Fully automated monitor reduces intake of *E.coli-* contaminated raw water

The rapid results generated by the fully automated Colifast At-Line Monitor (CALM) is providing continuous data on the content and variations of *E.coli* in raw water taken from the Göta River by the Gothenburg Water and Sewage Works in Sweden. Besides the increased surveillance, use of the monitor helped reduce the intake of contaminated raw water. Colifast is a biotechnology company based in Oslo, Norway, that specialises in early warning solutions for microbial contamination.

All raw water sources are subject to potential faecal contamination. Treatment processes are often designed to handle a more or less normal raw water quality, but sudden increases in faecal contamination increase the risk of waterborne diseases. Many water companies and waterworks need frequent and reliable results from microbial tests on their primary and secondary sources. This information is difficult to obtain when most reference methods require 24 to 72 hours to complete and also require laboratory personnel to perform analysis. For many applications, the ability to reopen and close the primary water source as soon as contamination episodes occur or end is paramount.

The CALM monitors the intake of water by the Gothenburg Water and Sewage Works. Specifically, the system monitors the level of *E.coli* based on the hydrolysis of 4-methyllumbelliferyl-ß-D-glucuronide in the Colifast *E.coli* medium. Two times every day the instrument automatically collects and analyses a sample by a five-vial Most Probable Number (MPN) technique. The results are based on the number of positive vials after 12 hours incubation with potential early warning after 10 hours. The selected sample volume and number of vials gives the following possible results (approximate): <50, 50, 100, 200, 400 and >400. This set up is selected for a pass/fail level of 400 *E.coli*/100ml. A mA signal correlating to the number of positive vials is then sent from the instrument to the main operating computer at the control room at the Alelyckan water treatment plant. The results are also available through a network connection, which enables remote control of the instrument. The water inlet is closed from the control room when bacterial levels reach equal or above 400, and water is not permitted into the processing facilities.

Samples analysed by standard methods are usually collected three times a week. Therefore, continuous monitoring night and day by the Colifast instrument improved the waterworks' knowledge of *E.coli* content and variations in the raw water intake. Consequently, the monitor's rapid results helped reduce the intake of raw water contaminated by *E.coli*.

The rapid results generated by the fully automated Colifast At-Line Monitor (CALM) have proved to be a powerful and reliable tool for frequent monitoring of *E.coli* in water. Colifast technology provides information from the sample earlier than traditional methods. The Colifast patented technology is based on the fact that all bacteria possess characteristic and specific enzymes. Selective fluorogenic substrates, along with a variety

Continuous monitoring night and day by the Colifast monitor improved Gothenburg Water and Sewage Works' ability to take action quickly in reaction to variations in *E.coli* found in raw water intake.
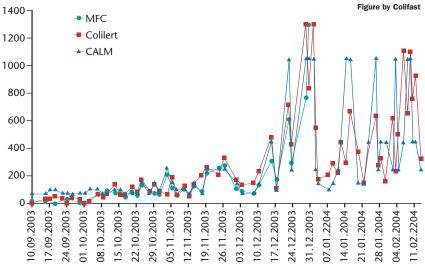

Figure 1 shows a comparison of CALM/Colifast *E.coli* Media versus the MFC and Colilert method for determination of *E.coli* in Göta River during the period from September 2003 to February 2004. Comparison between MFC (44°C), Colilert (35°C) and Colifast CALM/Colifast *E.coli* medium (37°C). CALM results <50 are plotted as 25, and >400 are plotted as 1000. The CALM instrument correctly reported all pass/fail for under/over 400 *E.coli*/100ml.

of compounds, are added to detect target microorganisms. When the bacterial enzyme hydrolyses the selective substrate, a fluorogenic compound is released and measured as fluorescence. This gives the user the opportunity to extract and exploit information found in the sample within three to twelve hours. The operator is then given extra time to act and make operational and quality control decisions.

Tests for determination of total and thermo tolerant coliforms, *E.coli*, and *Pseudomonas aeruginosa* in water, sewage, and industrial process water are also available. The instrumental platforms are one semi-automated laboratory model, the Colifast analyser (CA), and one fully automated at–line monitor, Colifast at-line Monitor (CALM). Depending on the chosen method, CALM will present results directly in CFU/100, MPN, and/or Presence/Absence. Results are transmitted directly from the monitor location in the plant or remote location to the control room for process decision-making. Colifast also provides a handheld, battery driven instrument suited for field use, the Colifast Microdetector (CMD). The results can easily be transferred to a PC for further analyses, e.g. Microsoft Excel.

Authors' Note
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