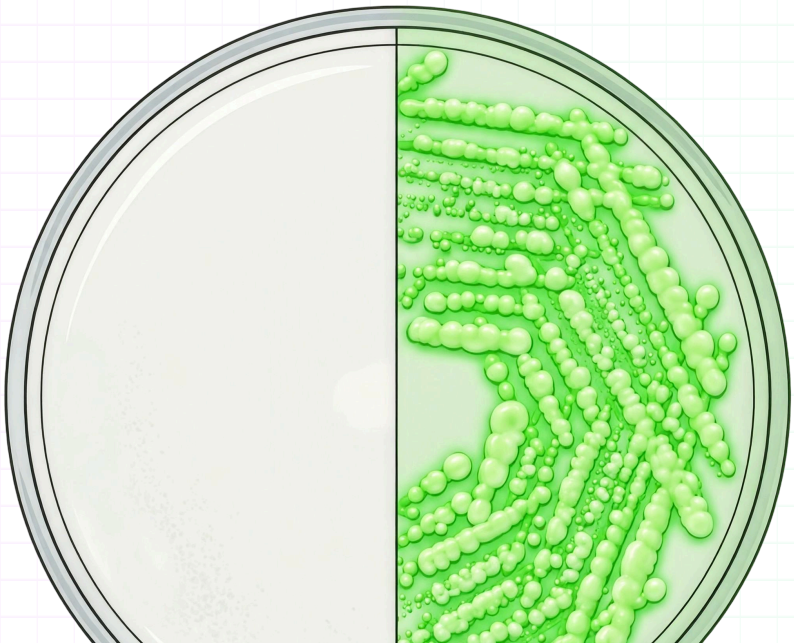




PROTOCOL

Fluorescent Yeast Genetic Engineering Kit

Engineer Any Yeast to Glow Green.



What You'll Do

In this experiment, you'll insert a GFP gene (the same jellyfish gene that makes bacteria glow) into a strain of baker's yeast: *Saccharomyces cerevisiae*. When the yeast takes up the gene, it produces Green Fluorescent Protein and glows under blue light.

What makes this kit special: it works with the yeast provided, or with any dried yeast you have at home for bread yeast, beer yeast, even supermarket packets. You're doing real genetic engineering with everyday ingredients.

Safety Notes



Saccharomyces cerevisiae is the same yeast used in bread and beer, it is safe to handle.



Wear gloves during the transformation steps as good lab practice.



Wash hands after the experiment.



G418 antibiotic plates should be disposed of in the trash after use.



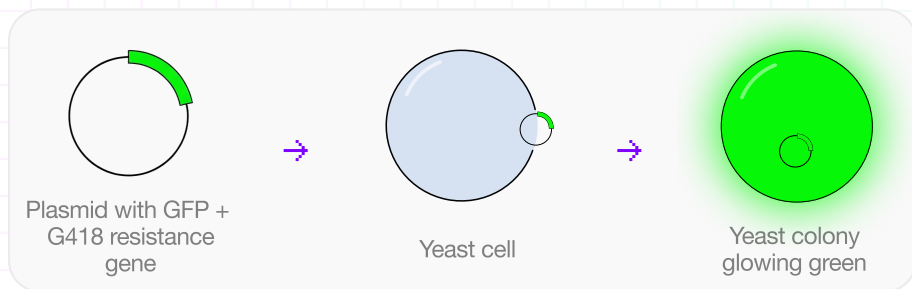
Keep your work area clean. Wipe surfaces with rubbing alcohol before you start.

How It Works

Yeast cells make proteins the same way all living things do, by reading DNA. We'll trick a yeast cell into reading our GFP plasmid by mixing it with a transformation buffer that contains chemicals which temporarily open the cell walls.

A heat shock step drives the plasmid in. Once inside, the yeast replicates it and starts making GFP.

The GFP plasmid also carries resistance to G418 (an antibiotic). Only yeast that successfully took up the plasmid can survive on G418 agar plates making it easy to identify your engineered colonies.



