

Student Guide

Assessment of Inhibition of Bacteria by Silver Colloid-Impregnated Bandages

Introduction: Manufacturers have recently been introducing products that contain silver colloids or silver nanoparticle. In these products, the silver has been added with the intent of inhibiting microbial growth. Silver is a natural anti-microbial agent. One example is silver-impregnated bandages designed to reduce wound infection by inhibiting the growth of bacteria in the wounds. In this activity you will be testing the effectiveness of silver nanoparticles on inhibiting bacterial growth. It will be up to you to design your own experiment.

General procedure for the experiment is at the end of the notebook form.

Materials

- 4 Petri Dishes
- Nutrient Agar
- Inoculating loop
- 3 Band-aids
- 1 Silver Curad Band-aid
- Ag Silver Colloid
- Triple Antibiotic
- Cotton Swaps
- *Micrococcus luteus* bacteria culture
- Scissors
- Forceps
- Bunsen Burner
- Rubbing Alcohol

General Procedure:

- Each group will have:
 - a test-tube with the bacteria in broth.
 - four petri dishes that have been pre-poured with agar.
 - three untreated and one silver-treated band-aids.
 - antibiotic ointment
- Using sterilized cotton swabs or inoculating loop you will spread the bacteria from the test-tube over the entire surface of the agar using the procedure demonstrated by your teacher. Remember to always use sterilized scissors and forceps when handling the materials of your experiment.
- Design an experiment with the given materials to test the effectiveness of Ag nanoparticles on bacterial growth.
- Use the Science Notebook Form to record your experiment and results.

SCIENCE NOTEBOOK FORM

1. Define your testable question:

2. Identify variables for the experiment

a. Independent variable (factor you changed)

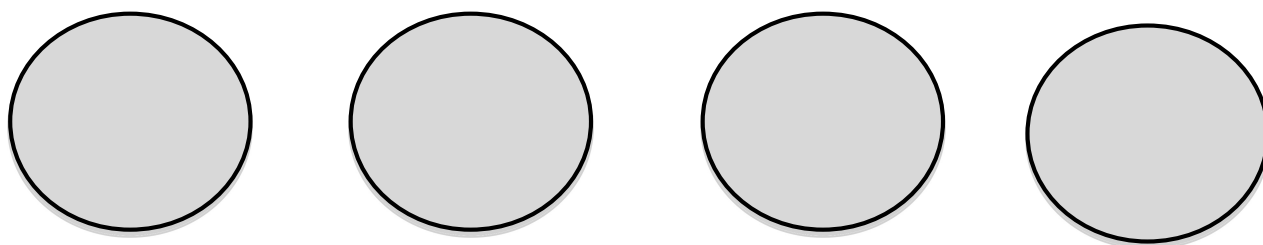
b. Dependent variable (factor that changed due to independent variable)

3. Controlled variables (identify the factors you plan to keep the same in your experiment)

4. Hypothesis (identify what you predict will happen to the dependent variable changes)

5. Experiment Plan (list of materials and detailed step by step directions for your investigation).

6. Results (attach one or more separate sheets of: 1. Observations; 2. Data tables; 3. Graphs.



| Petri Dish Label | Growth Under Band-aid? | Zone of Inhibition (mm) |
|------------------|------------------------|-------------------------|
| | | |
| | | |
| | | |
| | | |

7. Conclusion/Explanation of Results (The conclusion should refer to your hypothesis and use the results to give a reasonable explanation of what happened with your experiment)

8. Ag Nanoparticles and Consumers – What are the implications of using Ag nanoparticles in consumer products? Base your answer on using credible sources. Cite your references.

RUBRIC: For each item listed below, an evaluation will be made on the following scale:

- 10= EXCELLENT. Work demonstrates a high degree of thought, effort and attention to instructions.
- 8= ACCEPTABLE. Work demonstrates thought and effort. Some room for improvement.
- 6=NEEDS WORK. Work shows some promise, but lacks sufficient detail or effort shown in acceptable work.
- 4=MINIMAL EFFORT. Little or no thought or effort. Incomplete or unfinished. Unacceptable.
- 0=Not attempted.

10 8 6 4 0 QUESTION, VARIABLES AND HYPOTHESIS

- ✓ Clear and TESTABLE QUESTION. Not a “How” or “Why” question. Reading the question leads logically to an experiment to answer the question.
- ✓ Variables are correctly identified for the experiment.
- ✓ All necessary variables that could have an effect on the outcome are controlled
- ✓ Hypothesis discusses how the dependent variable will vary with the independent variable.

10 8 6 4 0 EXPERIMENT PLAN

- ✓ The plan is detailed and easy for the reader to follow.
- ✓ The procedures are safe, ethical and doable with available materials.
- ✓ Specific materials are identified on the first two lines.
- ✓ Procedure is recorded as numbered steps.

10 8 6 4 0 RESULTS

- ✓ Observations are specific and clear statements of fact and avoid assumptions and inferences.
- ✓ Includes qualitative and quantitative results when appropriate.
- ✓ Data tables are logically organized, clearly labeled and units of measure are specified.
- ✓ Graphs are included when necessary.

10 8 6 4 0 CONCLUSIONS and EXPLANATIONS

- ✓ Results are used and referred to in conclusions.
- ✓ Explanations are reasonable and do not contradict results.
- ✓ Errors in the experiment are addressed with possible solutions proposed.
- ✓ Needs for further investigation are addressed

10 8 6 4 0 Ag NANOPARTICLES AND CONSUMERS

- ✓ Implications are reasonable and include positives and negatives.
- ✓ Sites consumer products and potential impact of use (environmental and economic)
- ✓ Reference sources are cited and appear credible.
- ✓ Needs for further investigation are addressed

10 8 6 4 0 QUALITY OF WRITING

- ✓ Answers express complete thoughts and are written in complete sentences.
- ✓ Writing is done in impersonal tone and avoids the use of “I” and “WE”.
- ✓ Plan is detailed and avoids the use of “it” and “they”.

10 8 6 4 0 NEATNESS

- ✓ Work is neat and legible.
- ✓ Evidence of effort to follow all directions and present a high quality finished product.