

# WILD YEAST PROJECT

**Isolating wild populations of *Saccharomyces* yeasts**

# WHAT ARE YEASTS?

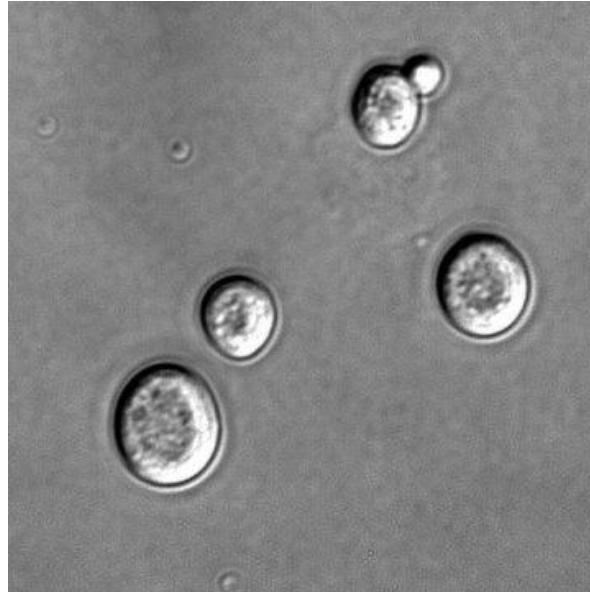
- Yeasts are **fungi**, meaning they're not plants, animals, or bacteria.
- Yeasts are **microbes**, meaning that they are single-celled organisms that, at the single-celled level, are only visible with a microscope.
- Yeasts are recognized by their shape and the way they reproduce, by division of a single cell to produce two single cells.
- Yeasts are **non-motile**, meaning that they don't have ways of moving around.

# PICTURES OF YEAST (*SACCHAROMYCES CEREVISIAE*)

Cells (Electron microscope)



Cells (Light microscope)



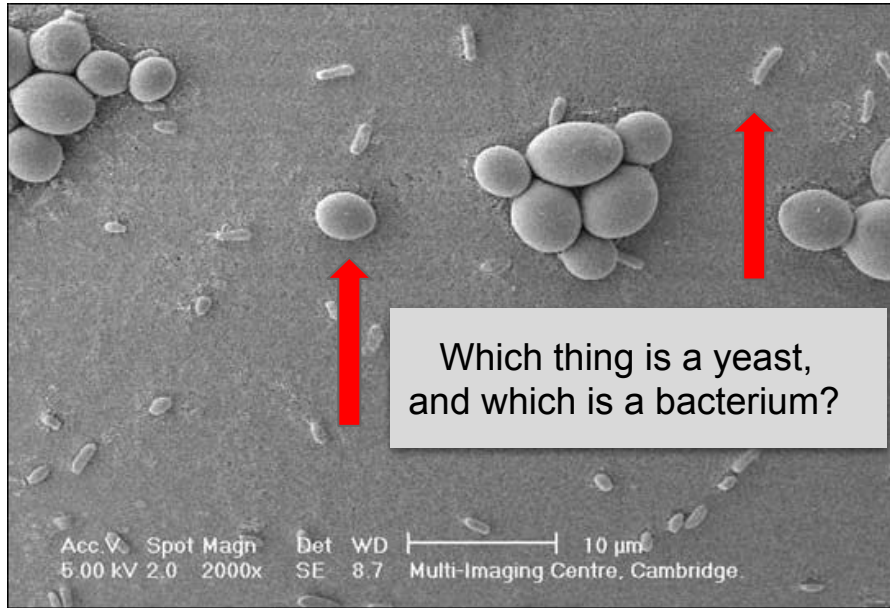
Colonies



# *SACCHAROMYCES CEREVISIAE* IS (ALMOST) EVERYWHERE!

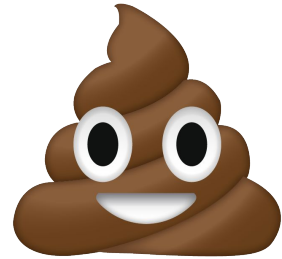
- “Saccharomyces” means “sugar yeast”
- “cerevisiae” means “beer” (cerveza, anyone?)
- *S. cerevisiae* loves sugar, and turns it into various other things (alcohol, CO<sub>2</sub> gas, flavorful compounds)
- Humans first started using wild yeast to make tasty and alcoholic foods and beverages over 5,000 years ago.
- Bread, beer, and wine strains became “domesticated”, but some people still use wild strains
- Wild yeast is used in coffee, chocolate to convert sugar into flavors

