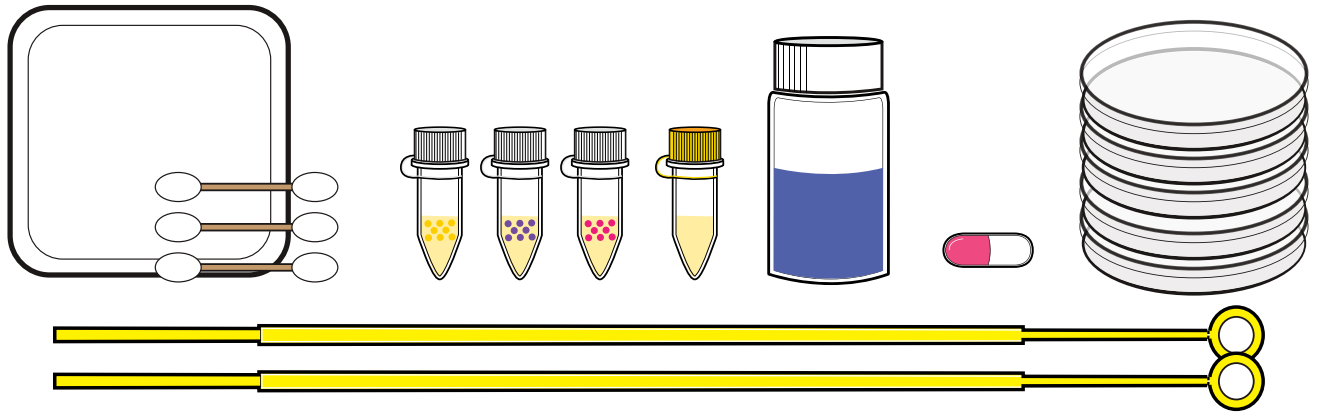
BIO PRINT-IT KIT™

MANUAL



in collaboration with
Marcus Banks

www.amino.bio

Version 5.0, Feb 2024

BIO PRINT-IT KIT™

User Manual

Welcome! Let's get started

This User Guide was created to help you get the most out of your Amino Labs Experience. Even if you are familiar with genetic engineering, science or other Amino Labs™ products, please take the necessary time to read through this guide. This will ensure you practice safe science, store, use and get the most out of your Kit and importantly, know what to do in case of a spill or accident.

In the first section, you will learn about your kit's components, how to store them before and during your experiment, as well as a few tips on activities to complete before you get your hands wet. The second section is procedural -- these are the step by step instructions on how to run your experiment. Make sure to follow our tips to ensure your best success! The third section covers "what's next"; how to keep your creations, store or dispose of any leftover ingredients and general clean up instructions. The final section is there to help you -- a glossary, troubleshooting, and our contact information.

Amino Labs is excited to welcome you to the world of the Genetic Engineering with the Engineer-it Kit™, Canvas Kit™, Print-it Kit™, and our entire ecosystem of easy-to-use, easy-to-succeed at products!

Following this guide will help ensure that you are getting the most out of your current and future experiences to keep on making new creations with DNA. Have fun!

Practicing safe science

Genetic engineering and life sciences are safe activities when you follow simple guidelines. Read on to ensure you adopt safe practices.

The kit in your hands contains only non-pathogenic ingredients. These are part of the biosafety Risk Group 1 (RG1) (Biosafety Level 1). This is the most benign level and therefore the safest: with these kits, no special containment or training is required in North America. But you must follow these safety guidelines for your safety and the success of your experiment(s)!

We recommend the system and kits for ages 12+, under adult supervision, and 14+ with or without supervision. We recommend that an adult empties the discard container. The cleaning instructions must be strictly followed for safety and experiment success. Make sure to store the kit per the instructions found in this booklet.

- **Do not eat or drink near your experiments.** Keep your experiment at least 10 feet from food, drinks, *etc*. Under no circumstances should you eat any of the kit's content.

- **Immunocompromised persons:** While the ingredients in these kits are non-pathogenic, some persons, such as immunocompromised persons, can be affected by large numbers of bacteria and should talk to their doctor before doing any experiment.

- **Wash your hands before and after** manipulating your experiment, or the hardware.

- **Wear gloves**, even when cleaning your station or handling the kit contents (petri plates, loops, etc). This will protect you from your experiment, and your experiment from you. Any latex, nitrile, or general purpose gloves you can find at the pharmacy will do. After you put your gloves on, be aware of what you touch. Try not to touch your face or scratch itches with your gloved hands!

- **If using the DNA Playground™ or BioExplorer™ place it on a stable work surface.** Keep it level at all times.

- **Clean up your station, spills and work surface before and after use.** Use a 10% solution of chlorinated bleach generously sprayed onto a paper towel and rub onto any contaminated surfaces. (Careful! This can discolor your clothes). A chlorinated spray cleaner also works.

- **Find a container to hold the inactivation bag where you will discard used items**. An old 1L yogurt container, large plastic cup or the like will do. Used items (in science, these are often called consumables) will be loops, tubes or used petri dish.

- **Eye-wear is not provided but can be worn**.

You can download a biosafety poster for your space from www.amino.bio/biosafetyinaction and complete a short safety quiz at www.amino.bio/biosafety-quiz

If you would like to do a short Online lab safety course for your edification, we recommend a Government of Canada course: www.amino.bio/biosafety

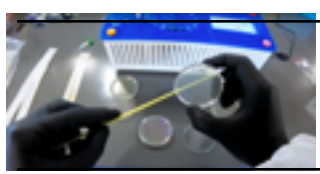
How will I learn?

Learning and prototyping with genetic engineering and cells is becoming accessible to newcomers ages 12+ thanks to dedicated scientists and kits such as the one you are about to use!

One of the easiest ways to learn a new science, hobby or topic is by trying it hands-on. Amino Labs kits make it easy to do science by following the instructions in this booklet. Everything you need is included; each ingredient in the kit is pre-measured and labeled for a beginner-friendly experience. Our all-in-one DNA Playground minilab (mini-laboratory) decreases setup time, mess, guesswork and the need to collect and calibrate multiple machines. The included instructions should be easy-to-follow for everyone but may contain some new terms for which we have added a glossary at the end. Don't hesistate to flip to it during or before your experiment.

We also have additional resources to help you go further:

An essential addition to our ecosystem are the free **Virtual Bioengineer™ simulations** developed with the educators at the Biobuilder Educational Foundation. These simulations are 20 minutes guided experiences that make it easy to practice using a DNA Playground™ and experiment kits beforehand. The simulations includes additional information on the manipulations and a more in-depth look into the kit components. We recommend them strongly! Complete online at www.amino.bio/vbioengineer.



View **Real-time tutorials** videos at youtube.com/c/AminoLabs.

Would you like for an Amino Labs team member to guide you through your journey? Try the **Cyber Workshop & Tutoring**, a 3-day+ experience completed via video conferencing.
www.amino.bio/products/cyberworkshop.

Are you interested in the theory behind the experiment? In going deeper on the science, learning pro-tips and eventually moving onto advanced genetic engineering? The ***Zero to Genetic Engineering Hero*** **book** is for you. Find out more at www.amino.bio/book

Why make Art with biology?

A word by BioArtist Marcus Banks

I use biologicals in my art for a few reasons: the relationships between organisms can be so complex they become the only analogies suitable for certain art pieces, bacteria are so interesting they automatically bring an additional layer of meaning to my art and, most simply, BIOLOGY IS COOL!

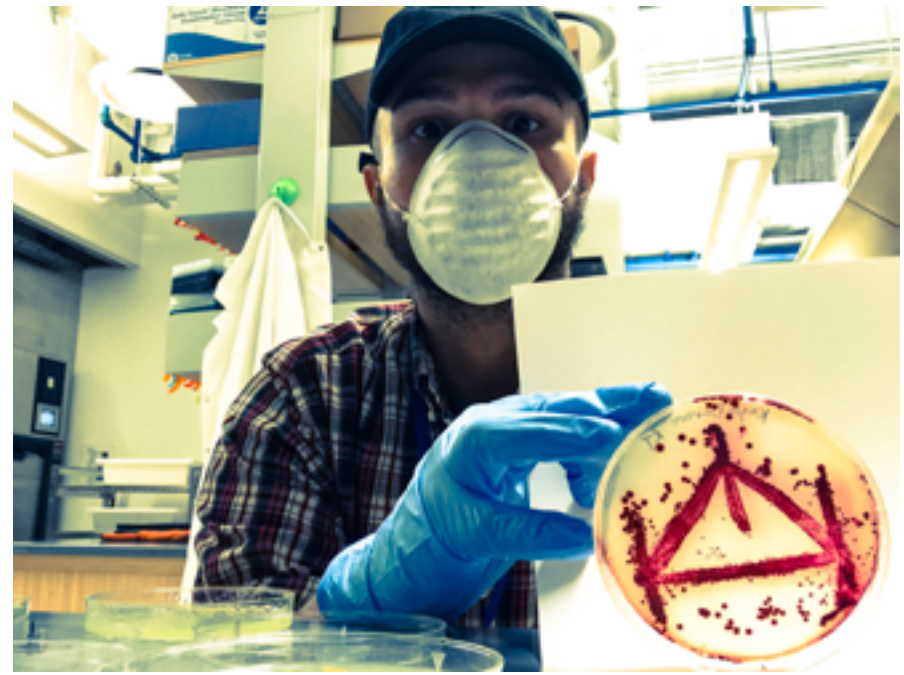
Through safe practices, you can easily create and wear or display your bacterial images. And as you paint it's fun to see what has worked and what hasn't, what is different from your original idea and how the bacterial growth can provide an element of randomness to certain images.

