Lab 1. The Path of Yeast Resistance: Testing the Advantage of Multicellularity in Yeast

PRE WET LAB ASSIGNMENT (5 questions; 15 marks)

Download this document from cuLearn and save it on your computer. Record your answers for each question in the appropriate location. Be sure to save the document often while you work and back it up by saving a copy on a memory key, portable hard-drive or by emailing it to yourself.

Once you have completed your assignment, make sure it is saved as a word (.doc or .docx) or pdf (.pdf) document with the appropriate file name (see page 20 of your lab manual: Lab1PREWET_YourLabSection_YourFullName_YourStudentNumber.docx or .pdf).

Log on to the course cuLearn page, locate the appropriate submission dropbox for this assignment and your lab section and then submit by following the instructions provided on page 93 of your Winter 2019 lab manual (in Appendix III).

***Important note**: You won't always find these answers explicitly stated in the material we've provided. To answer them, you may need to really think through the question and perhaps do a little bit of research using other sources that are available to you, especially if the topic of the question is unfamiliar to you. Having said that, unless a question specifically tells you to include citations and references, these items should not be included for assignment questions.*

1. While rotifers are a model organism for our purposes, what about rotifer anatomy indicates that they could not have been a predator species that may have led to the first origin of multicellularity? As a hint, think about the anatomical characteristics of animals in the Kingdom Animalia (the Kingdom that rotifers belong too). **(2 Marks – Maximum 100 Words)**

Record your answer below. Use as much space as you require, however keep the word limit in mind. Once the word limit for a question is reached, nothing written past that point will be marked.

Multicellulaity may not have originated with rotifers because their anatomical characteristics are much more advanced for a microscopic organism. Rotifers have a body cavity and are bilaterally symmetrical. Their body is divided into head, trunk and foot. They have a well defined digestive system that starts with a mouth and ends with anus. This includes pharynx, oesophagus, stomach, intestinal structures and a cloaca at the end. Rotifers also have a complex nervous system. They have a small brain and several nerves that extend throughout its body. They also have 2 pairs of antenna and a set of 5 eyes as well. These are complex systems which is the reason why they have been included in the animal kingdom and they are less likely to be the first multicellular organism that could have originated on earth because such complexity is gradually accumulated over long periods of time.

2. In Will Ratcliff's multicellular yeast strain called *S. cerevisiae*, how did they select for multicellular yeast? Second, how did they select for larger multicellular yeast **(2 Marks – Maximum 100 Words)**

Record your answer below. Use as much space as you require, however keep the word limit in mind. Once the word limit for a question is reached, nothing written past that point will be marked.

Selecting for rapid settling through liquid media , unicellular yeast evolved into simple multicellular organisms in as little as seven days. Genetically, this resulted from a single mutation that knocked out a gene required for mother-daughter cell separation after mitosis.simple multicellularity can evolve rapidly.

3. Rotifers have two unique organs: the wheel organ and the trophi. Read the section of your textbook (by Campbell) on Rotifers and explain the function of these organs. **(2 Marks – Maximum 100 Words)**

Record your answer below. Use as much space as you require, however keep the word limit in mind. Once the word limit for a question is reached, nothing written past that point will be marked.

Wheel organ : Corona is composed of several ciliated tufts around the mouth of rotifers, that in motion resembles wheel. These create a current that sweeps food into the mouth . It also helps in locomotion.

Trophy : It is jaw like structure, helps to gather food . It is located behind the mouth in the pharynx. Shape of trophy varies among different species. In suspension feeders, it is covered in grinding ridges,in more actively carnivorous species, they may shaped like forceps to bite into prey .

4. In the video link (see Lab 1 - Background), it is said that once a unicellular organism has made the transition to multicellularity, the evolution of cellular division of labour can begin to occur. What is cellular division of labour? Why is it important? **(2 Marks – Maximum 100 Words)**

Record your answer below. Use as much space as you require, however keep the word limit in mind. Once the word limit for a question is reached, nothing written past that point will be marked.

Cellular Division of labour - In a multicellular organism there a many number of cells and these cells form a lineage which further get proliferated and differentiated i.e a particular function is assigned to these cells .