# *S. cerevisiae* AS A PROBIOTIC

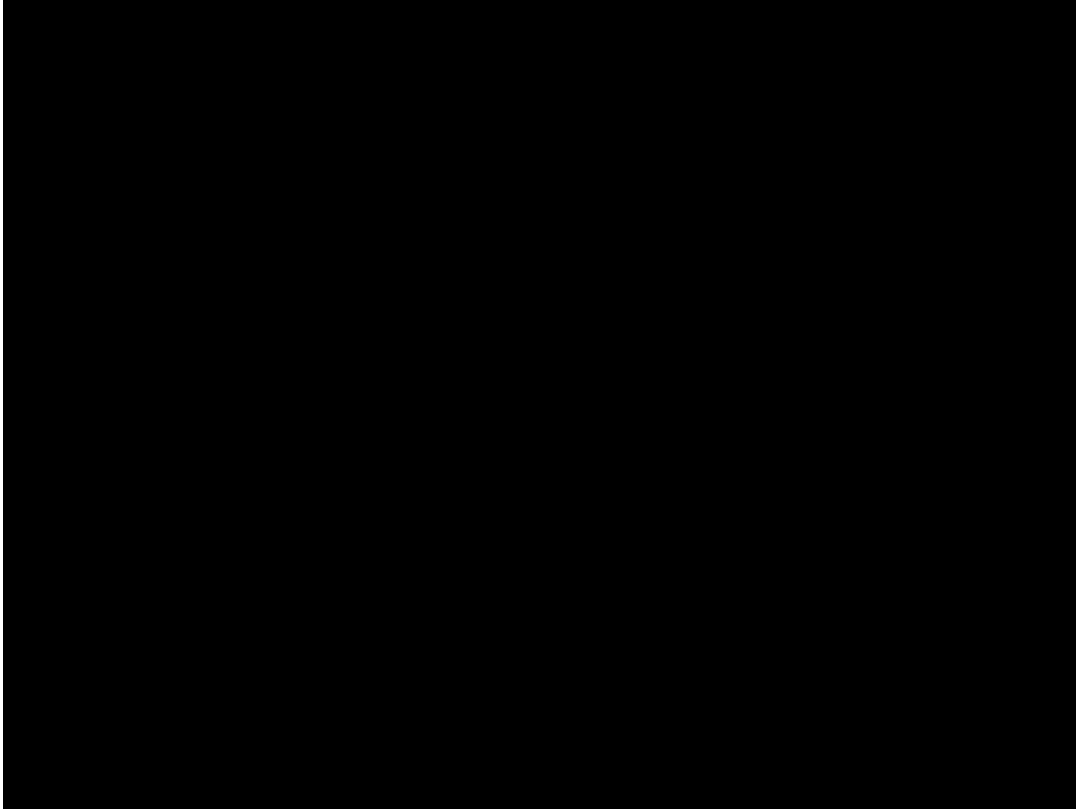


*S. cerevisiae* are bigger than the types of bacteria in your gut

*S. cerevisiae* is not normally a resident of the gut microbiome, passes through within a few days of consumption.