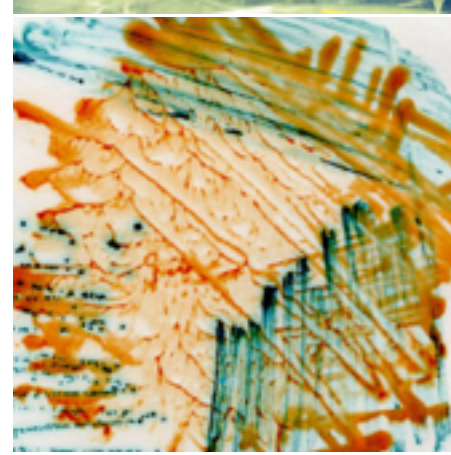
Art and Science are connecting in ways like never before and with this kit, we hope you are able to continue exploring microbiology, molecular biology, and art practices. I

We encourage you to take notes on your process, make some predictions, and record your results to further explore your predictions! But, most of all, have fun!

-Marcus

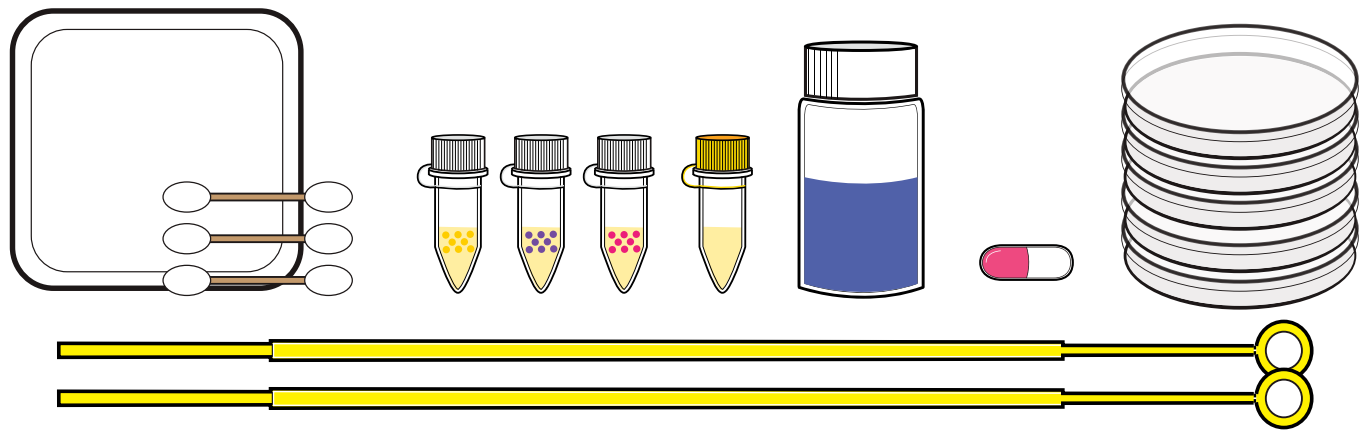
Marcus Banks can be reached through email at marcusbioart@gmail.com



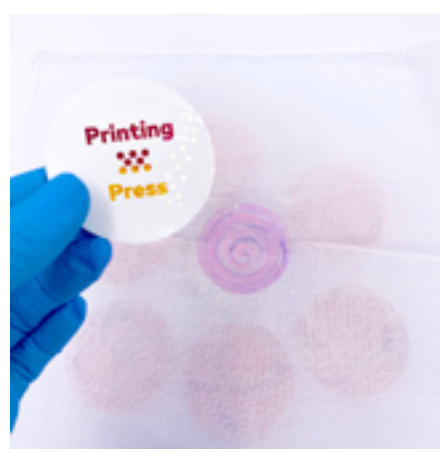


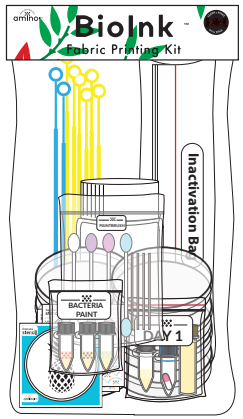
Art by Marcus Banks

Discover your BioInk Print Kit™



The BioInk Print Kit™ lets you use the provided colored bacteria or/and your previously engineered bacteria made with an Engineer-it Kit to create prints! Simply create selective agar petri dishes following these instructions, use the bacteria "paintbrushes" to create your art on the agar, incubate and transfer the designs, patterns, paintings to the provided fabric, some papers or any porous surface. Let your creativity grow with bacterial art!



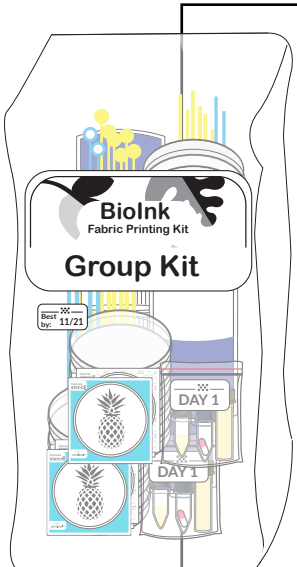


Individual kit size

The Individual kit size will lets you complete the experiment in full, one time! This kit can be used alone, (with parent supervision if necessary) or in a small group.

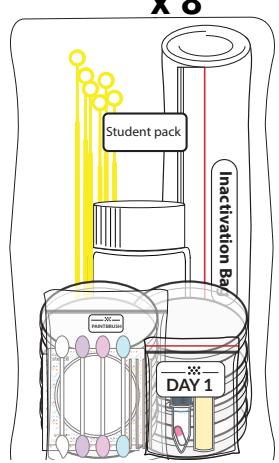
Group kit size

The Group kit size contains **8** individually-wrapped student packs and one shared materials bag that contains the bacteria paint, the inactivation bags and the ink sealer paintbrush. These items will be shared by the group. In the students packs, you will have everything else you need for the experiment to be done once.



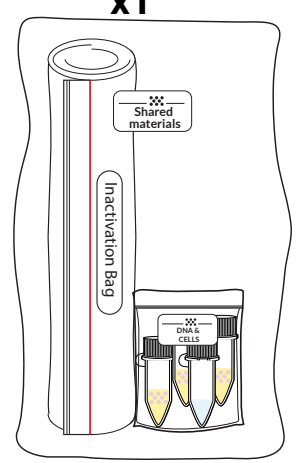
Student Pack

x 8



Shared materials

x1



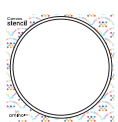
Kit Components

Agar Powder: This LB agar powder is industry standard. Each tube of LB agar powder can make 45 mL of molten LB agar (3.5% w/v). Agar is both the surface the bacteria grow on and the food they eat to grow.[1]

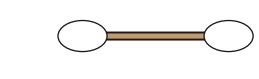
Sterile Water: Sterility is critical when doing experiments. This is distilled water that has been sterilized with an autoclave in order to ensure there are no contaminating organisms present. In this kit, you will use 100 mL of water, which, when used with LB agar powder, is enough to make 8 LB agar plates. Depending on when you received your kit, your sterile water will come in 2 water bottles of 50 mL each (pre-March 2023) or 1 water bottle with 100 mL [1]

Yellow Loops: Inoculating loops are used for transferring 1 uL (blue loops) or 10 uL (yellow loops) of liquid and for streaking bacteria. [1]

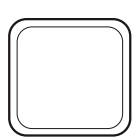
Petri Dish / Plate: 6cm petri dishes are large enough for typical lab experiments and help save on cost of reagents as well as reduce waste. This kit comes with 8 petri dishes [1]



