

CAT LARYNX SIMULATOR FOR INTUBATION TRAINING

AUTHORS

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CONICET



C I V E T A N

DESCRIPTION

The LaryngoCUBE is an educational portable simulator of a cat larynx for the purpose of endotracheal intubation training for veterinary students. It consists of a wooden cube with a cavity in which a silicone cat larynx is embedded.

Briefly, the simulator production consists of three steps:

- (1) fabrication of the wood container
- (2) three-dimensional (3D) printing of a mold of the larynx
- (3) rubber silicone casting of the mold into the wood container

MATERIALS

- 9,5cm x 9,5cm x 12cm (3" x 3" x 4,7") low density wood cube
- Sandpaper for wood N° 180 (optional)
- White acrylic paint (optional)
- 15 gr PLA 1,75 mm filament for 3D printing
- Cyanoacrylate adhesive (instant glue)
- 60 cc of RTV rubber silicone shore 18 (57cc silicone + 3cc catalyst)
- Red acrylic paint
- Paper or acetate tape

TOOLS

- Drill Press (or Home Power Drill + Bench Wise)
- 35 mm flat wood bit drill
- 3D printer
- 100-200 cc cup
- 100 cc measuring cup or 60cc syringe
- 3-5 cc syringe or pasteur pipette
- Spoon or mixer stick

INSTRUCTIONS - WOOD CONTAINER

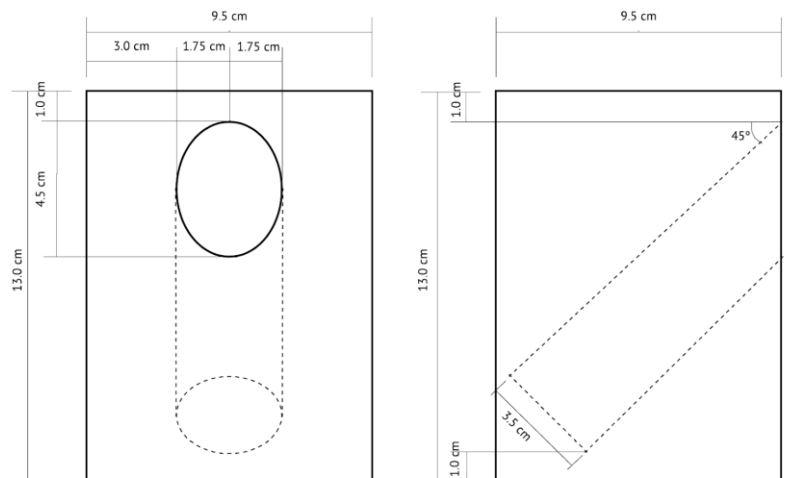
STEP 1 of 3

To fabricate the wood container (**Figure 1**), drill a cylindrical canal of 30mm diameter and 10cm length into one face of the wooden cube at a 45° angle. In order to do this, the cube must be tightly placed at a 45° angle with respect to the bench wise. It is recommended that all sides of the wooden cube are painted to increase durability and to enhance external appearance of the simulator. Sanding of any irregularities and 3-4 acrylic white paint will provide a neat finish.



CAUTION This step must be carried out by trained personnel. Always read and follow the operating and safety instructions in the power tool owner's manual and the instructions for use of the accessory. Always wear safety goggles to protect your eyes, gloves to protect your hands, and wear other appropriate protection equipment. Make sure the wood cube is well secured in the bench wise.

