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BioMi 290

Cryptosporidium and the NYC Watershed

The protection of the NYC population from *Cryptosporidium* is the central concern of this study. The question of whether or not an expensive filtration system should be implemented must be based on the effectiveness of watershed protection. Given the containment of the pathogen to its source (nearby farms with livestock), this study validates the effectiveness of watershed protection, and that filtration is not necessary to prevent the spread of *Cryptosporidium*.

Data was gathered using microscopy-analysis with fluorescent antibodies at five sites expected of exposure. These sites included an aqueduct, a reservoir, a stream, and a nearby farm where cow manure and pasture soil were analyzed. As expected, a high incidence of *Cryptosporidium* was found in the cow manure, with additional oocytes present in the nearby pasture soil. However, the pathogen's presence was limited to the farm area and did not spread into the neighboring stream. The reservoir also tested negative for *Cryptosporidium*, as did an aqueduct on the opposite side of the reservoir. Although fecal matter from cows and other livestock acts as the major source of watershed contamination, other sources exists (such as geese, sewage, and runoff). It is important to note that these areas were similarly negative for *Cryptosporidium*.

It is assumed that the lack of oocytes in the five fields sampled was a significant negative, although further studies sampling a greater number of fields in a greater variety of locations would provide greater statistical significance. Also, as outlined by the EPA constant vigilance is essential to watershed protection. This study focused on one reservoir from the Catskills watershed, but New York is required to provide constant,

repeated testing of the entire watershed area. This study uses this reservoir as a sample for developing conclusions on the whole watershed, but in reality, one sample is insufficient given the extent of the watershed and the variability in different locations. While for the purposes of this case study, the results produced are assumed an accurate depiction of the containment of *Crytosporidium*, NYC would require much more data than this study provides.

Given the effectiveness of watershed protection, filtration is unnecessary. As a replacement for watershed protection though, filtration would be a poor substitute. *Cryptosporidium* is not killed by chlorination, and water treatment does not effectively remove all the oocytes that spread infection. However, filtration processes cannot remove all oocytes either. The only way to truly secure the water supply is to ensure the containment of the pathogen at its source – agricultural runoff. Farms along the watershed are the major source of infection, with fecal matter from runoff containing a huge amount of the oocytes that travel in runoff into reservoirs. Whether or not filtration is implemented, watershed protection is absolutely essential.

My final recommendation, given the cost of filtration and the observed effectiveness of watershed protection, is that NYC need not filter the entire water supply to meet EPA standards for water safety in terms of *Cryptosporidium parvum*.