Blank stencil: Use these stencil to draw your design/image before tracing it on the agar. Place the stencil under the petri dish to trace. [1]



Bacteria Paintbrushes: Cotton swabs and toothpicks serve as your sterile paintbrushes to help you paint your bacteria art on agar. [1]



Fabric / Bandana: Use this specially chosen fabric as your final canvas. Wear it as a bandana, headband, tie it around your backpack, display it in a frame... explore the possibilities[1]

Printing press: A plastic disk to help you transfer the bacteria paintings from the petri dishes to your fabric. [1]

Ink sealer: Always use the fixing medium on top of your bacteria print on fabric or paper to help "fix" the print and make it safe for touching and wearing [1]

Colored bacteria paint: These safe and friendly bacteria are engineered to be colorful so that you may paint your artwork on petri dishes before transferring it onto fabric. In the group kit, the bacteria paint is in the Shared Materials bag. [1]

Image stencil: This/these stencils can be used as your image. Place the stencil under the petri dish to trace. In the group kit, the image stencil is in the Shared Materials bag [1]

Ink sealer paintbrush: A classic paintbrush will help you spread your fixing medium. In the group kit, the paintbrush is usually in the Shared Materials bag [1]

Inactivation Bag: A heavy duty bag to put all of the kit waste in. After your experiment, add bleach and water to the bag to inactivate all the samples and practice safe science. In the group kit, the inactivation bag is in the Shared Materials bag [1]

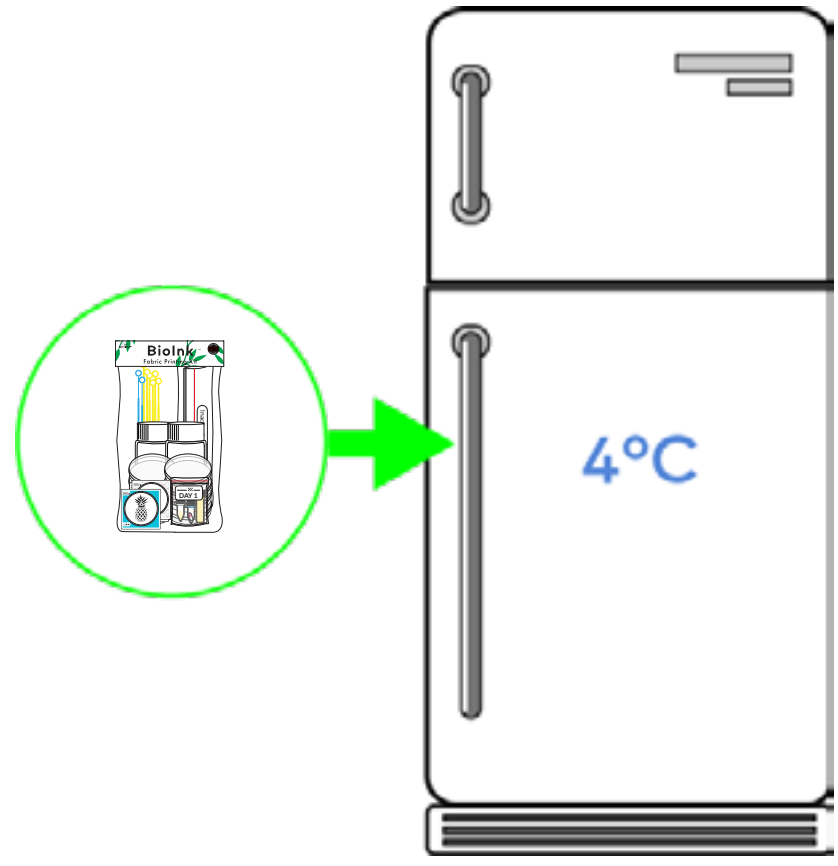
[1] For education purposes only.

Unpacking and Storing your kit

For a better shelf life and successful experiments, place your Kit in a standard refrigerator at around 4°C.

If your refrigerator is not a science-only refrigerator, we recom- mend placing your science experiments inside a sealed plas- tic container before placing them in the refriger- ator, especially once your kit is open.

Do Not Freeze your kit!



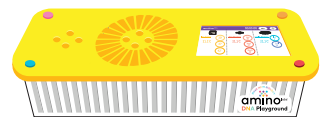
Technical specs

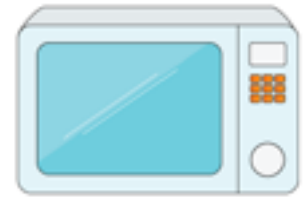
Growth plates: 6 cm petri dishes	LB agar powder (1.6 g)	Colored bacteria stabs: variable
Selection/Antibiotic: variable	50 mL sterile water	Paintbrushes & Loops

Necessary Equipment

For Best results:

- DNA Playground™ or BioExplorer™
- Microwave
- Permanent marker (like a Sharpie)





Alternative solution:

- **Microwave**
- **Timer**
- **Incubator or warm environment + thermometer** (for 37°C): This will replace the **Incubator** set to **"37"**. If you do not have an incubator (biology or egg one, as long as they set to 37°C), you can create one using an online tutorial. Search for DIY incubator on our youtube chanel - Youtube.com/aminolabs - or go to this direct link: https://www.youtube.com/watch?v=LEsv0Qvbczs If you have neither incubator or DIY version, you can try incubating the cells in a resealable bag in a warm environment. Your yield won't be as good as with an incubator but should work. Note that it will take a few more days to see results.

Necessary safety supplies

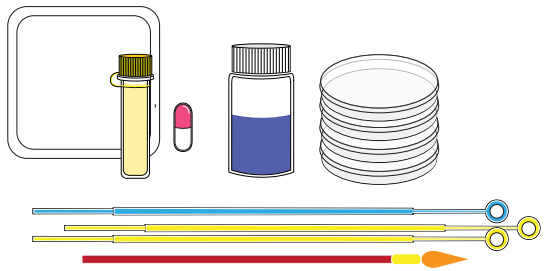
Disposable container 500ml-1L
to hold tubes, loops and other contaminated waste (e.g., yogurt container, plastic cup).

Latex or nitrile gloves
like the ones found at a pharmacy. 1 pairs/person if you will keep & reused each day, or 4 pairs/person if not saved & reused.

Chlorinated bleach spray
1 regular bottle (or you can mix a 10% solution: 1 part bleach to 9 parts water in a spray bottle)

Bleach ~250 mL
to inactivate all the experiment materials at the end of the experiment.

Timeline



BioInk Kit

Day 1

Create selective agar Petri dish, streak colored bacteria to create painting palette

(45 minutes)

Incubation 24-48 hours

Day 2

Prepare pattern/art stencils, paint with bacteria paint on petri dishes

(45 minutes)

Incubation 24-48 hours

Day 3

Print on fabric

(20-45 minutes)

Drying 24+ hours

Day 4+

Seal pattern. Show off BioArt!

(15 minutes)

The Print-it Kit™ takes 4 days of hands-on activity to complete. 6 main "activities" make up the Kit experiment:

1. Make selective plates
   Day 1, 20-35 minutes
2. Streak your colored cells to make paint
   Day 1, 20 minutes, incubate 16-24 hrs
3. Stencil your art on paper
   Day 2, variable time
4. Paint with your Bacteria
   Day 2, 20+ minutes , 24-72 hrs incubation
5. Print your art on fabric
   Day 3, 20+ minutes , 24 hrs drying
6. Seal your art on fabric and display it!
   Day 4, 10 minutes , 24 hrs drying

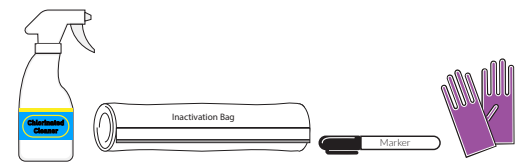
Experiment Protocol

0. Prepare your space

Goal Set yourself up for sucess.

Materials from the kit
(1) Inactivation bag

Materials not in your kit
(1) 1L discard container
Chlorinated bleach spray or wipes
Paper towels
(1/person) Pair of gloves



Make sure you have the necessary materials as explained on page 11, including gloves, microwave, and cleaner before you start.

0.1 Put on your gloves, and if you have one, your lab coat or apron.

0.2 Set your inactivation bag inside your disposable 1L yogurt-type container. You will use your inactivation bag to dispose of:

- your tubes of cells if you are not saving them for a future experiment*,
- any used inactivation loops,
- bacteria paint palette once it is used (unless you are saving it to paint your other canvases later)*
- any empty tubes like the agar, buffer and selection tubes,
- any gloves that have touched bacteria.

