THE ECVAM LABORATORY

An interactive experience on Alternatives to Animal testing for VR & Web

End-user manual

AGENDA

1. OVERVIEW

The “ECVAM Laboratory” VR experience is an innovative digital learning application for teenagers between 14 and 18 years of age. It offers an playful approach to learn about alternatives to animal testing in laboratories, aiming at enhancing understanding and awareness. Through immersive engagement, this application seeks to trigger curiosity and enthusiasm for non-animal approaches in scientific research, while also gaining basic knowledge of laboratory practices.

2. CONTENT & TOPICS

This experience takes the users inside a real-life laboratory environment where non-animal testing methods are explored. Under the guidance of a virtual professor, users will step into the role of a researcher and will perform a series of experiments to reproduce test method results. Through these hands-on tasks, users will engage in a playful and enriching experience about:

- Alternative to animal testing, by acquiring knowledge on in vitro methods used to replace traditional animal experimentation in scientific research.
- Essential laboratory activities, by gaining practical experience with core laboratory tasks such as cell identification, cell culture, microscopy, automation, and chemical assessment.

The application is available in English, the duration of the experience is about 20-30 minutes (excluding retries) and is part of curriculum/teaching set. (Information from JRC where to find and in which knowledge surrounding).

3. HARDWARE

The experience is developed for Virtual Reality Googles, specifically Meta Quest 2. It is also available for download to play locally as a desktop game on a PC (not smatphone/ tablets). The VR version is strongly recommended due to higher immersion, interactivity and therefore a possibly higher learning impact.

4. TECH SETUP & USE (VR)

4.1. General

This VR application is developed only for Meta Quest 2 and needs to be installed on the headsets in advance. In general a fully charged device has about 2-3 hours of battery life. The devices and controllers should be charged before each use. Only one student at a time can play with one VR goggle and the experience is played while sitting.

4.2. Installation guide

- Installation of application: https://www.meta.com/en-gb/experiences/ecvam-virtual-lab/6300052700119217/

4.3. Preparation of the Room

- Depending on how many VR goggles are available, the room needs to be prepared beforehands.
- A radius of 1,5 meter is recommended for each VR goggle setup
- The application needs to be used in a sitting position and preferably on a rotating chair
- To avoid that room barriers (e.g. a desk) could become obstacles, it is recommended to move the chair away from any furniture. Alternatively, the VR area could be moved to the aisles between the table (see example).
- Definition of boundaries: After preparing the room, put on the googles on the spot where the application shall be played and set the boundaries, which will either pop-up automatically or:
    - Open Oculus Menu (Oculus button on right controller) and navigate to settings / via quick settings (hover over the clock on the left side of the universal menu)
    - Select Guardian, and choose stationary boundary, confirm.

4.4. User information for / before usage

- Users can wear their glasses under the Quest 2
- Audio is integrated so no need to use extra headphones
- Explanation of controllers, headset and main control buttons should be done before starting the application. Nevertheless the specific game controls are being explained within the experience.
- Adjustment of glasses and head straps are supposed to be done before usage as well. This preparatory step is crucial for a smooth and enjoyable experience with the device. These are the main steps:
    - Loosen the side straps and then the top strap. Put the headset on from back to front. If users wear glasses, put the headset on the front first.
    - Pull the back strap down so that it rests against the back of your neck.
    - Tighten the side adjustment straps and then the top strap.
    - Make sure the straps are not too tight. The headset should fit comfortably and not put too much pressure on your face and head.
    - While holding the headset with hands on both sides, slowly move it up and down until the image is sharp and the headset fits comfortably.
- If the image is blurry, use left thumb to move the image slider on the left bottom of the headset left and right until the image is sharp.

- As this is a sitting experience and also for their own safety, users should be told, not to stand up and move around.

4.5. Start of application / streaming

- The device content can be shown/streamed on another end device (e.g. tablet or TV) if required. This enables other users to watch the application if there are not enough glasses available. But please have in mind, that users can feel embarrassed or uncomfortable when wearing a VR headset, since they are not able to see what happens around them.
- Streaming instructions:
    - Make sure you have the oculus app installaed on your smartphone
    - Pair the oculus device within the app
    - In Meta Quest 2 device: press oculus button on the right controller, select share and choose cast. In the casting options, select your smartphone
- The application can be started via the application list on the device.
- The application can be paused by pressing the Oculus button.

4.6 End of application / restart

- If the application was played until the end, it restarts automatically.
- To end the application manually, users need to use the oculus button on the right controller and select to end the application.
- There is no option to skip or jump any experiment within the application.

