OrganKits
for STEAM

NEUMOHEALTH AND ENVIRONMENT
OBTAINING FLEXIBLE LUNGS

Co-funded by
the European Union

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1. SUBJECT

Indications of the modus operandi to perform the plastination technique using silicone (S-10) in order to obtain flexible plastinated lungs (compressible and with the ability to recover shape).

2.- REAGENTS, PRODUCTS and MATERIALS

REAGENTS & PRODUCTS

- Formaldehyde 3% or 5%.

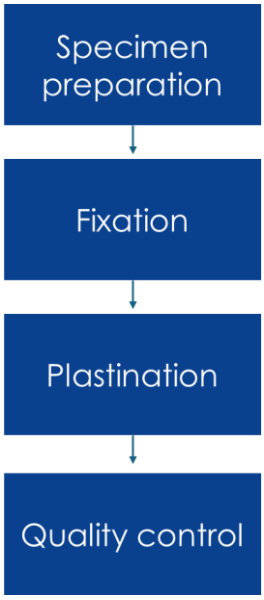
MATERIALS

- Forceps.
- Scalpel.
- Silicone Pipes.
- Peristaltic pump.

PERSONAL PROTECTIVE EQUIPMENT

- Gloves.
- Scrub.
- Protective footwear.
- Motorized individual ventilation equipment with solvent and formaldehyde filter.

3.- OPERATING PROCEDURE



3.1 SPECIMEN PREPARATION

When the slaughterhouse samples arrive, they will be checked one by one to confirm that they are in optimal condition, which means:

- No cuts in the lung parenchyma.
- No signs of disease are observed (pneumonia, necrosis of the parenchyma...).
- Correct anatomy and morphology.

Once the condition of the specimens has been checked, they will be prepared mainly by extracting as much blood as possible from the lung parenchyma.

To do this, a silicone tube is inserted and anchored in the trachea and several washes are carried out to the lungs by introducing running water through the pipe. An increase in the volume of the lungs will be observed as the water penetrates the parenchyma, it's important to avoid excessively inflating the lungs as this can cause the pleura to burst.

Washes will continue until the lung parenchyma appears pale pink. The piece will then be left to drain for a few hours to expel as much water as possible.

3.2 ATTACHMENT

Fixation is performed using a perfusion-dilation method with a continuous infusion of fixating solution with a peristaltic pump. The pump is attached to the lungs using the tube previously placed in the trachea.

The piece should be immersed in a 3-5% formaldehyde solution, maintaining a constant pumping of fixative for the next 24-48 hours. After this time, the specimen can be disconnected from the peristaltic pump and kept immersed in fixative solution as usual.

3.4 PLASTINATION

Plastination will be carried out following the general guidelines, considering the following:

- Before introducing the specimen into the impregnation mixture, the lungs must be filled with the silicone mixture. This will be done using once again the pipe in the trachea.
- A slow curing of the piece will be carried out with air insufflation in the trachea continuously. Generally, from week 4 of curing, the specimen can be introduced into the curing chamber.

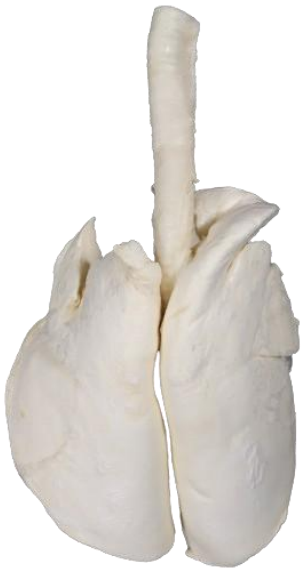
4. RESULTS AND QUALITY CONTROL

The result will be flexible lungs, so that they regain their normal anatomical shape after compression. The trachea will have the lumen open and must allow an endoscope to enter.

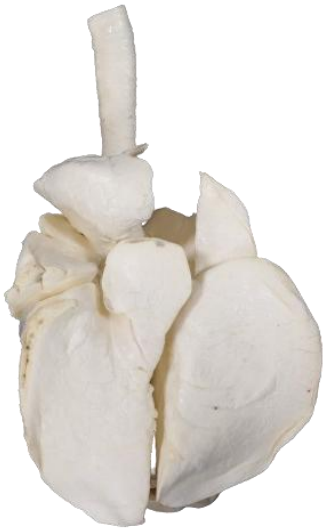
Checklist

- Suitable color ( )

- Adequate size, no alterations due to retraction ( )
- Firm and non-greasy texture ( )
- Absence of odours ( )
- Trachea ( )
- Main bronchi ( )
- Cranial right cranial lobe ( )
- Caudal right cranial lobe ( )
- Right middle lobe ( )
- Right caudal lobe ( )
- Right accessory lobe ( )
- Cranial left cranial lobe ( )
- Caudal left cranial lobe ( )
- Left caudal lobe ( )



Sheep lungs, dorsal view



Sheep lungs, ventral view

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NEUMOHEALTH AND ENVIRONMENT
OBTAINING BRONCHIAL TREE MOLDS

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1. PURPOSE

Indications of the modus operandi to perform the RTV silicone injection technique in the lungs and thus create a cast of the bronchial tree that is hidden under the lung tissue.

