Group name: Team Grumpy Bacteria

Research question: How efficient are washing machine and dryer at killing bacteria found in sweat and dirty laundry?

Control condition: The shirt before washing

Experimental condition: The shirt after washing

Synopsis of investigation: People often wonder how many times they can wear their clothes before having them become "too dirty" and throughout the day, the average person perspires to some degree. Sweat bacteria produces a foul odor that people want to rid their clothing of. In this experiment, we will be investigating the efficiency of washing machine and dryer n removing sweat bacteria from clothing. We will have one subject perspire enough sweat for the parameters of the experiment and compare the colonies of bacteria with and without washing and drying of the shirt. From this, we will gather how effective modern cleaning technology is.

(1) Bacterial count hypothesis: T-shirt after washing will have fewer bacterial colonies than T-shirt before washing.

(2) Motility hypothesis: Bacteria from the T-shirt after washing will be less motile than bacteria from the T-shirt before washing.

(3) Gram stain hypothesis: Bacteria from the T-shirt after washing will be more gram negative than bacteria from the T-shirt before washing.

(4) Antibiotic resistance hypothesis: Bacteria from the T-shirt after washing will be less resistant to antibiotic than bacteria from the T-shirt before washing.

(5) Ampicillin sensitivity: Bacteria from the T-shirt after washing will be less resistant to antibiotic than bacteria from the T-shirt before washing.

(6) Kanamycin sensitivity: Bacteria from the T-shirt after washing will be less resistant to antibiotic than bacteria from the T-shirt before washing.

(7) Gentamicin sensitivity: Bacteria from the T-shirt after washing will be less resistant to antibiotic than bacteria from the T-shirt before washing.

Rationale: Although water alone is a great solvent because of its chemical nature, it is not the best at removing the bacteria that thrive in sweat [1]. Water alone cannot kill the odor producing bacteria found in our clothing at the end of an eventful day. For this reason, detergents, fabric softeners, chemical additives, and the dryer are integrated into the washing experience. One bacterium that goes by the name of actinobacteria has flagella, is motile and is gram-positive, which means that it can effectively ward of the powers of the washing machine and be more resistant to antibiotic in comparison to other gram-negative bacteria [2].

Impact: While we think of washing our dirty clothes maybe full of sweat with washing machine, we often believe it would make our clothes clean, killing most of the bacteria. It might be true in some instances, but there are a lot of factors we have to consider. Using water that reaches certain temperature is required in order to kill bacteria, which ordinary washing machines fall short to achieve [3]. Disinfectant or chlorine bleach is also necessary to use [4]. So finding out whether washing machine can effectively kill bacteria can detect the issue relying with the condition of washing machine, the relationship between water temperature, detergent and killing of bacteria. A better understanding of whether or not washing machine and dryer are able to kill bacteria can allow us to make further improvements on washing technology.

Material: One sweaty shirt

A washing machine

One bottle cap of Tide detergent

A dryer

Protocol:

1. Acquire a t-shirt made from 100% cotton material
2. Place the shirt on the subject
3. Have the subject go to the gym and run on the treadmill for 10 minutes on the sixth setting
4. Have the subject run for longer if they have not sweat enough for sampling size
5. Remove the shirt from the subject and swab the sweat stains from the underarm areas (Make a grid of 15cm \* 15cm on both sides)
6. Cross off swabbed section on the shirt
7. Cut the shirt in half. Label the sweaty half A, and the washed half B. Leave A and place B into the washing machine in the mix of a normal size load of wash
8. Add the appropriate amount of Tide detergent to the load of wash
9. Wash the clothes on the "normal" setting
10. After the clothes go through their washing cycle, put them in the drying machine and dry them on a high temperature setting
11. After the dryer completes its cycle, take samples from the same area of the shirt
12. Compare the samples of the bacteria prior to washing and following washing, looking at the colonies of bacteria to see how the numbers differ
13. To choose one colony from both the experimental swab and the control swab to isolate and characterize for motility, gram stain, and antibiotic resistance, we will choose a colony based on its similarity to the others – the average colony.

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