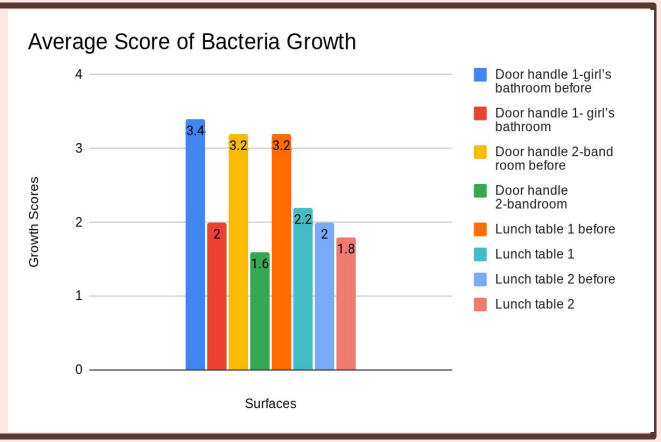
How clean is our school?

Research Question

How much bacteria is on commonly touched surfaces in YC HS?

Data Analysis And Results



Methodology

- Swabbed 2 door handles and 2 lunch tables before and after cleaning
- Rubbed that swabs onto petri dishes and labelled respectively
- Grew the bacteria on the petri dishes by placing them in a warm dark spot, recorded the growth data

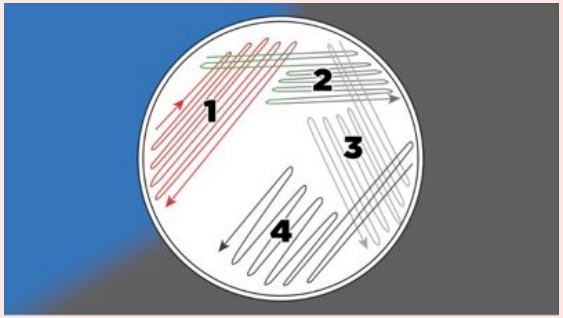
Conclusion

The results show that the surfaces are dirty and full of bacteria before being cleaned. The hypothesis is supported because the door handles had very high amounts of bacterial growth before cleaning, and the lunch tables didn't have much more growth when compared to after being cleaned. The door handles had a significant amount of growth because they aren't cleaned as often, while the lunch tables are cleaned twice a day.

Introduction: Background Research

Schools are often filled with millions of germs and bacteria. This makes washing hands and sanitizing surfaces often a very important practice, although this is repeated many times by parents and teachers alike, many students do not go through with it. The CDC recommends washing hands after using the bathroom, after and before eating, using this one can assume that we should be washing our hands at least 5 times a day. When surveying 30 of YC's students how many times a day they wash their hands, 23 of them said that they wash their hands at least 5 times a day, and 13 out of 15 staff members said the same. However, lots of students and staff said that they washed more than 10 times with some even saying more than 35.

The lunch tables are cleaned twice a day, once after both lunches using everyday cotton rags. After asking a janitor how often they clean the door handles, he said about 1 time in a day, although he emphasized that the handles are not cleaned very often. Lysol all-purpose spray is used for cleaning both the tables and handles.



For growing the bacteria, agar petri dishes and the T-streaking method were used. Agar petri dishes were best for this experiment because they are easy to use, accessible, and there are many resources explaining how to use them. Although there are many kinds of ways to streak, the T-streak was recommended by the majority of sources due to the simplicity of the procedure. References said to leave the petri dishes in a dark, warm environment for 3-6 days for the bacteria to grow to a desirable amount.

Introduction: Hypothesis and Purpose

Hypothesis

YCHS will be relatively clean, the swabs from the lunch tables after being cleaned won't have lots of bacteria when compared to the before swabs, however the door handles will still have a moderate amount of bacteria.

Purpose

The purpose is to show that it is important to have a clean school environment and how dirty our school can be to remind students and staff that washing hands throughout the day is crucial. As well as, to find out if the regularly touched surfaces in YC HS are clean

Problem and Predictions

Problem
How much bacteria is on commonly touched surfaces in YC HS?

Prediction
YCHS will be relatively clean, the swabs from the lunch tables after being cleaned won't have lots of bacteria when compared to the before swabs, however the door handles will still have a moderate amount of bacteria.

Investigative Methods: Materials

- (40) Agar nutrient petri dishes
- (40) Sterile swabs
- (4) Paper towels
- Lysol Disinfectant Spray
- 2 different door handles
- 2 different lunch tables

Investigative Methods: Procedures

1. Take one sterile swab and swab one bathroom door handle to the girls restroom at YC HS during midday.
2. Rub the swab onto an agar petri dish in an alternating zig-zag motion.
3. Label the petri dishes: *door handle 1-dirty, trial 1.*
4. Repeat 1-3 4 additional times for door hand 1. Label *door handle 1-dirty, trials 2-5 respectively.*
5. Repeat steps 1-4 on a different door handle, the bandroom door handle.
6. Label the second set of petri dishes: *door handle 2-dirty Trials 1-5,* respectively.
7. Repeat steps 1-4 on a lunch table inside the YC HS cafeteria right after lunch, label the petri dishes: *lunch table 1-dirty Trials 1-5,* respectively. Do this for a separate lunch table and label the dishes: lunch table *2- dirty Trials 1-5,* respectively.