2. SCOPE

This protocol serves to obtain any species' bronchial cast of lungs.

3. REAGENTS, PRODUCTS & MATERIALS

REAGENTS & PRODUCTS

- RTV silicone.
- RTV Catalyst.
- Hydrogen peroxide.

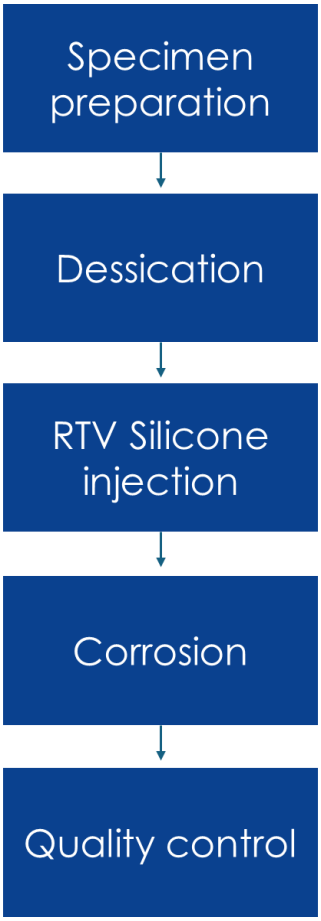
MATERIALS

- Silicone gun.
- Silicone hose (7 x 13).
- Hose adapter.
- 100 ml syringe.

PERSONAL PROTECTIVE EQUIPMENT

- Scrub.
- Gloves.
- Safety footwear.

4. OPERATING PROCEDURE



4.1 SPECIMEN PREPARATION

A cardiopulmonary block will be cleaned by selecting only the lungs. A tube will be attached to the trachea (knotted) along with an adapter.

4.2 DESSICATION

Before drying the lungs, they will be washed repeatedly with running water, allowing them to fill and emptied with massages in the parenchyma.

Later, a hose is connected to the tracheal tube, which comes from an air compressor. At a constant but not excessive pressure, the lungs should be left connected to the compressor for a minimum of 5-6 days.

The lungs must be well filled with air in order to avoid possible collapses.

4.3 RTV SILICONE INJECTION

First, the RTV type silicone mixture must be prepared following the proportions:

X mL of silicone + 10% of X in catalyst.

Example: 150 mL of silicone will be added to 15 mL of catalyst.

As a general rule, *between 150 and 180 mL of mixture should be used* for sheep lungs.

The parts will then be prepared for injection. To do this, a piece of flexible tube will be assembled in the tip of a 100ml syringe, which in turn will be connected to the lungs by means of the adapter previously placed in the trachea area. Then, with the help of the silicone gun, the silicone mixture will be injected through the windpipe.

The injection must be done very slowly, allowing the silicone to reach the entire interior of the lung and without applying too much pressure to prevent the resulting mold from being excessively dense.

Once the injection is finished, the syringe will be removed from the tube and a cap will be put on to prevent the mixture from spilling.

The following must be taken into account:

- The injected lungs must be curing for at least 2 days for the silicone to harden.
- A little sample silicone will be left to check the hardening of the mixture.

4.4. CORROSION

After the hardening of the injected silicone, the lungs will be boiled to detach the lung parenchyma from the cast created. It should be boiled about 1 hour or until the tissue softens. With the help of tweezers, the tissue will gradually be released from the cast.

In order to remove smaller remains, it will be immersed in 15% hydrogen peroxide for 24 hours.

If there are still traces of tissue, boil it again and immerse it in hydrogen peroxide.

5. RESULTS AND QUALITY CONTROL

As a result, a complete cast of the bronchial tree will be obtained that must have a loose and flexible consistency of the bronchioles and present a sufficient definition of the tracheal rings, main bronchi, segmental and several generations of bronchioles (5-6 at least).

If you notice that the bronchial mold has a sticky touch, this may be due to the fact that the products with which the mixture has been made are old or an insufficient amount of catalyst. As a possible solution, we can introduce the bronchial mold into a curing chamber with a catalyst for a few days.

Checklist

- Suitable color ( )
- Suitable size ( )
- Firm and non-greasy texture ( )
- Flexible ( )
- Absence of odours ( )
- Trachea ( )
- Main bronchi ( )
- Lobular bronchi of the right lung ( )
- Lobular bronchi of the left lung ( )
- Segmental bronchi ( )
- Bronchioles

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