

# Temperature on the growth and survival of bacteria biology essay

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Abstraction: The purpose of this experiment was to assess the growing and endurance of 5 bacteriums. The method involved putting each of the bacteriums in H<sub>2</sub>O baths of assorted temperatures for certain periods of time, taking them out and putting them in their optimal temperatures and supervising their growth/survival rate over the course of the week.

The consequences obtained showed that how good the bacteriums grew after they had been placed in their optimal temperatures and left for a week. From this it was concluded what the temperature category of each bacterium was. Introduction: The aim of the experiment was to look at the growing and survival rate of 5 bacteriums viz. , *Bacillus*

*stearothermophilus*, *Escherichia coli*, *Enterococcus faecalis*, *Bacillus subtilis* and *Pseudomonas fluorescens*. *Escherichia coli*, normally referred to as *E.*

*coli* is a gram negative bacteria which is rod shaped. It is normally found in the big bowel of warm blooded animate beings. It is besides found in nutrients and H<sub>2</sub>O. It is a facultative aerobe significance that O<sub>2</sub> is non needfully required for growing but is preferred for better growing therefore it is able to metabolize both aerophilic and anaerobically. Every micro-organism has a minimum, optimum and maximum temperature. These are known as central temperatures and they tell us a batch about the nature of a micro-organism. A mesophile is an being which grows at its best in medium temperature conditions.

A psychrophile on the other manus is an being which is capable of turning in highly cold temperatures. Thermophiles are virtually the antonym of psychrophiles. They ' re beings which are capable of turning and reproducing

the hot environments. The term thermophile means that it is heat loving or heat tolerant. The temperature and pH are good indexes of the environment *E. coli* can be found. The fact that it has a pH of 6-7 agencies that it is found in mildly acidic to impersonal topographic points which explains why it is in the big bowel of mammals.

The bacterium manage to last in these assorted environments due to their adaptative metamorphosis. ( Madigan, Martinko, Dunlap and Clark, 2008 ) .

*Enterococcus faecalis* ( *E. faecalis* ) is a gram positive and is of course happening in the bowel of mammals, the dirt, in workss and in H<sub>2</sub>O. The presence of *E. faecalis* and *E. coli* in the H<sub>2</sub>O is normally an indicant that the H<sub>2</sub>O has been contaminated. It is found in similar home grounds to *E.*

*coli*. *Bacillus stearothermophilus* ( *B. stearothermophilus* ) is besides a rod shaped gram positive being it is normally found in hot springs and the dirt.

*Pseudomonas fluorescens* ( *P. fluorescens* ) is a gram negative rod shaped bacteria. It is normally found in ice chest environments such as H<sub>2</sub>O. It is an obligate aerobe which means that it can non turn in the absence of O.

*Bacillus subtilis* ( *B.*

*subtilis* ) is besides a rod shaped gram positive bacteria which is chiefly found in the dirt. It excessively is an obligate aerobe ( Brooker, Widmaier, Graham and stilling, 2007 ) . Method: Please mention to the agenda for this.

## **Consequences:**

Below are the tabulated consequences that were obtained from the experiment. Table 1 shows the consequence of inoculating the bacterium at

different temperatures had on their growing rate. Table 2 shows the consequences of exposing the bacterium to extreme heat conditions on their endurance rate.

**Temp ( & A ; deg ; C )**

**25**

**37**

**42**

**55**

**E.**

**coli**

+++

+++

+++

++

+++

+++

+++

+++

+++

+++

++

++

-

-

-

—

**E. farcalis**

+++

+++

+++

+++

+++

+++

+++

++

+++

+++

+++

+

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**B. subtilis**

++

+++

++

++

+++

+++

+++

++

+++

+++

+++

+++

### **P. flourescence**

++

+++

+++

-

++

-

-

++

++

-

-

-

-  
-  
-  
-  
-  
-  
-  
-

**B.**

**steaothermophilus**

-  
+  
-  
-  
-  
-  
+  
-  
+  
-  
++  
-



+

++

+++

+

The tabular array above shows how good the bacterium grew at different temperatures. Truly strong growing is represented by +++, medium by ++, slow growing by + and no growing by -. Looking at E.

coli for illustration it is clear that it merely grows good in the part of 25-42 & A ; deg ; C anything beyond this showed perfectly no growing happening.