You can dispose of paper and plastic packaging in the regular garbage can, as well as gloves if you have not accidentally touched bacteria.

0.3 Wipe down your work surface with the chlorinated bleach spray or wipes.

0.4 Set down your DNA Playground, BioExplorer, or other personal lab equipment (it is recommended you use an incubator for this experiment) on or near your work surface. Make sure it is level and on a stable surface. Refer to the instruction manual to make sure you know how to use your equipment safely.

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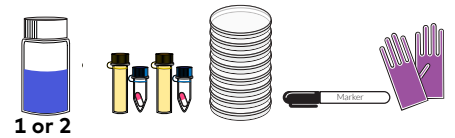
* If you are saving the tubes of cells or your painting palette for a future experiment, place them back in their ziploc bag after use and store them in a refrigerator. We recommend you use a sealed plastic container to store all your experiment materials inside a refrigerator if you also use this to store food or drinks. *

1. Creating selective LB Agar Plates Day 1, 25 minutes

Goal Create selective LB agar plates.

Materials from your kit
100 mL of sterile water *(in one or two bottles, depending on your kit)*
(2) LB agar powder tube
(2) antibiotic pill
(8) petri dishes

Materials not in your kit
(1) Sharpie marker



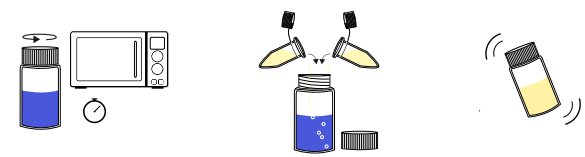
Prepare

1.1 Label each petri dish with a sharpie-type pen. Label the bottom of the petri dishes (*the bottom is the part that has the smaller diameter of the two: the bottom fits inside the lid*) as follows: **8x** S. (for selective) + Add [your initials] if doing this in groups with multiple kits.

If your kit came with 2 water bottles of 50 mL of sterile water each, pour one of the bottle into the other so that one of your bottle is empty and one has 100 mL of sterile water. Continue the instructions as below.

Mix the Agar

1.2 Unscrew the lid from the sterile water bottle and keep it loosely on top of the bottle to prevent any contaminants from entering the water, but allowing air to escape. This will prevent pressure build-ups.



1.3 Place the bottle in the microwave and heat the water **until you see it boil**. You can use 75 seconds as your starting time but you have to see a rolling boil where many bubbles are rising constantly before you continue to the next step. Careful, the bottle will be hot! **!! If the water does not boil, the agar powder will not dissolve and your plates will not solidfy !!**

1.4 Add the **two tubes of agar powder** to the boiling water. Careful, the water is hot! Some agar powder may "clump" around the lip of the tube due to the water evaporation. This is okay, we have accounted for it.

1.5 Microwave the water and agar powder in 4 seconds intervals until you see it boil again. Instead of a rolling boil, you will see more of a foam forming above the molten LB agar liquid. ***Careful, the liquid will boil over if you microwave in more than 4 sec. increments.*** After you see the liquid foaming, swirl to mix for 10 seconds. Try not to shake vigorously as this will create bubbles in your agar and make the surface of your agar uneven.

Make selective (S.) plates

1.6 Open your two tubes of antibiotic pills and **add both antibiotic pills** to the bottle of agar. Gently swirl for a few minutes until the contents of the pills have dissolved. Try not not introduce bubbles into the LB agar: don't swirl too vigorously.

1.7 Once the antibiotic pills are dissolved, pour the molten LB agar into the bottom half of the 8 petri dishes. Place the lids 3/4 of the way back on so that the agar can cool and dry (solidify).

Pro-tip: If there are water droplets on the surface of the LB agar, this can disrupt your art. Bacteria that you will be painting with can enter a droplet and spread throughout the droplet therefore 'smudging' your art. To avoid this

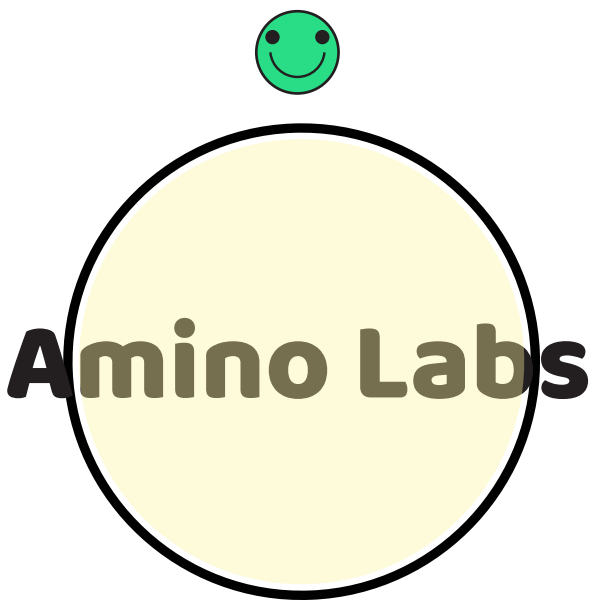
make sure the lid is partially over top to allow for evaporation and a dry LB agar surface.
1.9 Let the LB agar harden. This can take up to 20 minutes depending on how warm and humid your environment is. You will use 1 plate in the next step. Store the remaining 7 plates in the ziploc bag in the refrigerator for day 2.

Troubleshooting tip

If your plates do not solidify after 30 minutes it is very likely that the water was not boiled enough to dissolve the agar powder. As a ‘hack’, you can pour all of the petri dish content back into the water bottle and microwave until you see it boil. Swirl to mix and re-pour your plates.

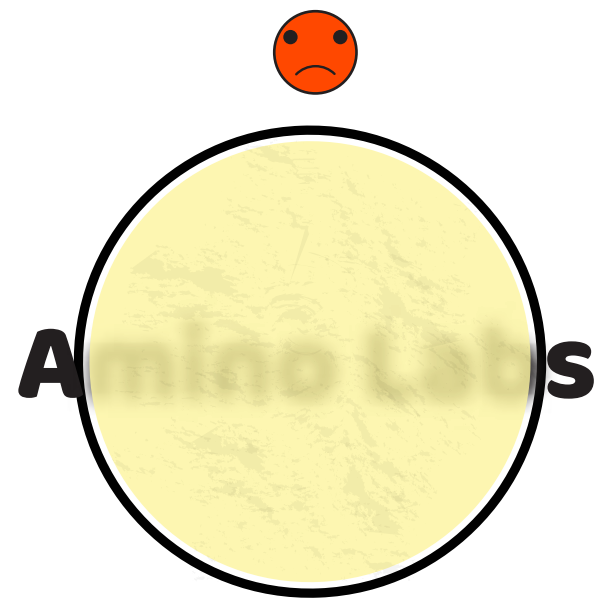
Checkpoint - Agar Plates

Use this guide to check if you are ready to move onto the next step.



A perfect Agar plate is completely clear and solid - if you set it 4” above some image or text, you should be able to read it / see it clearly.

Move on to the next step!



An agar plate that is cloudy and/or bumpy and/or soft is not ideal - if you set your plate 4” above some text or image and cannot see clearly through it, it means you needed more boiling or mixing.

Troubleshooting tip

If your plates do not solidify after 30 minutes it is very likely that the water was not boiled enough to dissolve the agar powder. As a ‘hack’, you can pour all of the petri dish content back into the water bottle and microwave until you see it boil. Swirl to mix and re-pour your plates.

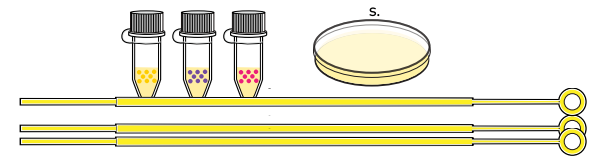
Unfortunately, if the agar does not solidify, this means you need to halt your experiment and complete the troubleshooting guide and follow the instructions at www.amino.bio/troubleshoot

2. Create your painting palette Day 1, 25-45 minutes + 24 hours wait time

Goal **Create bacteria paint painting palettes.**

Materials from your kit
(1) Selective agar plates
(3) Yellow loops

Shared resources
3 Tubes of bacteria paint



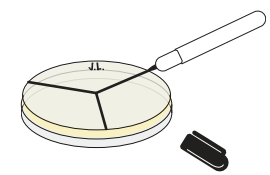
Prepare

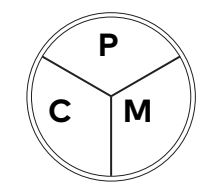
2.1 If you have an incubator, turn it on to 37°C.

