

IRB-BART Reaction Patterns

Quick Break Training

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Iron related bacteria (or IRB) are the name that covers all of the bacteria that can take up (iron oxidizing) or release (iron reducing) iron. In the oxidized form the iron is red-brown and is called ferric while in the released dissolved form it is ferrous iron and is commonly green but it can turn to black. IRB-BART tester does detect the oxidizers and reducers as well as the bacteria that simply accumulate the ferric until they become a very rusty biomass! Because the tester is so sensitive to different IRB there are many reactions that can occur and this quick break training will just deal with the major ones.

There are three reactions that can occur first. One of these is when the base of the tester goes white (WB, white base) which means carbonates have been produced and this does affect any treatment strategy being planned. WB is not recognized however specifically as a bacteriological reaction. The other two are: (1) cloudiness (CL); or (2) foam formation (FO). CL is easily recognized by holding the tester up to the light and the sample inside is seen to be growing cloudier. This indicates oxidative conditions. FO is specifically the formation of a ring of foam bubbles around the BART ball. This occurs under more reductive (anaerobic) conditions. If you get CL there is a greater probability that there iron oxidizers present while the FO would favor the iron reducers. There are more reactions following the CL reaction than the FO.

Secondary reactions commonly associated with iron oxidizers include: (BR) when there is a brown ring around the BART ball and this commonly occurs when sheathed iron bacteria or *Gallionella* are present; (BC) is the whole sample going brown cloudy which darkens and gets dirtier over time and this is common when there is a mixed population of iron oxidizers possibly along with general bacteria; (RC) is a red clouded reaction that may also include a brown or greenish gel (BG) and these are typical of enteric bacteria and where ochres are growing; and (GC) is a green clouding of the sample which often starts clear but always becomes very dirty and cloudy and is caused by pseudomonad bacteria that appear to trigger the generation of ferrous-iron to give the green color. Where there is an FO reaction then this can be followed commonly by BC, GC or BR. In the case of FO-BR then this sample was from a redox front where both reductive and oxidative conditions occur at an interface (front). If there is a very active population of enteric and pseudomonad bacteria then the tester may end up turn to a black liquid (BL). These are the principal reactions that can occur in the IRB-BART tester and the order of these reactions tells a lot about the iron related bacteria in the water sample.

Word of caution when setting up the IRB-BART tester: either of two colors may be seen being generated as the chemical in the base cone of the tester dissolves into the water sample. Both of these colors are clear (unless the water sample is dirty). If the color is yellow then this indicates iron oxidative conditions while if the color is green (and this can be quite dark) then that indicates iron reductive conditions exist.