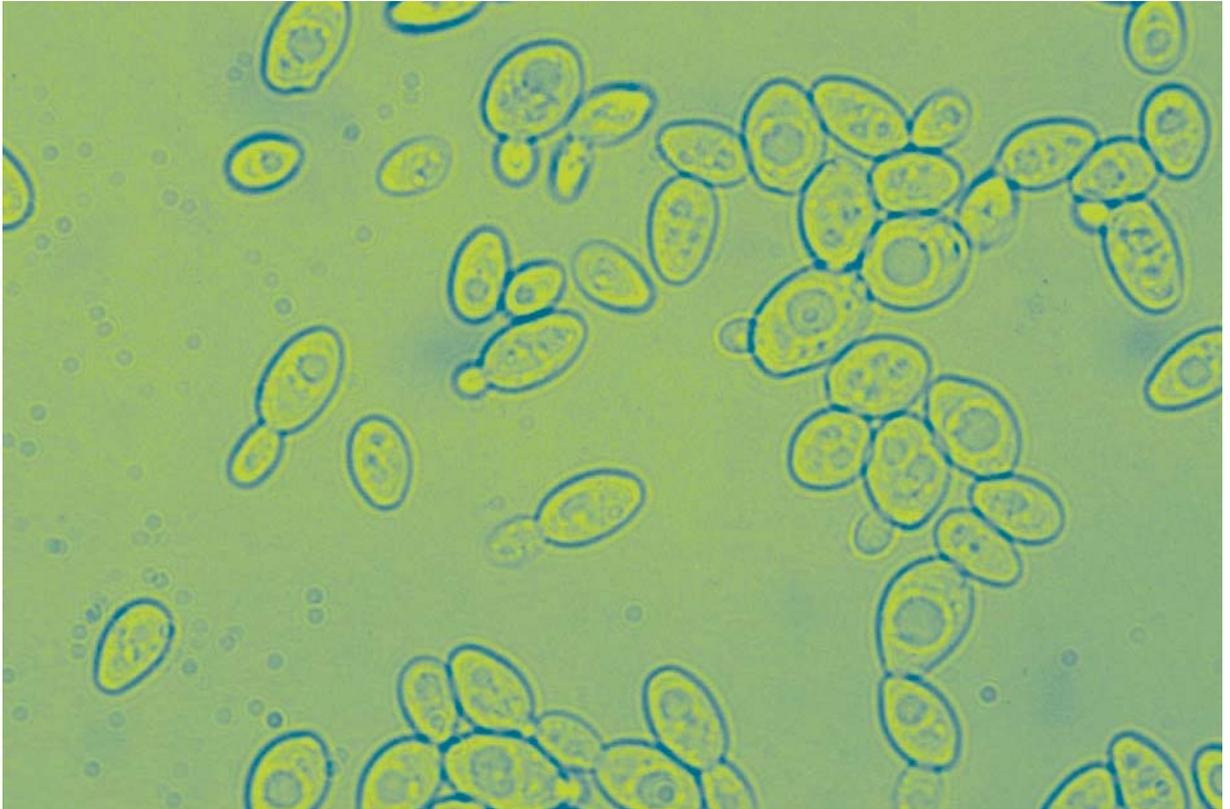


### A famous micro organism: yeast



The main actor in this experience is the micro organism *Saccharomyces cerevisiae*, i.e., yeast. Experiences prove that yeast breathes, reproduces, eats and contains DNA. These are all characteristics of living beings. The objective of this programme is to think about the idea of biotechnologies. Using a micro organism to obtain a biotechnological product. Yeast, as a genetic model, is now used in research labs; this is why it can be considered part of advanced or modern biotechnologies.

#### **Experiences**

- A.1 Bread making
- A.2 Alcohol fermentation
- A.3 Extraction of DNA from yeast

## A.1 Bread making

Question for all grades

Which ingredient facilitates breathing? And in what concentration?

### Objectives

Highlight the role of yeast in the bread making and underline how it uses the different substances involved in the process.

Show the different optimal conditions for the rising of bread, operating on the flour proteins and on the activity of the enzymes.

Clarify the concept of breathing: yeast is a micro organism (a unicellular fungus) which, during its life processes, generates alcohol and carbon dioxide (that swell up the dough).

Define the metabolism: yeast transforms the proteins (gluten) and carbohydrates (amid) in the flour to build amino acids and produce energy.

### What do you need

materials and tools in the kit

hotplate

graduated cylinder

4 50ml Becker

other materials and tools

scale

stopwatch

plastic containers for the dough

strong glass rod to stir the dough

for each dough

2g of hydrated yeast

50g of hard wheat flour

50ml of water

50 ml Becker

other ingredients

amylase

salt (NaCl)

Glucose

Wheat and hard wheat flour

### what to do

Melt 2g of dehydrated yeast in 50ml of water and leave it to re-hydrate.

Add 50g of lour and mix well to obtain a homogeneous dough.



## i-lab Biotechnology

At this point we can prepare other doughs introducing other variables, that is adding other ingredients (vitamine C, amylase, NaCl, glucose, wheat flour). To evaluate the effect of each variable each dough must contain only one ingredient-variable. Each ingredient will have a different effect, some will help the rising process, others will inhibit it.

Model the dough in a Becker and put the Becker on a heat source.

In this case we use a hotplate because a higher temperature accelerates the experiment. We could also try the same experiment without the hotplate, but it would take longer.



What happens after 5 minutes? And after 10? After 15? ...



We can note on our book how the volume of the dough varies in half an hour, observing it every 5 minutes.

### what to observe

The rising of the bread takes some hours. The doughs rise and they increase their volume more quickly if we place them on the hotplate.

Let us observe the variations taking place every 10 minutes during one hour and observe the different effects produced by the added ingredients.

Let us also note every 5 minutes the differences between the different types of yeast.

Each dough grows at a different pace and in a different way depending on the different composition. Yeast is a living organism, it has its own metabolism, it breaths, it eats.

Let us analyse and note on our book all the qualitative characteristics of its aspect.

The surplus salt inhibits the development of the micro organisms because it dehydrates them.

The sugar is a source of energy, it favours the fermentation of the yeast, it enhances the production of carbon dioxide (CO<sub>2</sub>) which determines the rising of the dough.