Streak

2.2 Using a sharpie, divide up the bottom of your petri dish into 3 sections, one for each of your bacteria colors.

2.3 Use the sharpie to write the name or the abbreviation of the different colors of bacteria in each section on the bottom of the petri dish. One color per section. The order does not matter, as long as each color has a section.





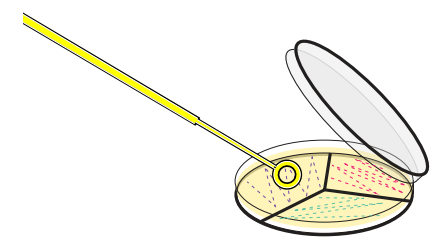
2.4 Open one of the yellow loop by holding the straight end of it, not the loop end. Remove from the packaging. Don't let the loop end touch anything yet!

2.5 Open one of your bacteria paint tube. Dip the loop end of the yellow loop into the stab (tube) of bacteria paint.

2.6 On your petri dish, find the section that you marked for this color and, using the end of the loop you dipped in the colored bacteria, trace the zigzag line like on the stencil on the next page.

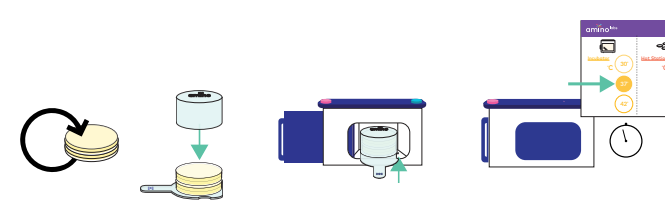
2.7 Discard the loop in your inactivation bag or discard container.

2.8 Using a new yellow loop each time, repeat steps 2.5 - 2.8 for each colored bacteria tube you have.

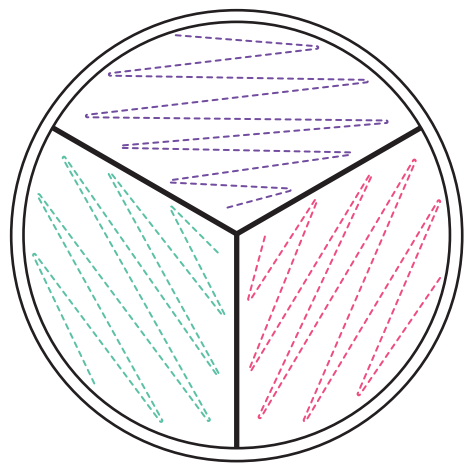


Incubate Overnight

2.9 Incubate your streaked plate **upside down** at ~37°C for 24 to 48 hours. This will be your biopaint to create your living art. (It may take longer if you do not have an incubator, up to 5 days. Note that the colors will be more pastel if you are incubating at room temperature). *If you need to incubate your bacteria paint for longer than 48 hrs in an incubator (ex: over the weekend) you can incubate it at 30°C instead of 37°C. This is only okay in the Canvas kit! * **Note: Remember to flip your plate upside down! If you have Amino Labs' minilab, remember to put the humidity chamber on top of your plate and to close and lock the incubator door.**

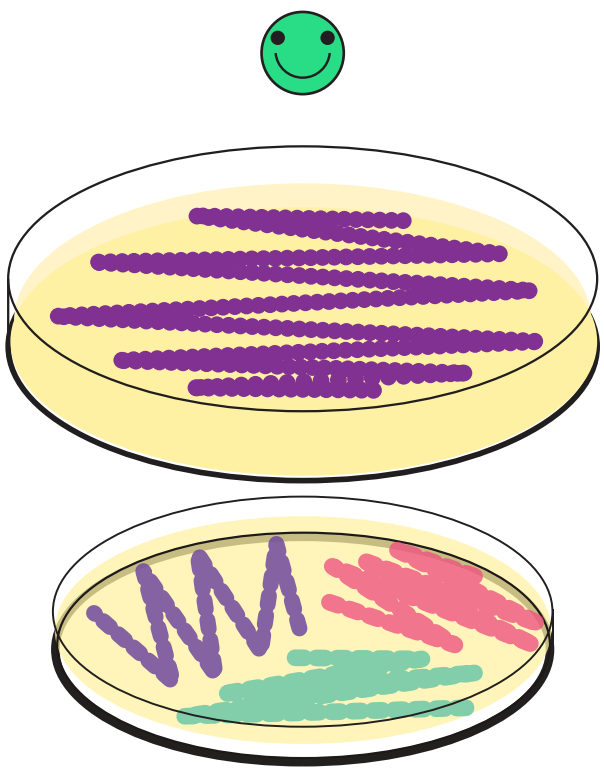


2. Tracing stencil

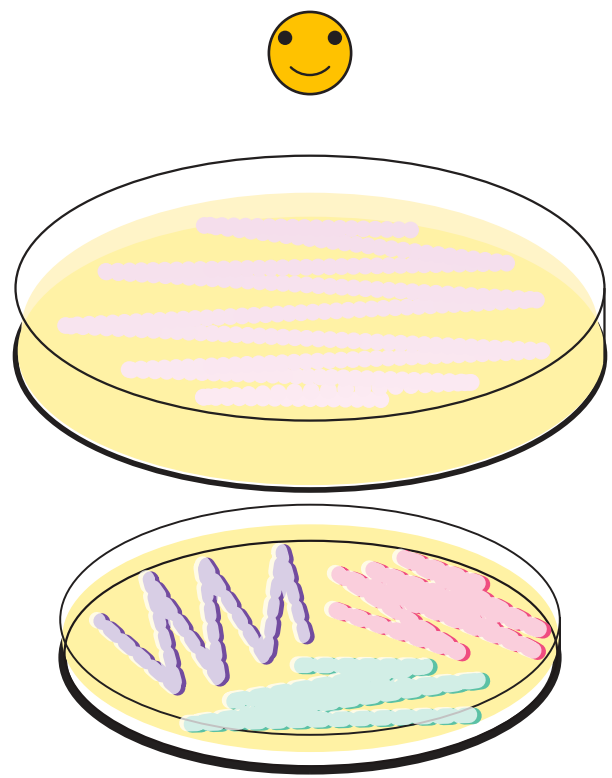


Checkpoint - Bacteria Paint

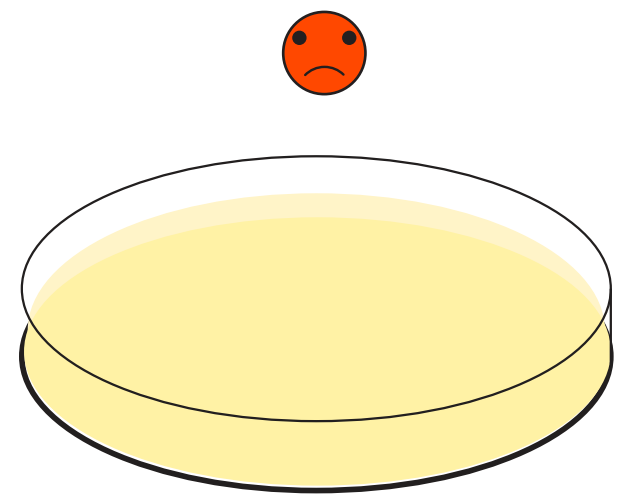
Use this guide to check if you are ready to move onto the next step.



A perfect bacteria plate has lots of brightly colored bacteria after incubation. Proceed to the next page.



A bacteria plate with somewhat colored bacteria after incubation needs more time to grow. Incubate longer and verify at 12hr intervals until the colors are bright.



If you see no growth on your plate:

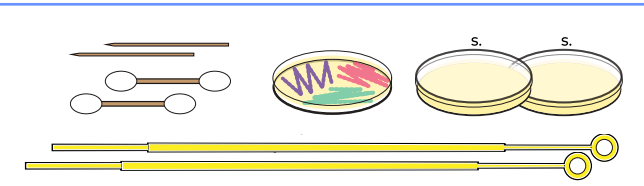
1. If your incubator was not at 37°C or is homemade, incubate for another 24hrs.
2. If you are certain you incubated at 37°C, or incubated for 48hrs and still have no colonies, you might not have had cells on your loop when you streaked. Repeat Step 2: Grow your bio paint on the plate.
3. If you still have no colonies after repeating Step 2, contact us at help@amino.bio and we will help you succeed.

