

## Caesarean Sectioning and Cross-Fostering of the Mouse

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**[Abstract]** A caesarean section is required if the recipient of an embryo transfer or any pregnant mouse has not given birth by the delivery time that is normal for the particular strain. It is commonly used to derive a strain of pathogen-free mice from a strain with an infection problem or one of unknown health status. It may also be necessary when some experimental procedures, such as embryonic tamoxifen administration or in utero electroporation that are known to cause difficulty in natural delivery, are to be performed during pregnancy. Ideally, use as a foster mother a female who has successfully reared one or more litters of her own and has given birth the same day or no more than 5 days before the day of operation.

**Keywords:** Mouse, Caesarean section, Foster

### Materials and Reagents

1. Paper towel
2. Ethanol wipe or 75% ethanol
3. Sterile drape
4. Pregnant mouse

### Equipment

1. Heating plate or thermal blanket which can maintain 30-37 °C
2. Surgical forceps: #7 or curved blunt
3. Straight surgical scissors

### Procedure

Caesarean section is usually performed in the afternoon, 18 days after vaginal plug is detected, *i.e.*, gestational day 19 (Video 1).



**Video 1. Caesarean sectioning and cross-fostering of mouse**

1. Kill the pregnant mother by cervical dislocation. Note that don't use drugs to anesthetize the mouse as this will reduce the survival rate of the pups (Reference 3).
2. Place the mouse on its back to expose the abdomen. Disinfect the abdomen with 75% ethanol (Murphy and Carter, 1993).
3. Lift the skin with a pair of surgical forceps and make a midline incision using surgical scissors. Pull the muscular layer away from abdominal organs to avoid damage to the uterus and make a midline incision in the same manner.
4. Take out the uterus and put it onto sterile drape using your fingers or blunt end instruments instead of sharp instruments to avoid unintentionally harming the pups, placentae or rupturing the uterine wall.
5. Carefully cut open the uterine wall to expose the embryos covered by fetal membranes. Dissect the pups from the yolk sac and amnion, and then cut the umbilical cord.
6. Transfer the pups to a clean paper towel and gently roll them over the paper towel to clean the amniotic fluid and secretions, and simultaneously stimulate the breathing.
7. Place the pups on moist tissues on a 37 °C heating plate to keep them warm until they can automatically breathe. The most obvious characteristics of the pups starting automatic breath are that their skins become pink, and they can move vigorously and squeak when their tails are gently pinched.  
*Important: Keep the pups warm throughout the whole procedure.*
8. Gently rub the foster pups with bedding material from the foster mother, and mix the foster pups with pups from the natural litter of the foster mother. Remove some of the original pups so that the foster mother has the similar number of pups to feed. Minimize the temperature difference between the two sets of pups.
9. Check for adoption not earlier than 24 h after transfer.

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This protocol is adapted from the protocol Behringer *et al.* (2013).

**Ethical statement:** Experimental protocols and the use of animals were approved by the Institutional Animal Care and Use Committee, at Fudan University and conducted in accordance with institutional guidelines of Institutes of Brain Science (IOBS), Fudan University, China.

## **References**

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