5. TECH SETUP (Desktop)

5.1 General

The web version is developed only for Windows PCs, not for Apple, Linux or Smartphones/Tablets. A mouse or trackpad is needed for navigating through application.

5.2 Installation guide

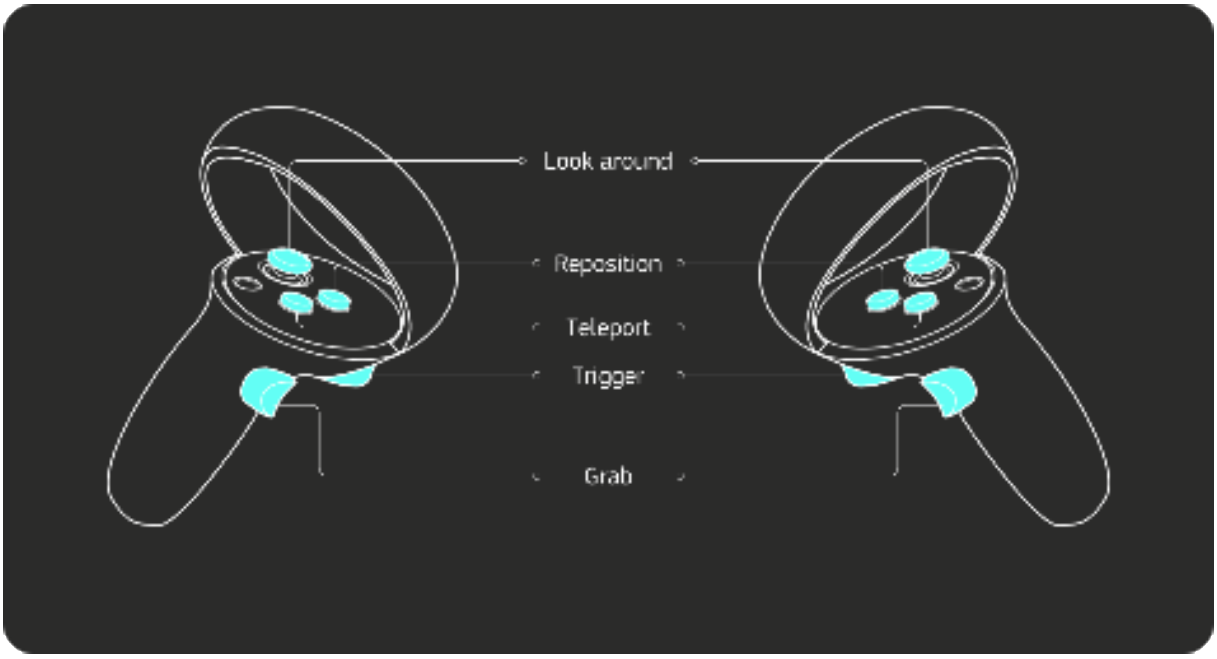
- Go to Website https://joint-research-centre.ec.europa.eu/reference-measurement/european-union-reference-laboratories/eu-reference-laboratory-alternatives-animal-testing-eurl-ecvam_en
- Download https://jeodpp.jrc.ec.europa.eu/ftp/jrc-opendata/EURL-ECVAM/datasets/ECVAM_Lab/ECVAM_Lab_Desktop.zip , unzip and open VirtualLab.exe.

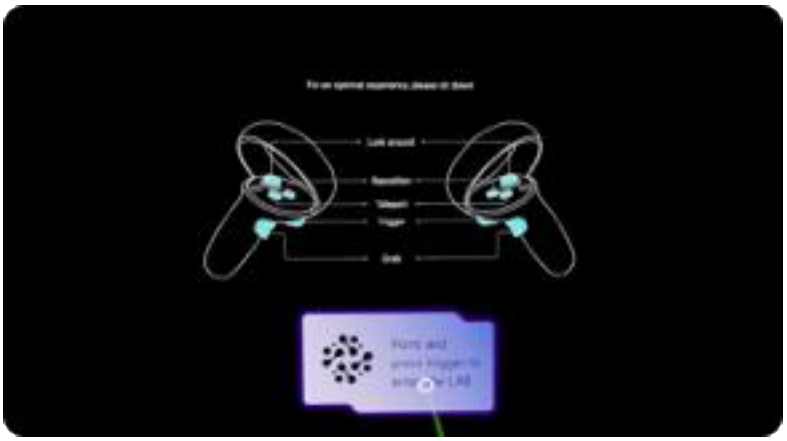
5.3 Start / Pause/ End application

- with help of the menu, the application can be paused, restarted or ended. The Menu can be found on the upper right corner, marked with a X.