# VIDEOS OF YEAST CELLS BUDDING

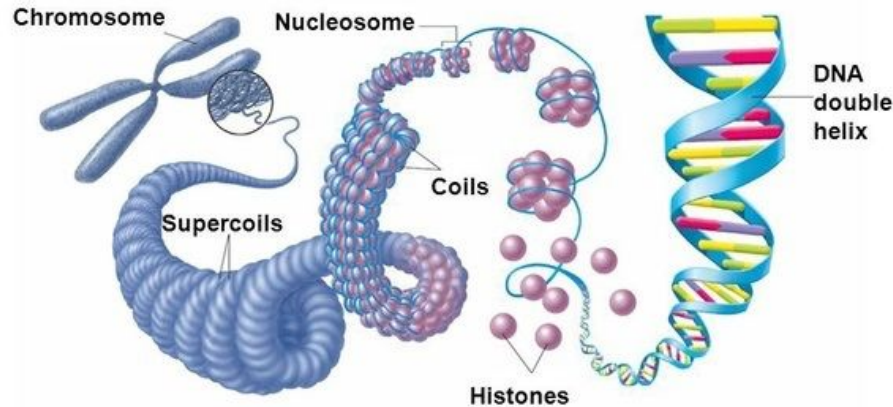


From YouTube video "The Life of Yeast"

# WHAT ARE CHROMOSOMES?

## DNA and Chromosomes

– Eukaryotic Chromosome Structure

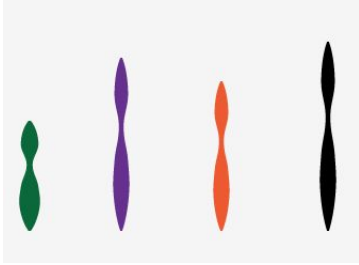


Chromosomes contain genes (DNA) wrapped up with proteins in a compact form.

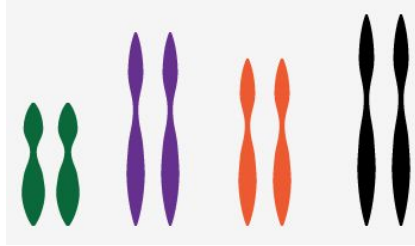
Does anyone know how many chromosomes humans have?

-Humans have 23, yeast have 16

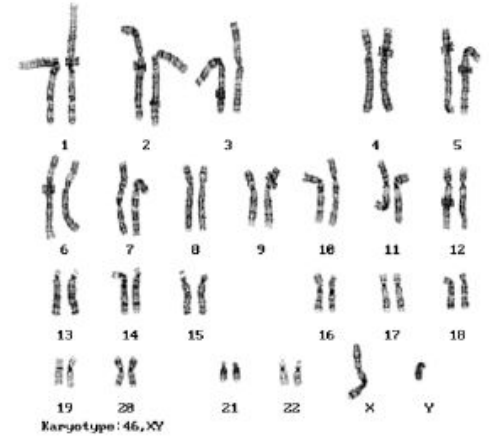
# YEAST CELLS CAN BE HAPLOID OR DIPLOID



Haploid: one copy of each of the chromosomes per cell



Diploid: two copies of each of the chromosomes per cell



Haploid or diploid?  
Yeast or Human?

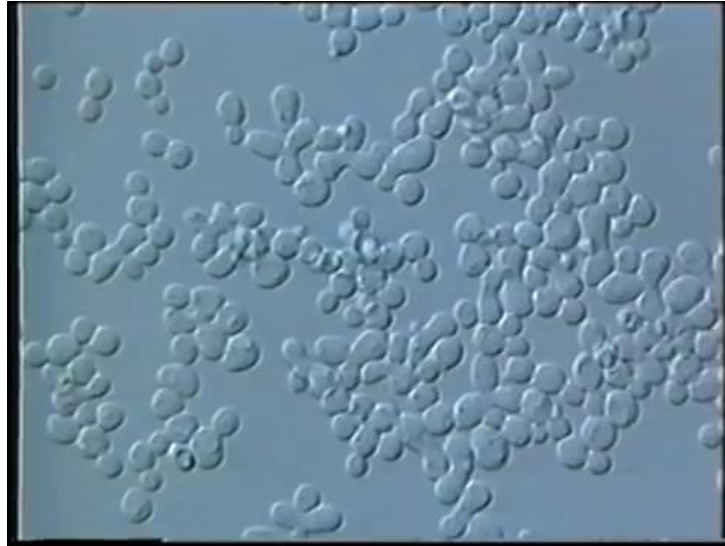
Humans have 23 chromosomes  
Yeast have 16 chromosomes



# HAPLOID YEAST CELLS CAN FUSE TO FORM DIPLOID CELLS

Haploid cells are one of two “mating types”, a or alpha.

