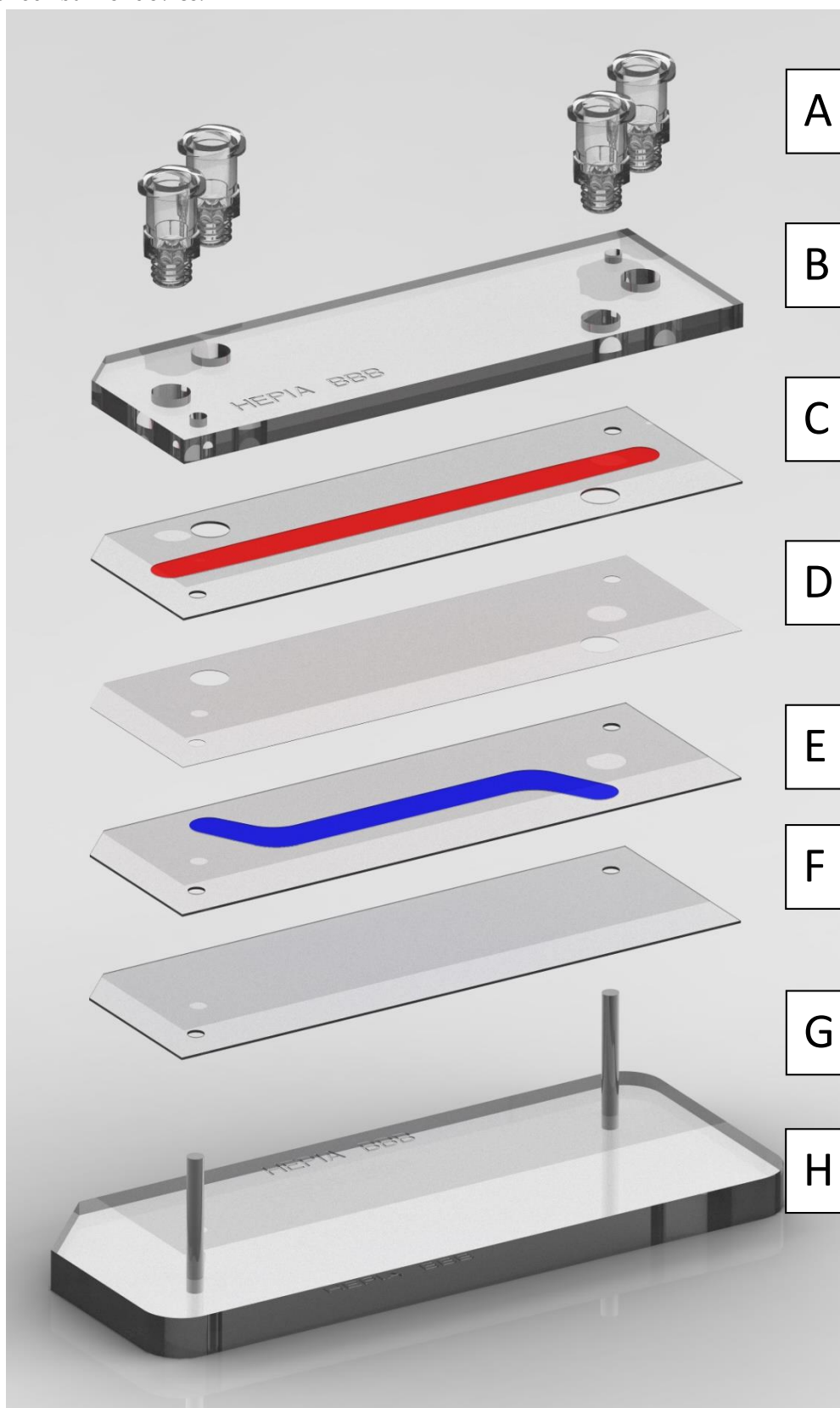


Supplementary data 1. Device manufacturing procedure

Exploded view of our barrier device:



Legend:

- A. Polycarbonate 10-32 UNF Female Threaded Luer
- B. 3 mm Cell Cast Acrylic Glass: « hepia_bbb_top.stp »
- C. 0.5 mm Cell Cast Acrylic Glass + 467MP 200MP Adhesive: « hepia_bbb_upper_channel.stp »
- D. PET Unique-Mem Track-Etched Membrane (0.4 µm pores)
- E. 0.3 mm Cell Cast Acrylic Glass + 467MP 200MP Adhesive: « hepia_bbb_lower_channel.stp »
- F. 0.3 mm Cell Cast Acrylic Glass: « hepia_bbb_bottom.stp »
- G. 2 x 20 mm A4 Stainless Steel Pin
- H. 5 mm Cell Cast Acrylic Glass: « hepia_bbb_template.stp »

Material and consumables:

