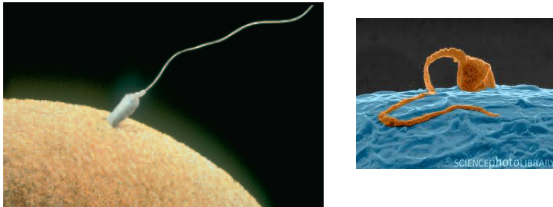


**Fertilization**

Egg cells have receptors on their surface to which sperm cells can bind.

Once binding has occurred, the enzymes found in the head of the sperm cell break down the cell membrane enough to allow the sperm cell's nucleus to enter the egg.

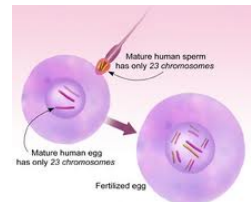
Once inside, the sperm cell's nucleus fuses with the egg's nucleus, creating a diploid nucleus. This fusion is called **fertilization**.



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Once the nucleus of sperm cell enters the egg, the chemical composition of the cell membrane changes to prevent other sperm cells from fusing with it.

The fertilized egg cell is now called a **zygote**.



The zygote starts to divide by mitosis almost immediately.

By the time it is implanted in the uterus, it has approximately 64 cells.

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**Multiple Births**

If two eggs are released during the same cycle, and both are fertilized, the result is fraternal twins.

Fraternal twins are no more alike than any other siblings.

If a zygote splits early on, and both halves continue in their development, the result is identical twins. Their DNA is identical since it came from the same original fused cell.



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**Development**

The development of the embryo occurs in 3 main stages:

1) **Implantation**: once the mass of cells is implanted into the uterine wall, cells start to **differentiate**.

Differentiated cells are specialized for a particular job and will only ever create the same kind of cell through mitosis.

ex: muscle cell vs. liver cell

2) **Gastrulation**: different layers start to emerge in the embryo.  
 - External layers will become the skin;  
 - Internal layers will become the inside lining of organs; and  
 - Middle layers mostly become tissues.

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3) **Neurulation**: At this stage, the nervous system is developed as tissues fold around a space from which the spinal cord and the brain will eventually develop.

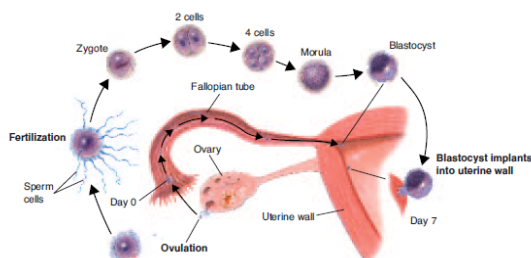


Figure 39-19, p. 1017

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Not all the cells from the originally implanted cluster will become a part of the embryo - some will develop into the tissues that surround and protect it.

The **amnion** will develop into a fluid-filled sac in which the embryo will develop. It protects and cushions the embryo.

The **chorion** will develop on the external surface and small projections called villi will intertwine with the uterine wall to keep them connected.

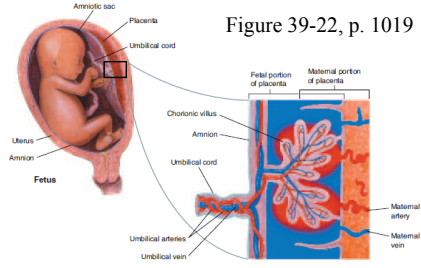


Figure 39-22, p. 1019

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**The Placenta**

The interconnected villi will form the placenta which acts as the developing baby's connection to its mother.

The mother and the baby's blood never mix, but instead flow next to one another. They are separated by a membrane that allows certain molecules to pass through.

In this way, food, oxygen and other necessary nutrients can be provided to the baby and waste materials can be removed.



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The placenta also prevents some things from entering or leaving the baby's blood stream, thereby protecting it from certain infections or harmful agents.

Unfortunately, not all harmful substances are blocked: HIV, alcohol and many drugs can pass through the membrane freely and have devastating effects on the baby.

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**Childbirth**

Many factors are responsible for the onset of labour.

One of these factors is the production of the hormone oxytocin (produced by the anterior pituitary gland).

This hormone acts on the involuntary muscles of the uterus and causes them to contract rhythmically. These contractions loosen the placental connection and start to force the baby out of the body, along with its associated tissues.

The role of the mother's reproductive system does not end at birth.

Within hours of the birth, the pituitary gland will secrete a hormone called prolactin which will stimulate the production of milk in the breast tissues.

Breast milk usually continues to be produced until demand stops. Once a child is weaned, the pituitary gland stops sending prolactin, and milk production stops.

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**Multiple Births**

If two eggs are released during the same cycle, and both are fertilized, the result is fraternal twins.

Fraternal twins are no more alike than any other siblings.

If a zygote splits early on, and both halves continue in their development, the result is identical twins. Their DNA is identical since it came from the same original fused cell.



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