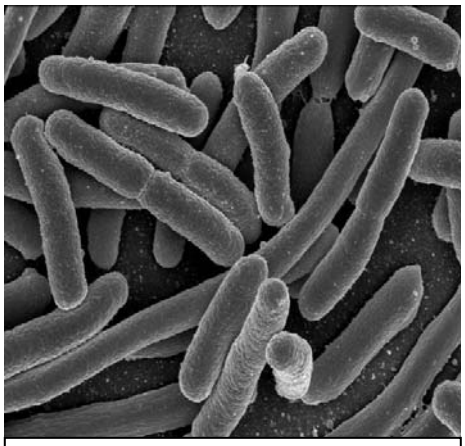
E. Coli: What is It? What Causes It? How can Management Help Mitigate Problems?

Escherichia coli (*E. coli*), is one of many bacteria species living in the intestines of warm blooded animals, ie: humans, cattle, and wildlife. *E. coli* are part of a larger bacteria group called fecal coliforms, which is part of an even larger group called total coliforms. *E. coli* assist cattle in the breakdown of forage and other feeds. They are very abundant organisms. We have found as many as 10,000,000 individual *E. coli* colony forming units (cfu) in a single gram of fresh cow fecal material on California rangelands (1 gram = 0.03 ounces). A small portion of *E. coli*, certain strains such as *E. coli* O157:H7, can cause illness in humans and animals. We do not currently have a solid estimate for the number of *E. coli* excreted by California range cattle which can cause illness in humans (pathogenic), but preliminary data indicate as many as 10% may be pathogenic. The number of individual *E. coli* that a human defecates per day can be as high as 100 billion. *E. coli* can also live and replicate outside of the gut, in warm, nutrient rich environments such as pastures and moist sediments on a warm summer day.



Individual *E. coli* bacteria. Magnified about 15,000 times. *E. coli* are a rod shaped bacteria

The presence of *E. coli* in surface water is commonly used as an indicator to measure for fecal contamination of surface waters. We are concerned about fecal contamination which increases the level of actual pathogens such as *Giardia* and *Salmonella* in surface waters. Based on EPA recommendations, the presence of *E. coli* above 235 cfu indicates fecal contamination of water and further investigation for the presence of pathogens should be initiated. However, it can be misleading to use *E. coli* alone as an indicator of the presence of pathogens because not all *E. coli* in a stream sample comes from the gut of a human, cow, or other animal.

The test we use for *E. coli* in the UFRW water monitoring program does not determine the source of the *E. coli* or if the *E. coli* detected are pathogenic or not. So the specific risk to human safety cannot be determined. Likely sources of *E. coli* we are detecting include all animals (humans, livestock, wildlife) living in the watershed above the sample point, as well as bacteria which have replicated in the environment (soil surface mulch, stream sediments, etc.). It is very likely that cattle are contributing to these high numbers, but they are certainly not the only source.

Livestock management and pasture irrigation practices that can increase *E. coli* numbers in streams include: 1) direct deposition of fecal pats by cattle into streams and irrigation ditches flowing directly to streams; and 2) heavy grazing during irrigation events with high runoff rates. Thus, **grazing and irrigation management can be used to reduce *E. coli* numbers flowing off pastures**. We have also found that grass buffer strips and small wetlands can reduce *E. coli* runoff from pastures from 40 to 90%. Putting "dirty" tailwater from a heavily grazed pasture across a hay field can also dramatically reduce *E. coli* numbers because the hay field can act as a grass filter. More information on these practices can be found at:

http://californiaagriculture.ucop.edu/0704OND/toc.html - Knox, A.K., K.W. Tate, R.A. Dahlgren, and E.R. Atwill. 2007. Management Reduces E. coli in Irrigated Pasture Runoff. California Agriculture. 61:159-165.

Manage vegetation to minimize fecal-stream interaction, filter tail water before it returns to creeks, don't irrigate under livestock, minimize livestock's direct access to creeks