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| **Session 9:** | 1. **Hormonal Control of the Menstrual Cycle**

 **b) Modelling the spread of an STI** |

##

**Skills developed in this session:**

* Use of databases
* Use of Excel to design Tables and graphs
* Use of Excel for basic statistics

## Assessed criteria

Criteria C: Processing data

Criteria E: AIE

1. **Research Question**

“How can we represent the level of hormones on a graph?”

**Background Information**

When a human female is born, her ovaries already contain all the immature eggs that will later

mature and produce functional eggs during her lifetime. Eggs usually begin to mature between

the ages of 12 and 14, when a release of hormones triggers puberty and a young woman

reaches sexual maturity. Most commonly, eggs mature every 28 days or so. They usually

mature one at a time, in alternating ovaries. This rhythmic maturation of eggs and the other

chemical and physical events that accompany the process are called the menstrual cycle.

As a reaction to increasing levels of the hormone FSH (follicle stimulating hormone) eggs

start to mature in a woman’s ovary. Each egg matures inside an egg sac, or follicle, near the

surface of one of the ovaries. When the egg is fully mature, another hormone — LH (luteinizing

hormone) — reaches peak level. As a reaction to these high hormone levels, the follicle bursts

open and releases the egg. This process is called ovulation. Tiny microscopic hairs, called

cilia, on the cells at the opening to the Fallopian tube or oviduct, sweep the egg into the tube

which leads to the uterus.

As a reaction to increasing levels of the hormone estrogen, the lining of the uterus has been

prepared to receive a fertilized egg by building up its lining with nurturing tissues and blood

vessels. After the egg is released from the follicle in the ovary, the remaining follicle tissue becomes a hormone secreting gland, the corpus luteum (“yellow body”). The gland releases the hormone progesterone. High levels of progesterone help maintain the uterine in its built up, nurturing phase.

If the released egg remains unfertilized, it does not implant in the uterus lining. This triggers

further hormonal changes. Both estrogen levels and progesterone levels drop. This causes the

lining of the uterus to deteriorate. As a result both unfertilized egg and uterus lining are shed

and pass out of the body. This periodic loss of tissues and fluids from the uterus is a normal

function known as menstruation (a period).

Menstruation is considered the beginning of the monthly menstrual cycle. All of these changes are governed by coordinated hormones carried in the bloodstream from their releasing gland to their responding target cells. These hormones act through feedback mechanisms. The pituitary

gland, at the base of the brain, secretes the two hormones that trigger the growth and development of the egg in the ovary — FSH (follicle stimulating hormone) and LH

(luteinizing hormone). In response, the ovary then secretes the two sex hormones that control

development of the egg and uterus lining — estrogen and progesterone. When ovarian hormones reach low levels, this “feeds back” and stimulates the pituitary gland to once again

secrete its hormones to stimulate the development of another egg for another cycle.

**Table 1: Levels of hormones in the menstrual cycle**

|  |  |
| --- | --- |
|  | Amount per milliliter |
| Day | FSH | Estrogen | LH | Progesterone |
| 1 | 9 | 30 | 9 | 0,6 |
| 2 | 11 | 40 | 12 | 0,8 |
| 3 | 13 | 50 | 16 | 1,0 |
| 4 | 14 | 70 | 18 | 1,0 |
| 5 | 15 | 80 | 19 | 1,0 |
| 6 | 14 | 100 | 16 | 1,0 |
| 7 | 14 | 130 | 12 | 1,2 |
| 8 | 15 | 140 | 19 | 1,2 |
| 9 | 13 | 180 | 15 | 1,3 |
| 10 | 11 | 200 | 16 | 1,5 |
| 11 | 9 | 220 | 20 | 1,5 |
| 12 | 18 | 230 | 30 | 1,6 |
| 13 | 13 | 220 | 75 | 1,8 |
| 14 | 9 | 200 | 58 | 2,0 |
| 15 | 9 | 180 | 30 | 2,3 |
| 16 | 8 | 150 | 14 | 3,7 |
| 17 | 8 | 120 | 10 | 5,8 |
| 18 | 8 | 100 | 9 | 8,3 |
| 19 | 8 | 50 | 7 | 10,4 |
| 20 | 7 | 30 | 5 | 12,0 |
| 21 | 7 | 25 | 3 | 11,8 |
| 22 | 6 | 25 | 3 | 10,3 |
| 23 | 5 | 25 | 2 | 7,2 |
| 24 | 5 | 25 | 3 | 4,0 |
| 25 | 6 | 20 | 3 | 3,0 |
| 26 | 7 | 20 | 4 | 1,5 |
| 27 | 7 | 25 | 5 | 0,8 |
| 28 | 8 | 25 | 7 | 0,7 |

**Method**

Using the data in table 1, create two line graphs which show how the levels of hormones change over an average 28 days of the menstrual cycle. One graph will represent the **levels of hormones secreted by the pituitary gland**, the other graph will show **the levels of hormones secreted by the ovaries.**

**Results**

Copy and paste your graph here.

**Conclusion**.

1. Describe how the levels of oestrogen change over the first 14 days.
2. What happens after day 14 to the levels of oestrogen?
3. Is this seen in the levels of any other hormones in the menstrual cycle?
4. Which physiological event occurs at day 14?
5. Describe, with reference to its function, how the levels of progesterone change over the 28 day cycle.
6. Can you outline an example of positive and one of negative feedback in the menstrual cycle? (do some research if needed)
7. **Research Question**

“How can an STI spread in a social group?”

**Background Information**

Add the following BI, with references:

1. Why do scientists use “models”?
2. How are STI´s transmitted from person to person?

**Materials**

|  |  |
| --- | --- |
| WaterStarch solutionIodine 11 plastic cupsPippettes |  |
|  |  |
|  |  |

**Method (To be followed by the complete group, not in pairs)**

1. Label the cups with the following names:

Rachel

Richard

Pauline

Paul

Mike

Chris

Lily

Steve

Sara

John

Jodie

1. Fill 10 cups with water, except the cup marked Richard, which will have a starch solution.
2. Take 1 cup each and listen to the story read out by your teacher.
3. When a couple meet and have sexual intercourse, model this by exchanging liquid with the pipettes.
4. When the story is complete, test each cup using the iodine solution.

**Results**

|  |  |  |
| --- | --- | --- |
|  | **Positive Test Results** | **Negative Results** |
| Names: |  |  |
| Total: |  |  |

**Conclusion** (*How does the story model the spread of an STI? What treatments could you suggest to treat the chlamydia infection?)*