6. GAMEPLAY & INTERACTION OVERVIEW

Those are the interaction possibilities with the controllers for users. Interactions can be done either with right or left hand.



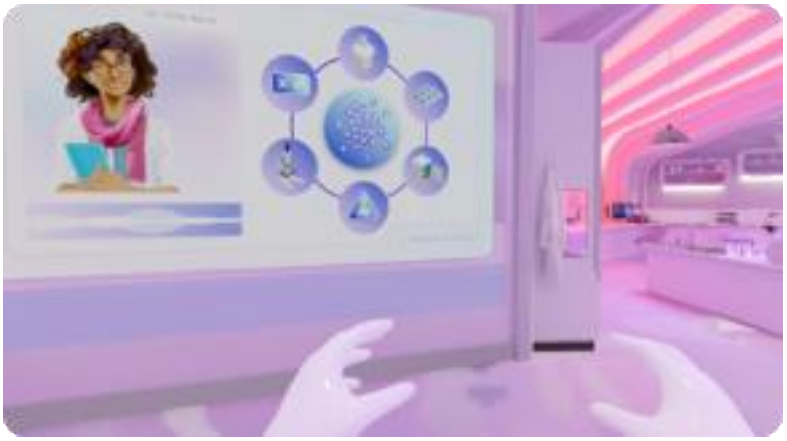


6.1 Start

Before the experience starts, you can get an overview of how to operate the controllers. To start the application, aim the light beam at the start button and confirm this by **pressing the trigger button** on the controller with your index finger.

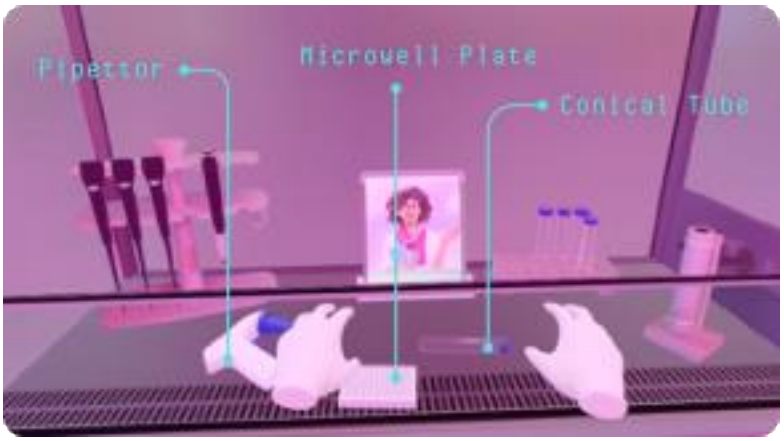
6.2 Intro

After you have entered the lab, you will receive a video call from professor Elena. You can accept the call by aiming the light beam at the phone icon and **pressing the trigger button** on the controller with your index finger.



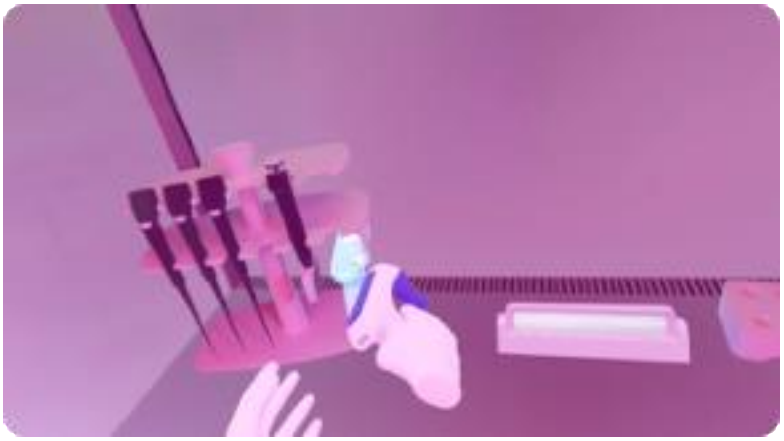
While the professor explains the upcoming experience, you can watch her presentation or look around the lab by **using the joysticks** on the controller or turning around on a rotating chair.

After the intro, the first blue teleportation point appears. To teleport there, **press the teleport button (A or X)**, aim at the teleportation point and **release the button**. You can use this principle to move through the laboratory throughout the entire experience.

