

Transfer of Diseases - A Yeast Model

Introduction: Many diseases are transferred by contact between a sick person and a healthy person. Yeast are microbes that do not cause disease, but they can be used to show how microbes are transferred between people. This is called a model system.

Purpose: To observe how microbes are transferred from person to person by hand contact.

Safety: There are no particular safety concerns with this lab. Students should always practice safety in the lab by keeping the work area clear and clean. They should wash their hands after all lab activities.

Materials (per class)

- yeast solution
- pieces of hard candy
- Sabaroud Dextrose agar plates (or home-made gelatin media) (one per person)
- cotton swabs in clean water
- disinfectant soap
- markers

Procedure

1. Students should wash their hands thoroughly before they start this lab activity.
2. Just before the experiment the teacher will place one piece of candy in the yeast solution and the other in plain water and then remove them onto two paper towels (move the non-yeast one first). The students should not know which piece is covered with yeast. The teacher should wash her/his hands thoroughly after touching the candy.
3. Two volunteer students (A1 and B1) each take one piece of candy and rub it thoroughly on their right hand.
4. The teacher rubs a fresh damp cotton swab on the right hand of students A1 and B1 and then liberally rubs the whole surface of the swab on Sabaroud Dextrose agar plates or home-made gelatin plates (one for each student). The teacher then discards these swabs. After the teacher swabs each plate, it is given to the student who then labels it with her/his name and records who shook their hand.
5. Each of these two students (A1 and B1) then shakes right hands with one other student in the class (A2 and B2).
6. The teacher rubs a fresh damp cotton swab on the right hand of students A2 and B2 and then liberally rubs the whole surface of the swab on fresh Sabaroud Dextrose agar plates or home-made gelatin plates (one for each student). The teacher then discards these swabs. After the teacher swabs each plate, it is given to the student who then labels it with her/his name and records who shook their hand.
7. Repeat steps 4-5 until each student in the class has had his/her hand shaken once. Be sure to record who shook whose hand and in what order. Also, the teacher should be careful not to touch the students' hands, except with the swab, and should swab the right hand very thoroughly, especially after the first couple of hand shakes. Encourage students to shake hands by rubbing them thoroughly (although they need not grip tightly) to transfer yeast to the recipient.
8. After they are finished, all students should wash their hands thoroughly (although the yeast will not hurt them).
9. Incubate the plates at room temperature for 4-7 days
10. Record which plates have yeast growth and which do not.

Results

The class should interpret the growth data and decide which of the original two students had the yeast-coated candy. If some plates have growth that should not be there, the colonies are probably normal bacteria from skin and not yeast. Look at the colonies carefully to see if students can distinguish yeast colonies from non-yeast colonies. If there is no accidental cross-contamination of yeast it should be relatively easy to determine which student had the contaminated candy, and how far it was transferred by hand-shaking.

If home-made gelatin plates is used, many other organisms besides yeast can grow; however, it is often possible to recognize the shape, size, color, and smell of yeast colonies. Disregard plates that have growth that is not yeast.

Discussion

1. Microorganisms can be transferred between individuals in different ways.
2. Hand-shaking can transfer microorganisms as can touching doorknobs or other surfaces that have been touched by an infected individual.
3. Hand-washing can help prevent the transfer of microorganisms between individuals.

Teacher Instructions

In advance

Purchase baker's yeast, hard candy, germicidal hand cleaner, and other materials for the activity. Purchase or prepare Sabaroud Dextrose agar plates (available from scientific suppliers). These are best for the growth of yeast and fungi.

If a commercial medium is too expensive, you can prepare homemade gelatin plates that will allow many fungi to grow. This homemade medium can be poured into sterile disposable petri plates or, if those are too expensive, can be poured into foil muffin cup liners and stored in plastic sandwich bags.

For homemade plates you will need

- plain gelatin
- water
- sugar
- beef bouillon granules
- foil muffin (cupcake) cups
- muffin pans
- measuring spoons

In a saucepan, mix 4 envelopes of plain gelatin with 4 cups cold water, 8 tsp. sugar and 4 tsp. bouillon granules (or 4 bouillon cubes). Bring slowly to a boil, stirring constantly. Cool slightly and fill either (1) sterile disposable petri dishes or (2) foil muffin cup liners (cupcake cups) in muffin pans for support, about 1/3-1/2 full with the hot gelatin solution. Cool until the gelatin is solid. Remove foil muffin cup liners from muffin pan and store in plastic zip-lock bags in the refrigerator. Do not touch the surface of the gelatin. Makes 25-30.

Day of lab

Dissolve one envelope of yeast and one tsp. sugar in about a 1/4 cup of water and leave for about 10-15 min until yeast start to grow.

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