Control by heat and uv - lab report example

Science, Biology

Control by Heat and UV

Effects of Temperature and UV on Bacterial Growth OBJECTIVES To determine how temperature affects growth rates and colonial morphology of Escherichia coli, Serratia marcesens and Pseudomonas fluorescens

2. To determine the effects of UV radiation on growth rates of E. Coli, S. marcesens, P. fluorescens and Bacillus subtilis

APPARATUS: 3 TSA plates, Incubator, refrigerator

THEORY

Bacteria require different physiological and environmental requirements to survive. These include oxygen, temperature, and light. Different bacterial species have different requirements for these environmental factors. The requirements vary according to the habitat of the organism, and each bacteria species will thrive in environments with optimal conditions. The bacteria will always try to sense and develop adaptation to their environments. Extremely low temperatures may inhibit the bacterial growth while high temperatures denature the bacterial proteins and thus kill the bacteria. Some bacteria though have developed adaptive measures to sustain high-temperature exposures, for example, T. aquaticus that is used in PCR. Psychrophiles are those that require low temperatures of less than 20^{o}C while mesophiles require 20-40^{o}C. Thermophiles, on the other hand, require high temperatures of above 40^{o}C to survive. Most bacteria that infect human are mesophiles and grow optimally at 35-37^{o}C. Bacteria that have endospores are more likely to survive extreme environmental conditions such as high temperature and high UV irradiation (Prescott, John and Donald, 54)

PROCEDURE

Part 1 – Effects of Temperature

Three TSA plates were acquired and labeled with a name, lab time, and temperature. Each was divided into three sections. Each section was marked with the abbreviation of the test organisms. A single streak (about 1cm) of each organism was made on its respective section. They were incubated at temperatures of 35^{o}C incubator, Room temperature (or 25^{o}C incubator) and Refrigerator (~10^{o}C).

Part 2 – control by UV light

Four TSA plates were acquired for each bacterium. Each was labeled with the name, lab time and the organism name. The plates were then divided into half each and labeled control and UV on each side. A sterile swab was inoculated into the culture. Three zigzag lines were made on the agar surface at 45 degrees to each other. The plates were exposed to UltraViolet light for 3 minutes before incubation at 35^{o}C for 48 hours.

Part 3 – control by heat

Four Trypticase Soy Broth tubes were labeled with name, lab time, organism and time. Each tube was inoculated with the appropriate organism. Each student in the team exposed the organism to different temperature of 40^{o}C, 55^{o}C, 80^{o}C and ~100^{o}C. Each organism was exposed to heat for a given length of time, that is, 10, 20, 30 and 40 minutes. The tubes were vortexed after every 10 minutes. After the appropriate length of time, the tubes were dried and incubated at 35°C for 48 hours.

RESULTS

Part 1

Part 2

Part 3

40^{o}C

50^{o}C

80^{o}C

70^{o}C

10 min

20 min

30 min

40 min

10 min

20 min

30 min

40 min

10 min

20 min

30 min

40 min

10 min

20 min

30 min

40 min

BS

+

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EC

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+

+

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-

-

-

Key

+ = Growth / cloudy

-= no growth / clear

DISCUSSION

The four types of bacteria exhibited different responses to exposure to varying degrees of temperature and UV radiation. E. Coli, P. Flourescens, B. subtilis and Serratia marcesens were all exposed to similar conditions of varying temperatures and then cultured to determine their adaptability. From the first experiment, it could be determined that the bacteria grew optimally at body temperature of about 35^{o}C. In the third experiment, it

could be seen that B. subtilis grew even when exposed to high temperatures of about 100^{o}C. This is because it is a spore former and uses spores to survive the high temperatures. The other bacteria were also inhibited by the UV radiation except bacillus, which grew in the section exposed to UV.

CONCLUSION

The objectives of the experiment were met. The various bacteria were exposed to different environmental conditions, and their growth and morphology was determined by being cultured. It was established that some bacteria have developed mechanisms to adapt to extreme conditions such as spores of Bacillus subtilis.

Works Cited:

Prescott, Lansing M, John P. Harley, and Donald A. Klein. Microbiology. Dubuque, IA: McGraw-Hill Higher Education, 2005. Print.