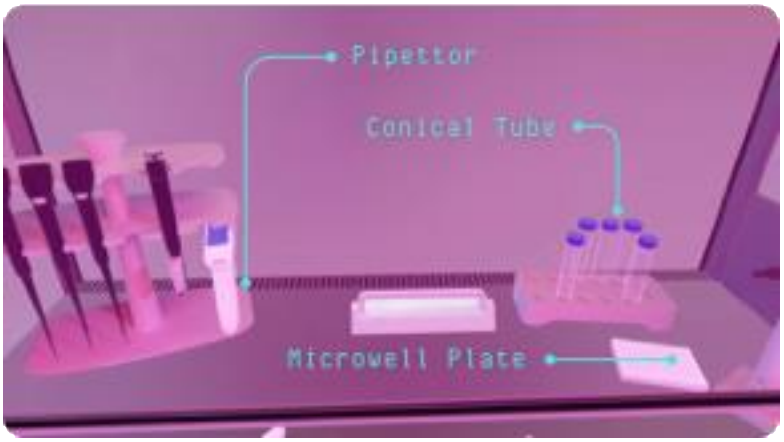


6.3 Preparations

Your first assignment is to clean up the laminar flow hood and put each tool (the **pipettor**, the **microwell plate** and the **conical tube**) in its designated place.



Grab the tool by **pressing the grab button** on the controller with your middle finger. When grabbed, move the tool to the designated place and then let it go.



When you have put all the tools back in the designated place, your workspace should look like this.

6.4 Cell Matching

Your second task is to test your ability to recognise organ-specific cell images. You have to assign each cell type to the correct organ on the human hologram. Just grab a cell image located on the table to your left and hold it on the corresponding organ. Grab the image by **pressing the grab button** on the controller with your middle finger.

When you get closer to the right organ, you can feel a vibration on your controller as well as hearing a sound. As soon as you can see a blue circle indicator, you know you found to right organ. Wait until the cirle is fully loaded.

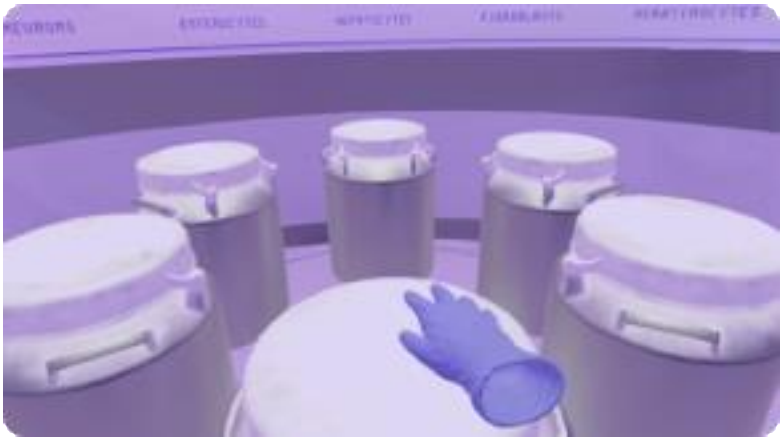
When you have assigned the cell image to the correct organ, you will hear a sound that tells you that you are right. When you have correctly assigned all four cell images, the task is complete.

6.5 Nitrogen Room

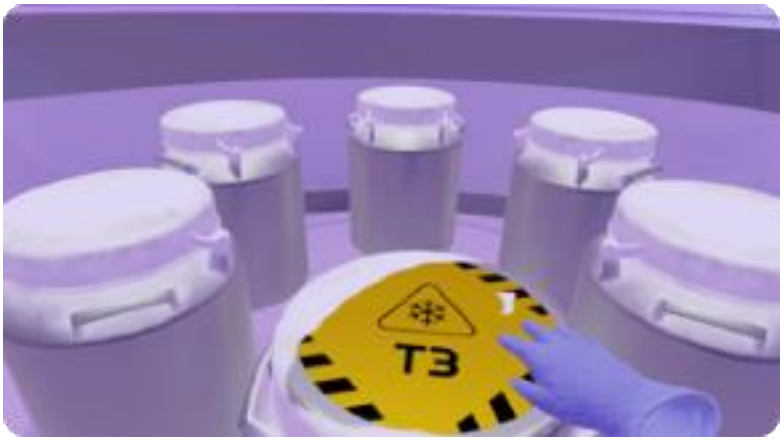
To ensure your safety during the next procedure, you have to put the safety gear on. There are gloves and a visor in the locker in front of you. You can put on the gloves by grabbing them with the **grab button** on the controller.

You can also grab the visor by **pressing the grab button**…

... and hold it in front of your face to put it on.