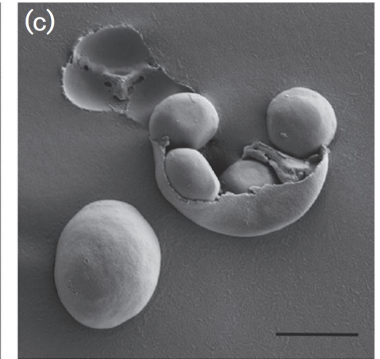
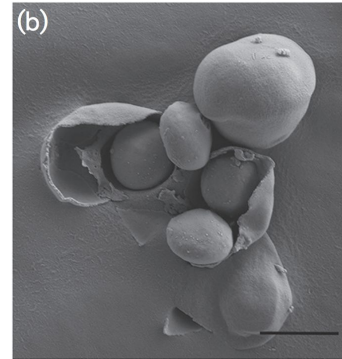
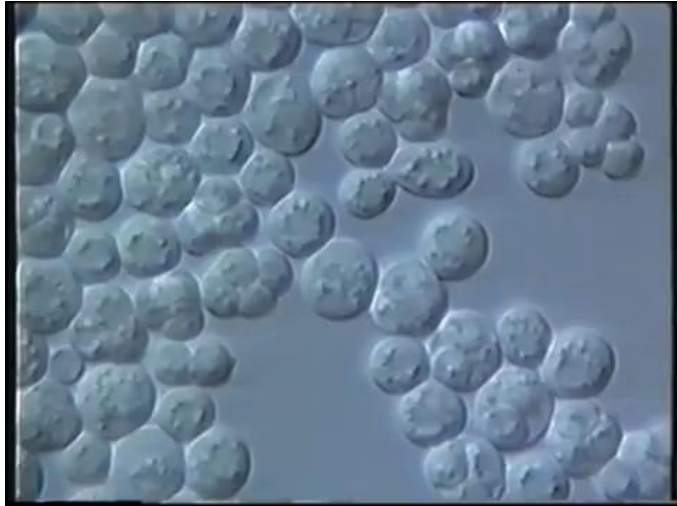
Only a and alpha haploids can fuse/mate to form diploids.



From YouTube video “The Life of Yeast”

# DIPLOID YEAST CELLS CAN SPORULATE TO FORM HAPLOIDS

When diploid cells are starved in the right way, they can sporulate and produce up to four haploid cells (two a, two alpha) within each diploid cell. This is called an ascus



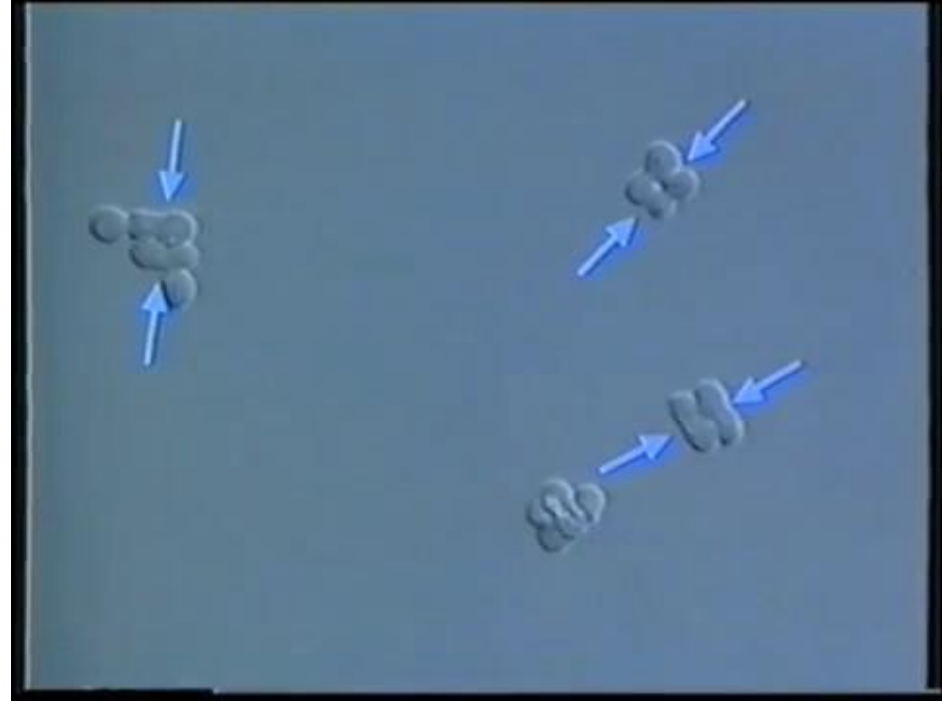
From YouTube video “The Life of Yeast”

