

Class: Biology 122

Lesson Title: Menstrual Cycle Kinulation

Class Size: 24

Time: 60 mins

Curriculum Outcomes:

313-4 Explain the human reproductive cycles.

313-3 Analyze and describe the structure and function of female and male mammalian reproductive systems

Learning Objectives:

1. Students will develop an understanding of the 4 stages of the menstrual cycle and the process of menstruation.
2. Students will be able to distinguish between the 4 major hormones involved in the menstrual cycle (estrogen, progesterone, FSH and LH)
3. Students will be able to understand what occurs in the cycle when an egg is fertilized and when it is not.

Materials:

- Pinnies (5 different colours to represent each hormone and the uterus lining)
- Tape (to create a pathway representing the fallopian tube leading to the uterus)
- Phase cards (Menstruation Phase, Follicle Stage, Ovulation Stage, Corpus Luteum Stage)
- A name tag for the student selected to be the follicle. One side of their name tag should say "follicle" and the other side should say "corpus luteum".
- Nametag or white blanket for the sperm
- Helmet for the mature egg (optional)
- Streamers for fallopian tube (optional)

Preparation beforehand:

- Tape an area on the floor that resembles Figure 1
- Prepare phase cards (cardstock paper works well)

Note: Only one fallopian tube and ovary will be represented in this kinulation for clarity

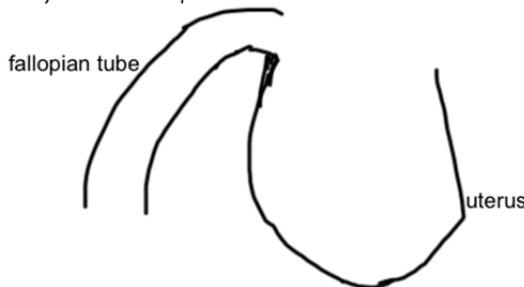


Figure 1

Things to know beforehand:

- **Menstruation Phase** (Days 1-7)
 - o Begins the first day of bleeding (a woman's period)
 - o Levels of progesterone and estrogen are low
 - o Uterine lining is shed through cervix, out the vagina
- **Follicle Phase** (Days 7-14)
 - o Estrogen is released from ovaries to thicken uterus lining, helps it grow, ready to receive a fertilized egg if pregnancy occurs
 - o Follicle stimulating hormone (FSH) released (from pituitary gland) to stimulate growth of ovarian follicles
 - o Each follicle contains an egg, later in the phase only one follicle continues to grow (the dominant follicle)
 - o An estrogen surge occurs just before ovulation and this stimulates the luteinizing hormone (LH)
 - o LH surge occurs to commence the ovulation phase

- **Ovulation Phase** (Days 14-15)
 - o The LH surge triggered ovulation, aka the release of the mature egg from follicle into one of the fallopian tubes
 - o The egg moves down the fallopian tube while the uterus lining continues to thicken and grow
 - o FSH levels decrease
 - o The egg has a very short time to be fertilized in the fallopian tube (within 12-24 hours of ovulation)
- **Corpus Luteum (or Luteal) Phase** (Days 15-28)
 - o After ovulation, the follicle becomes a hormone producing structure called the corpus luteum
 - o This produces progesterone which readies the uterus for the implantation of a fertilized egg
 - o If pregnancy does not occur, the corpus luteum will degenerate 2 weeks after ovulation, causing progesterone levels to drop and signaling the menstruation phase
 - o Estrogen levels are still high
 - o If fertilization does not occur and the egg is not implanted in the uterus, progesterone and estrogen levels drop and the menstruation phase begins to restart the cycle

Introduction:

1. Introduce the topic. Possible prompt questions include:
 - a. What do you know about the reproductive systems in females/males?
 - b. What is the menstrual cycle? What occurs during it?
 - c. What parts of the body are involved?
 - d. How long is the cycle? What regulates the cycle?
 - e. What are the different hormones involved in this cycle?
2. Explain what a kinulation is (broken up into kinesthetic and simulation). Tell them that these are used to help students learn difficult concepts that are otherwise difficult to picture. It allows students to become part of the demonstration, and therefore easier to remember and learn. Ask students if they would like to try one.

Activity #1 – Menstrual Cycle Set Up:

1. Explain to students that we are going to "kinulate" the menstrual cycle, following the path of an egg through the complete cycle.
2. Ask for a volunteer to be the timekeeper. They will be in charge of holding the phase cards and changing them as the cycle progresses.
3. Tell students that we are going to start in the follicle phase – right after a period has ended (after menstruation).
 - a. Where would the egg be at this point? (Start at an ovary)
 - b. Explain to students that there are two ovaries but we will just be kinulating one side of the reproductive system today.
 - c. Ask students how we could form an ovary? Ask 3-4 students to become the ovary, standing holding hands in a circle.
 - d. What are located in the ovaries? (Eggs) Ask 2-3 students to become eggs and stand in the middle of the ovary (see Figure 2).
 - e. Ask students what would happen next? We need an egg to start maturing and to do that we need a follicle. But in order to have a follicle we would need FSH. Ask for a student volunteer to put on a coloured pinny to be FSH. They can go to the ovary circle and "stimulate" the ovary to produce a follicle. The follicle will be one of the students who were part of the ovary, and should simply embrace the egg that will be matured in their arms (maintaining proximity to the ovary to represent its continued attachment – see Figure 3). Give the student who is the follicle the double-sided nametag