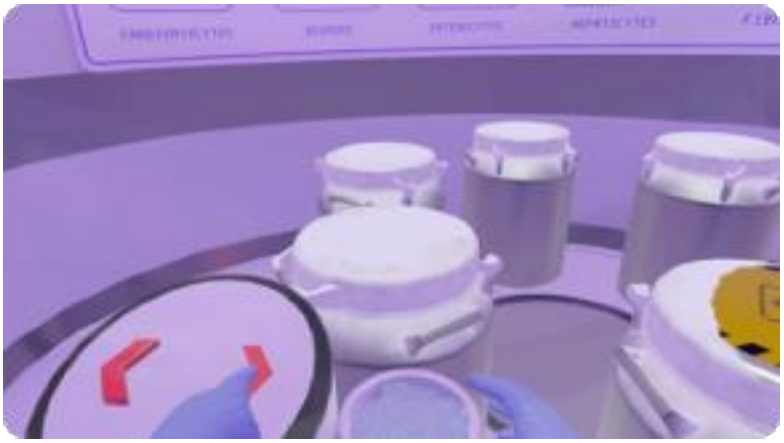


Your next task is to find the neurons for the upcoming experiment. To find the neuron cells, you must identify the tank in which the cells are stored. The tank number is hidden under a layer of frost on the lid of the tanks.

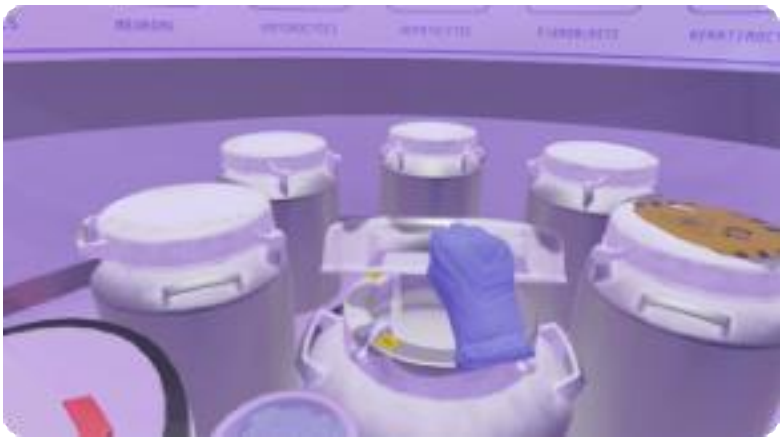


Scratch the frost off the lid by moving your hand over it **without pressing any button** on the controller. Then read the labels to see if it is the right tank.

The tank you are looking for is number **2.**



To search for the right tank, you can rotate the roundabout by pressing the red arrow buttons. Simply press the button with your virtual index finger **without pressing any button** on the controller.



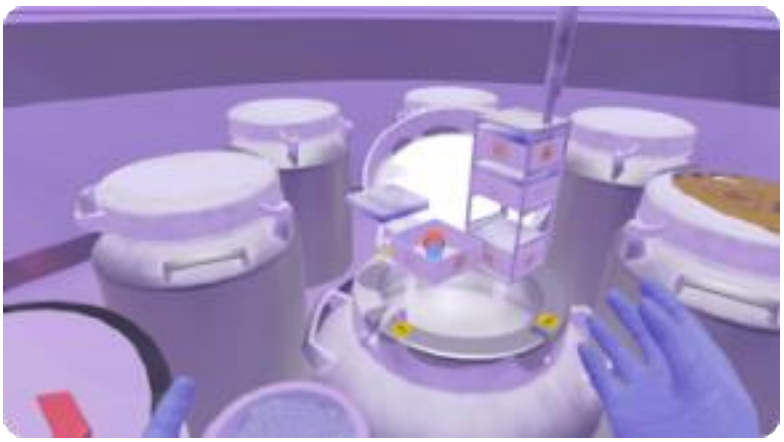
When you have found the tank with the right number, open it. Just grab the handle by **pressing the grab button** and push it back.

After you have opened the tank, you will see various hooks holding racks with cell vials. Grab the hook by **pressing the grab button** with your middle finger and pull the right one up. After you have pulled the rack out, you can simply release it.

The rack you are looking for is number **4**.

Once you have found the right rack, you now need to find the box in which the neurons are located. To open the box, simply tap it with your virtual index finger **without pressing any button on the controller**.

The box you are looking for is number **3**.