3. Paint with bacteria! Day 2, 30-60 minutes + 24+ hours wait time

Goal **Create living paintings**

Materials from your kit

Selective Agar petri dish
Painting palette
Loops
"Bacteria Paintbrushes"

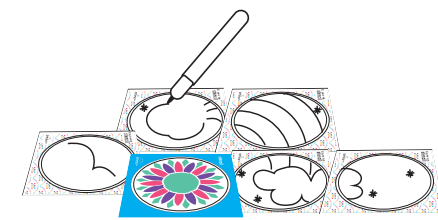


Prepare

3.1 Make sure you have colored bacteria on your painting pallette petri dish from the prior day. If you have an incubator, turn it on to 37°C.

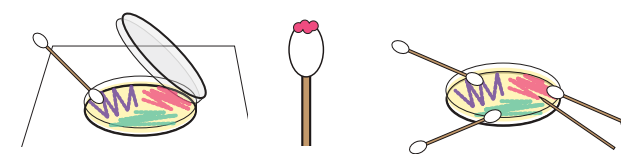
Paint!

In the next steps, you will paint your art. You do not need to paint all canvases at the same time. In fact, we recommend painting 1 or 2 the first day and seeing how the image develops while it incubates. Bacterial painting is an art that surprises! See step 3.5. to learn how to store your materials for use later.



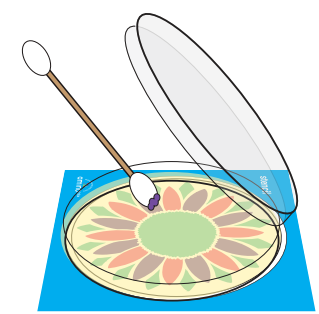
Note that you can only incubate 2 petri dish canvases at a time in a DNA Playground Home size. You can choose to paint them all now and place those that you cannot incubate right away in a ziploc bag with your painting palette and refrigerate until you are ready to incubate them, or refrigerate the painting palette and unpainted agar for painting at a later time.

3.2 Using the blank stencils and image stencil in your kit, plan your design. (If you will be using the magnetic frame in your kit (optional), notice that the display window is 4x6 inches. Design accordingly!) Sketch your art piece for each petri dish your are painting.



3.3 Set one of your selective petri dish canvas on top of your sketched stencil or the image stencil from the kit.

3.4 Using yellow loops, blue loops and the bacteria "paintbrushes" (the sterile cotton swabs and toothpicks), paint your art onto the agar by dipping into the colored bacteria from the biopaint petri dish and tracing your image, gliding on top of the agar. The agar is like a Jell-O, be careful not to puncture it as you paint. Holding your painting implement at an angle like a butter knife will help prevent punctures.

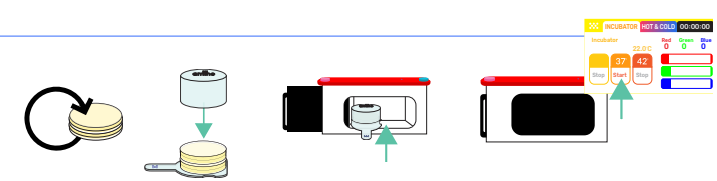


Notes: Assign a bacteria color to each paintbrush as you only have a few of these. Set them down on the edge of the bacteria painting palette when you are not using them until you have completed your art. You will not see the bacteria appear right away, but you may be able to see a “wet” trace where you have painted on top of the agar. **You only need to dip into the colored bacteria on the painting palette once to collect paint.**

3.5 Return any unused agar petri dishes, painting palette petri dish and paintbrushes to a ziploc bag and refrigerate. If you painted multiple canvases and cannot incubate them right away, place them in the refrigerator too.

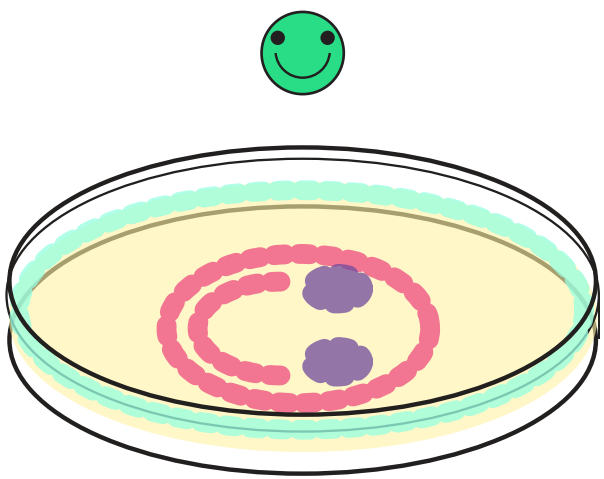
Incubate

3.6 Incubate your art canvases **upside down** at ~37°C for 16 to 24 hours (it may take longer if you do not have an incubator). You must flip your plates upside down so that the agar is up and the lid down. Place it on top of the incubator paddle if you are using Amino Lab’s hardware, and place the incubator humidity chamber on top before sliding it into your incubator.



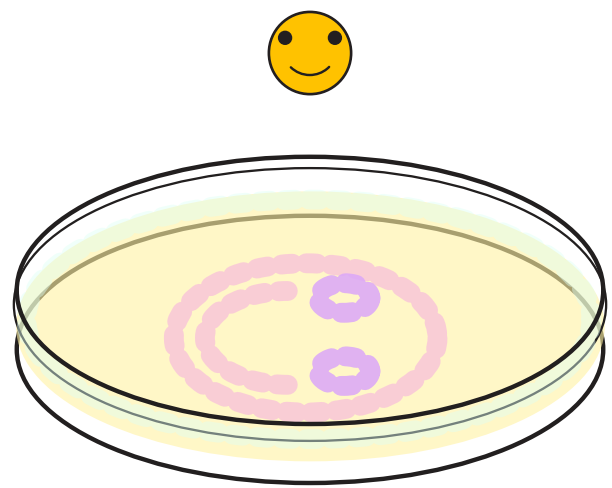
Checkpoint - Did your living art grow?

Use this guide to check if you are ready to move onto the next step.

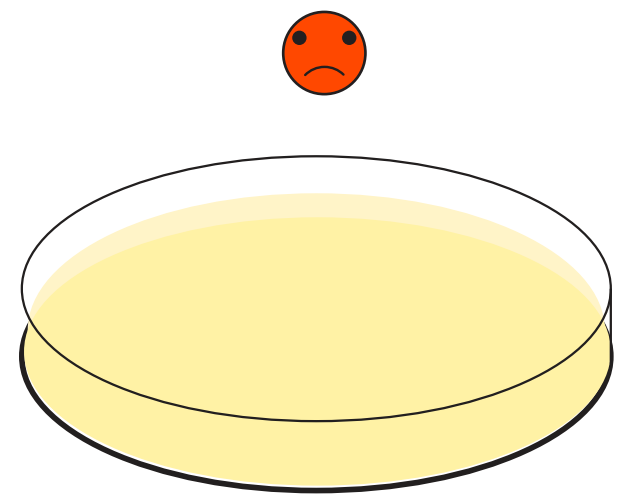


Your living painting appears over the next 16-48 hours of incubation. Your painting is ready when it is brightly colored, or as brightly colored as you like.

Proceed to the next step



A bacteria plate with somewhat colored bacteria after incubation needs more time to grow. Incubate longer and verify at 12hr intervals until the colors are as bright as you want.



If you see no growth on your plate:

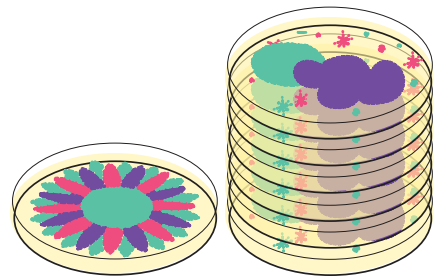
1. If your incubator was not at 37°C or is homemade, incubate for another 24 hrs.

2. If you are certain you incubated at 37°C, or incubated for 48hrs and still have no colonies, you might not have had cells on your loop when you streaked. Repeat Step 3: Paint with bacteria on the plates.

3. If you still have no colonies after repeating Step 3, contact us at help@amino.bio and we will help you succeed.

4. Prepare to print ! Day 3 or 4, 5-10 minutes, 2 hrs + of drying time

Goal Prepare your living paintings so that stick on fabric



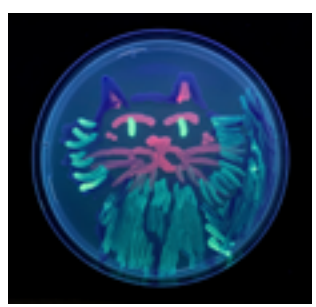
You will see your living paiting appear over 24 to 48 hours!