Figure 1: Wooden casing measurements



INSTRUCTIONS - MOLD PRINTING

STEP 2 of 3

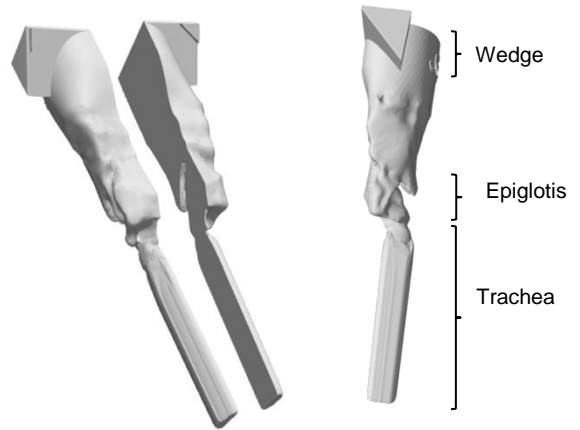
The anatomic similarity of the simulator it is obtained with a 3D printed mold (**Figure 2**) to use in the silicone casting.

Download the STL file available at <https://www.vet.unicen.edu.ar/HEPA/index.php/en/investigacion/LaringoCUBE> which contains the digital model to 3D print under the parameters shown in **Table 1**. Both parts of the mold (**Figure 2**) are then glued with cyanoacrylate adhesive.

Table 1. 3D Printing parameters and mold characteristics

Dimensions	width) 44 mm Y (length) 29 mm Z (height) 128 mm
Printing time	2 h
Material	15gr PLA 1,75 mm
Layer thickness	0,2 mm
Wall thickness	1,2 mm
Printing velocity	40 mm/s
Layer fan	Yes
Infill	15%
Support structures	None

Figure 2: Final appearance of the printed parts and final mold



INSTRUCTIONS - SILICONE CASTING

STEP 3 of 3

The final step for the simulator fabrication consists on the silicone casting of the mold, into the wooden container.

With the cube resting over a flat surface, place the printed mold into the drilled hole. With the L-CUBE logo facing up, the slim end must contact the bottom of the hole and the wedge must rest over de opening. As shown in **Figure 3**, the mold has to contact the upper edge of the end of the canal and the wedge is not centered in the opening. Once the mold is correctly settled, use tape to secure it to the cube.

Put 60cc of the fluid RTV silicone and add red acrylic paint to colour until a pink mucosal-like colour is achieved. Then add 3cc (5%) of the provided catalyst and mix thoroughly. There is no need of degassing.

Pour delicately into the wooden cube canal until all the epyglottis is filled. Tilt lateraly to release any air bubbles trapped. After the cavity is filled, tap gently the whole cube on the surface a few times to help any errant bubbles dislodge themselves and float up to the top. Refill 15-20 min later if necessary. Let the mold cure in total stillness 24 hours, at 10-25°C and a relative humidity of 40-70%. Demold, pulling the mold by the wedge. For a neat finish, cut any excess silicone that may protrude beyond the casing.

Figure 3: Printed mold placed into the wooden container

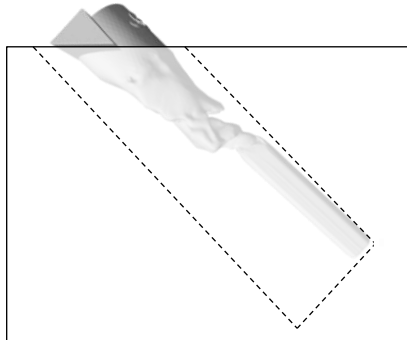
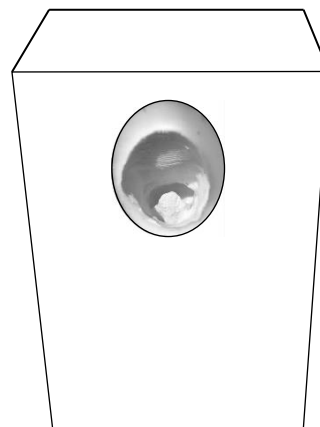


Figure 3: Finished LaryngoCUBE.



COMMENTS AND CONTACT

We welcome your questions, comments and suggestions. Please contact us at the Hospital Escuela de Pequeños Animales (hepa@vet.unicen.edu.ar) or PLADEMA Institute (pladema@exa.unicen.edu.ar) for further information.

We do acknowledge that the wooden cointainer is actually a prima, not a cube. But we didn't want to sound so nerd.