

# Prenatal Development and Care

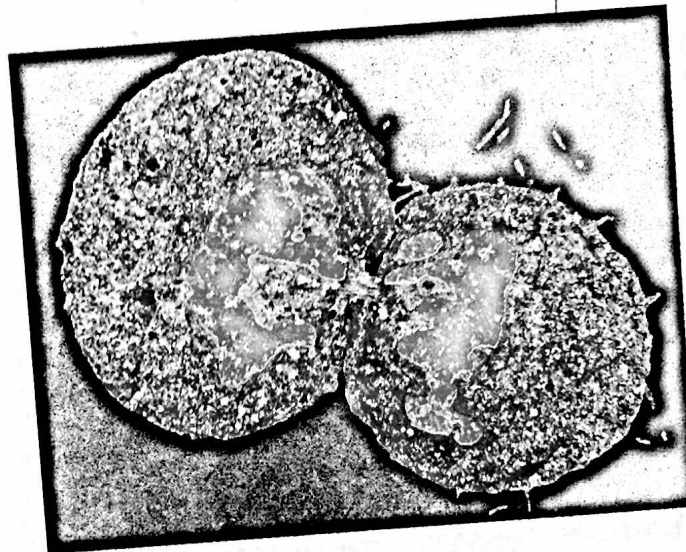
You and everyone you know began as a single microscopic cell smaller than the head of a pin. Within a nine-month period, this cell divided again and again, millions of times. Ultimately, it formed tissues, organs, and systems that made up your body, your characteristics, and the person you are today.

## HEALTH TERMS

**embryo**  
**placenta**  
**umbilical cord**  
**fetus**  
**Apgar test**  
**miscarriage**  
**stillbirth**

## HEALTH CONCEPTS

- Every individual starts off as a single microscopic cell.
- The health of a developing child is dependent on a number of factors, many of which are controlled by the mother-to-be.
- Eating healthfully, getting enough rest, and avoiding harmful substances, including tobacco, alcohol, and other drugs are all essential steps in sound prenatal care.



Cell division

## Prenatal Development

The entire complex human body begins as one cell that is formed by the union of an egg cell, or ovum, from a female and a sperm cell from a male. These two cells are microscopic in size. The union of these cells is called *fertilization*. As soon as the ovum is fertilized, it is called a *zygote*. Once the zygote has been formed, a protective membrane around it prevents more sperm from entering the ovum. By the time the zygote reaches the uterus, it has divided many times to form a cluster of cells that has a hollow space in the center. It is now called a *blastocyst*.

### Implantation

As the cells of the blastocyst divide, they begin to implant, or attach, to the lining of the uterus. This process is called *implantation*.

The lining of the uterus is made up of layers of tissue that will protect and nourish the fertilized egg throughout pregnancy. The *cluster of developing cells following implantation* is called an **embryo**. At this time, the embryo is about the size of the dot over the letter *i*.

