

Bread, beer and cell
biology ??? what has
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Bread, Beer and Cell Biology ??? What has *Saccharomyces cerevisiae* taught us about cancer? The modern civilization has become dependent upon yeast. Without yeast we would lose one of the most fundamental grains (bread) as well as the choice drink of many, beer. More importantly though *Saccharomyces cerevisiae* is a model eukaryotic organism for understanding cancer at a cellular level, from it we have learned how to identify cells with an elevated potential to become cancerous, are able to study cancerous characteristics and can test cancer treatments on yeast. (Nitiss & Heitman, 2007; Sheltzer et al, 2011) Yeast has been key to many cancer advancements in this world. Research on yeast cells shows that certain cells are predestined to evolve into cancer cells. One study found that aneuploidy in cells lead to genomic instability and that this genomic instability correlated to an elevated rate of cancer development. (Sheltzer et al, 2011) Aneuploidy as well results in recombination defects and defective DNA repair which again in many cases leads to cancer. (Sheltzer et al, 2011) When these cells are identified in humans measures can be taken to prevent cancer. Such as by eliminating these cells before they become cancerous or regular check-ups to see if the pro-oncocells have developed into oncocells. Early detection of these cells saves lives. Cancerous characteristics of *Saccharomyces cerevisiae* cells can be observed by scientists and compared to those of human cancer cells. From these studies we now know several causes of cell proliferation that create cancer.

For example in many cases of cancer, it arises from a cell cycle control malfunction. (Palermo & Walworth, 2007) Many factors assist in controlling cell cycle checkpoints if a single one of these factors suffers a mutation then

uncontrolled cell division can arise. Even though yeast is a simple organism its cell cycle still functions very similarly to that of the human cell cycle. (Palermo & Walworth, 2007) Therefore mutations of these factors in *Saccharomyces cerevisiae* have helped doctors and scientists study and replicate them in human cells.

With yeast cells scientists have been able to use experimental drugs and test their effectiveness. One said drug is rapamycin, an antiproliferative drug discovered in the 1970s. (Rohde, Zurita-Martinez & Cardenas, 2007) Several experiments have been conducted on *Saccharomyces cerevisiae* studying rapamycin and its affects. From this scientists know the exact functions of this drug. (Rohde, Zurita-Martinez & Cardenas, 2007) One of the functions of rapamycin is that it works by inhibiting the Tor kinase, which is part of the cell control of growth and differentiation.

The Tor kinase is found in both yeast and humans, making yeast an excellent organism to conduct these studies upon. (Rohde, Zurita-Martinez & Cardenas, 2007) *Saccharomyces cerevisiae* is a very important organism for the testing of anticancer drugs. Lots of information has been learned from yeast and specifically *Saccharomyces cerevisiae* about cancer. An abundance of knowledge such as some biological factors that increase the likely hood to develop cancer, mutations to cell cycle points that cause uncontrolled cell proliferation and viable treatment methods of cancer have been learned from yeast. (Nitiss & Heitman, 2007; Sheltzer et al, 2011) As scientific research continues to advance this simplistic organism keeps bringing us closer to more complex results and answers that continue to

change our world for the better. Perhaps one day *Saccharomyces cerevisiae* will give us the cure to cancer. References Nitiss, J. L. , & Heitman, J. (2007). Yeast as a tool in cancer research. (p. 440). Dordrecht, The Netherlands: Springer. Palermo, C. , & Walworth, N. C. (2007). Yeast as a model system for studying cell cycle checkpoints. Master's thesis, The State University of New Jersey). Rohde, J. R. , Zurita-Martinez, S. A. , & Cardenas, M. E. (2007). Yeast as a model to study the immunosuppressive and chemotherapeutic drug rapamycin. (Master's thesis, Duke University Medical Center). Sheltzer, J. M. , Blank, H. M. , Pfau, S. J. , Tange, Y. , George, B. M. , Humpton, T. J. , Brito, I. L. , & Hiraoka, Y. , Niwa, O. , Amon, A. (2011). Aneuploidy drives genomic instability in yeast. *Science AAAS*, 333(6045), 1026-1300. doi: 10.1126/science. 1206412