## **Time ( proceedings )**

### **E. coli**

Temp ( & A ; deg ; C )025309040Y, N, YY, Y, YY, Y, YY, Y, YY, Y, Y60Y, Y, YY, Y, YY, Y, YN, N, NN, N, N80N, Y, YN, N, NN, N, NN, N, NN, N, N100N, N, YN, N, NN, N, NN, N, NN, N, N

**B. subtilis**

**40**

**Y, Y**

**Y, Y**

**Y, Y**

**Y, Y**

**Y, Y**

60Y, YY, YY, YY, YY, Y80Y, YY, YY, YY, YY, Y100Y, YY, YY, YY, YY, N  
 Table 2: The consequence of heat on endurance of bacteriums. Key: Y= growing present  
 N= no growing

**E.**

**faecalis**

**40**

**Yttrium**

**Yttrium**

**Yttrium**

**Yttrium**

**Yttrium**

60YttriumYttriumYttriumYttriumNitrogen80YttriumYttriumYttriumNitrogenNitr  
 ogen100YttriumYttriumYttriumNitrogenNitrogen

## **B. stearothermophilus**

**40**

**Y, N**

**Y, N**

**Y, N**

**N, N**

**N, N**

**60**

**Y, N**

**N, N**

**N, N**

**N, N**

**N, N**

**80**

**N, N**

**N, N**

**N, N**

**N, N**

**N, N**

**100**

**N, N**

**N, N**

**N, N**

**N, N**

**N, N**

**P. fluorescens**

**40**

**Y, N, Y**

**Y, Y, Y**

**Y, Y, Y**

**Y, Y, Y**

**Y, Y, Y**

**60**

**Y, Y, Y**

**Y, Y, Y**

**Y, Y, Y**

**N, N, N**

**N, N, N**

**80**

**N, Y, Y**

**N, N, N**

**N, N, N**

**N, N, N**

**N, N, N**

**100**

**N, Y, N**

**N, N, N**

**N, N, N**

**N, N, N**

**N, N, N Discussion:**

With the information that is in table 1 the nature of each bacteria can be established. *E. coli* showed exceptionally strong growing in the scope of 25 to 42 & A ; deg ; C.

These consequences are absolutely in line with the features of a mesophile as such it is safe to presume that *E. coli* is a mesophile. This besides explains why it is found in the human bowel. The nucleus temperature of the human organic structure is 36. 8 & A ; deg ; C  $\pm$  0. 7 which harmonizing to the literature is the optimum temperature of *E. coli*.

The same thing goes for *E. faecalis*. It excessively is a mesophile and one of the locations where it is found is besides the GI piece of land.

The information in table 1 coupled with the fact that it is found in the same location as *E. coli* means that it excessively has the same optimum temperature as *E. coli*.

*B. subtilis* grew throughout all the temperature ranges but grew the best in 55 & A ; deg ; C. It was nevertheless unusual to see it turn in the countries of 25-37 & A ; deg ; C as it is by nature a Thermophile. The minimal

temperature that is required for thermophiles to turn is about 42 & A ; deg ;  
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C. B. *stearotherophilus* on the other manus showed a authoritative illustration of a thermophilic bacteria. It grew best at 55 & A ; deg ; C. The last bacteria in table 1 was P.

*Fluorescens*. It grew good at 25 & A ; deg ; C but seemed to be diminishing quiet well at 37 & A ; deg ; C. The information on the tabular array did non quiet tantrum in with the features which are exerted by mesophiles.

Mesophiles normally grow best at around 30-40 & A ; deg ; C nevertheless P. *fluorescens* ' optimum temperature was around 25 & A ; deg ; C which meant that it could non be a psychrophile. It did nevertheless suit the features of a psychrotroph. Psychrotrophs are being which grow at 0 & A ; deg ; C i. e.

similar to psychrophiles but, normally have an optimal temperature of 25 & A ; deg ; C whereas psychrophiles have and optimal temperature of 10-12 & A ; deg ; C ( www1 ). Table 2 showed the effects of exposing the bacterium to high temperatures had on their endurance. Temperature is most likely the most of import factor that contributes to the growing and endurance of the bacteriums.

From the literature it can be gathered depending on the being, exposing it to really high temperatures will kill it. In the instance of *E. coli* this is the instance. It managed to remain alive at 40 & A ; deg ; C for 90minutes.

This is apprehensible as this is below its maximum temperature. Once it had been placed into higher temperatures for a long adequate continuance, it died off. This was non the instance for B.

subtilis. It proved to be turning throughout all temperature ranges for the full 90 proceedings of the experiment. The fact that it managed to last at temperatures every bit high as 100 & A ; deg ; C implies that it may be a hyperthermophile ( Madigan, Martinko, Dunlap and Clark, 2008 ) . P. fluorescens besides died off after being exposed to increased temperatures for some clip.

At 30 and 90 proceedings, all of people who were making the experiment reported that there were no bacteriums alive at 60 & A ; deg ; C. At 2 proceedings into the experiment at 80 and 100 & A ; deg ; C none of the bacteriums were alive. Most of the consequences obtained from the experiment seemed to be in line with the information found in the literature some were n't for illustration E. faecalis was still alive in about all of the higher temperature ranges when clearly it should n't hold been as it was is a mesophile and should n't turn after around 46 & A ; deg ; C.

B. stearothermophilus, a thermophile was non turning in temperature ranges where it should hold been. These errors may hold been due to applied right sterile techniques while inoculating decently. In order to extinguish such mistakes the experiment could be run 2 to 3 times.