away.

Due to such traumatic events as the Indian Ocean Earthquake/Tsunami in December, 2004, health organizations like the International and American Red Cross have been focusing on the aftermath effects caused by mass flooding. While a hurricane, typhoon or tsunami begins its ascent onto a community, TV cameras are there to bring nature's force and destruction right into our living rooms. But what happens after the storm leaves? The sensationalism of seeing large structures mauled or persons stranded while emergency teams perform miraculous feats of rescue does finally come to an end with the drama subsiding into a more subtle realization of unsanitary conditions and persons living in make-shift shelters for unspecified time periods.

The fact is, floods can increase the transmission of water-borne diseases, such as typhoid fever, cholera, leptospirosis and hepatitis A. In addition, vector-borne diseases (living organisms that can transmit infectious diseases between humans or from animals to humans), such as malaria, dengue (high fever, severe headaches, joint and muscle pain, pain behind the eyes, nausea, vomiting, skin rash, and mild bleeding) and dengue hemorrhagic fever, yellow fever, and West Nile Fever are other diseases that appear as aftermath health issues once the storm subsides.

The major risk factor for outbreaks associated with flooding is the contamination of drinking-water facilities. Such was the case in Trust Territories of the Pacific in 1971 when a typhoon forced people to use sources of groundwater that were heavily contaminated with pig feces. As a result, there was an outbreak of balantidiasis, an intestinal protozoan. Nine year later, a cyclone and flooding in Mauritius led to an outbreak of typhoid fever.

Floods may indirectly lead to an increase in vector-borne diseases through the expansion in the number and range of vector habitats. Standing water caused by heavy rainfall or overflow of rivers can act as breeding sites for mosquitoes, and therefore enhance the potential for exposure of the disaster-affected population and emergency workers to disease.

Malaria epidemics in the wake of flooding are a well-known phenomenon in certain parts of the world. For instance, an earthquake and subsequent flooding in Costa Rica's Atlantic region in 1991 and flooding on the Dominican Republic in 2004 led to malaria outbreaks. Flooding may initially flush out mosquito breeding, but it comes back when the waters recede. The lag time is usually around 6-8 weeks before the onset of a malaria epidemic.

West Nile Fever – a disease of concern in the US - has resurged in Europe subsequent to heavy rains and flooding, with outbreaks in Romania in 1996-97, in the Czech Republic in 1997 and Italy in 1998.

The aftermath of the 2004 Indian Ocean tsunami led to rotting corpses, smashed sewer lines, overcrowded refugee camps and contaminated freshwater supplies. Body disposal, and the disinfecting of affected areas, was a primary concern in the days following the tsunami. Massive pits



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and trenches were dug to quickly bury the dead bodies to minimize the spread of diseases (there were over 300,000 fatalities from the initial tsunami). Grave sites and corpses were also sprayed with disinfectant to further combat the spread of disease. However, the total avoidance of disease spread was impossible. Infectious diseases such as yellow fever, diarrhea, cholera, and typhoid fever were unavoidable.

**Cholera** is an infectious disease that spreads in areas of poor sanitation. Cholera causes a combination of diarrhea and vomiting while death can come within hours after contracting the disease. The primary treatment is oral rehydration with a mixture of water, salts and sugar.

**Typhoid Fever** is a disease that today is mainly found in disaster zones, and results from sewage contaminating the drinking water. It mainly affects the elderly and the weak who consume contaminated food and water. The Indian Ocean earthquake, along with the wall of water that hit shore, caused sewer lines and holding tanks in many coastal areas to rupture, allowing raw sewage to mix with freshwater sources. Toilets are nearly non-existent in hard-hit regions. Chlorine has been used to kill the disease-causing bacteria in contaminated water.

**Skin diseases and rashes** include chicken pox, measles, scabies, fleas, and lice. The overcrowding of refugee camps, combined with the poor sanitation and damp, muggy conditions helps generate such diseases. The fleas and lice are of special concern because they carry typhus, an incredibly dangerous disease that could spread rapidly if proper measures are not taken. Typhus causes headaches, vomiting, diarrhea, and can lead to pneumonia and swelling of the liver and spleen. If untreated, typhus can be fatal. Some prevention measure include topical antibiotics but increased hygiene in affected areas in the primary preventative measure.

General infections, as noted from Hurricane Katrina, is a significant health factor, regardless of region. These are a result of open wounds (caused as a result of severe body contact during the storm event), which due to unsanitary conditions and/or lack of cleaning wounds, are not properly treated. The typical causes for these infections have been attributed to *V. vulnificus*, *V. parahaemolyticus*, and nontoxigenic *V. cholerae*. While these organisms are acquired from the environment, they are characteristically unlikely to cause outbreaks from person-to-person transmission.

Ensuring uninterrupted provisions of safe drinking water after a flood is most important as this is the main method to reduce the risk of outbreaks of water-borne diseases. Another preventative measure is the use of *free chlorine*. Free chlorine is the most widely and easily used, and the most affordable of the drinking water disinfectants. It is also highly effective against nearly all waterborne pathogens (except *Cryptosporidium parvum* oocysts and *Mycobacteria* species). When properly prepared, free chlorine generally inactivates >99.99% of enteric bacteria and viruses. After 30 minutes, the residual concentration of active chlorine in the water should be between 0.2-0.5 mg/l, which can be determined using test kits (typical costs range from \$10.00 - \$50.00).

**September 11 is one of our worst days but it brought out the best in us. It unified us as a country and showed our charitable instincts and reminded us of what we stood for and stand for**

– Senator Lamar Alexander