

## N-BART reaction patterns

*Quick Break Training*

*13 March 2009*

Nitrifying bacteria are considered a serious threat in waters that have been reductive and contain ammonia as a daughter product of the reductive breakdown of proteins. The threat comes from the fact that this ammonium if carried in the water to an oxidative regime will then be oxidised by the nitrifying bacteria to nitrate. The very young and the very old are both susceptible to high nitrate levels causing physiological trauma and even death. Public health authorities therefore provide strict guidelines to acceptable levels of nitrate in drinking waters. It is the activities of the nitrifying bacteria that therefore create a potential health risk through their production of nitrate as an end product. N-BART testers detect the presence of nitrifying bacteria by the oxidative generation of nitrates.

Nitrifying bacteria can function not just in open waters but also in soils (particularly those that are saturated with water and oxygen), and some shallow ground waters. Testing for the level of activity of the nitrifying bacteria can be performed using the N-BART tester. There are a number of differences between the N-BART tester and the other BART products. These are summarized as: (1) the test has a fixed length of five days before testing for the presence of nitrate or nitrite; (2) the tester has three BART balls and is lain on its side to maximise the oxidative conditions; (3) to detect nitrite the cap is changed to on that has the chemical reagents that will turn color (to pink – red from colorless) if nitrates or nitrites are detected; and (4) a single tester cannot be used to quantify the population of nitrifying bacteria.

Testing a water sample for the activity of nitrifying bacteria uses a volume of 9ml of sample which is added to the tester that is then turned on its side so the BART balls sit partially out of the water but in a moist oxidative environment. These provide ideal conditions for the growth of nitrifying bacterial activity. The five days is needed because it takes three to four days for the nitrifying bacteria to adapt to the conditions in the BART tester before activity commences. By day 5 the bacteria would then have now become sufficiently active to have succeeded to oxidise the ammonium to nitrate in adequate quantities to be detected. Each box of seven N-BART testers also includes a tube containing seven reaction caps. Follow the protocol on the Certificate of Analysis to perform the test. It should be noted that the colors in the finished test do relate to the level of activity with the darker red reactions indicating greater levels of nitrate production from the ammonium.

In some circumstances (such as in the testing a aerated municipal waste water treatment lagoons) a better level information of the activities of nitrifying bacteria can be gained by testing the original water sample and then a  $10^{-1}$  and  $10^{-2}$  dilution of that sample. Generally when there is a very serious outbreak of nitrifying bacteria in the secondary and tertiary lagoons then the  $10^{-2}$  dilution will also go positive indicating that this activity may be sufficient to affect the accuracy of the 5day BOD test. It should be remembered that the N-BART tester cannot function reliably in waters where there a residual concentration of  $>3$ ppm nitrate since this would automatically detect a positive presence for nitrate. This test is therefore best applied to waters that have significant ammonium content and a low oxygen concentration with the ORP value being reductive.

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