What's in the Kit

1. Equipment



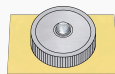
1x

250mL glass bottle
(for melting agar)



1x

50mL tube
(for measuring water)



1x

orange UV filter sheet +
blue LED light



6x

1.5mL tubes pre-filled
with YPD broth



5x

inoculation
loops



5x

pairs of nitrile
gloves



1x

adjustable pipette
(10–100 μ L) + pipette tips



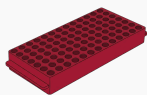
14x

petri
plates



25x

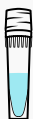
microcentrifuge
tubes



1x

microcentrifuge
tube rack

2. Perishables (store in fridge on arrival)



1x

sterile water
tube



1x

YPD agar powder tube
(plain yeast media)



1x

YPD + G418 agar powder
tube (selection media)



1x

dried *Saccharomyces
cerevisiae* yeast packet

3. Perishables (store in freezer on arrival)



1x

tube of yeast GFP
expression plasmid,
freeze-dried, 100 ng/ μ L



1x

tube of yeast
transformation buffer
(40% PEG 8000, 200 mM LiAc,
0.1 mg/mL carrier DNA)



1x

tube of pre-engineered
GFP yeast strain freeze-
dried (positive control)

Timeline at a Glance



DAY 1, AFTERNOON (~1 HOUR)

Make agar plates. Streak yeast onto a plate.



DAY 1, EVENING

Let yeast grow overnight (12-18 hours).



DAY 2, MORNING (~2 HOURS)

Prepare competent cells, add plasmid, heat shock, plate.



DAY 2-4

Wait for colonies to grow, then check for fluorescence.

Before You Start: Pipette Practice

Before running the experiment, practice drawing up 10 μ L of water accurately. The liquid should reach the first line on the pipette tip with no air bubbles.



See our video guide for a full walkthrough.

Warning:

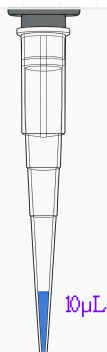


Pipette accuracy is critical. The most common failure is drawing up the wrong volume.

Plasmid Preparation and Handling

Your GFP plasmid tube contains freeze-dried DNA, it may look empty. The DNA is dried on the tube walls and will dissolve when you add water.

Thaw your plasmid tubes and flick them with your wrist to collect liquid at the bottom. Practice drawing up 10 μ L of water accurately before you begin.



Correct 10 μ L volume in pipette tip — liquid reaching the first demarcation mark, no air bubbles.

60-Second Video Guides

Before starting your experiment, check out these fast 60-second video protocols.

They walk you through every step of making agar plates, from melting and pouring to cooling and storage, so you can avoid common mistakes and set up your lab work for success.



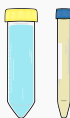
60 Second Video Protocols
“How to Make Agar Plates”.

STEP: 1 TIME: ~1h

Make Agar Plates

Agar plates are solid nutrient surfaces for yeast to grow on.

You'll make two types: plain YPD agar (for growing yeast) and YPD + G418 agar (antibiotic plates – only transformed yeast survive here).



1 Pour the contents of the YPD Agar tube into the 250mL glass bottle.



2 Use the 50mL measuring tube to add 150mL of tap water to the bottle. Shake vigorously.



3 Loosely place the lid on top – do **NOT** screw it down tight. Place the bottle in the microwave.



4 Microwave in 20–30 second bursts, swirling between each burst. Stop if you see boiling.



5 Continue until the liquid looks completely clear and yellow with no visible grains or cloudiness. Total time: about 2–3 minutes of microwaving.



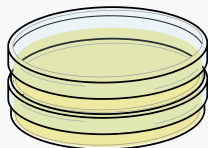
6 Remove carefully (bottle is hot). Let cool 20–30 minutes until you can hold it comfortably.



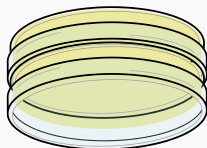
7 While still warm, pour into 7 petri plates: lift each lid, pour just enough to cover the bottom half, replace the lid. Don't move them until solid.