There are different kind of cells which perform different functions for example - **Red Blood Cells** : carry oxygen and carbondioxide from blood to cells and vice versa respectively . **White Blood Cells :** they help to combat with infections . Other examples are **Hepatocytes (Liver cells) , Kidney cells etc .**

Division of labour is important beacuse it helps a multicellular body to carry out it's complex function in an organised and efficient manner .

5. In this lab, you will test if rotifers preferably prey upon unicellular yeast when given the choice between unicellular and multicellular yeasts. As a group along with your bench mates, you will conduct feeding preference tests on multiple individual rotifer. For each rotifer, you will calculate the proportion of unicellular and multicellular yeast it has ingested (see Lab 1 methodology for details). This data will allow you to generate a histogram showing the proportion of unicellular yeast ingested on the x-axis and the number of rotifers tested on the y-axis. For this question, make three conceptual histograms illustrating the following possible outcomes: **(7 Marks)**

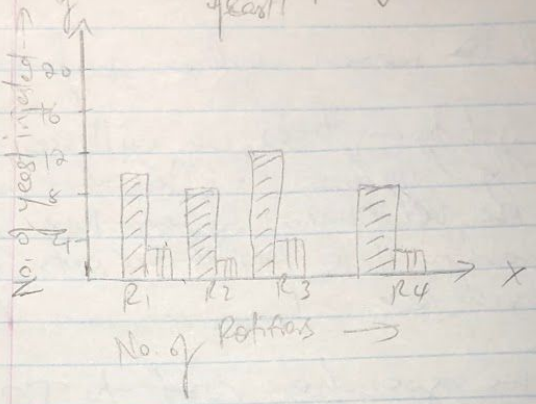
    a. Rotifers feed preferably on unicellular yeast
    b. Rotifers feed preferably on multicellular yeast
    c. Rotifers do not show a preference for multicellular or unicellular yeast.

The absolute values on the y-axis are not important as long as the graphs illustrate the trends and they include proper axis labels. **You can either create the figure digitally OR draw it on a piece of paper and digitize it (i.e., scan it or take a digital picture of it). Regardless of the method you choose, you will submit your figure below (you can paste it into this document, drag and drop it, or use the insert function – the choice is up to you). Note that the image must be clear and the text legible. Make sure to include a properly formatted figure title, and indicate which graph matches which scenario (a, b and c).**

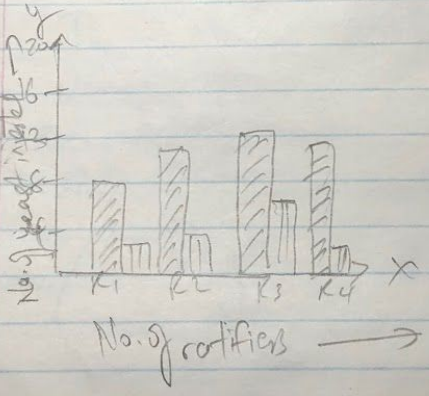
If applicable, include your properly formatted figures below. Make sure to take a look through Appendix II for information about properly formatting your figures.

5.

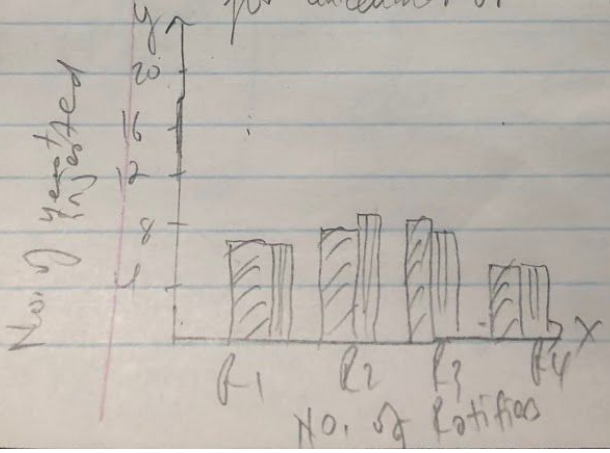
(a) Rotifers fed preferably on Unicellular yeast



(b) Rotifers fed preferably on Multicellular yeast



(c) Rotifers not showing preference for unicellular or Multicellular yeast



Clue Box

- Unicellular yeast
- Multicellular yeast

R1 – Rotifer 1
R2 – Rotifer 2
R3 – Rotifer 3
R4 – Rotifer 4