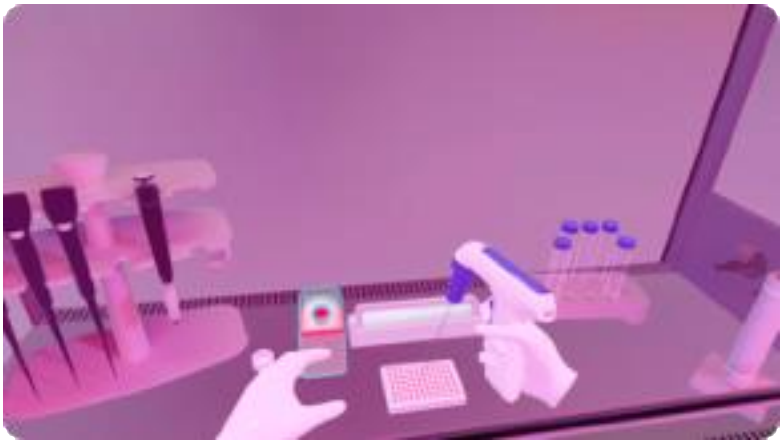


After you have tapped the correct box, it will open automatically and you will find the vial containing the human neurons required for the upcoming experiment.

Now you have to place the neurons on ice. Just grab the vial by **pressing the grab button** on the controller with your middle finger and place it in the ice bucket to your left.

6.6 Culturing neurons

Your next task is to culture the cells. First, take the pipettor by **pressing the grab button** on the controller and insert it into the bottle with the red culture medium. Carefully aspirate the liquid out of the bottle by pressing the trigger button – hold it

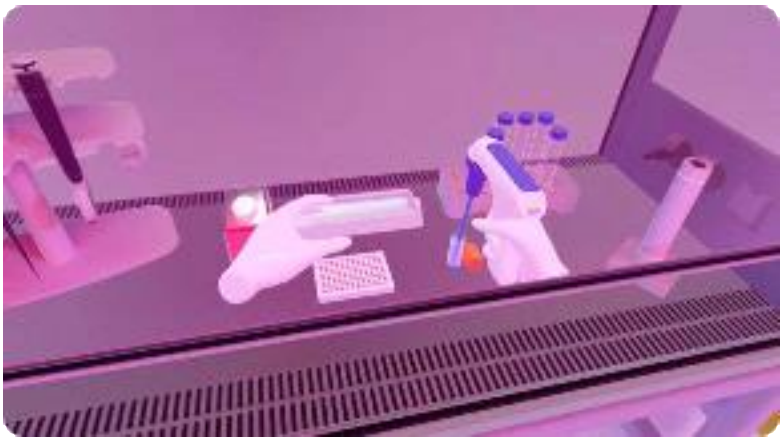


Now guide the filled pipette to the empty microwell plate and gently dispense the culture medium from the pipette into it by **releasing the trigger button** on the controller.

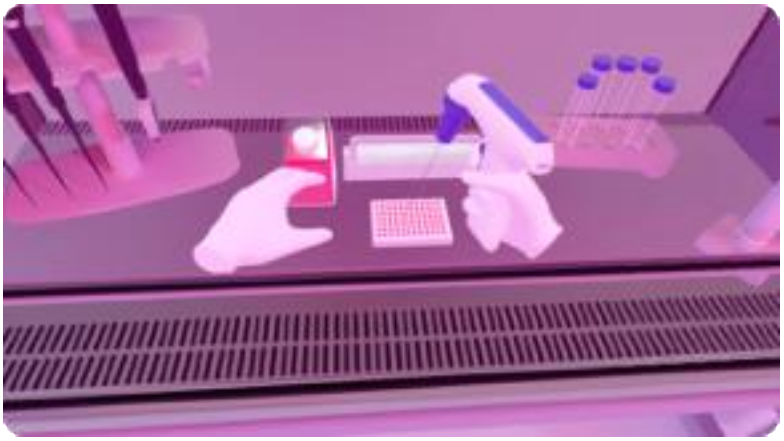
If you let go of the medium outside the microwell plate, the professor explains, that you have spilled the liquid and you need to do step 1 of aspirating the red culture medium again.

Now we have to exchange the pipette, to make sure it is sterile for its use with neurons. Hold the pipettor into the pipette dispenser to your right.

Note: this can be difficult. The pipettor needs to put into the dispenser as seen in the picture. When successfull you can hear a sound, the professor starts speaking and the dispenser is not highlighted in blue anymore.



Now it is time to mix the neurons with the culture medium. Carefully aspirate the neurons (blue medium in little tube) out of the vial by **pressing the trigger button** on the controller.



Once you have aspirated the neurons, move your pipette to the microwell plate and dispense them into it by releasing the trigger button.

This can be repeated if the cells have been dropped outside the microwell plate

6.7. Incubator

Your next task is to adjust the right settings (**temperature, humidity and CO2**) on the incubator to maintain the ideal conditions for culturing the neurons.

To adjust the **temperature**, grab the handle on the left side by **pressing the grab button** and pull it down carefully.