- 8 Let cool at least 1 hour. Repeat the whole process for the YPD + G418 agar tube, making 7 more plates. Label them clearly. ☐
- 9 Store plates upside down in the fridge (4°C). They'll last 1–2 months. ☐



Petri plate columns with labels:
"YPD agar and "YPD + G418 agar"

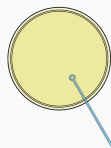


Correct upside-down storage in fridge

STEP: 2 TIME: ~10min

Prepare the Yeast

Your *S. cerevisiae* arrives freeze-dried. You'll rehydrate it and streak it onto a plain YPD agar plate to grow a fresh colony overnight.



- 10 Add 100 μ L of sterile water to the dry yeast tube using the adjustable pipette. Remember to always change pipette tips in between uses to keep from accidentally mixing leftovers in the tip. ☐
- 11 Shake for 1 minute until the yeast are fully dissolved. ☐
- 12 Pipette all 100 μ L of the yeast suspension onto a plain YPD agar plate (**NOT THE ANTIBIOTIC PLATE**). ☐

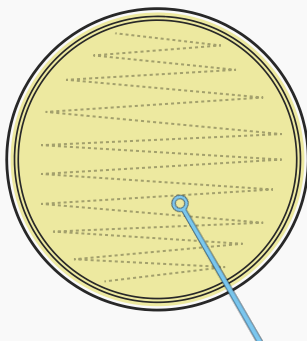
13

Use an inoculation loop to gently streak the yeast across the plate in a zigzag pattern.



14

Place the lid back on and let the plate grow at room temperature overnight (12–18 hours). **DO NOT REFRIGERATE**. Colonies are ready to use when they appear as visible white or cream-colored dots spread across the plate.



Zigzag pattern across plate

Warning:



Use the plain YPD plate here — NOT the G418 antibiotic plate.



Do not grow yeast above 30°C. It damages the yeast and the experiment will fail.



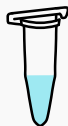
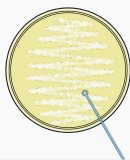
If agar solidifies in the bottle before you finish, briefly re-microwave to liquefy it again.

STEP: 3 TIME: 2h

Transformation: Adding the GFP Gene

This is the main event. You'll mix yeast with the transformation buffer (which temporarily makes cell walls porous), add the plasmid DNA, then heat shock the mixture to drive the plasmid inside.

3.1 Prepare Cells



15

Take an inoculation loop and gently scrape a small amount of yeast from your overnight plate. You want the loop to be visibly coated – a thin film is enough.



16

Transfer the yeast into a microcentrifuge tube containing 100 μ L of transformation buffer. Swirl the loop to release the yeast. The liquid should look cloudy. Break up clumps by pipetting gently up and down.



3.2 Add the Plasmid DNA

17

Take the GFP plasmid tube. Add 10 μ L of sterile water and shake for 1 minute to rehydrate the freeze-dried DNA.



18

Add 10 μ L of the rehydrated GFP plasmid to your yeast tube. **MIX GENTLY.**



3.3 Incubation

19

Incubate the mixture at room temperature for 30 minutes (with or without gentle shaking) to let the DNA attach.



3.4 Heat Shock

20

Heat shock the tube in warm water at 42°C (108°F) for 60 minutes. You can test temperature with your wrist — it should feel hot but not painful. Maintain the temperature as best you can — a warm water bath works well.



21

After 60 minutes move the tube to room temperature.



🔥 = 42°C/108°F

3.5 Recovery

22

Add 900µL of YPD broth (dissolve one of the YPD broth tubes in 1.5mL of water, shake well) to your transformation tube.



23

Incubate at 30°C for 1–2 hours, or at room temperature for at least 4 hours. This lets the yeast recover and start expressing GFP.