Polycarbonate 10-32 UNF Female Threaded Luer (#LMX66-YC0, Ark-Plas)
Thickness 0.3, 0.5, 3, or 5 mm transparent VOS Cell Cast Acrylic Glass (PMMA) (HESAGLAS VOS, Topacryl)
Adhesive Transfer Tape (#467MP 200MP; 3M)
PET Unique-Mem Track-Etched Membrane 0.4 µm pores (Oxyphen)
20 mm A4 Stainless Steel Pin (#BN31113, Bossard)
Two component epoxy glue (#EPO-TEK 302-3M, Epoxy technology)
CO₂ laser cutter (Speedy 100R, Trotec)
Other material : Nitrile gloves, small mallet, steel spatula, glass plate, tweezers, 70 % ethanol, clean room wipes (#05511, Kimtech), scalpel, rubber hand roller, squeegee

Files used to cut the PMMA and adhesive tape:

« hepia_bbb_top.stp » or « hepia_bbb_top.dxf »
« hepia_bbb_upper_channel.stp » or « hepia_bbb_upper_channel.dxf »
« hepia_bbb_lower_channel.stp » or « hepia_bbb_lower_channel.dxf »
« hepia_bbb_bottom.stp » or « hepia_bbb_bottom.dxf »
« hepia_bbb_template.stp » or « hepia_bbb_template.dxf »

Preparation of the PMMA and adhesives:

- Preparation of the plate B:
 - Cut a 3mm PMMA plate with the CO₂ laser cutter using the file « hepia_bbb_top.dxf »
- Preparation of the plate C
 - Remove the two protective layers of a 0.5mm PMMA plate
 - Apply the adhesive transfer tape on both sides of the PMMA plate using a squeegee
 - Cut the prepared 0.5mm PMMA plate with the CO₂ laser cutter using the file « hepia_bbb_upper_channel.dxf »
- Preparation of the plate E
 - Remove the two protective layers of a 0.3mm PMMA plate
 - Apply the adhesive transfer tape on both sides of the PMMA plate using a squeegee
 - Cut the prepared 0.3mm PMMA plate with the CO₂ laser cutter using the file « hepia_bbb_lower_channel.dxf »
- Preparation of the plate F
 - Cut a 0.3mm PMMA plate with the CO₂ laser cutter using the file « hepia_bbb_bottom.dxf »
- Preparation of the plate H
 - Cut a 5mm PMMA plate with the CO₂ laser cutter using the file « hepia_bbb_template.dxf »

Assembly:

1. Assembly of the template:

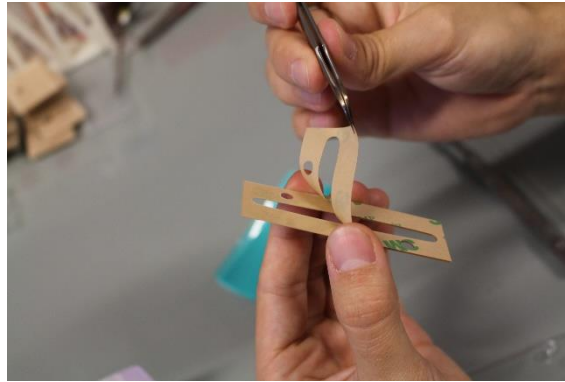
Remove the two protective layers of the plate **H** using tweezers.

Gently drive in the pins **G** in the 2 mm holes of the plate **H** using a small mallet.

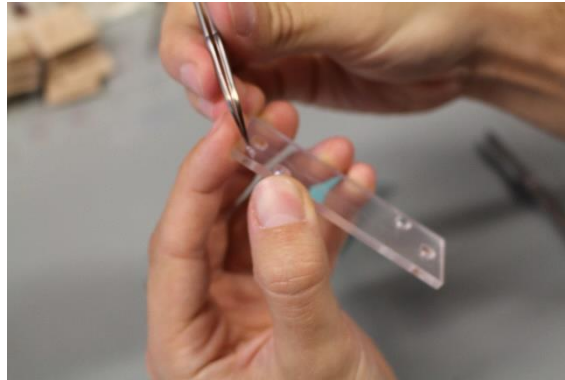
2. Assembly of the upper part:

Place the plate **C** into the template. Mind the location of the notch

- a. Remove the top adhesive protective layer of the plate **C** using tweezers



- b. Remove the two protective layers of the plate **B** using tweezers



- c. Glue the plate **B** on the plate **C** into the template
i. Mind the location of the notch
d. Remove the plate **B** and **C** assembly of the template
e. Place the membrane **D** over the clean glass plate
f. Wet the membrane using 70 % ethanol



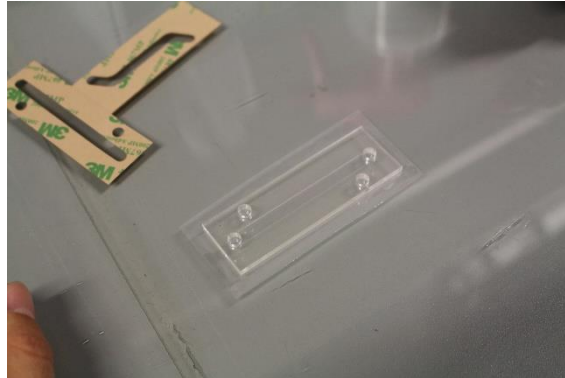
- g. Gently spread the membrane using a clean room wipe
i. Do not apply pressure over the membrane
ii. Use nitrile gloves to prevent contaminations



