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INNOVATIVE ANIMAL-FREE TRAINING TO STEREOTAXIC NEUROSURGERY

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BACKGROUND - RATIONALE

Who performs experimental surgery ?

Surgeons, veterinarians, and **mostly researchers and technicians**
- very different background, training, and level of experience
- large variety of experimental models and species.



There is a need to harmonize practices and enhance reproducibility.

Stereotaxic neurosurgery is not taught as a subject per se, but rather passed-on behind closed door in laboratories, resulting in a variety of practices and success rates.

Here we introduce an **animal-free training on stereotaxic neurosurgery** based on our 10-years experience in regulatory initial surgery training, without animals, with high-definition simulation and compliant with the 3Rs principle.

PRE-REQUISITE

Online course covering elementary concepts of surgery



- Aseptic techniques
- Anaesthesia
- Pain management
- Per-operative animal care
- Incision and suture
- Recovery monitoring
- Post-operative care the 3Rs principle.



Online test for validation

TRAINING COURSE OBJECTIVES AND CONTENT

SOFT SKILLS

OBJECTIVES



To design a protocol combining scientific interest and animal welfare
Culture of excellence for a better culture of care

KNOW HOW

- to build a mental representation a 3D brain structure from a 2D atlas
- to identify the optimal surgical approach
- to plan and carry out the implantation of a probe from precise coordinates
- to minimize risk of irreversible harm and surgical complications

E-LEARNING AND CLASSROOM

THEORY



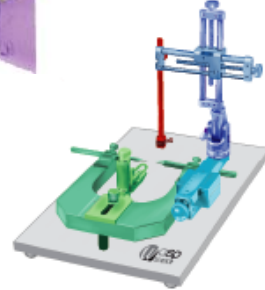
Theoretical background of stereotaxy :
- principles and technique
- anatomy and functional organisation of the brain, 3-dimensional
- arrangement of vessels and ventricles

Principles

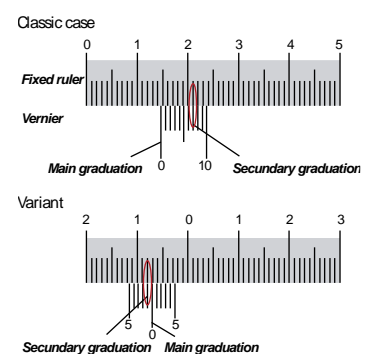
Anatomical reference planes



Stereotaxic apparatus



Precision in stereotaxic surgery
Ruler and vernier

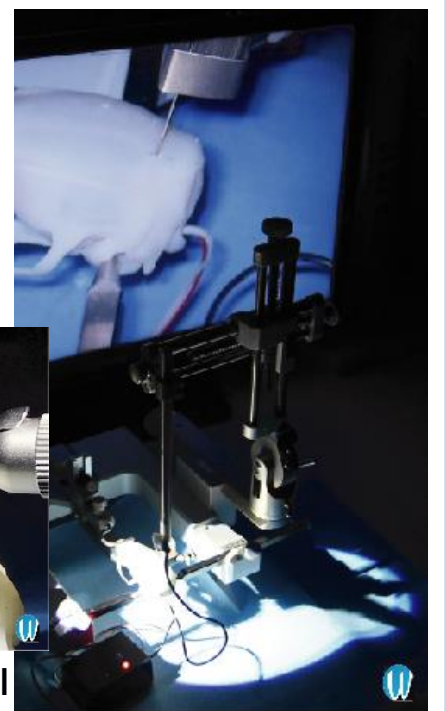


Brain atlas, cranial landmarks

Stereotaxic frame, holders, and micropositioners

Surgical approaches to optimize spatial precision and to reduce harm and complication.

High-resolution simulation
Checking the placement of a probe



HANDS ON PRACTICE



Stereotaxic frame, holders and micropositioners handling
Rulers and verniers
Calculations of stereotaxic coordinates of a brain target structure and entry point of the brain
High-resolution simulation devices
- to measure coordinates of cranial landmarks and entry points
- to safely prepare the skull for insertion and fixation of a probe

Preparing the skull for an implantation
Placing an anchor screw



Drilling the skull

1:3
Teacher/
Trainee
ratio

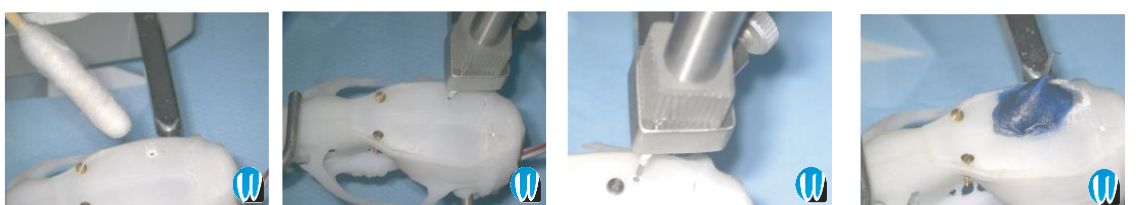


Exercises are repeated as needed
Accurate placement of a probe can be checked promptly without the need of histology.
Tools and supports available for self-evaluation and maintenance of skills once back to the laboratory.

CONCLUSION

Really designed with the 3Rs' principle in mind, this course should contribute to promote more reproducible and compassionate approaches in animal research in Neuroscience.

A new tool with predefined targets, allowing a self-evaluation under multiple approaches



Keywords : Alternative methods; Training program; Continuing education; Stereotaxic neurosurgery; Simulation