

STUDENT PRACTICAL SHEET	NAME	FORM	DATE

Investigating the growth of microbes

Introduction

If nothing limits the growth of microbes they can grow very fast indeed. The doubling time of bacteria is the time taken for the population to double. In the case of *E. coli*, this is 20 minutes, as long as there are no limits on its growth. You are going to investigate the effects of lower temperatures on microbe growth using a website which is used by research scientists. This information is very important for food safety.

Aim

To investigate how colder temperatures affect microbial growth.

Equipment

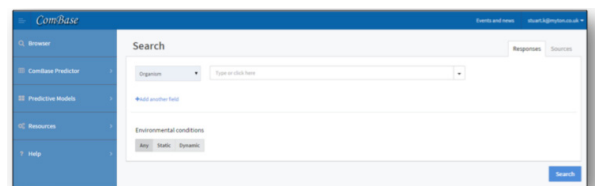
Using an internet enabled device, log on to www.combase.cc

First you need to register for an account so that you can log on and use this free resource. You will need to provide them with an e-mail address.

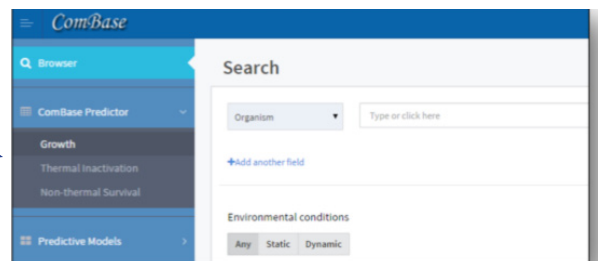


Method: Part 1

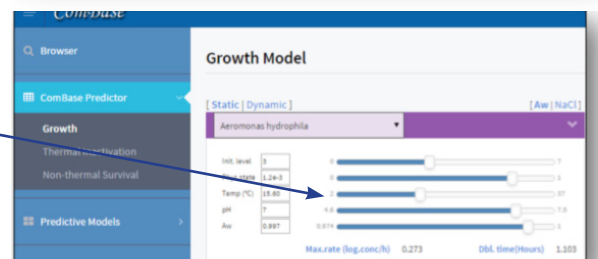
1. When you first log in to ComBase you will see the home page



2. Select ComBase Predictor and click on 'Growth'



3. Move the slider on temperature (Temp (°C)) and use it to answer the questions on the next page.



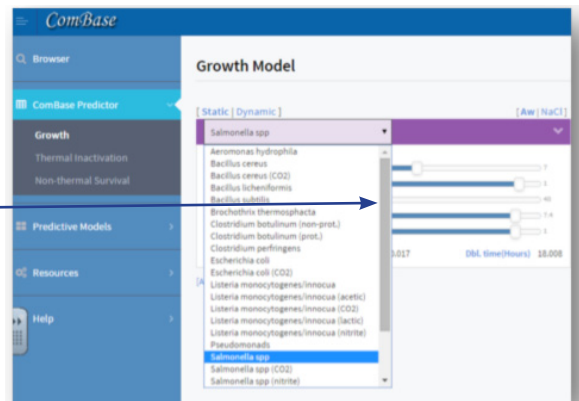
Questions: Part 1

- At 20°C, what is the "Dbl. Time" - doubling time of the bacterium (the time taken for the population to double)?
..... hours
- What is the doubling time at 11.2°C?
..... hours
- Why is a fridge set at a maximum temperature of 5°C?
.....
.....

Method: Part 2

Use the selection arrow to change the bacterium that you are investigating. This time select *Salmonella*.

Change the temperature again using the slider and answer the question below.

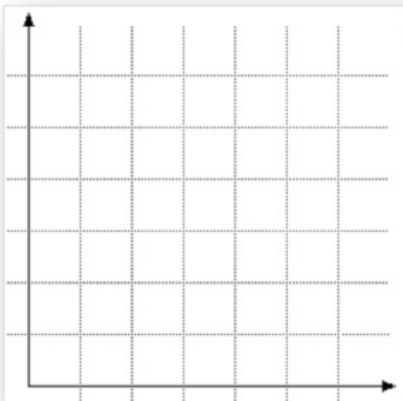


Questions: Part 2

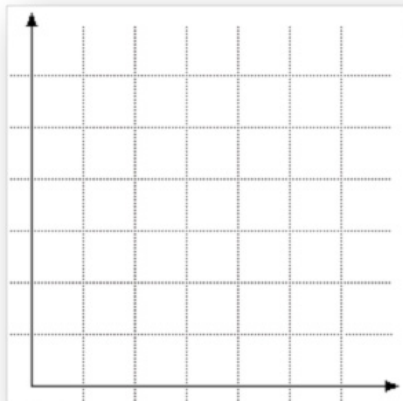
- Salmonella* is a bacterium that can cause illness. It is often found on raw meat. Using the data from ComBase explain why raw meat should be kept chilled.
.....
.....

Pick a microbe of your choice – write down its name then sketch the graph of its growth below at two different temperatures. Don't forget to label your axes

NAME:.....



NAME:.....



TEACHERS NOTES

Investigating the growth of microbes

Teaching ideas

ComBase is designed for use by industry and research scientists so initially it appears a little complex for students. Encouraging them to use positive learning habits, such as resilience will help them. Also, remind students that this website is used by people working in the field of food safety.

Acknowledgements

Images taken from ComBase website:
<http://browser.combase.cc/Search.aspx>

Extension

For very able students they could change other factors such as pH or investigate other predictions on the ComBase platform.

Answers

Part 1

1. 0.696 hours
2. 2.076 hours
3. At 5°C the bacterium does not grow, meaning that food is likely to spoil before there is an unsafe level of bacteria on or in it. This is crucial for ensuring human health.

Part 2

1. We keep raw meat (and eggs) cool to reduce the growth rate of *Salmonella*, a bacterium. It does not start growing rapidly until the temperature is more than 10°C. Doubling time is much reduced in a warmer room and the optimum growth rate is 35 to 43°C, suited to animal hosts.