## Embryonic Development

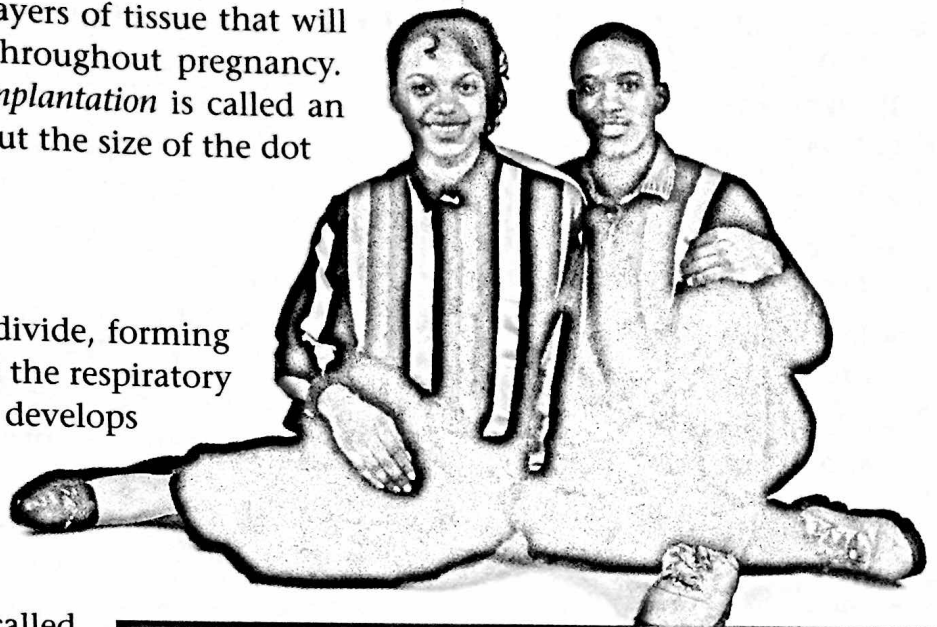
The cells of the embryo continue to divide, forming three layers of tissue. One layer becomes the respiratory and digestive systems. Another layer develops into muscles, bones, blood vessels, and skin. The third layer becomes the nervous system, sense organs, and mouth.

At the same time, a thin membrane called the *amniotic sac* forms and surrounds the developing embryo. Fluid in this sac acts as a shock absorber that protects the embryo when it is jarred or bumped. The fluid also helps insulate the embryo from temperature changes.

A *blood-rich tissue developed from an outer layer of cells from the embryo and tissue from the mother* develops into the **placenta**. The embryo is connected to the placenta by the **umbilical cord**, a tube through which *nutrients and oxygen pass from the mother's blood into the embryo's blood*. The blood vessels of the umbilical cord also carry waste products from the embryo, where they diffuse into the mother's blood. These wastes are then excreted from the mother's body along with other body wastes.

## Fetal Development

During the first six weeks of pregnancy, the embryo grows rapidly in length and gains weight. At the start of the third week, it is about one-half to one inch long (2 to 2.5 cm), or 10,000 times the size of the original egg cell! At eight weeks the embryo measures about 1½ inches in length (3.5 to 4 cm). *The name by which the embryo is known from the end of the eighth week until birth is fetus*. The skin of the fetus is clear and hairless and covered with a waxy protective coating. The fetus contains millions of cells that will arrange themselves into tissues and organs.



TWINS

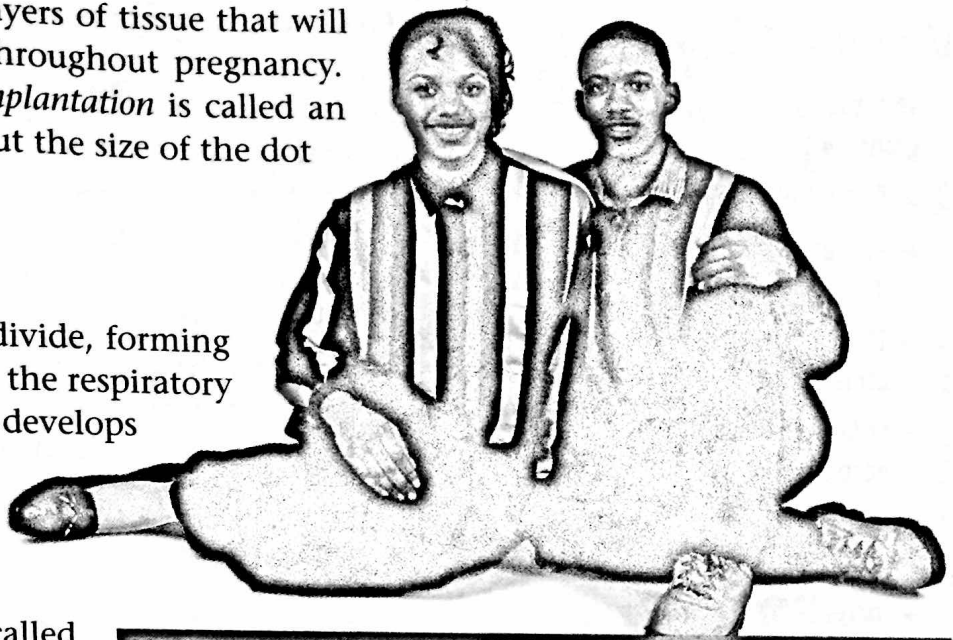
In most cases of twins, a female's ovaries release two mature ova instead of one. If a separate sperm fertilizes each ovum, two embryos develop. The two embryos, called *fraternal twins*, have different genetic makeup and therefore do not look any more alike than brothers and sisters normally do. Fraternal twins can be the same gender or different gender.