Investigative Methods: Procedures (continued)

1. At the end of the school day, swab door handle 1 five times again after it is cleaned and rub the swabs onto petri dishes.
2. Label the dishes: *Door handle 1-clean trials 1-5,* respectively
3. Repeat steps 1-4 for door handle 2, label the petri dishes: *Door handle 2-clean Trials 1-5,* respectively.
4. Swab lunch table 1 five times after you clean it, then rub the swabs onto petri dishes.
5. Label the dishes: *lunch table 1-clean Trials 1-5.*
6. Repeat steps 11 and 12 for lunch table 2, label the petri dishes *lunch table 2-clean Trials 1-5,* respectively.

7. Gather all the petri dishes, put them into cardboard boxes separated by labels, then put all the boxes into a bag. This will ensure the dishes stay insulated and dark.
8. Place the bag in a warm dark place for 2-5 days for the bacteria to grow.
9. Count and record the number of bacteria cultures in each petri dish.

Investigative Methods: Variables

Independent:
The surfaces, both clean and unclean.

Dependent:
Amount of bacteria on the petri dish.

Controlled:
The type of petri dish, school, day, time of day, disinfectant.

Results and Data Visualizations

4-thick, close together
(colonies almost touch each other)

3-thick, spread out
(colonies not close together)

2-thin, close together
(colonies almost touch each other)

1-colonies thin, spread out
(colonies not close together)

Amount of bacteria cultures before cleaning surface
(on the scale from 1-4)

Trial	Door handle 1-bathroom	Door handle 2-bandroom	Lunch table 1	Lunch table 2
1	3	2	2	4
2	4	3	4	3
3	3	4	3	3
4	4	4	4	2
5	3	3	3	3

Amount of bacteria cultures after cleaning surface
(% surface area)
(amount of colonies)

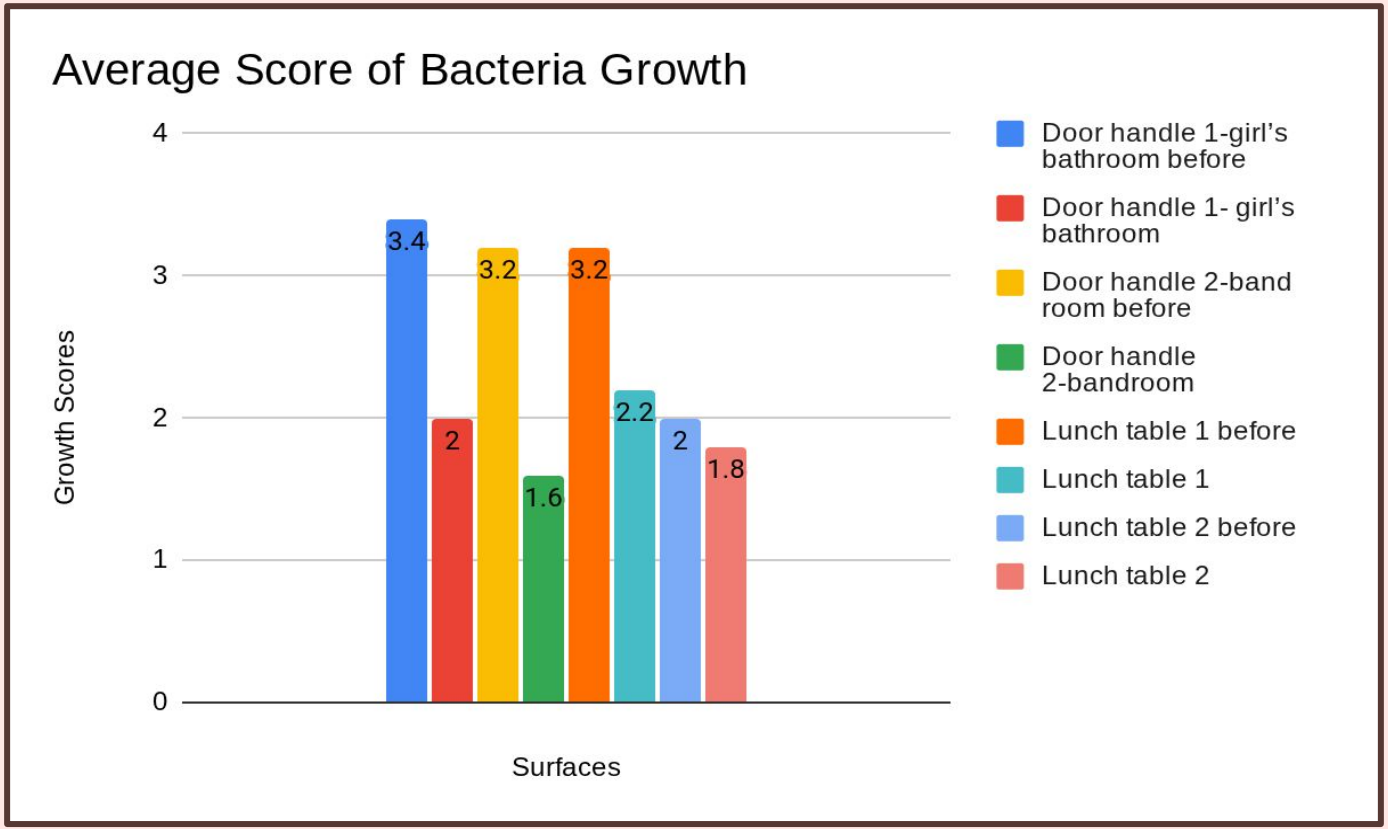
Trial	Door handle 1-girl's bathroom	Door handle 2-bandroom	Lunch table 1	Lunch table 2
1	2	1	2	3
2	2	1	1	3
3	2	2	2	1
4	2	2	3	1
5	2	2	3	1

