The fungus rhizopus stolonifer

The fungus Rhizopus stolonifer is a widely distributed thread like mold which is commonly found upon bread surfaces and other food. This is why it has the common name of black bread mold. Due to the fact that it is so common and can easily grow upon bread substances it makes it a very appropriate fungal choice to experiment on. Rhizopus stolonifer grows rapidly when placed in a moist environment where the temperature stays between 15 and 30 degrees Celsius and can easily reproduce in these temperatures. Rhizopus stolonifer is capable of causing infections in humans and so it makes it appropriate to choose Dettol, Savlon, and Bleach as substances to apply to the fungus as these substances are known to kill pathogens, fungus and clean surfaces. Fungi are known to have a resistance to certain antiseptics however if sufficient concentration of a substance is added, the antiseptic can overcome such resistances.

Aim:

To determine the effect of certain household substances on the growth of the Rhizopus stolonifer fungus species.

Hypothesis:

From the research gathered in the literature review, it is expected that- if the variables of the fungus being tested such as species, size are kept constant- Dettol will have the greatest effect on the fungal growth. As it will most efficiently overcome the resistance of the cell membrane as it will be the the first to overcome the resistance of the cell membranes of the fungi due to two of its active ingrients (CHLOROXYLENOL and ISOPROPYL ALCOHOL). It is expected that Savlon will have little or no effect on fungal growth, as through

previous research gathered (stated in literature review) Savlon only has anti-bacterial properties.

Literature Reviews:

There is a research paper by Mahmood and Doughari from the African Journal of Biotechnology, from the Department of Microbiology, School of Pure and Applied Sciences, Federal University of Technology which was posted for peer review on 16 May 2008.

It shows an experiment that was conducted in order to determine the effect of Dettol on the viability of some microorganisms associated with nosocomial infection such as Candidia albicans which is a fungus.

The experiment sought to determine which concentration of Dettol the fungus would be more susceptible to destruction. Results showed that after adding Dettol little change occurred in the cell count of the fungus in 5 minutes however after 10 minutes there was a rapid decline in the cell count of the fungus.

Cove and Holland suggested in 1983 that in order to completely kill all of the fungal cells, a sufficiently high concentration of the antiseptic must be in contact with the cells for longer than those cells’ resistance time.

Cove and Holland also reported that microorganisms which were exposed to toxic agents will almost always show a constant death rate in the cells.

Doughari found and then supported the idea of Cove who stated that there is a constant death rate of the cells when in prolonged contact with an antiseptic.

What was good about the experiment/research?

The same type of fungus was tested and all the fungi were grown to the same size.

The fungi were all exposed to the same volume of antiseptic.

Two types of water were used to dilute the Dettol.

Bad things about the experiment/research:

It was not repeated more than twice for each concentration.

Our hypothesis stated that if fungi, with constant variables, were exposed to equal concentrations of Dettol, Savlon and Bleach, the Dettol would be the first substance to overcome the fungus' resistance and therefore start decreasing the growth of the fungus by killing its cells. This report shows exactly how quickly the Dettol kills the cells and therefore supports our hypothesis. [1]

Similarly there was another research paper by Emeka, Awodele, Agbamuche and Akintonwa which was peer review and posted on 16 April 2007 at the African Journal of Biotechnology, from the Department of Pharmacology, College of Medicine, Idi-Araba. University of Lagos, Nigeria. Which was all about the antimicrobial activities of some commonly used disinfectants on several bacteria and fungi such as Candilida albicans.

They tested Savlon, Jik and Methylated Spirit. The experiment showed that Jik and Methylated Spirit had inhibitory activities on both fungi and bacteria however Savlon had only antibacterial activity.

Good things about the experiment:

They inoculated and incubated each of the fungi and bacteria before the experiment to keep them sterile and to avoid cross contamination.

Constant variables such as temperature were kept constant.

A control was introduced.

Bad things about the experiment

They did not repeat the experiment enough times.

In our hypothesis we expected Savlon to be weaker as an antifungal substance compared to Bleach because through this research we have come to realise that there is a potential issue that no matter how concentrated the Savlon is, it proves to be unable to kill the cells of the fungus and therefore it has no effect on the growth of the fungus. However we will still be incorporating Savlon in our experiment in order to test whether this result was valid and correct. [2]

There was a third journal which had a similar experiment which was conducted in Nigeria by Oyewale, Mojeed and Oladapo at the Department of Applied Sciences. The experiment tested the effectiveness of antiseptic substances such as Savlon and Bleach on fungal growth. The results

matched their hypotheses: both Bleach and Savlon managed to completely kill off the mould.

Existing knowledge is that Pelczar observed that there was an initial time which enables penetration of chemical agents into the fungal cells and then this will interfere with those cells' protein synthesis.

The results relate to our hypothesis because it shows that Bleach can act as an effective antifungal antiseptic and therefore there is the potential that our original hypothesis is valid and correct however it opposes the experiment results of Emeka, Awodele, Agbamuche and Akintonwa's experiment which stated that Savlon has no effect upon fungal growth. [3]

Method:

Data Plan:

We will measure the size of the fungi using a series of utensils such as a square cm grid, as well as using a ruler to measure the area regularly.

The growth of the fungi will be monitored and recorded daily.

Then once the fungi have grown to a useable size we will measure and record the size of each fungus in each Petri dish using the same methods as before.

We will then trim the fungi which are too large as we need to keep size a constant.

Temperature will remain constant as well as light available to the fungi.

We will then record exactly what the concentration of substance used on each fungus. This will be constant for every dish.

We will then measure the change that this substance causes every 30 min for 6 hours.

We will leave the fungi for a week longer, recording results and appearances daily.

After a week we will restart the experiment but increase the concentration of the substances added to the fungi.

Method:

Prepare the bread which will be used to grow the fungus by cutting one slice into 4 equal pieces and then removing the crusts on all pieces. In this way the type of bread, thickness and size of the slice and the age of the bread is kept constant. The size of the bread should be 5 x 5 cm however this will differ according to chosen bread size.

Place one piece into each Petri dish.

Label the dishes A-D.

Contaminate each piece with chosen fungus by using sterilized instruments. Each bread piece must receive spores of the same species of fungus.

Monitor the fungi growth for about two weeks until it has grown enough to undergo the experiment with. These dishes must be left in the same

environment therefore keeping light and temperature equal for all dishes, preferably a temperature/light controlled room.

Trim the larger grown fungi so that the size of the fungi is constant in all dishes however this is not strictly necessary.

Record the size of the fungi.

Prepare the household substances which you will be treating the fungi with. The concentration of substance to water must be equal for all the substances; therefore if one substance is mixed with water, then all are mixed with the same volume of water.

Using substance A, place 2ml of substance on every 1cm of fungus growth in dish A.

Do the same for dishes B and C. Place the same amount of sterilized water onto the fungus in dish D.

Record the size of the fungi every 30 minutes for 8 hours. Take note of any other observational changes such as colour and smell. Note: Replace the lid on the Petri dish and place back in a light/temperature controlled room.

After an hour, leave the fungi for the night and take notes the next day. Record size changes again if available.

Do this every day for the rest of the week.

After a week, clean up the dishes and sterilize all equipment. Repeat the experiments however use a stronger concentration of substances this time.

Results:

Table showing the results recordings every 30 minutes for the size changes in the fungi after 3 different substances were individually placed in contact with the fungus.