



Choosing a Method for the Microscopic Particulate Analysis

The USEPA Consensus Method (910/9-92-029) for the Microscopic Particulate Analysis (MPA) was published in 1992 and has not been updated since. It is based on the assumption that if groundwater is under the influence of surface water it should be possible to find organisms such as algae, rotifers and insects in addition to plant debris. Surface water typically contains all of these organisms as well as pollen, nematodes and other organisms although they are usually only seasonally abundant. It is assumed that if surface water is reaching wells then contamination with waterborne pathogens such as *Giardia*, *Cryptosporidium* and verotoxigenic *Escherichia coli* may also occur as the tragic events at Walkerton (ON) demonstrated. In order to detect these indicators and the protozoan pathogens a large volume of well water is filtered, the filter is eluted in the laboratory and the recovered material is examined by phase and fluorescent microscopy. Primary bio-indicators are enumerated and scored for risk potential according to ranges published as tables in the method. It is recognized that the method is only semi-quantitative and results in an estimation of low, medium or high risk for the well. It is recommended that at least two samples be taken after both dry and wet periods.

The Consensus Method was based on the original method for *Giardia* as developed by USEPA in 1979 and employs a string wound cartridge which must be cut from the core and eluted by either hand or machine washing techniques. The particulate matter washed out of the filter is concentrated by centrifugation and examined microscopically. The method presents both sampling and analytical challenges including:

- Low recovery of particulates from string wound filters that is compensated for by filtering a large volume of water (1900 to 3800 L),
- High volume of pellet often composed mainly of clay and precipitated iron. Ideally the whole pellet should be examined by microscopy but this is rarely possible so sub-sampling is usually employed,
- A flotation step is included in the method to reduce the amount of background (mostly mineral) material but it is inefficient and often means that organisms of interest are lost,
- The rate of filtration is limited to 10 LPM which means that each sample will take several hours, large amounts of water will have to be drained away and pumping equipment must operate continuously for an extended period,
- Quality Assurance for the method is limited to good laboratory practice, equipment maintenance and the qualifications of the analyst. There is no protocol for performance testing.

In contrast with the MPA, methodology for the detection of *Giardia* and *Cryptosporidium* in water supplies has been the subject of much research and development work that is embodied in the current Method 1623 based on the use of better filters (that can be eluted effectively), immunomagnetic capture and separation of parasites and improved microscopic techniques. The method is easily adapted to the MPA by simply examining the pellet after immunomagnetic separation instead of discarding it. This offers several important advantages:

- Higher and more reliable capture and recovery of all particulates including *Giardia*, *Cryptosporidium* and algae,
- Much reduced volume of sample, typically 100-200 L, which means shorter field time, less wear and tear on equipment and fewer problems with wasting water while sampling,
- The amount of background (interfering) material is greatly reduced because of the lower volume of water filtered. This permits the examination of the entire pellet for most samples and avoids loss of primary indicators by flotation techniques,
- A full Quality Assurance protocol is included in the method for both ongoing precision and recovery and performance testing for *Giardia* and *Cryptosporidium*. It is not difficult to expand this to include representative algae.

Hyperion Research Ltd. has done a considerable amount of development work to combine the MPA with Method 1623 (see additional links on this page) and has achieved accreditation by the Canadian Association of Laboratory Accreditation for this analysis. In the meantime, independent research funded by the Water Research Foundation has recommended the same approach in their comprehensive study [*Methods to assess GWUDI and Bank Filtration Performance*](#). At some time in the future the USEPA may update their MPA methodology but in the meantime the modified 1623 protocol is the best available technology.

The Modified 1623-MPA method is recommended by Hyperion for GWUDI determination but the company continues to offer the Consensus Method for those clients whose jurisdictions require it by regulation.