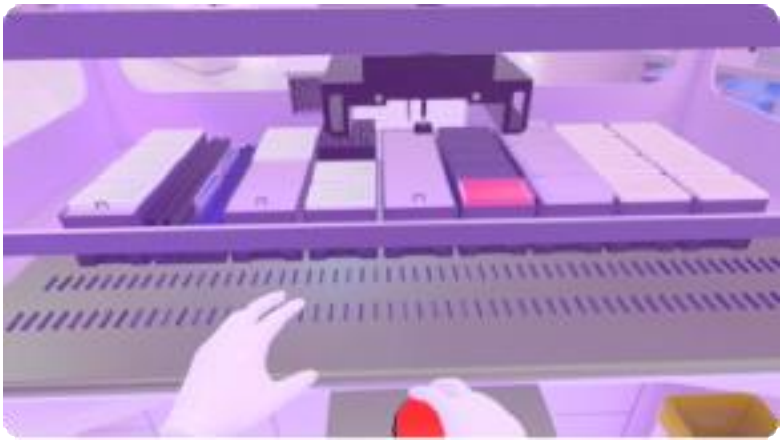
The correct setting is **37°C**

To set the **CO2** level, grab the control wheel on the right side by **pressing the grab button** and turn it carefully until you have found the right setting.

The correct setting is **5%**.

To set the **humidity**, simply press the red button on the incubator until you have found the right setting. Just use your virtual hand **without pressing any button on the controller**.

The correct setting is **95%**.



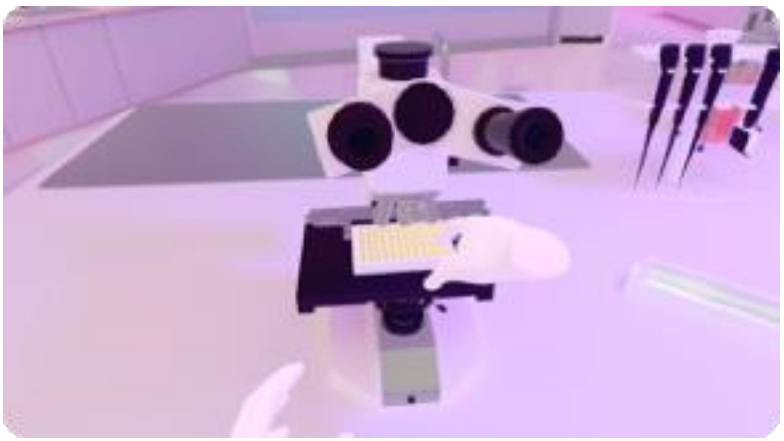
6.8 Robot

Your next task is to expose the cultivated neurons to the selected chemicals. To do this, simply start the liquid handling robot by pressing the big red start button and see what happens.

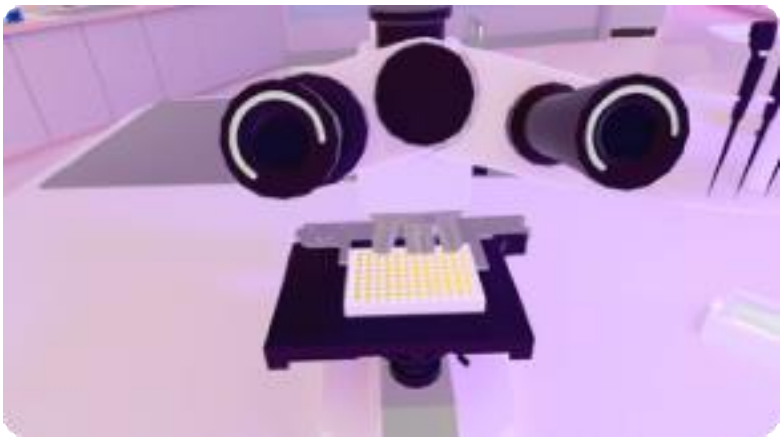
Just use your virtual hand **without pressing any button on the controller**.

6.9 Microscope

In the next step you can have a look at the result of the experiment. To do this, simply grab the well pate on your right by **pressing the grab button** on the controller....

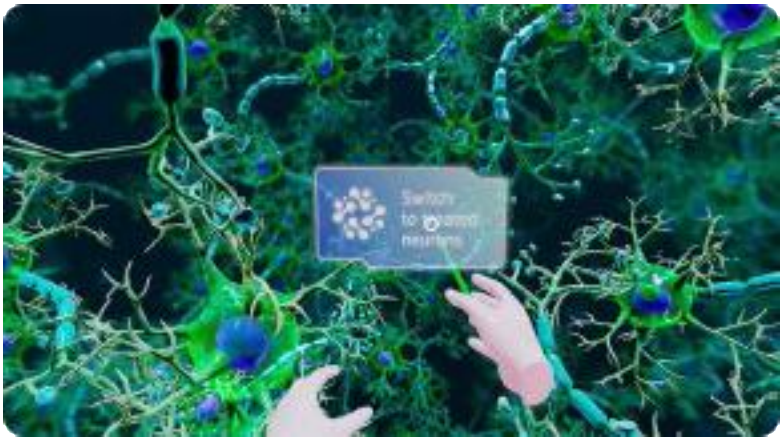


...and put it under the microscope lens.



