

Carlson: Human Embryology and Developmental Biology, 5th Edition

Chapter 02: Transport of Gametes and Fertilization

Test Bank

Multiple Choice

1. During the fertilization process, acrosin functions
 - A. To assist the sperm in penetrating the zona pellucida
 - B. To initiate the acrosomal reaction
 - C. To bind the sperm to the plasma membrane of the egg
 - D. As a sperm attractant
 - E. To stabilize the plasma membrane of the sperm

ANS: A

2. Which molecule of the zona pellucida serves as a specific sperm receptor?
 - A. ZP₁
 - B. ZP₂
 - C. ZP₃
 - D. Hyaluronic acid
 - E. Chondroitin sulfate

ANS: C

3. Of the barriers to sperm survival and transport within the female reproductive tract, low pH is most important in the _____.
 - A. Upper uterine tube
 - B. Lower uterine tube
 - C. Uterine cavity
 - D. Cervix
 - E. Vagina

ANS: E

4. As part of the fast block to polyspermy,
 - A. The plasma membrane of the egg becomes rapidly depolarized
 - B. Within the first minute, a wave of Ca⁺⁺ begins to pass through the egg from the site of sperm entry
 - C. The acrosome reaction is completed
 - D. Secretory products released from the cortical granules hydrolyze the ZP₃ sperm receptors in the zona pellucida
 - E. The nucleus of the spermatozoon decondenses

ANS: A

5. Under the influence of estrogens secreted before ovulation, which of the following changes in the female reproduction tracts occur(s) to facilitate the transport of the ovulated egg and/or spermatozoa?
- A. Decreased smooth muscle activity
 - B. Increased viscosity of the cervical mucus
 - C. Increased ciliation of the epithelium of the uterine tube
 - D. All of the above
 - E. None of the above

ANS: C

6. In the slow block to polyspermy, what most directly stimulates the cortical granules to release their contents into the perivitelline space?
- A. Ca^{++}
 - B. Protamines
 - C. Na^+
 - D. ZP_3
 - E. Hyaluronidase

ANS: A

7. The principal role of the corona radiata in transport of the egg into and down the ampullary portion of the uterine tube is_____.
- A. Facilitating ion exchange with the maternal fluids
 - B. Immunological protection of the egg
 - C. Providing mechanical bulk
 - D. Stimulating ciliary action in the tubal epithelium
 - E. Serving as a chemoattractant

ANS: C

8. Which of the following are functions of the ZP_3 protein?
- A. Binding of sperm and stimulation of the cortical reaction
 - B. Stimulation of the fast block to polyspermy and the cortical reaction
 - C. Binding of sperm and stimulation of the acrosomal reaction
 - D. Stimulation of completion of the second meiotic division and the cortical reaction
 - E. Stimulation of capacitation and the release of acrosin from sperm

ANS: C

9. After a spermatozoon penetrates an ovum, its nucleus decondenses and protamines are lost from the chromosomes. The protamines will be replaced by _____.
- A. Phospholipids
 - B. Acrosin
 - C. Histones
 - D. Hyaluronic acid
 - E. None of the above

ANS: C

10. In humans and other mammals that have been studied, the first spermatozoa arrive in the uterine tubes within _____ of the deposition within the upper vagina.
- A. 1 minute
 - B. 1 hour
 - C. 6 hours
 - D. 12 hours
 - E. 24 hours

ANS: B

11. Which molecule helps the spermatozoon penetrate the zona pellucida?
- A. Hyaluronic acid
 - B. Acrosin
 - C. Alkaline phosphatase
 - D. Oct-3
 - E. Activin

ANS: B

12. During the fertilization process, the acrosomal reaction plays its most important role in assisting the spermatozoon to penetrate the _____.
- A. Plasma membrane of the ovum
 - B. Corona radiata
 - C. Perivitelline space
 - D. Nuclear membrane of the ovum
 - E. Zona pellucida

ANS: E

13. The principal energy source for ejaculated spermatozoa is _____.
A. Prostatic acid phosphatase
B. Internal glucose
C. Prostatic citric acid
D. Fructose in seminal vesicle fluid
E. Glycogen released from the vaginal epithelium

ANS: D

14. During the fertilization process, the acrosomal reaction plays its most important role in assisting the spermatozoon to penetrate the _____.
A. Plasma membrane of the ovum
B. Corona radiata
C. Perivitelline space
D. Nuclear membrane of the ovum
E. Zona pellucida

ANS: E

15. Exposure to an increased concentration of which ion(s) stimulates the cortical reaction during fertilization?
A. Na^+
B. Ca^{++}
C. H^+
D. K^+
E. All of the above

ANS: B

16. The slow block to polyspermy is based on release of the contents of the _____.
A. Pronuclei
B. Cortical granules
C. Acrosome
D. Zona pellucida
E. None of the above

ANS: B

17. Which component of the zona pellucida serves as the binding site for spermatozoa?
A. Acrosin
B. ZP_1
C. ZP_2
D. ZP_3
E. Hyaluronic acid

ANS: D

18. The zona pellucida is directly involved in _____.
- A. Spontaneous abortions
 - B. Neural induction
 - C. Prevention of polyspermy
 - D. Identical twinning
 - E. Implantation

ANS: C

19. In humans, the structural basis for the slow block to polyspermy is the _____.
- A. Corona radiata
 - B. Zona pellucida
 - C. Inner acrosomal membrane
 - D. Perivitelline space
 - E. Plasma membrane of the egg

ANS: B