

Monocular Deprivation in Mice

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[Abstract] Monocular deprivation is an experimental technique to study the ocular dominance plasticity during critical period (Hubel and Wiesel, 1963). Generally one eye of an animal is sutured during critical period, and the sutured eye is re-opened after either less than three days (short term) or more than three days (long term). Here we describe a detailed protocol for short-term and long-term monocular deprivation in mouse (Ma *et al.*, 2013).

Materials and Reagents

1. Cotton
2. 75% Ethanol
3. Ketamine hydrochloride (100 mg/ml) (Ketaject, Phoenix Pharmaceuticals, NDC number: 57319-542-02)
4. Xylazine hydrochloride (100 mg/ml) (AnaSed Injection, LLOYD, NADA number: 139-236)
5. Xylocaine (lidocaine hydrochloride) 2% Jelly (AstraZeneca, NDC number: 0186-0330-01)
6. Bacitracin zinc ointment (USP 500 U/g) (Fougera Pharmaceuticals, NDC number: 0168-0011-31)
7. Saline (0.9% sodium chloride injection USP)

Equipment

1. Hood
2. Autoclave
3. Aluminum foil
4. Dumont #5 forcep (Fine Science Tools, catalog number: 11254-20)
5. Dumont #3c forcep (Fine Science Tools, catalog number: 11231-20)
6. Cohan-Vannas spring scissor (Fine Science Tools, catalog number: 15000-02)
7. Fine scissor (Fine Science Tools, catalog number: 14060-09)
8. UNIFY Silk surgical suture [small (P-3) 13 mm, reverse cutting 3/8 circle needle. 4-0 18"/45 cm thread] (AD Surgical)
9. Alcohol pad (PDI, catalog number: B603)

10. Gloves
11. Microscope
12. Illuminator (AmScope, catalog number: Model HL250-AY)
13. Heating pad (Harvard Apparatus, catalog number: 507220F)

Procedure

A. One day before the surgery

1. Sterilize the hood with ultraviolet germicidal irradiation for 1 h.
2. Autoclave the surgical tools wrapped with aluminum foil, some cotton wrapped with aluminum foil and another N+1 (N is the number of mice to be sutured) aluminum foil. Surgical tools include two Dumont #5 forceps, one Dumont #3c forcep, one Cohan-Vannas spring scissor and one fine scissor.
3. Sterilize the suture needle and thread with 75% ethanol one day before the surgery.

B. On the day of surgery

1. Put all the surgical tools along with some alcohol pads in the sterilized hood.
2. Anesthetize the mouse with the mixture of 100 mg/kg ketamine hydrochloride and 10 mg/kg xylazine hydrochloride intraperitoneally.
3. Clean the mouse with alcohol pads, and then put it on one sterilized aluminum foil. Put all the tools on another foil. Spray the gloves with 75% ethanol.
4. Under microscope and illuminator, suture the eyelids using sterilized needle and thread with the help of Dumont #5 forceps as follow: make 2-3 stitches, tighten the thread, make two knots, and cut the thread with the fine scissor as short as possible. For monocular deprivation of more than three days, cut the eyelashes and the edge of eyelids using the spring scissors before suturing. In case of bleeding, stop it with the cotton before continuing.
5. Apply a thin layer of xylocaine 2% Jelly and bacitracin zinc ointment to the sutured eyelids.
6. Put the mouse on the heating pad.
7. Spray the surgical tools with 75% ethanol, clean it with alcohol pads, and put it back on the aluminum foil. Dispose the dirty aluminum foil used for the mouse.
8. Repeat procedure 2-7 for other mice.
9. Put all the mice back into the holding cages after making sure they are fully recovered.
10. Clean all the surgical tools and the hood with 75% ethanol. Sterilize the hood with ultraviolet germicidal irradiation for at least an hour.

C. After monocular deprivation

1. At the end of the deprivation period, mice were anesthetized, stitches were removed, and lid margins were separated. Eyes were flushed with sterile saline and checked for clarity under a microscope. Only mice without corneal opacities or signs of infection were used.

Acknowledgments

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References

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