After you have positioned the microwell palate under the microscope lens, you can **look through the microscope** to see the result of your experiment. Bend your head in the direction of the microscope **without pressing any of the buttons** on the controller. When you get close enough to the microscope, you will see two loading indicators on the ocular lens.

After a short moment, you will automatically enter the cellular space, where you can look around and explore the healthy neurons.



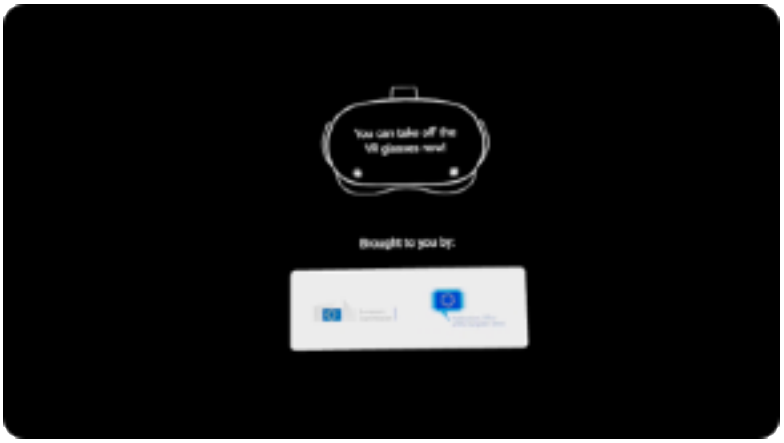
Your next task is to find out if neurons have changed with the treatment. To do so, press the switch button by aiming the light beam at the button and **confirming with the trigger button**.

This is how the environment of treated cells look like. You will get back to the lab automatically, no teleportation necessary.

6.10 End of Game

After a short time, you will automatically return to the lab and the professor will appear on the large screen. In this task you have to confirm whether your experiment was successful or not. To do this, aim the light beam at one of the buttons on the screen and confirm your answer by **pressing the trigger button**.

After you have confirmed the correctness of the test, …



…the experience is over and you can take off the VR glasses.

The application will start again automatically.

6.11 Help

If you get stuck with one of the tasks, a skip-device will appear after a short time. You can skip the task by pressing yes with your virtual index finger. You can also grab the device by the red handles and place it where you want. This way you can continue the task and can skip later if necessary. If you press no, the device disappears.

7. TROUBLESHOOTING & FIRST AID

If users are having issues with the headset, try to reboot to resolve the issue. To restart the device:

- Press and hold the power button to display the power off options.
- To restart the device, select Restart using the controller.

The Quest and room should be calibrated before usage if possible. For example new furniture or light differences can cause issues:

- Open the Settings menu.
- Select Devices.
- Select Controllers.
- Under Left Controller or Right Controller, select Calibrate Controller.
- Follow the on-screen instructions.

Positioning:

- Use the headset indoors and avoid direct sunlight, as this can negatively impact the cameras on the device.
- Quest works best with reference points within sight, so avoid using it in empty rooms
- Avoid using it on highly reflective or polished floors (like linoleum) – this might make it hard for the Quest to detect the floor and align the tracking, especially in combination with light reflections from bright light sources.
- Users should have enough space to use their arms freely and remove any objects that could be in the way
- A swivel chair can enable more seamless orientation, but the game also offers in-game options to re-center the position when pressing the “B” button and turning aroung using the joystick.

Motion Sickness:

- Users, while in VR, should not be left unattended. Be aware of and respect each user‘s comfort level with VR; monitor users for any signs of discomfort or distress during the VR experience.
- Users can remove the headset at any time, especially if they feel any symptoms of motion sickness, like dizziness or nausea.

Hygiene:

- Ensure proper hygiene by cleaning and disinfecting the headset and controllers before and after each use, particularly if shared between users.
- If the users are outside the boundary or too close to it, they either see a mesh grid or the room itself (and no longer the digital world). The users either have to move back into the boundary or the boundary needs to be reset.
- If users are feeling like they are hovering, this means the floor/ room is not detected. To solve it and re-calibrate within the room, press the B-Button for about 1 second.

Developed by: