Yeast Growth in Different Environmental pHs in Relation to Women's Health

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Biology 160: Biology with Lab

Abstract

The pH of an environment can influence yeast growth and survival. This study investigated how starting pH (4, 6, and 8) affected yeast growth and pH changes over three weeks. We hypothesized that higher starting pH would produce greater yeast growth. Results partially supported this hypothesis. As yeast growth peaked during Week 2, with 820 living cells at pH 4, 2000 at pH 6, and 460 at pH 8. By week 3, pH 6 had the greatest survival which aligned with our hypothesis as the control group.

Introduction

Candida albicans is a type of yeast that normally live in the human body but can sometimes overgrow and cause infections, including vaginal yeast infections. The vagina is typically acidic, around pH 3.8-4.5, yet this type of yeast can survive across a wide range of pH conditions. Environmental pH is important because it can affect fungal growth and gene expression. Research has shown that acidic conditions tend to promote the rounded yeast form of *C. albicans*, while ~neutral conditions leads it to form longer structures called hyphae which are associated with infection (Rane, 2019.)

In this experiment, the independent variable was the starting pHs (4, 6, 8) with pH 6 as control. The dependent variable was yeast growth and pH change over time. These results partially support our hypothesis and show that environmental pH can influence yeast growth and survival. Which may help us understand conditions associated with women's health and yeast infections.

Methods

Materials & Location

The experiment was conducted in the Biology 160 laboratory. Materials included Candida albicans yeast, solutions with starting pH levels of 4, 6, and 8 in beakers, methylene blue, pipettes, a hemocytometer, microscope, digital pH probe, and laptop.

Procedure

Three beakers were prepared with starting pH levels of 4, 6, and 8, and yeast was added to each. The cultures were observed over three weeks. Each week a sample from each culture was diluted and mixed with methylene blue. The samples were placed on a hemocytometer and examined under the microscope to count living yeast cells. The pH of each culture was also measured using a digital pH probe connected to a laptop. Cell counts and pH measurements were recorded each week and compared between the three starting pH treatments.

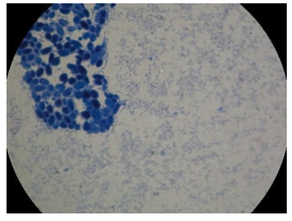

Figure 1.Yeast cells stained with methylene blue and viewed under a microscope. Methylene blue was used to distinguish living and non living yeast cells for counting

Yeast Survival and pH Changes Over Three Weeks

Starting pH	Week	Living yeast cells counted	Measured pH
4	1	640	4.0
4	2	820	4.18
4	3	280	4.26
6	1	880	6.0
6	2	2000	4.23
6	3	1160	4.35
8	1	200	8.0
8	2	460	5.14
8	3	840	5.1

Table 1. Living yeast cells were counted weeks for cultures beginning at pH 4, 6, and 8. The pH of each culture was also measured each week to observe changes over the three week period.

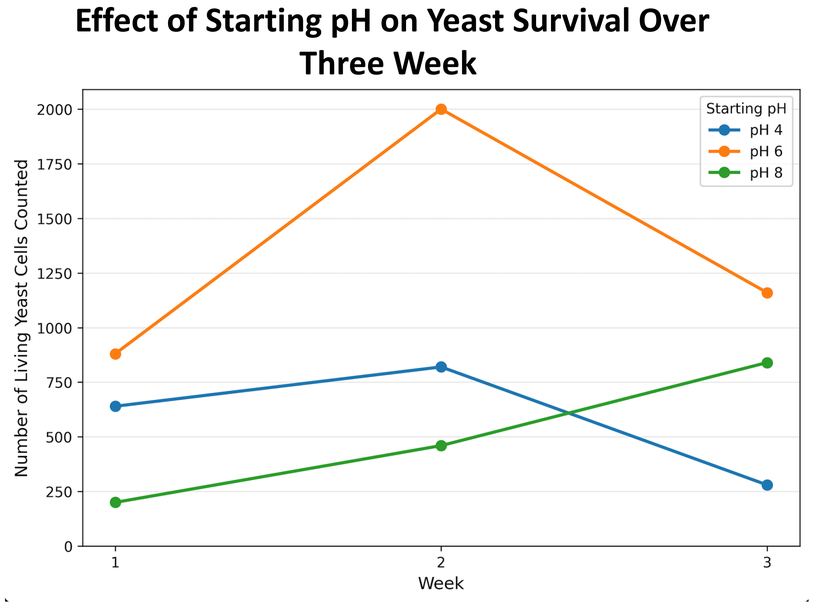

Figure 2. Living yeast cell counts at starting pH levels of 4, 6, and 8 over the three weeks. Yeast survival was at it's highest at pH 6, with the highest cell count occurring during week 2.

Discussion

Our results showed that starting pH affected yeast growth and survival over the 3 weeks experiment. During the second week, yeast growth was highest at pH 6, with 2,000 living cells, compared to 820 at pH 4 and 460 at pH 8. By the third week, the pH 6 group also had the greatest survival. These results show that yeast growth and survival can change depending on the pH of its environment.

Our results supported our hypothesis that pH would affect yeast growth. The pH 6 treatment had the greatest amount of yeast growth and survival compared with pH 4 and pH 8. The pH 6 provided the most favorable conditions for the yeast in our experiment. The lower growth at pH 4 and pH 8 suggests that conditions farther from pH 6 may have made it more difficult for the yeast to grow.

What we found out is important when thinking about women's health because Candida albicans is a type of yeast that can normally live in the human body but can sometimes grow too much and cause vaginal yeast infections. Our experiment used yeast to investigate how pH affects growth, so our results can't directly predict what happens in the human body. However, the experiment shows that environmental conditions, including pH, can influence yeast growth. This helps explain why studying yeast growth can be useful when learning about vaginal yeast infections and women's health.

One limitation of our study was that we only tested 3 pH levels and collected date for a limited period of time. Other factors, such as temperature, nutrients, the amount of yeast used, and measurement errors could have also affected our results. Future research could test more pH levels, repeats the experiment with more trials, and specifically study Candida albicans. This could help researchers better understand how pH affects yeast growth and how these conditions may relate to vaginal yeast infections.

Acknowledgements

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