# SOME HAPLOID YEAST CAN SWITCH MATING TYPES

From a to alpha, or alpha to a.

This only happens after the haploid cell has budded at least once.

Now you have cells of opposite mating type! and they can fuse.



From YouTube video "The Life of Yeast"



# THE HO GENE IS REQUIRED FOR MATING-TYPE SWITCHING

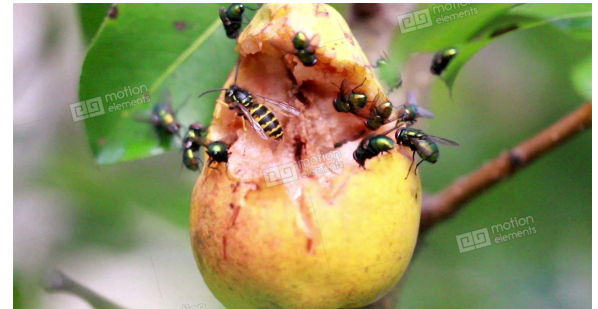
- If yeast cells have functional HO gene, then spores can switch mating types after budding, and an isolated haploid spore can produce a colony that contains both haploid and diploid cells.
- If yeast cells have a mutant HO gene, then spores can't switch mating types, and an isolated haploid spore will produce a colony containing only haploid cells

# WHERE DO *SACCHAROMYCES* SPECIES LIVE IN THE “WILD”?

- Rotting fruit and the legs and guts of insects who feed on rotting fruit



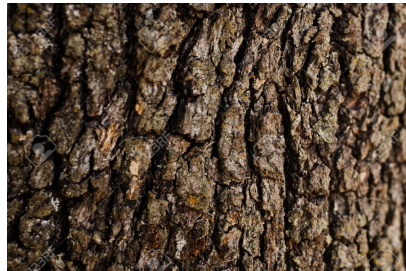
shutterstock.com · 264253049



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motionelements.com

- Bark of trees with sugary “exudates”



# LET'S GO FIND SOME NEARBY OAK TREES!

<https://denverco.mytreekeeper.com/>

Search for “cheesman park”.

Click on the “\$” icon in the toolbar on the right to hide/show “Tree Benefits”; hide it.

Click on the pointing hand icon to select “Map Tools”. Click on the gold medal icon for “Show gold medal trees”.

Zoom out on the map by clicking on the “-“ button in the top left corner until you can see many yellow circles (gold-medal trees) but you can still distinguish one from another.



# LET'S GO FIND SOME WILD *SACCHAROMYCES*!

## Materials:

- Pliers (for breaking off a piece of bark)
- Gloves (so microbes don't fall off your hands)
- Germicidal wipes (clean the pliers)
- Labeled tubes with growth media
- Map of trees in Cheesman Park

