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WHAT IS A GUDI ANALYSIS?

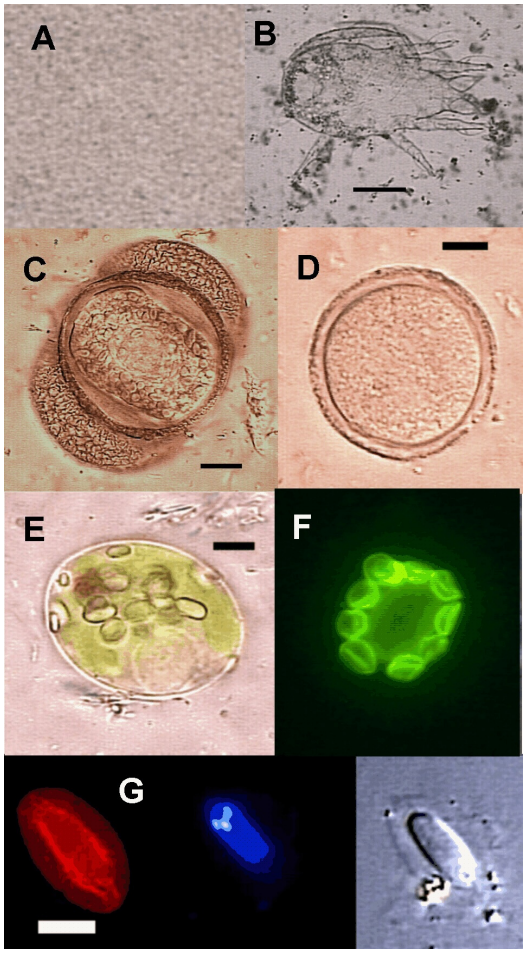
GUDI or GWUDI stands for Groundwater Under the Direct Influence of surface water and it means that water coming from a well or spring is directly connected to a nearby surface water body such as a lake or stream. True groundwater may be deep or shallow but it has passed through soil, weathered material or rock and is stored underground in the tiny spaces between rocks and particles of soil. This provides natural filtration and long term storage that removes potential pathogens. Surface water is defined as water open to the atmosphere and subject to surface runoff which may be contaminated with microbial pathogens. Potential drinking water sources such as springs, infiltration galleries or shallow wells (<15 m or 50 feet) may produce water that has recently been in contact with the surface. Lakes, ponds, streams etc. within 60 m (200 feet) of wells are potential sources of surface water that may reach wells or springs, particularly when large volumes of water are being pumped.

How Can You Tell if a Well is GUDI?

Groundwater under the direct influence of surface water demonstrates significant and relatively rapid shifts in turbidity, temperature, conductivity or pH which closely correlate to climatological or surface water conditions. GUDI wells also contain surface water organisms such as algae and insects and may be contaminated with pathogens such as *Giardia lamblia* (beaver fever) or *Cryptosporidium*.

Monitoring of physical parameters in both well water and adjacent surface waters can reveal correlations that indicate surface water influence. A knowledge of local hydrology and details of the well installation are essential. If these factors indicate a possible GUDI well, an additional analysis called a Microscopic Particulate Analysis can be performed to confirm hydrogeological investigation. In this test, a large volume of the well water is filtered through a 1 µm filter and the trapped particulate matter is examined for the presence of surface water organisms. Secondary indicators such as plant debris and nematodes which are commonly found in groundwater are not good indicators of surface water infiltration. At least one sample should be taken and preferably two, one at high water in the spring and another at low water later in the year.

The original method for the Microscopic Particulate Analysis was developed by the United States Environmental Protection Agency and can be downloaded at www.doh.wa.gov/ehp/dw. Hyperion has combined this protocol with Method 1623 for *Giardia* and *Cryptosporidium* in order to improve the recovery of particulate matter.



A. Precipitated minerals suspended in a non-GUDI sample. **B.** Immature crustacean. **C**. Spruce pollen. **D**. Nematode egg. **E**. Algae cell from a GUDI well. **F**. *Cryptosporidium* oocysts surrounding a *Giardia* cyst. **G**. *Giardia* cyst by immunofluoresence, showing nuclei and by light microscopy.

Taking A Microscopic Particulate Analysis Sample

An MPA sample is taken by filtering a large volume (2-5000 L) of raw water through a 1 µm cartridge filter at the wellhead. The sample is shipped to the laboratory over ice in a cooler where it is dismantled and the particulate matter washed out and concentrated. Background minerals are reduced by density gradient centrifugation and the sample is split for *Giardia/Cryptosporidium* analysis and examination for surface water organisms by light microscopy. *Giardia* and *Cryptosporidium* are stained with fluorescent dyes attached to antibodies which causes them to glow against a dark background (see panel at right). The results are tabulated and a risk assessment is made based on the type and number of organisms found.

Why Hyperion?

Hyperion Research Ltd. has been analyzing water samples for *Giardia*, *Cryptosporidium* and microscopic particulates for over 25 years. The company is based in Medicine Hat and serves the Canadian water industry in all provinces and territories. Hyperion is the only lab in Canada that is accredited by CALA for the Microscopic Particulate Analysis test. Visit our website at www.hyperionlab.ca for further information or call.