Drinking Water Quality

Introduction

Water is essential to life as we know it. Humans are dependent on freshwater which makes up a very small percentage of the water on earth. Less than 1% of the water on earth is readily available to humans as freshwater. Fortunately, this small percentage is sufficient to meet human needs, in large part because this freshwater is continuously collected, purified, redistributed and recycled via the hydrologic cycle.

Certainly, there are problems with **water quantity**, the supply of freshwater, in some regions of the world due to differences in annual precipitation driven by global differences in climate. But a larger and more widespread problem is that of **water quality**.

Water quality is diminished when any physical, biological or chemical change occurs that results in adverse effects on living organisms or causes the water to be unsuitable for its desired use.

There are many categories of water pollutants such as infectious agents, oxygen-demanding wastes, inorganic chemicals, organic chemicals, sediments, radioactive materials, and heat. Infectious agents can include organisms such as bacteria, viruses, protozoa and parasitic worms which can cause disease in humans. Oxygen-demanding wastes include animal manure and plant debris and can result in large populations of decomposer organisms that degrade water quality by depleting the water of dissolved oxygen. Inorganic chemicals include water-soluble acids, toxic metals such as lead and arsenic, salts and fluorides. The harmful effects of inorganic chemicals are varied. For example, infants and children exposed to lead can experience physical and mental developmental delays and adults can experience damage to the nervous system, liver and kidneys. Organic chemicals include oil, gasoline, plastics, pesticides, cleaning solvents and detergents which can cause a variety of effects ranging from nervous system damage to reproductive disorders to cancer. Plant nutrients such as nitrate, phosphate and ammonium ions can cause excessive growth of algae and other aquatic plants, leading to depletion of dissolved oxygen content and fish kills.

Water hardness does not pose a health threat. However, it does make several processes more difficult to accomplish and can

cause minor damage to property. Certain minerals, most frequently calcium carbonate, can leach into groundwater and cause water hardness. Calcium carbonate can precipitate out of the water and leave a hard deposit on pots and pans, toilets, and faucets. Calcium carbonate can also attach itself to soap and make it more difficult to clean dishes and clothes.

In this lab we will test two water sources for some common water contaminants and parameters.

Materials

- Water from Krug Hall room 14 tap
- Water from a private well
- pH test kit
- Alkalinity test kit
- Coliform bacteria test kit
- Lead test kit
- Chlorine test strip
- Copper test strip
- Iron test strip
- Nitrate/nitrite test strip
- Hardness test strip

Procedure

Week 1

1. Work in groups by lab table.
2. Obtain some water from the source assigned to your table.
3. Carry out the tests for pH, alkalinity, chlorine, copper, iron, nitrate/nitrite, hardness and lead as indicated by the instructions in the test kits or on the container for the test strips and record your results in Table 1 and on the transparency (or blackboard).
4. Set up the coliform bacteria test according to the instructions in the test kit and label with your group name and section number.

Week 2

1. Obtain your coliform bacteria test set-up from the previous week, "read" the test and record the results in Table 1 and the transparency (or blackboard).

Drinking Water Quality LAB WRITE-UP Submit Pages 3-6

Student Name: _____Lab Date: _____
Lab Instructor: _____ Lab Section: _____

Results (Data)

Table 1. Values for tested water quality parameters by lab group.

	Sample Type					
	Well water			**Tap water**		
	Lab Table #:			**Lab Table #:**		
Parameter	**1**	**2**	**3**	**4**	**5**	**6**
pH						
Alkalinity						
Chlorine						
Copper						
Iron						
Nitrate/nitrite						
Hardness						
Lead						
Coliform						

- Continued -

Conclusions (Questions): *For full credit, these questions should be answered thoroughly, in complete sentences, in legible handwriting.*

1. Did either water sample test positive for coliform bacteria? Which one(s)? Do you think the source of the sample might explain the difference observed? Why or why not? Why are we concerned about coliform bacteria in drinking water?

2. Did either water sample test positive for lead? Which one(s) and at what level? Do you think the source of the sample might explain the difference observed? Why or why not? Why are we concerned about lead in drinking water?

3. Compare the two water sources on the basis of the results for the other 7 parameters tested: pH, alkalinity, chlorine, copper, iron, nitrate/nitrite, and hardness. Discuss 1) variations in results for a given sample among groups, 2) variations in results by sample type, 3) whether or not the results should cause concern when determining the suitability of the water sample as a drinking water source, 4) whether or not the results are consistent with your expectations based on the source of the sample, and 5) whether or not you think these tests were sufficiently accurate.