**CITIZEN SCIENCE**

**Group Name**: Doctor Chill **Date**: 01/17/17

**Research Question**: Does more bacteria form on the inside or the outside knob on a door?

**Control Condition**: Indoor knob/handle/bar

**Experimental Condition**:Outdoor knob/handle/bar

**Synopsis of Investigation:** We are going to swab doorknobs on the inside and outside of a door leading to the outdoors. Our question is which side has more bacteria on it. We believe that the inside knob will have more bacteria, due to it being the winter and bacteria thrive in warmer weather (Thompson, 2016). This experiment is important because it can give people a deeper understanding of an action they do every day from a microbiological standpoint.

1. **Bacterial count hypothesis:** I predict that there will be more bacteria on the inside of doors because bacteria prefer a warmer environment.
2. I predict that there will be little motility in either of our colonies but there will be more on the inside doorknobs than the outside.
3. **Gram Stain hypothesis:** I expect the samples to stain about 50/50 negative and positive on the in and outside doorknobs. Staph is gram positive and the most abundant but E coli and Klebsiella are both gram negative.

**Rationale:**

It is likely that our readings will surpass 85% for contamination indoors. A study in Abuja, Nigeria cited that restrooms in restaurants were 100% contaminated (Nworie, 2012). However, his group also found that the bathroom’s traffic is largely determinant of a person’s decision not to wash their hands, and thus, the depleted student body over citsci could stand to lower the percentage of bacteria present on the inside doorknob.

Because the bacteria that was found in the highest quantity in Nworie’s study was Staph and Staph is not motile (Escherichia Coli, n.d.). In a study done on the bacteria levels on toilet seats in a children’s hospital, it was found that when alcohol wipes were not used on the toilet seats prior to use, there was a 50 fold increase in bacterial count (Muzslay et al., 2017). Staph was found on toilets that were not wiped-down prior. The hand can often come into contact with the toilet seat and can therefore expose the door handle to staph if hands are not properly sanitized.

Staph is gram positive and the most abundant but E coli and Klebsiella are both gram negative.According to Nworie, Staph constitutes about 30% of the bacteria present while the aforementioned gram negative bacteria encompass about 40% (Nworie, 2012). Another study by Scott and Bloomfield concluded that gram positive bacteria transferred more readily than gram negative, and therefore, it is conclusive that the ratio will balance out somewhere within the range of 50/50 (Scott, Bloomfield, 1990).

**Impact:**

Door handles in busy and high acuity clinical environments were variably contaminated with

Bacteria [11]. Meanwhile, particularly due to frequent breakdowns occurring in hand hygiene, door handles of restrooms have the potential to become contaminated by pathogenic bacteria as well [12]. The impact of the experiment can be seen through testing done around a hospital [2]. Yes, our experiment only deals with handles but the goal is generally the same, checking the sanitary. In bacterial infested settings (i.e. college campus), we want to make it as clean and sanitary as possible to keep and maintain a healthy environment. Surgical wards, bathrooms, the patients’ rooms themselves, and the like we swabbed and had heavier microbial burdens in the more medical than surgical wards regarding bacteria count and leftover. Sanitational habits of a college are not upheld as important as places where it is key, for example a hospital or science lab,

however, it would be interesting to which areas of campus have the higher bacterial counts and why they would be the most contaminated. This would bring focus to sanitary habits of people entering and leaving buildings. Although there was another experiment discussing airborne bacteria and viruses, the testing and experiment itself, it is quite useful and discusses the same impact material and reasoning regarding sanitary habits. The purpose was finding out more about concentrations, sources, transformation, and fate of viruses in the atmosphere [7]. This ties into the atmospheres and surfaces taken from the samples. Different locations were used to record indoor and outdoor data to see the difference in bacteria and viruses. That is what is being recorded in this experiment but specifically on doorknobs/handles/bars. It will be interesting to see the bacteria accumulated on the surface rather than just air particles. All in all it is extremely important discussing the sanitary conditions around campus based on sanitary habits of the inhabitants of Bard. This is no hospital nor science lab but it is still useful to know the conditions of the college.

**MATERIALS**:

* 60 cotton swabs
* 10 doors (10 inside doorknobs and 10 outside doorknobs)
* Ziploc bags (60)
* Gloves
* Annotation Post-it Tabs

**Experimental Protocol:**

Each partnered pair of the group will do the following for each door tested (10 doors):

1. Swab 6 spots of the handle of the inside door (one swab per spot) and contain in labelled ziploc
2. Swab 6 spots of the handle of the outside door (one swab per spot) and contain in labelled ziploc
3. Record whether it is a handle or bar
4. Once in lab, use gloves and swabs to cover the petri dish and 6 parts, One petri outside, one petri inside, Two petri dishes per door
5. Leave overnight to accumulate bacteria in a constant environment (temperature, humidity,)

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The result of the testing in this experiment, bacterial surface contamination was above the threshold in certain places like bathroom handles also alongside the labs and offices of the hospital.

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