Results and Data Visualizations

Average Score of Bacteria Growth

Door handle 1-girl's bathroom before	Door handle 1-girl's bathroom	Door handle 2-band room before	Door handle 2-band room	Lunch table 1 before	Lunch table 1	Lunch table 2 before	Lunch table 2
3.4	2	3.2	1.6	3.2	2.2	2	1.8

Results and Data Visualization



Discussion and Interpretation: Data Analysis

Analysis

The dirty trials had much more growth than the clean trials, although this wasn't the case for lunch table 2. As shown on the bar graph, handles 1&2 and lunch table 1 had a much larger amount on average than the clean trials. Trial 1 on lunch table 2 before cleaning had 50% more growth than trial 4 before cleaning. Growth from trial 2 in lunch table 1 decreased by 75% after being cleaned. The hypothesis was supported because the lunch tables didn't average as big of a difference after being sanitized when compared to the door handles.

Conclusion

The results show that the surfaces are dirty and full of bacteria before being cleaned. The hypothesis is supported because the door handles had very high amounts of bacterial growth before cleaning, and the lunch tables didn't have much more growth when compared to after being cleaned. The door handles had a significant amount of growth because they aren't cleaned as often, while the lunch tables are cleaned twice a day.

Implications and Ideas for Future Research

Ideas for Future Research

There could have been more trials on different surfaces. Such as five door handles, five lunch tables, and five different water fountains. Having swabs on a variety of surfaces would help to further answer the question of whether or not YC HS is a clean school. The petri dishes could have been all the same size exactly to further eliminate any variables; this would allow for more precise growth measurements.

Application

This can help remind people to wash their hands and business owners to sanitize their buildings regularly.

References

Clark, P. (2025, February 20). *The 5 most dangerous bacteria lurking in Schools (And How to Stop Them) | Vanguard cleaning systems of the Ozarks*. Vanguard Cleaning Systems of the Ozarks. https://www.vanguardozarks.com/2025/02/the-5-most-dangerous-bacteria-lurking-in-schools-and-how-to-stop-them/#:~:text=Schools%20harbor%20a%20variety%20of,Bacillus%20species%2C%20and%20Enterobacter%20species.

Clinic, C. (2025, April 22). How Often Should You Wash Your Hands? *Cleveland Clinic*. https://newsroom.clevelandclinic.org/2024/10/14/how-often-should-you-wash-your-hands

Growing bacteria in petri dishes - Steve Spangler. (2020, October 1). Steve Spangler. https://stevespangler.com/experiments/growing-bacteria/

Hand hygiene facts and statistics. (n.d.). Healthy Schools Healthy People. https://www.healthyschoolshealthypeople.org/community/hand-hygiene-facts-and-statistics

Handwashing facts. (2024, April 17). Clean Hands. https://www.cdc.gov/clean-hands/data-research/facts-stats/index.html

References

Infection Control Today – HAIs, Infection Prevention, and Safety News. (2020, November 14). Millions of germs and bacteria await kids at school; NSF international findings highlight the importance of handwashing in illness prevention. *Infection Control Today – HAIs, Infection Prevention, and Safety News*. https://www.infectioncontroltoday.com/view/millions-germs-and-bacteria-await-kids-school-nsf-international-findings-highlight

Instructables. (2020, October 11). *Growing bacteria at home*. Instructables. https://www.instructables.com/Growing-Bacteria-at-Home/

Libretexts. (2021, May 26). *2.2: Introduction to bacterial growth and aseptic techniques*. Biology LibreTexts. https://bio.libretexts.org/Courses/North_Carolina_State_University/MB352_General_Microbiology_Laboratory_2021_(Lee)/02%3A_Cultivation_of_Microbes/2.02%3A_Introduction_to_Bacterial_Growth_and_Aseptic_Techniques

School's in and so are the sneezes! (2025, August 12). Wellspan Health. https://www.wellspan.org/articles/2025/08/back-to-school-illnesses---8-12-25

SCHOOL HAZARD FACTS FOR FAMILIES. (2015). In *UNITE FOR SCHOOLS FREE OF DUST, DIRT AND GERMS*. https://njwec.org/PDFs/FSDirtFinal.pdf