4.1 Once satisfied with the colors that have developped in your art, leave the plates at room temperature with the lids partially open so that all the excess water in the agar evaporates.

This will help your art “stick” to the fabric. Leave them to dry over a few hours or overnight.

4.2 If you have unused canvas petri dishes, you can repeat Step 3 for those canvases. Remember that you can only incubate 2 petri dish canvases at a time in a DNA Playground Home.

Note:
If you cannot see any growing cells at all after 48 hours of incubation at 37C, your experiment may have failed. See our troubleshooting guide at the end of the manual, compare results with your group, if applicable, or contact us with photos of your result and any documentation of your process so that we can help you succeed in the future. Make sure, if possible, to also review the video tutorials on the youtube channel (youtube.com/c/aminolabs) to see if you missed any steps!



Cat
by Amino Labs
@aminobiolab

Abstract
Neuva School
@nuevaschool

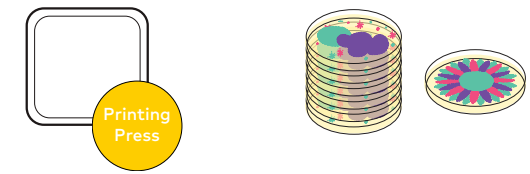
Flower
Teacher @ CCTCA2024
@aminobiolab

5. Print! Day 3 or 4, 20-60 minutes + 24 hours wait time

Goal **Transfer your art to fabric**

Materials from your kit

Your art	Loops	Printing press disk
(1) Fabric	"Paintbrushes"	



Prepare

5.1 Plan where you want to print your agar art onto the fabric... once it is pressed, the original disappears. If you will be using the magnetic frame in your kit (optional), notice that the display window is 4x6 inches. Plan your design accordingly!

Customize

If you still have biopaint left on the original biopaint petri dish, you can use it to add details and patterns to your fabric. Do this either through the pressing technique below or by dipping a clean paintbrush in the bacteria and painting directly on the fabric.

Print!

5.2 Open the first art canvas you want to print. Make sure it has been “air dried” at least 2 hours, with the lid partially open.

5.3 Lay the fabric on top of the agar, at the location where you want the art to be transferred onto the fabric.

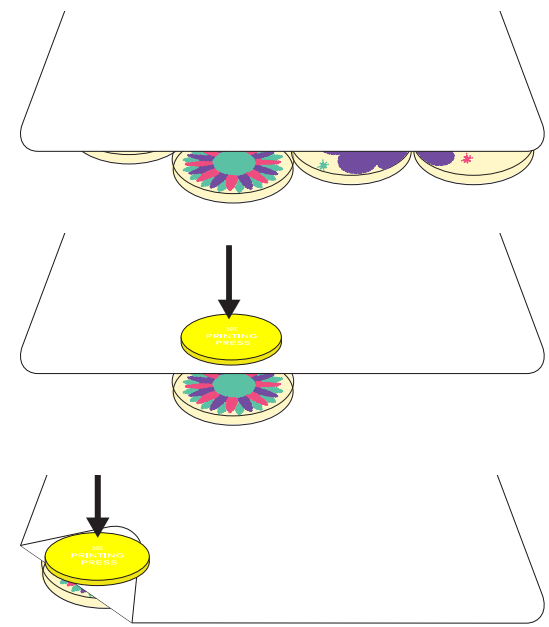
5.4 Press down on the fabric using gloved fingers and the Printing Press disk in your kit. Make sure that all the fabric touches the art.

5.5 Leave the fabric inside the petri dish for a minute to ensure good contact and transfer.

5.6 Remove the fabric gently and, **with gloved hands**, remove any pieces of agar that may have become stuck on the fabric (it happens!). Throw these in the inactivation bag.

5.7 If you have other canvas art plates, or some remaining art on the first agar art plate, repeat steps 4.3 to 4.6. This can be done over a few days as your canvases get incubated. Repeat for any patterns or art you wish to transfer.

Tips: Try layering your art by pressing the same fabric spot in different agar art canvases or folding the fabric to create mirror images! Add details with a bacteria paintbrush dipped directly in your incubated colored bacteria.



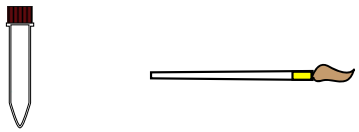
Air dry

5.8 Let your printed fabric air dry for 12-24 hours away from sunlight.

6. Seal your print Day4+

Goal **Seal in, or "fix" your print on fabric for safety and preservation**

Materials from your kit
Your printed fabric (1) Ink Sealer / Fixing medium tube (1) Sealer paintbrush



Seal
6.1 Using a large paintbrush or your gloved fingers, spread the fixing medium from your kit over the entire print surface on your fabric. This will make sure you can safely wear and touch your fabric prints.

Note:
If you are printing your fabric over a few days, wait until your printing is complete before sealing the art.

Air Dry
6.2 The fixing medium will dry over another 24 hours. Once dry gently handwash it with soapy water and rinse.
If you are displaying your art in a frame, fold or cut the fabric to fit.

Congratulations!

You have now joined the global community of bioartists! You have now made a mixed medium art piece using biology, and only a few people in the world can say that.

Share your results with your friends and our growing community and visit our website to see what's next on your journey! @aminobiolab

Now, let's make sure you dispose of and store your remaining material correctly.

Storage, Disposal, Clean Up

After you sees your results, all experiment Petri dishes, tubes of cells and loops should be in the inactivation bag in your discard container. Disposing of experiment materials is an integral part of the experiment. **Always wear gloves for cleanup!**

A. Preserving Petri dishes: If you want to preserve the living paintings or experiment results in Petri dishes instead of disposing of them, use one of our Keep-it kits. This will help you maintain the petri dish by pouring a special resin on top. If you do not have Keep-it Kits on hand but will be getting one soon, keep the Petri dishes you want to preserve in a ziploc bag in a cool area and out of sunlight in the meantime. You can refrigerate it to keep it "fresh" for up to a month.

B. Reusable materials: If you have DNA in your kit, it can last up to 6 months when stored in a refrigerator. If you wish to keep it, store it in a ziploc bag inside a sealed plastic container in a refrigerator away from food items. If you do not wish to keep it, add to an inactivation bag. Make sure the lids are separate from the tubes so that the inactivating liquid can get inside. If you see any mold or unknown bacteria growing on any material at any point, immediately inactivate them by using a solution of bleach water. Follow the inactivation instructions below. If you are out of inactivation bags, use a sturdy ziploc type bag or disposable container with a lid. Always wear gloves when handling experiment materials and cleaners!

C. Unused ingredients: If you did not use all the agar Petri dishes you poured, store these for later use. Store them in their ziploc bag within a sealed container in the refrigerator for up to a few months. Keep them away from food items. If you see any mold or unknown bacteria growing inside, then you should always immediately inactivate the Petri dishes.

D. Inactivation: Make sure all bacteria, agar, tubes, loops, paintbrushes, Petri dishes, contaminated gloves, and other non-paper material you are not keeping are in the inactivation bag. Remember that any paper packaging like loop wrappers, plastic bags, and gloves that have not touched bacteria go in the regular garbage or recycling.

Make sure all the tubes have their lids off once in the inactivation bag and add a solution of 1 part bleach to 4 to 6 parts water to the inactivation bag. Close the bag and let sit for 24 to 48 hours before discarding the liquid in the toilet and the solids & bags in the garbage. Step-by-step instructions are on the inactivation bag and in an Inactivation video on youtube; youtube.com/c/AminoLabs.

Spray some chlorinated bleach cleaner in the discard container once emptied if it has become contaminated by experiment materials. Let it sit for an hour before wiping down. You can wait to wipe it down until you empty out your inactivation bags the next day.

E. Clean your workspace: Use a chlorinated spray cleaner, wipes, or a solution of 1 part chlorinated bleach to 9 parts water to wipe down your work area and equipment. You can wipe down the minilabs with this solution and follow it with an eyeglass or window cleaner to remove the inevitable streaking from the bleach cleaner. Never use rubbing alcohol (isopropyl alcohol) on the DNA Playgrounds.

Glossary

Agar: is a Jello-like substance that serves as a growth media for bacteria. It is mixed with our bacteria's favorite food: Lysogeny broth (LB). LB is made up of yeast, vitamins, and minerals. LB can also be found liquid-form.

Antibiotics: When you transform bacteria, they will become resistant to a type of antibiotics no longer used in hospitals. This antibiotic will be mixed in with the agar and LB so that, as you incubate your culture, only transformed bacteria will grow. This is called a "selection marker".