In about one-third of these cases of twins, *identical twins* result. In this situation, a single ovum that has been fertilized divides and two embryos develop. These embryos have the same genetic information. These twins will be the same gender and look almost exactly the same. They are identical twins.



▲ **Identical twins have the same genetic makeup.**  
**ACTIVITY** How is genetic research with twins helpful in finding health cures?

The lining of the uterus is made up of layers of tissue that will protect and nourish the fertilized egg throughout pregnancy. The *cluster of developing cells following implantation* is called an **embryo**. At this time, the embryo is about the size of the dot over the letter *i*.



TWINS

## Embryonic Development

The cells of the embryo continue to divide, forming three layers of tissue. One layer becomes the respiratory and digestive systems. Another layer develops into muscles, bones, blood vessels, and skin. The third layer becomes the nervous system, sense organs, and mouth.

At the same time, a thin membrane called the *amniotic sac* forms and surrounds the developing embryo. Fluid in this sac acts as a shock absorber that protects the embryo when it is jarred or bumped. The fluid also helps insulate the embryo from temperature changes.

A *blood-rich tissue developed from an outer layer of cells from the embryo and tissue from the mother* develops into the **placenta**. The embryo is connected to the placenta by the **umbilical cord**, a tube through which nutrients and oxygen pass from the mother's blood into the embryo's blood. The blood vessels of the umbilical cord also carry waste products from the embryo, where they diffuse into the mother's blood. These wastes are then excreted from the mother's body along with other body wastes.

In most cases of twins, a female's ovaries release two mature ova instead of one. If a separate sperm fertilizes each ovum, two embryos develop. The two embryos, called *fraternal twins*, have different genetic makeup and therefore do not look any more alike than brothers and sisters normally do. Fraternal twins can be the same gender or different gender.

In about one-third of these cases of twins, *identical twins* result. In this situation, a single ovum that has been fertilized divides and two embryos develop. These embryos have the same genetic information. These twins will be the same gender and look almost exactly the same. They are identical twins.

## Fetal Development

During the first six weeks of pregnancy, the embryo grows rapidly in length and gains weight. At the start of the third week, it is about one-half to one inch long (2 to 2.5 cm), or 10,000 times the size of the original egg cell! At eight weeks the embryo measures about  $1\frac{1}{2}$  inches in length (3.5 to 4 cm). *The name by which the embryo is known from the end of the eighth week until birth is fetus*. The skin of the fetus is clear and hairless and covered with a waxy protective coating. The fetus contains millions of cells that will arrange themselves into tissues and organs.



▲ **Identical twins have the same genetic makeup.**

**ACTIVITY** How is genetic research with twins helpful in finding health cures?

## Did You Know?

The average pregnant woman gains 24 pounds, as follows:

- The fetus weighs 7 pounds.
- The amniotic fluid weighs 4 pounds.
- The increased weight of the uterus is 2 pounds.
- Enlargement of the breasts accounts for 3 pounds.
- Increased body fluids add an additional 3 pounds.
- Increase in lean body mass contributes 2 pounds.
- Increased fat equals 3 pounds.
- Total weight gain = 24 pounds.

