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Environmental Technology Verification (ETV) Program

IRB-BART™

Technology Fact Sheet for Droycon Bioconcepts Inc.

Performance Claim

Droycon's IRB-BART™ (iron related bacteria - biological activity reaction test) technology allows the determination of the iron related bacteria (IRB) in water samples at three levels of aggressivity when detected and will differentiate the IRB, when present, into five major communities. The detection limit is equivalent to 67 cells per litre using a 15 ml water sample.

Technology Application

The IRB-BART™ technology has been used in the field and laboratory for the detection of IRB in waters suspected of having biofouling challenges. It forms a part of the strategy for the determination of the effectiveness of management practices in natural and engineered water systems. IRB are a significant bacterial component in many biofouling events that lead to significant deterioration of water systems due to plugging, clogging and corrosion.

Performance Conditions

Any water sample taken for testing using the IRB-BART™ must be collected following the protocols for the collection of a water sample for microbiological analysis. Transportation and storage of the sample should follow the standard guidelines practiced for sample handling prior to the initiation of microbiological examination. This should include hygienic aseptic handling, the use of sterile sampling containers and minimizing the sample storage time to less than four hours at room temperature or twenty-four hours when cooled to refrigeration temperatures. The IRB-BART™ technology commonly operates at ambient room temperatures but has the ability to be used at incubation temperatures ranging from +1°C to +55°C under exceptional circumstances. The packaged sterile test vial has a three year shelf-life when stored in a cool dry atmosphere. The IRB-BART™ tester can be used for both field and laboratory based investigations and will generate similar data with respect to time lag and reaction patterns where a water sample is split and incubated under similar conditions.

Technology Description

The IRB-BART™ uses a test vial modified by the insertion of a floating ball and a dried pellet of selective chemicals documented to induce the growth of iron related bacteria. When the water sample (15 ml) is added to the test vial, the ball floats up to create an aspect ratio that encourages the formation of oxidative environments above a reductive zone. The chemicals in the base of the test vial begin to dissolve and diffuse up through the water column. The net effect of these described events is that any IRB in the water sample being examined are presented with a range of environments within which they may become active and grow.

The level of IRB activity in the sample is recorded in two manners. First, the semi-quantitative determination of the population is achieved through the time lag (that period of delay) to the first observation of any of the recognized activities. This is converted into a determination of aggressivity based on a standard of three scaled steps using the days of delay (time lag). Second, the reactions observed as the IRB become active, grow and mature can identify which of the five communities are present in the sample. These reactions may be recognized from a standard chart including eight reaction types and the observations are interpreted at the semi-qualitative level.

Technology Description (continued)

To undertake a biological activity reaction test (BART™), the water sample is added using the standard microbiological practices to the fill line and the test vial is then incubated at room temperature (22°C) away from direct sunlight in a secure environment where it can be easily observed. Observation involves lifting the vial up to observe the contents against a dull light source without shaking the vial. Shaking disturbs the lateral environments that are created during the incubation period.

Verification

Droycon Bioconcepts Inc. carried out extensive examination of water samples for IRB and the IRB-BART™ tests have been used independently by Canada Agriculture (Prairie Farm Rehabilitation Administration – Technical Services, PFRA) and the U.S. Army Corp of Engineers (sponsored by the Centers for Expertise, Omaha, Nebraska). In both cases this test method was selected as the only test available for both the field and laboratory determination of the nature of IRB infestations in water wells. The evaluation of the IRB is challenging, because there has not been an effective standard bacteriological test that would embrace the broad range of species involved in the complex microbial communities that are formed. Therefore, the evaluation of performance has been achieved through the independent use of the IRB-BART™ for the effective monitoring of IRB activities in waters associated with water, relief, injection, and extraction wells in addition to the evaluation of the effectiveness of various rehabilitation protocols. The test performed effectively and reliably at the semi-quantitative and semi-qualitative levels differentiating three levels of aggressivity and five major IRB communities. The verification was reviewed by J. T. Trevors Consulting Services (Guelph, Ontario) using ETV Canada's General Verification Protocol (March 2000).

What is the ETV Program?

The Environmental Technology Verification (ETV) Program is a joint Environment Canada - Industry Canada initiative delivered by ETV Canada Inc. The ETV Program is designed to support Canada's environment industry by providing credible and independent verification of technology performance claims.

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Limitation of Verification

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