

Health and hygiene

Microbes and personal hygiene

This investigation uses a harmless microbe, *Saccharomyces cerevisiae* (the bread-making yeast), to show that hands can be contaminated by microbes during use of the toilet. The permeability of different toilet papers and the effectiveness of handwashing in removing the microbes is also investigated.

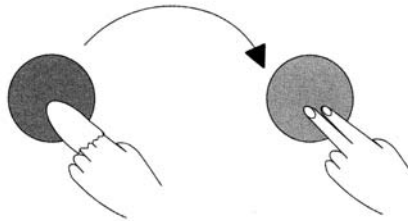
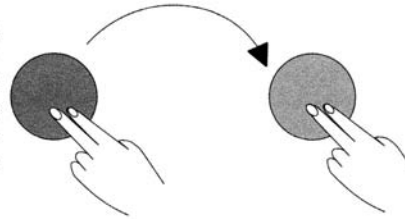
Learning objectives

To show:

- ▷ the permeability of toilet paper to microbes
- ▷ the importance of handwashing after visiting the lavatory
- ▷ how pathogens can be transmitted

Procedure

1. Label the bases of three sterile malt agar plates A, B and C and with your name and the date. Wash your hands thoroughly using hot water and soap, then dry them on a clean paper towel. Open one lawn plate of *Saccharomyces cerevisiae* and wipe two fingers lightly over the surface. Next lift the lid of dish A, touch the agar surface lightly with the same two fingers and quickly replace the lid. WASH YOUR HANDS THOROUGHLY.



2. Wrap two fingers in a layer of the toilet paper provided. Open another plate of *Saccharomyces* and wipe the wrapped fingers lightly over the surface. Try to wipe them in as similar way as possible to step 1. Remove the toilet paper and place it in the bag provided. Then lift the lid of plate B, touch the agar surface lightly with the same two fingers and quickly replace the lid. WASH YOUR HANDS THOROUGHLY.

3. Repeat step 2 using a fresh dish of *Saccharomyces* and plate C. After removing the toilet paper and discarding it into the bag, wash your hands thoroughly with the type of soap provided and dry them on a clean paper towel. Touch the surface of plate C with your washed fingers and quickly replace the lid.

4. Tape all the dishes and turn them upside down. They will be incubated until the next lesson.

⚠ Safety! Wash your hands before leaving the lab.

Next lesson...

5. Examine your agar plates without opening them. Answer the questions.

## Teacher's Guide

### Health and hygiene

## Microbes and personal hygiene

This investigation uses the harmless yeast *Saccharomyces cerevisiae* to simulate the contamination of hands with faecal microbes and the effectiveness of handwashing in removing them. Different brands and thicknesses of toilet paper and different types of soap may be evaluated.

### Learning objectives

To show:

- ▷ the permeability of toilet paper to microbes
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### Age range

Year 7 and above

### Duration

Session 1 40 minutes

Session 2 30 minutes

Incubation period: min. 48 h between sessions

### Recommendations

1. To prepare lawn cultures of *S. cerevisiae* inoculate malt extract agar plates with a few drops of the culture in malt extract broth. Spread the liquid evenly over the surface of the agar using a sterile glass rod spreader and incubate for 48 hours at 20–25 °C.
2. Even though all plates will be sterilised, it is important that students wash their hands thoroughly as directed to reduce the risk of inadvertently culturing organisms already present on the skin surface. Sterile gloves could also be worn.
3. All toilet paper should be placed in the autoclave bag immediately after use.
4. A combination of the traditional, smooth-style toilet paper and soft paper should be provided for comparison. Different thicknesses of paper could also be tested with different groups.

### Materials (each group)

- ▷ 3 lawn cultures of *Saccharomyces cerevisiae* on malt extract agar\*
  - ▷ 3 malt extract agar plates
  - ▷ different brands of toilet paper
  - ▷ different types of soap
  - ▷ autoclave bag
  - ▷ adhesive tape
  - ▷ marker pen
- \*Malt extract agar. Dissolve 15 g malt extract and 18 g bacteriological agar in 1 l distilled water. Dispense into bottles and sterilise by autoclaving. Malt extract agar is also available from school science suppliers.

### Questions

#### Session 1

1. What kinds of microbes occur in the human intestine?
2. Why is it important to wash your hands (a) before meals, (b) after using the lavatory?
3. What is an infectious disease?
4. What are the main defence mechanisms of the body against microbial infection?
5. What do you expect the appearance of dishes A, B and C to be next lesson?

#### Session 2

6. Does the appearance of your dishes match your predictions?
7. Are the class results consistent? If not, suggest reasons for any differences.
8. Do the class results show any evidence of differences in effectiveness of (a) toilet papers, (b) soaps?
9. What do the results suggest about personal hygiene procedures?
10. Suggest as many methods as you can to prevent the spread of infectious disease.