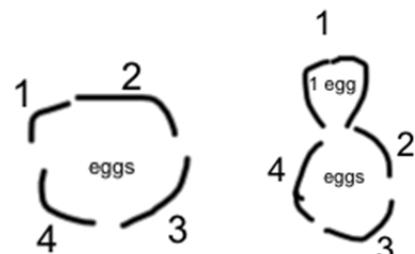


Figure 2

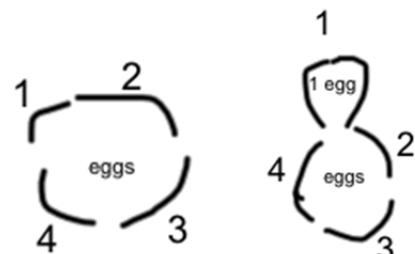


Figure 3

(Follicle/Corpus Luteum).

- f. Ask students what happens to this egg while it is in the follicle (it matures, gets ready for ovulation phase). The egg that is enclosed in the follicle can wear a helmet (optional) to show it is maturing and will be the one released (distinguishes the mature egg from the other eggs).
4. Ask the timekeeper student to change the phase to ovulation.
 - a. How does the body know to start ovulation? To trigger ovulation we need LH to be present, ask a new student to put on a different coloured pinny than the FSH student, and assume the role of LH.
 - b. The LH student can go over to the follicle student to help "release" the mature egg student currently inside the follicle.
 - c. The egg now needs to enter the fallopian tube. Get 3-4 new students to represent the fallopian tube "fingers". They will sweep the mature egg into the taped fallopian tube pathway (they can hold streamers to wave in the mature egg – optional).
 - d. Meanwhile, FSH starts to decrease so have the student playing this role stop encouraging the follicle to grow.
5. Ask the timekeeper to change the phase to corpus luteum.
 - a. Ask students what happens to the follicle once it releases the mature egg? (It becomes a structure called the corpus luteum). Ask the student who is the "Follicle" to turn their name tag over to the side that reads "Corpus Luteum".
 - b. The corpus luteum produces a hormone called progesterone whose role is to prepare the uterus for the implantation of a fertilized egg. Mention to students that estrogen is another hormone that is being produced throughout all of these phases as well (thickens uterine lining).
 - i. At this point, you can divide the remainder of the students into progesterone, estrogen or the uterine lining.
 - ii. Progesterone and estrogen students can wear two new coloured pinnies.
 - iii. The uterine lining students can go stand in the taped off area representing the uterus and line up along the sides of the uterine walls (they can wear red pinnies).
 - c. Ask the students who are progesterone and estrogen to start at the ovary/corpus luteum and travel through the fallopian tube, to the uterus and "prep" the students who are acting as the uterus lining for menstruation (they can high five, pat them on the back, say encouraging things). They can keep looping back and travelling from ovary to uterus several times to simulate the uterine lining thickening.
 - d. The person who is the mature egg is slowly travelling through the fallopian tube until they reach the uterus.
 - e. FSH and LH students are not being cycled in the system at this time (you could have them off to the side "waiting" for their time to shine again).
6. For the menstruation phase, the estrogen and progesterone levels are very low. Have the "time" student change the stage to menstruation.
 - a. Ask these hormone students to stop cycling through the system as frequently
 - b. Now, the student who is the egg has reached the uterus. To represent menstruation, the students acting as the lining can exit at the bottom of the taped area along with the egg that disintegrates and exits with the lining, blood, etc.

Activity #2 Run through with students explaining what is occurring:

1. Have students kinulate the menstrual cycle on their own now that it has been setup.
2. They can explain each step and talk it out as they are progressing through the cycle (make sure that each student talks about their role in the cycle as you proceed).
3. This is an opportunity for students to run through the cycle a few times and to give them a chance to change roles.

Activity #3 Fertilization of the mature egg:

1. Get students to go through the cycle again but now with the egg becoming fertilized in the ovulation stage

- a. What do you need to have in order to fertilize an egg? (Sperm). Ask a student to be a sperm cell (put on a white blanket or some other distinguishing item).
- b. When the student who is playing the role of the egg is released from the follicle and into the fallopian tube, have the person who is the sperm be in the fallopian tube. They can walk towards each other and then link arms when they meet to represent the egg becoming fertilized.
- c. They can travel together to the uterus. While all of this is occurring, progesterone and estrogen are still cycling through the system to prepare the uterine lining for a fertilized egg.
- d. This time when the egg reaches the uterus, it will implant there because pregnancy occurs (make sure students notice that this time Menstruation does NOT occur).

Optional Extension Activity:

1. Students can try to build the male reproductive system and kinulate the day in a life of a sperm.
 - a. It helps to have students list the parts of the male reproductive system they will need to include, on the board: testosterone, seminal vesicle, epididymis, sperm, vas deferens, testes, scrotum, penis, urethra, etc.
 - b. Much of the process is the same as the female reproductive system, other than different parts. This would be a good activity to have students extend their skills at the end and use their team-work skills to kinulate the male reproductive system.

Conclusion – Possible wrap-up questions:

1. Is egg release alternated between each ovary? (It is random).
2. What would happen if more than one mature egg were released? (Twins/triplets if fertilized!)
3. What complications can occur? (cycles out of sync, stages lasting longer than normal, problems fertilizing egg, etc.)