Fecal Coliform

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With the increasing occurrence of fecal contamination in surface waters, it is important to understand the dynamics of these organisms in aquatic systems. Fecal coliforms are a broad category of bacteria that are present in the intestinal tracts of humans and other warm-blooded animals. Of these fecal coliforms, *Escherichia coli* (*E. coli*) is probably the most widely known. It is important to realize that *E. coli* is found in the intestines of all warm-blooded animals. In fact, human feces may consist of as much as 5-50% of these bacteria (Laws 1993). Most strains of this bacteria are always present within the digestive tract, and pose no threat to human health. Health issues arise when certain serotypes (strains), known as enteropathogenic *E. coli*, are ingested. Although the same species, this strain of *E. coli* produces toxins that are responsible for the health problems associated with E. coli outbreaks.

In waters contaminated with human feces, the proportion of enteropathogenic *E. coli* is probably less than 1% and the percentage of persons excreting enteropathogenic *E. coli* is no more than 1-10% (Geldreich 1972). Therefore, the high counts of fecal coliforms and/or *E. coli* that may be observed within surface waters are not necessarily pathogenic strains, but show the potential for the presence of pathogenic strains.

In most aquatic systems, the presence of *E. coli* can be taken as evidence of recent fecal pollution (Laws 1993). Many factors affect the survival times of *E. coli* in water, with much shorter survival times in seawater than in freshwater (Fujioka et al. 1981). Also, *E. coli* survives longer in sediments than in the water column. The sediment's surface area and nutrient content promote the growth of bacteria (Burton et al. 1992; LaLiberte and Grimes 1982; Sherer et al. 1992). Studies performed in a Wisconsin lake found that sediment and organic materials maintained living bacteria for a minimum of four days (LaLiberte and Grimes 1982). Davies et al. (1995) found that fecal coliforms survived for up to 60 days in freshwater sediments, dropping, however, by 2-3 orders of magnitude within the first 29 days.

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Within the laboratory, Sherer et al. (1992) found that the "half-lives of fecal coliforms range from 11 to 30 days in fine and course sediments" and "the half-life of fecal coliforms in the overlying water was only 2.8 days." Temperature also plays an important role in influencing the survival of *E. coli* in aquatic systems. Generally speaking, *E. coli* survives longer in cooler conditions, the result of its lower state of activity. Reservoir and recreational lake studies have shown greater survival at 8° C than compared with 15 and 25 ° C (Chalmers et al. 2000). Porter et al. (1997) found that when pond water at 13° C was inoculated with *E. coli*, it survived for 21 days. Based on environmental studies of *E. coli*, "we can bracket its survival in waters containing moderate microflora at a temperature of 15-18°C of between 4 and 12 weeks (Edberg et al. 2000).

Even though these bacteria may survive for some time in the water, "multiplication of *E. coli* in aquatic systems is believed to be rare, but may occur in heavily polluted warm water containing high concentrations of bacterial nutrients." (Laws 1993)

With the fact that fecal coliform bacteria (including *E. coli*) are relatively short lived and rarely reproduce in most aquatic systems, one can expect the fecal coliform bacteria levels within surface waters to fall relatively quickly. This, of course, is provided that all inputs of human and animal wastes are eliminated. It is important to realize that both sanitary sewage and land runoff can introduce pathogens into the pond. Many times animal inputs are grossly overlooked, and the focus is largely placed on the threat of leaky septic systems. Therefore, not only do you need to be concerned with the potential seepage from nearby septic systems, but also with wildlife that visit or inhabit the water body. This includes geese, muskrats, and other warm blooded animals.

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