- h. Let the membrane air-dry
i. Remove the bottom adhesive protective layer of the plate **C** using tweezers



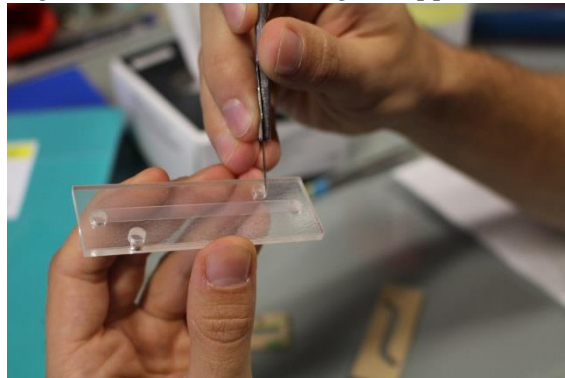
- j. Glue the plate **B** and **C** assembly on the membrane **D**
 - i. Ensure to lay flat the adhesive on the membrane to prevent folds
 - ii. Press gently on the whole surface to bond the membrane to the adhesive



- k. Trim the excess membrane around the edges by using the scalpel



- l. Open the membrane covering the 2 mm and 4.5 mm holes of the plate **C**
 - i. Use the tip of the scalpel to cut away the covered holes
 - ii. Do not damage the membrane covering the upper channel



- 3. Assembly of the lower part:
 - a. Remove the two protective layers of the plate **F** using tweezers
 - b. Place the plate **F** into the template
 - i. Mind the location of the notch
 - c. Remove the bottom adhesive protective layer of the plate **E** using tweezers

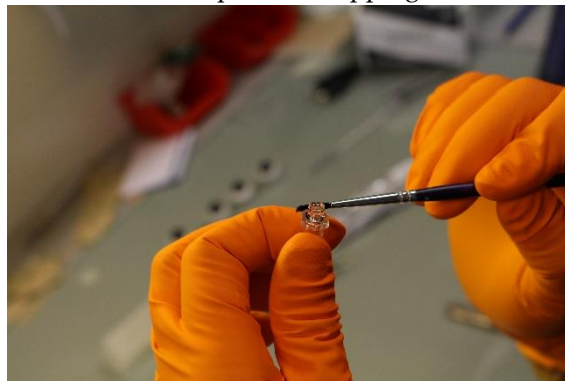
- d. Glue the plate **E** on the plate **F** into the template
 - i. Mind the location of the notch

4. Final assembly:

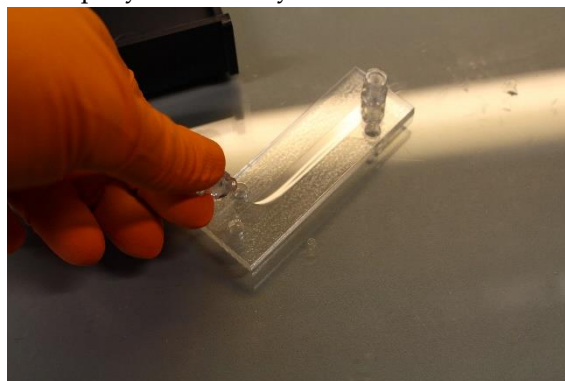
- a. Remove the top adhesive protective layer of the plate **E** using tweezers
- b. Glue the upper part on the plate **E** into the template
 - i. Mind the location of the notch
 - ii. Press gently on the whole surface to bond the membrane to the adhesive
- c. Remove the upper part and lower part assembly of the template
- d. Use the rubber hand roller to expel the air from the assembly
 - i. Protect the assembly from rubber residue by using a clean room wipe in-between



- e. Place a few drops of epoxy on the threads and chamfer of one Luer **A** using the steel spatula
 - i. Ensure to use a slightly thickened epoxy preventing the clogging of the channels
 - ii. Keep the bottom of the Luer free of any epoxy
 - iii. Do not overload the Luer to prevent dripping



- f. Push in the epoxy coated Luer in one of the holes in the plate **B**
 - i. Ensure that the epoxy coats evenly all around the Luer



- g. Repeat steps 4.d to 4.e until the four connectors are glued in the assembly
- h. Let the assembly dry upside-down at ambient temperature for 24 hours
- i. The biochip is ready for sterilisation

5. Sterilisation

Give preference to sterilisation processes that does not produce heat.

Ozone sterilisation is advised (#SterOx System, Sterilux);

Do not use solvents in the channels

Characteristics:

- Upper channel volume: 162.96 μL
- Lower channel volume: 90.4 μL
- Exchange area: 196.9 mm^2
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