Indicator Species Encyclopedia Article

Indicator Species

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Indicator Species

Indicator organisms are used to monitor water, food or other samples for the possibility of microbial **contamination**. The detection of the designated species is an indication that harmful microbes, which are found in the same environment as the indicator species, may be present in the sample.

Indicator organisms serve as a beacon of fecal contamination. The most common fecal microorganism that is used have in the past been designated as fecal coliforms. Now, with more specific growth media available, testing for ***Escherichia coli*** can be done directly. The detection of *Escherichia coli* indicates the presence of fecal material from warm-blooded animals, and so the possible presence of disease producing **bacteria**, such as *Salmonella, Shigella,* and *Vibrio.*

To be an indicator organism, the bacteria must fulfill several criteria. The species should always be present in the sample whenever the bacterial pathogens are present. The indicator should always be present in greater numbers than the pathogen. This increases the chances of detecting the indicator. Testing directly for the pathogen, which can be more expensive and time-consuming, might yield a negative result if the numbers of the pathogen are low. Thirdly, the indicator bacterial species should be absent, or present in very low numbers, in clean water or other uncontaminated samples. Fourth, the indicator should not grow more abundantly than the pathogen in the same environment. Fifth, the indicator should respond to **disinfection** or **sterilization** treatments in the same manner as the pathogen does. For example, *Escherichia coli* responds to water disinfection treatments, such as **chlorination**, ozone, and ultra-violet irradiation, with the same sensitivity as does *Salmonella.* Thus, if the indicator organism is killed by the water treatment, the likelihood of *Salmonella* being killed also is high.

Another indicator bacterial species that is used are of the fecal *Streptococcus* group. These have been particularly useful in salt water monitoring, as they persist longer in the salt water than does *Escherichia coli*. In addition, the ratio of fecal coliform bacteria to fecal **streptococci** can provide an indication of whether the fecal contamination is from a human or another warm-blooded animal.

The use of indicator bacteria has long been of fundamental importance in the monitoring of drinking water. Similar indicator organisms will be needed to monitor water against the emerging protozoan threats of **giardia** and **cryptosporidium**.