

7.8 Foodborne and Waterborne Infectious Diseases (No Update)

Climate change is expected to adversely impact both food- and water-borne diseases. Factors such as increased air and water temperature as well as fluctuations in relative humidity and precipitation patterns could extend the time period and expand the geographical range of climatic conditions favorable to the survival, proliferation, and transmission of food- and water-borne microbial pathogens. As climate and the environmental landscape changes, too will the residential, occupational, and recreational patterns of California residents, potentially increasing their opportunity to intersect with pathogens that formerly enjoyed comparatively restricted distribution, thus amplifying risk of infection.

Vibrio bacteria

Vibrio species bacteria, which exist naturally in coastal waters and are associated with shellfish, increase in numbers as seawater temperature rises and salinity profiles change (e.g., due to sea level rise). Illness occurs among persons who eat raw shellfish such as oysters and persons with fresh skin wounds exposed to contaminated seawater or shellfish. Although uncommon, *Vibrio vulnificus* is a leading cause of death from seafood contamination in the US. And globally, toxigenic *Vibrio cholerae* remains the cause of cholera outbreaks and epidemics, often waterborne. Rapidly changing global oceanic conditions have pushed *Vibrio* geographical ranges farther north into historically colder regions (Vezzulli et al., 2016), with detection of *Vibrio* in areas where the bacteria were previously absent or rarely reported (Baker-Austin et al., 2010). The spread of *Vibrio* will increase the potential exposure of shellfish consumers and recreational ocean water users throughout the coastal regions of the US, including in California.

Legionnaires' disease (LD)

Legionnaires' disease (LD) is a severe form of pneumonia usually caused by inhalation of aerosolized water containing *Legionella* bacteria. *Legionella* are found naturally in freshwater sources and can grow and spread in artificial water systems such as cooling towers, hot water tanks, hot tubs, decorative fountains, and large buildings with complex



water systems. People are exposed to the bacteria when devices aerosolize the contaminated water.

LD is more common during warm summer months, with increased rates of LD during periods of increased relative heat, humidity or greater rainfall (Fisman et al., 2005, Gleason et al., 2016; Hicks et al., 2007; Ricketts et al., 2009; Simmering et al., 2017). This is likely due to both ecological and human factors. *Legionella* proliferate in warm, wet environments with temperatures between 77 and 113°F (CDC, 2020; Yu et al., 2019). Increased numbers of *Legionella* in the environment, including in water supplies (e.g., water reservoirs) could facilitate further downstream amplification within artificial water systems used by humans and subsequent exposure (Walker, 2018). In artificial water systems already contaminated with *Legionella*, these conditions encourage bacterial proliferation. Increased use of cooling devices such as cooling towers during warm weather increase the aerosolization of *Legionella*. Once aerosolized in water, warm and humid environments increase the distance that aerosolized water can travel as well as survival of *Legionella* within that water, increasing the potential infectious range.

Increased frequency and severity of extreme weather events and natural disasters may also lead to intrusion of contaminated water into artificial water systems (e.g., damaging water infrastructure, flooding events contaminating water supply; Brigmon et al., 2020; Walker, 2018). Storm events may themselves enhance conditions for *Legionella* growth in water systems by favorably altering oxygen levels and biological and chemical makeup of the water supply (Brigmon et al., 2020). Droughts may cause further reliance on alternative water collection and storage methods (e.g., rainwater collection), which can increase the risk of *Legionella* growth due to favorable environmental conditions including contamination, stagnation and warm outdoor temperatures (Walker, 2018).



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Alexander Yu
California Department of Public Health*

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