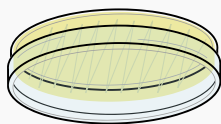


3.6 Plate the Yeast

- 24 Take a YPD + G418 plate out of the fridge and let it warm to room temperature. ☐
- 25 Pipette a few drops 400 μ L of your transformation mixture onto the G418 plate. ☐
- 26 Use an inoculation loop or spreader to gently distribute the yeast across the plate. ☐
- 27 Let the plate sit closed for 10 minutes so the liquid absorbs. ☐
- 28 Flip the plate upside down, put the lid on, and incubate at 30°C for 16–24 hours, or at room temperature for 24–48 hours. ☐



Petri plate with yeast spread evenly



Flip upside-down for incubation

STEP: 4 TIME: 1-3d

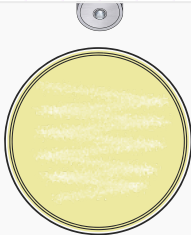
Check Your Results

After incubation, look for white or cream-colored dots on the plate — these are yeast colonies. Only transformed yeast survive on the antibiotic plate.

- 29 To check for fluorescence, hold the orange filter up to your eyes. ☐
- 30 Shine the blue LED light onto the plate. ☐

31

Transformed colonies will glow bright green through the filter.
Non-transformed yeast won't survive on the G418 plate.



Petri plate with white colonies visible



Petri plate under blue light and filter

Success:



Bright green glowing dots visible through the orange filter.



If no colonies appear:

The agar plate may have been too hot when yeast were plated. Try again.



If colonies appear but don't glow:

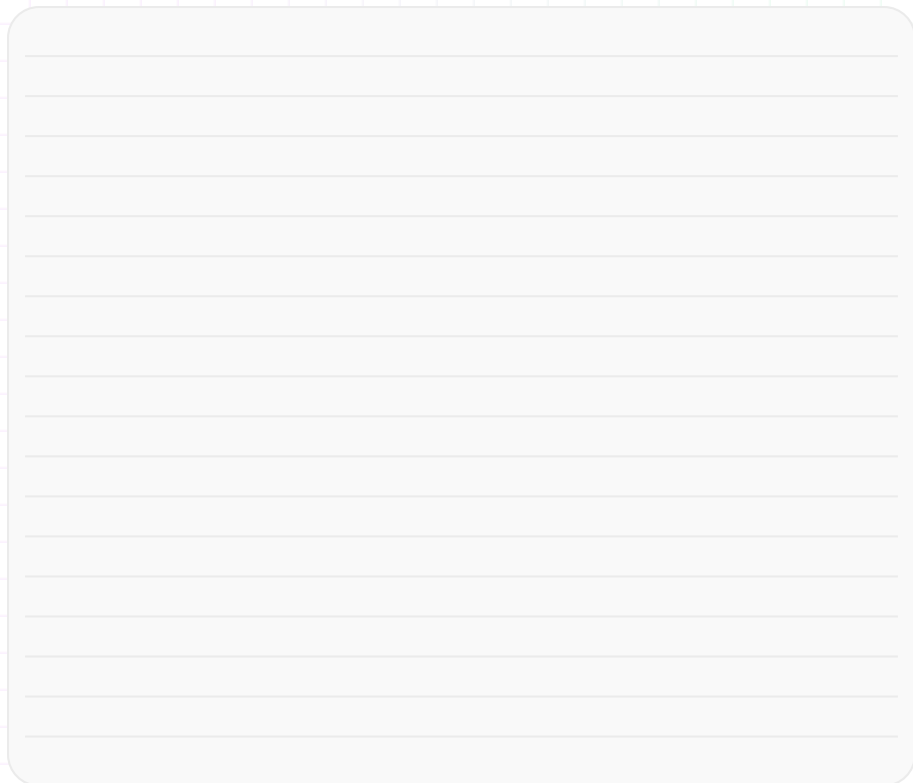
The plasmid may not have been taken up. Retry with fresh yeast.

Want to Use Your Own Yeast?

This kit works with almost any *Saccharomyces cerevisiae*. Bread yeast, beer yeast, wine yeast — if it's *S. cerevisiae*, you can engineer it.

Just substitute it for the provided yeast strain in **STEP 2**.

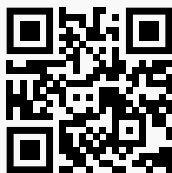
Record Your Results Here

A large, light gray rounded rectangle with a thin gray border, containing 20 horizontal lines for recording results. The lines are evenly spaced and extend across the width of the rectangle.



This Is Just the Beginning

Explore more experiments at the-odin.com



Need Help?

Contact us at odin@the-odin.com