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A Comparison of the Prevalence of *Tinea Pedis* in the Morrison and Bittinger Shower Drains of McPherson College

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ABSTRACT

Tinea pedis is the fungus that is responsible for causing athlete's foot. Athlete's foot is when the foot begins to itch, burn, crack, hurt and bleed. This can be very uncomfortable for the person. Athlete's foot can be spread through direct contact of the skin or by indirect contact through other objects, such as towels and floors. The purpose of this experiment was to compare the prevalence of *Tinea pedis* in the Morrison and Bittinger shower drains of McPherson College. This was done by collecting a sample from each of the shower drains and then by growing this sample in a petri dish of Sabouraud agar. I collected samples from all thirty-two showers. There were sixteen showers in each dorm. The samples were then placed into a thirty-seven degree incubator and left to grow for two weeks. Once this time had passed a simple crystal violet stain was performed on each sample. The samples were then examined under a microscope to identify whether the sample was fungal or bacterial. This examination revealed that of all the showers sampled only one contained fungus.

Keywords: *Tinea pedis*, athlete's foot, fungus, shower, shower drain, Morrison, Bittinger, McPherson College.

INTRODUCTION

Tinea pedis which is more commonly known as athlete's foot is a fungus that can affect anyone. Most people typically think of *Tinea pedis* as a fungus that can only affect people who play sports, however this is not the case. People are at risk of developing *Tinea pedis* if they wear shoes. When people wear shoes their feet rub on the shoes and create friction. The friction creates sweat that helps create the ideal environment for *Tinea pedis* to grow in. Another factor that increases the chances of developing *Tinea pedis* is the use of communal showers. This is another reason that people typically think of athletes as being the ones who develop *Tinea pedis*. So with these risk factors in mind I want to discover and compare the prevalence of *Tinea pedis* in the Morrison and Bittinger Hall shower drains.

Many people have an idea of what *Tinea pedis* is but they do not fully understand what it is. People think that it is just an itching of the foot, and while this is part of what *Tinea pedis* is it is not the whole fungal infection. *Tinea pedis* has many symptoms that include: dry skin, itching, burning, cracking, pain, and bleeding (Athlete's Foot, 2010). *Tinea pedis* is not something that should be taken lightly as it is a fungal infection that can be spread through contact either directly or indirectlty. If you use a shower that a person with *Tinea pedis* has recently used then you could obtain *Tinea pedis* yourself.

According to a study done by Field (2008) it has been observed that a higher number of *Tinea pedis* cases exist among athletes. This could be caused because athletes are sweating from their feet and creating an ideal environment for the fungus to grow. The athletes are also creating a lot of friction that helps cause *Tinea pedis* (Field 2008). To determine if *Tinea pedis* is present in the showers I will use a method similar to Albert (2007). I will make some slight adjustments due to the fact that I will not be using skin samples to test for *Tinea pedis* (Albert, 2007).

The purpose of this experiment is to discover whether or not *Tinea pedis* even exists in the showers. If it does exist there is it more prevalent in an all male or all female dorm. I think this will be valuable information for people who live in these dorms. If I do discover a significant amount of *Tinea pedis* present then this will be valuable to McPherson College so that they can address their cleaning methods in the showers.

MATERIALS AND METHODS

To determine if Tinea pedis is present in the showers I will use a method similar Albert (2007). I will make some slight adjustments due to the fact that I will not be using skin samples to test for Tinea pedis (Albert, 2007).

The materials that were needed included: sterile cotton swabs, Sabouraud agar, markers, thirty-seven degree incubator, test tubes, petri dishes, autoclave, slides, crystal violet stain, and a microscope.

The first step to perform in this experiment was to obtain the permission of McPherson College. The permission of the college was needed as this could be an ethical issue since it deals with the students and their personal health. The next step that was performed was to find out what time the bathrooms were cleaned and then determine what time the samples would be taken from the bathrooms. The next step was to go and collect the samples. The samples were taken by using sterile cotton swabs

and sticking them down into the shower drain and rubbing them around. After this was done the cotton swab was then be placed into a sterile test tube. The end of the cotton swab that has the sample on it was then cut and placed on the agar. The agar that was used was Sabouraud agar and it was prepared by following the instructions on the bottle. Then the sample was labeled with correct information. Once the sample had been obtained it would need to be tested for *Tinea pedis*. To test for *Tinea pedis* the sample was placed in an incubator set to thirty-seven degrees Celsius so that the fungi could grow. After two weeks in time had passed the sample was removed from the incubator. After the fungus had a chance to grow on the agar it was helpful to perform a simple gram-stain in order to help confirm that *Tinea pedis* was the fungus that was present in the showers. This made it easier to see and identify the fungus. This was done by taking a small amount of the growth from each plate and placing it on individual slides. After placing the culture on the slide it is necessary to dry or fix the culture over a gentle flame. The next step was to add the stain. Once the slides were stained they were examined under a microscope. This is when each slide was classified as bacterial or fungal. Once the amount of shower drains containing fungus was determined a χ^2 Test of Homogeneity was performed. For this test the critical value was 0.05 and the degree of freedom was one (LeBlanc, 2008).

RESULTS

After collecting and plating all of the samples I needed to use a microscope to further examine them. I sampled from two dorms and from thirty-two showers. Through further examination I was able to discover which of the showers had bacteria and which of the showers had fungus growth.

Some of the showers in each of the dorms had showers that had no growth. In the Bittinger Dorm the showers with no growth were: Lower Left numbers two and three, Lower Right number four, and Upper Right numbers three and four.

In Morrison the showers with no growth were: Lower Left numbers one, two, three, and four, Lower Right numbers one and four, and Upper Right numbers one and four.

Of the samples that did have growth, the one that had fungus was in Bittinger and it was the Lower Right number two shower.

In order to determine if the amount of *Tinea pedis* fungus that was found was a significant amount a χ^2 Test of Homogeneity was performed. The results from this test concluded that the amount of *Tinea pedis* present in the shower drains was not a significant amount.

DISCUSSION

So based on the results I did not find exactly what I thought I would. While I did discover some Tinea pedis, I did not find the amount that I expected. I expected to find the fungus in multiple showers in both of the dorms. The fact that the fungus was discovered in only one of the thirty-two showers will be comforting to the residents of those dorms. Since it was concluded that the amount of *Tinea pedis* was not significant this meant that the *Tinea pedis* was there due to random chance. So it was normal and should have been expected to find at least the presence of *Tinea pedis.*

I cannot be sure of the exact reason that the fungus was not high in presence in the showers but my guess would because the showers are being cleaned properly. The showers were cleaned daily, Monday through Friday, and they were disinfected with a one-step disinfectant called Virex II 256. This is the same cleaner that is used in hospitals and other health care facilities (Staff, 2011). Another possible reason was that of the people that used the showers none of them had the *Tinea pedis* fungus present on their feet. The methods of acquiring and testing the samples could also have been an issue and created an error in the results. The time that the showers were sampled could also have had an impact on the results. There might have been more fungus present if I would have sampled when the showers had not been cleaned for almost twenty-four hours.

If I were to change anything with this experiment it would be that I would collect samples from more showers. This would allow for a greater variety of people and showers. This would also allow me to test showers that are designed different and could possibly hold bacteria and fungus more than the other style of showers. I would also want to collect my samples at a different time such as the weekend when the showers are not cleaned. I believe doing these few steps differently would lead to different results.

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