Autoclave: An autoclave is a machine used to carry out industrial and scientific processes requiring elevated temperature and pressure in relation to ambient pressure/temperature. In life science, autoclaves are used to sterilize equipment and supplies by subjecting them to pressurized saturated steam at high temperatures (around 250 °F) for several minutes, up to an hour. Autoclaves are similar to some baby bottle sterilizers which you might be familiar with.

Buffers: Buffers are saline solutions that help, in this case, open up the cell membranes so that they may take up new DNA.

Cells: Cells are tiny, living units that function like mini-factories. Bacteria are single-celled organisms (unicellular) microorganisms. They are different from plant and animal cells because they don't have a distinct, membrane-enclosed nucleus containing genetic material. Instead, their DNA floats in a tangle inside the cell. Individual bacteria can only be seen with a microscope, but they reproduce so rapidly that they often form colonies that we can see. Bacteria reproduce when one cell splits into two cells through a process called binary fission. Fission occurs rapidly, in as little as 20 minutes.

Competent Cells: Since DNA is a very hydrophilic molecule, it won't normally pass through a bacterial cell's membrane. In order to make bacteria take in the DNA plasmid, the cells must first be made "competent" to take up DNA. This is done by creating small holes in the bacterial cells by suspending them in a solution with a high concentration of calcium (the transformation buffer). DNA can then be forced into the cells by incubating the cells and the DNA together on ice, placing them briefly at 42°C (heat shock), and then putting them back on ice. This causes the bacteria to take in the DNA and is called "Transformation".

DNA: The DNA is the set of instructions that tell the cell how to function like a computer program tells your computer what to do. DNA stands for **D**eoxyribo**n**ucleic **a**cid.

DNA plasmid: A plasmid is a small circular piece of DNA (about 2,000 to 10,000 base pairs) that contains essential genetic information for the growth of bacteria. Bacteria share vital information by passing it among themselves in the form of genes in plasmids. By inserting a new plasmid in our bacteria, we can get them to produce things for us,can get them to produce things for us, ike mini-factories. In this case, we have a plasmid that encodes for the creation of colorful pigments.

Genome: a genome is all genetic material of an organism. It consists of DNA. Learn more about genomes in the *What is DNA?* simulator on amino.bio

Heatshock: is when the cells are moved from ice-cold to warm temperature, typically 42°C, to take in DNA plasmids more efficiently.

Inoculation: is when you introduce bacteria into a medium suitable for its growth.

Inoculating Loops: are used to transfer liquids, cells, and DNA from one vial to the next instead of traditional lab pipettes, making your job easier, and less costly. They come in different pre-calibrated sizes, so you do not need to worry about minuscule liquid volumes. They are also used to spread bacteria on an agar surface without puncturing the soft agar.

Non-Selective: A non-selective plate means that any cells/bacteria put on this agar will grow as long as they are oxygen-loving organisms (called aerobic bacteria).

Plates (or Petri dish): A petri dish is a small plastic container used to culture (grow) bacteria in a controlled environment.

Recovery period: is the period after the heat shock in which the cells develop their antibiotics resistance and start dividing.

Selective: A selective plate means it contains antibiotics. When you insert a new DNA program into cells to make them create pigments, or anything else, you also put a “selective marker” (antibiotics resistance) inside the code. This means that only the cells that have taken up the new program will be able to grow on a plate that has the antibiotics mixed in. You only get the cells you transformed!

Transformation: See competent cells.

Troubleshooting

Here are some possible common issues:

Your agar is too wet/ doesn't solidify:

When done correctly, the agar will be the consistency of Jell-O. If it is not:

1. You likely did not heat (boil) the water before, or after adding the LB agar powder

2. You might not have added all the powder from the tube, resulting in too much water vs. LB agar powder.

3. You may not have fully dissolved the powder, meaning it cannot turn into a gel and will look cloudy. You can practice by making Jell-O! Next time heat and swirl longer to ensure the powder is fully dissolved.

You don't have any colonies and its been 24+ hours:

Don't worry, every scientist has experienced this, and it can take some practice before success.

1. Double check that your incubator is on at 37°C. If it is not, or if you are growing at room temperature, then it can take much longer to see the bacteria colonies. Keep waiting!

If you kept the second half of your recovered cells, you can pour them on your plate after 48 hours of seeing no engineered colonies grow and keep incubating.

2. You may need to try again to hone your skills. See our Youtube videos for tips and tricks on how to improve your chances of success.

Your colonies of bacteria grew, but they are the wrong color or there is mold on your petri dish:

Danger! If at the end of, or during, the incubation period your resulting bacteria/plate is: a)not the right color; b)is black when it shouldn't be, this is a sign that your culture is NOT YOUR ENGINEERED BACTERIA. You should immediately inactivate it and clean your space and unit.

To inactivate it, either add it to the inactivation bag or pour 100% chlorinated bleach into the dish, put the lid on and let it sit for 24 hours before throwing it out: The strong oxidizing environment degrades any living organisms. After 24 hours, if there are still organisms present add more concentrated bleach until it is almost full, and let stand for a further 24 hours.

There may be mold in your environment. We recommend, getting a small air purifier with a HEPA filter for the room.

Always be aware that concentrated bleach is a strong oxidizing agent and if poured on the skin can cause irritation, and on clothes remove color. Follow the safety and handling protocol on the manufacturer's label.

Find an interactive troubleshooter online at amino.bio/troubleshoot. We recommend using it for tips, tricks and to claim your Success Guarantee Kit if you need of one.

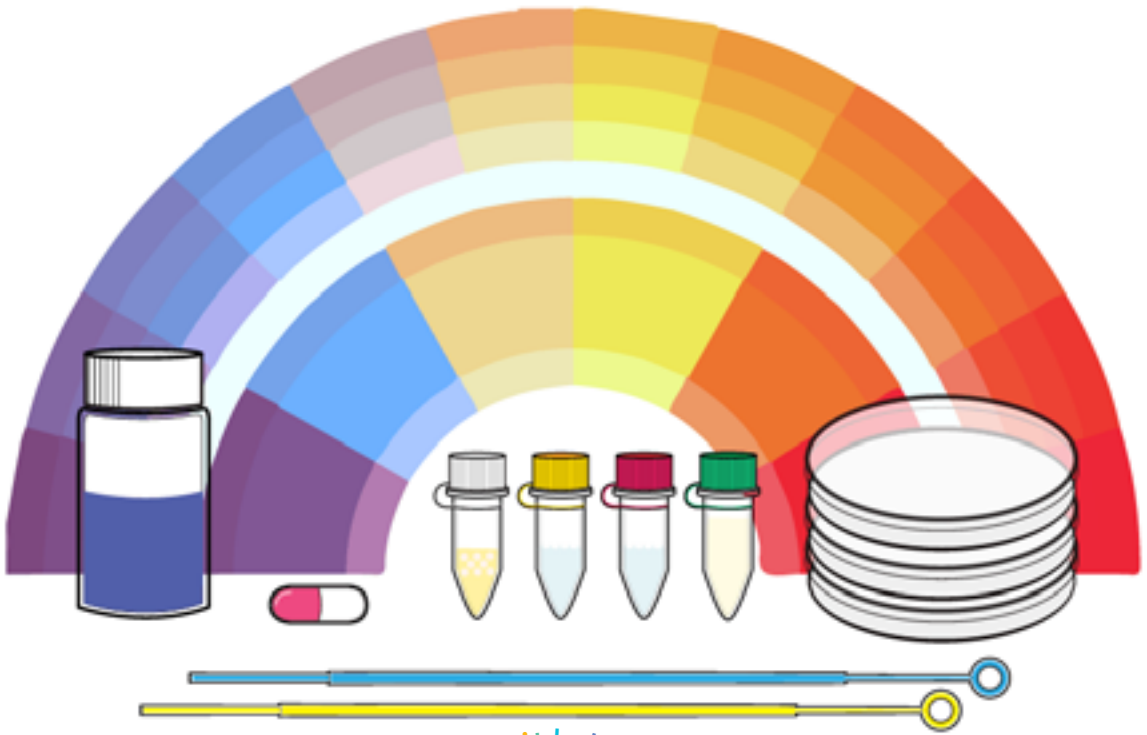
If anything else causes you issues, please contact us : help@amino.bio

More Information

Made in Canada

All Amino Labs products, from the hardware to the DNA, are invented, designed, manufactured and shipped by us, in our laboratory- workshop in Canada and we'd love to hear your feedback and suggestions to continue to make our products better and fitting to your needs. Answers to your questions and help are also just an email away.

Help and General inquiries: help@amino.bio
Feedback, Suggestions, Comments: info@amino.bio



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