Bacterial Sensitivity to Silver Nanoparticles

Purpose:
This lab was developed to test claims that silver nanoparticles have antimicrobial effects. Many products on the market have nanoparticles of silver in them. These include socks, clothing, and food containers. One advertising claim is that the silver nanoparticles inhibit the growth of bacteria and, hence, reduce odors or spoilage.

Materials
- 1 mM silver nitrate
- 1% sodium citrate
- Small test tube
- 250-mL beaker
- Disposable transfer pipets
- Agar plate
- Scissors
- Tweezers
- E. coli bacterial culture
- Coffee filter/filter paper
- Q-tip swab
- Small containers for soaking filter paper
- Incubator
- Hot plate
- Tongs
- Test tube rack
**Experimental Procedure:**

1. Make silver nanoparticles using the following method:
   
   a. Add 2 mL of 1mM silver nitrate to a small test tube.
   
   b. Place this test tube in a 250-mL beaker of boiling water. While waiting start on step 2 below.
   
   c. Leave test tube in boiling water bath for 10 minutes.
   
   d. Add 7 drops of 1% sodium citrate to the test tube containing hot silver nitrate.
e. Continue to heat until the silver nitrate solution changes color (yellowish).

f. Remove test tubes and set in a test tube rack to cool.

2. While waiting for silver nanoparticles to form, cut filter paper (or coffee filters) into small squares about 2 cm across.

3. Place filter paper squares in a small container and pour the test tube of silver nanoparticles over the squares.

4. Let the filter paper squares soak for about 10 minutes (or overnight). While waiting, start on step 5.

5. Mark the bottom of an agar plate with your initials, divide the bottom into sections and label each of the sections. Remember to set up your plate with a control for comparison.
6. Put 1 to 2 drops of bacterial culture on the agar plate using a 1-mL disposable transfer pipet.

7. Spread the drops of bacteria culture on the agar plate using a Q-tip swab.

8. Place your nanoparticle soaked filter paper squares and your control(s) in the designated areas.

9. Incubate your agar plate for 24 hours at 37°C.

10. Examine your agar plate the next day. Record data and analyze.