The brain is one of the first organs to develop. The nervous system grows rapidly, and at nine weeks the head develops. All the body systems are now present.

Growth of the fetus is rapid during the fourth month, but it slows down in the fifth month. During this time, the mother can feel the fetus move. It may begin to suck its thumb. By the end of the sixth month, the fetus is about 14 inches (36 cm) long.

During the last three months of pregnancy, the weight of the fetus more than triples. The fetus moves freely within the amniotic sac. The eyes open during the seventh month. During the ninth month, the fetus usually moves into a head-down position and is ready for birth. The fetus is now 18 to 20 inches (46 to 51 cm) long and weighs about 7 to 9 pounds (3 to 4 kg).

## Prenatal Care

The health of a developing baby is not totally within the control of the mother-to-be. Heredity, which will be addressed in the next lesson, is one unavoidable factor that can affect the developing baby. Yet, there is much the mother can do to improve the chances of having a healthy baby.

As soon as a female confirms her pregnancy, she should begin prenatal care. This includes having regular visits with either an obstetrician or a certified nurse midwife. An obstetrician is a doctor who specializes in the care of a female and her developing baby. A certified nurse midwife is an advanced practice nurse who, in addition to providing prenatal care, specializes in the delivery of healthy babies. Either professional will give the pregnant female a complete physical, including blood tests and a pelvic examination. Possible problems may be identified and corrected early.

Prenatal care gives the mother-to-be a chance to ask questions about pregnancy and the birth process, and it helps educate her with respect to important health behaviors. Nutrition is a special concern. The mother-to-be needs increased amounts of many micronutrients, especially calcium, vitamin E, and iron. Without sufficient iron, the fetus will draw its supply of iron from the mother, leaving her exhausted and possibly anemic. Eating foods rich in folic acid, such as whole grains and fish, reduces the chance of certain birth defects such as spina bifida, a neural tube defect that affects the baby's spine.

During prenatal care, the obstetrician or certified nurse midwife will also monitor the female's weight and discuss the importance of physical activity. An exercise program will be recommended depending on the female's health and level of fitness.

## hot link

**medicines** For more information on medicines and procedures for using them safely and correctly, see Chapter 23, page 518.

## hot link

**fetal alcohol syndrome (FAS)** For more information on fetal alcohol syndrome (FAS) and its dangers to the developing child, see Chapter 25, page 561.

## Medicines, Drugs, and Pregnancy

A pregnant female must be very careful about what substances she takes into her body. Any medicines, even natural supplements, should be taken only with her health professional's approval. Even prescription and over-the-counter **medicines** pose a potential danger to the fetus.

No illegal drugs should be taken. Illegal drugs present a serious threat to the mother and her baby. Babies can be born physically dependent on the drugs their mothers used while pregnant. Use of certain drugs during pregnancy can cause serious birth defects, including mental retardation.

Caffeine, which is present in coffee, tea, chocolate, and cola drinks, is another potential hazard to the fetus. A high caffeine intake has been associated with an increased risk of birth defects and other problems.

### ALCOHOL AND PREGNANCY

Females who drink alcohol during pregnancy may cause permanent damage to the developing baby. Alcohol use by females during pregnancy has been associated with many defects in their children, because the alcohol passes from the mother's body into the baby's bloodstream. Consumption of alcohol is associated with a risk of **fetal alcohol syndrome (FAS)** and other neurodevelopmental effects. Fetal alcohol syndrome consists of three main features: mental retardation, slow growth before and after birth; and a wide range of physical defects ranging from cleft palate to hip dislocation.

The tragedy of FAS is that the unborn baby has no control over what enters the body. The decision to drink alcohol or not is the

## Making Responsible

### Decisions

#### *When Saying No Counts Double*

**S**heila is seven months pregnant, which has her and her husband Tom very excited. Both are also eager that their baby be healthy—a point Tom's parents don't seem to understand. Tonight, Sheila and Tom



are out to dinner with Tom's parents to celebrate his mother's birthday. When Sheila declined the waiter's offer of

something from the bar, Tom's father insisted. "It's a doubly joyous occasion," he said loudly and ordered Sheila a glass of wine.