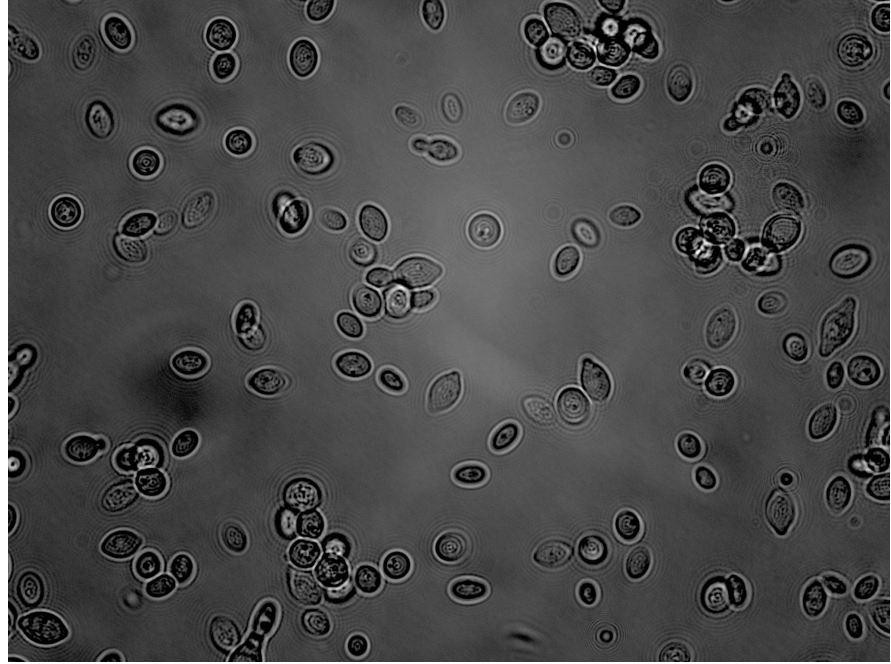
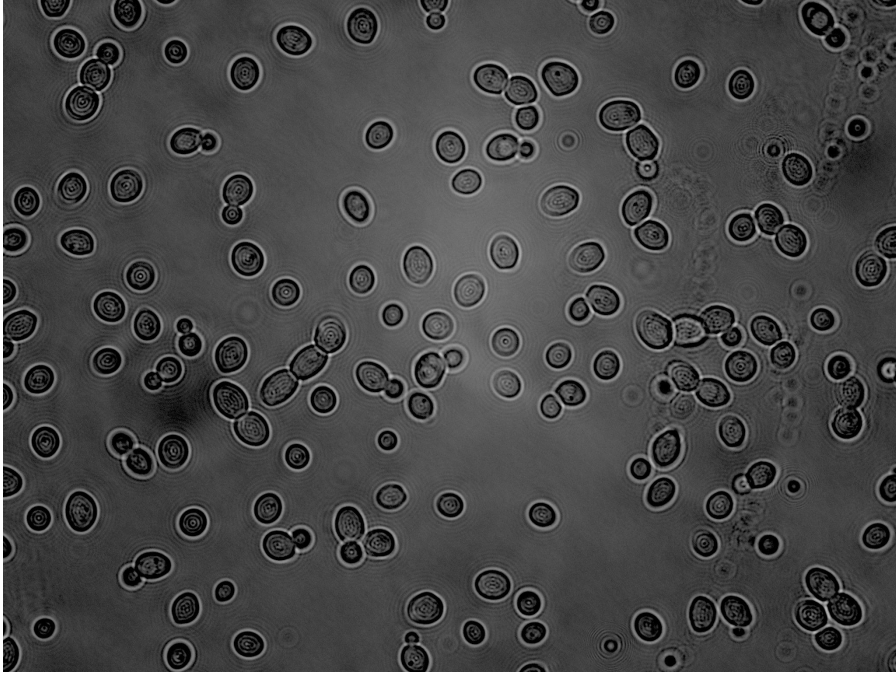


## Method:

- Sterilize pliers with wipe, wait a few minutes
- Break off a small chunk of bark and drop into tube
- Allow tube to sit for 1 week (monitor cloudiness and gas production)



# YEAST ISOLATED FROM OAKS ON OUR CAMPUS!





# WHAT'S NEXT?

- Check the cultures under microscope to look for yeast
- If any have yeast, plate some to petri plates to get colonies
- For those that look like yeast, my lab will isolate DNA and sequence part of the genome
- We'll send you the results to determine the species
- For any *Saccharomyces* species, we will sequence the *H0* gene to look for mutants