#### *What Would You Do?*

Apply the six steps of the decision-making process to Sheila's problem:


1. **State the situation.**
2. **List the options.**
3. **Weigh the possible outcomes.**
4. **Consider your values.**
5. **Make a decision and act.**
6. **Evaluate the decision.**

# A HEALTHY PREGNANCY

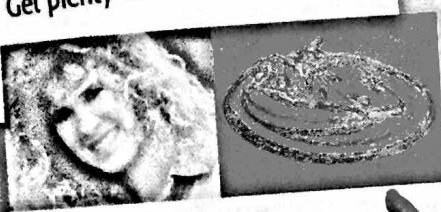
Here are some steps that a mother-to-be should follow to increase the chances that her baby will be born healthy:




► See a doctor or certified nurse midwife right away to begin prenatal care.




► Get plenty of rest.




► Eat at least three well-balanced meals rich in vitamins and minerals.



► Use stress-coping techniques such as relaxation or doing something enjoyable.



► Use safety belts while in a car.



► Exercise safely according to your health care professional's advice.



mother's. Because even small amounts of alcohol may be harmful, the safe decision for a pregnant woman is not to drink any alcoholic beverages. FAS is entirely preventable.

## TOBACCO AND PREGNANCY

A pregnant female also must avoid using tobacco. Babies born to females who use tobacco have a greater chance of being born prematurely with low birth weights. Babies weighing 5½ pounds (2.5 kg) or less at birth often develop serious health problems early in life. Low birth weight is a leading cause of death in a baby's first year of life.

Studies have found that smoking during pregnancy may affect the growth, mental development, and behavior of children at least up to the age of 11. Children whose parents smoke have a higher incidence of respiratory problems, such as bronchitis and pneumonia, than do children whose parents do not smoke.

## Stages of Birth

Babies usually are born headfirst. In the last few weeks of pregnancy, the baby's head moves to the lower part of the uterus. During the birth process, the baby is pushed out of the uterus and passes out of the mother's body. There are three stages in the birth process:



## Do's and Don'ts During Pregnancy

A mother-to-be should follow the guidelines above, and to protect the health of her baby she should:

- Never use tobacco, alcohol, or other drugs.
- Never take any drugs without your health care provider's permission.
- Limit or avoid products that contain caffeine such as tea, coffee, and cola drinks.



▲ **Both mother and baby are checked for signs of problems after the birth.**

**ACTIVITY** *List areas checked with the Apgar test.*

1. **Dilation**, or stretching of the cervix. This results from mild contractions, which are known as *labor*.
2. **Passage of the baby through the birth canal.** This is caused by continuing contractions that shorten the uterus.
3. **Afterbirth.** Once the baby is born, contractions continue for another 10 to 15 minutes, ultimately pushing the placenta, now called the *afterbirth*, out of the mother's body.

Immediately after birth, most hospitals administer an **Apgar test**. This is *a routine diagnostic test that determines an infant's physical condition at birth*. The Apgar test measures the baby's condition in five significant areas: appearance or coloring; pulse; grimace or reflex irritability; activity; and respiration. Any significant difference from the normal response in each of these areas may require further testing and observation.

## Complications During Pregnancy

**A**lthough pregnancy is not an illness, complications can occur, among these miscarriage and stillbirth. A **miscarriage** is *a spontaneous abortion*, in which the female expels the embryo or fetus. A **stillbirth** is *the birth of a dead fetus*. Females who use tobacco or drugs during pregnancy are more likely to have a miscarriage or stillbirth than those who abstain from their use. As with FAS, the problems associated with tobacco and drug use during pregnancy are completely preventable.