### Prenatal Development

- **Nature** and **nurture** combine forces in prenatal development.
- Much of development is generated by the fetus itself.

### Conception

- **Conception** is the union of the mother’s and father’s sex cells, also known as gametes or germ cells.
  - Mother’s sex cells are eggs.
  - Father’s sex cells are sperm.
- The union of sperm and egg forms a **zygote**.

![Image of zygote](image1.jpg)

### Developmental Processes

- The zygote is transformed into an embryo and then a fetus through the processes of
  - **Cell division** - Begins 12 hours after fertilization and continues throughout fetal development.

![Image of fetus](image2.jpg)

- The zygote is transformed into an embryo and then a fetus through the processes of
  - **Cell division**
  - **Cell migration** - Cells move from point of origin to elsewhere in the embryo.
Developmental Processes

- The zygote is transformed into an *embryo* and then a *fetus* through the processes of
  - Cell division
  - Cell migration
  - **Cell differentiation** - Cells begin to specialize, fulfilling the needs of separate bodily structures and functions.

Developmental Processes

- The zygote is transformed into an *embryo* and then a *fetus* through the processes of
  - Cell division
  - Cell migration
  - **Cell differentiation**
  - **Cell death** - The selective death of certain cells as they are no longer needed.

From Blastocyst to Implantation

- By the 4th day after conception, cells arrange themselves into a hollow sphere, the **blastocyst**.
- **Implantation** occurs in the week after fertilization.

The Fetal Support System

- **Placenta**: permits the exchange of materials between the bloodstreams of mother and fetus.
- **Umbilical cord**: structure containing blood vessels connecting fetus and mother.
- **Amniotic sac**: membrane within which the fetus floats in a clear liquid that acts as a protective buffer.
Cephalocaudal (Head-to-Body) Development

- Areas near the head develop at a more rapid pace than those farther away.
- The head develops before the body.
- The hands develop before the feet.

Prenatal Development

Embryo at 4 Weeks

- The four folds in the front of the head will become facial features. A heart is visible and is beating and circulating blood.

Embryo at 5–6 Weeks

- Rapid brain development
- The beginning of an eye is seen
- Spontaneous movement
Fetus at 9 Weeks

• All internal organs are present
• Sexual differentiation has started.

Fetus at 11–12 Weeks

• External genitalia, legs, arms, and fingers
• Chest makes breathing movements
• Grasping, swallowing, and sucking

Fetus at 16 Weeks

• The fetus will kick

Fetus at 18 Weeks

• May suck its thumb.
• Covered with lanugo (fine hair) and vernix (greasy protective coating)
Fetus at 20 Weeks
- can move its mouth, raise its eyebrows, and wrinkle its forehead.

Fetus at 28 Weeks
- The fetus could now be viable outside the womb.
- Eyes can open and it experiences REM sleep.
- It can hear and react to sound.

Fetal Behavior
- A fetus can swallow, move its arms and legs, yawn, and suck.
- The fetus gets ready to breathe outside the womb by “fetal breathing”

Fetal Experience
- **Touch**: The fetus’s body parts come in contact with one another. A fetus sucks its thumb.
- **Taste**: The fetus can detect the flavors of the amniotic sac. It likes sweets.
- **Smell**: The fetus can detect the smells of the amniotic fluid, which are influenced by what the mother eats.
Fetal Experience (continued)

- **Hearing:** Fetus responds to the sounds of the mother’s voice, of others talking to the mother, and of the mother’s blood pumping and her breathing.
- **Sight:** The fetus may react to a bright light shown against the mother’s skin, but its visual experience is very slight.

Fetal Learning

- **Habituation**—the decrease in response to repeated or continued stimulation—begins at about 32 weeks.
  - At this point, **learning** and **memory** begin to occur.
  - Can recognize familiar smells and the sounds from a Dr. Seuss book.

Hazards to Prenatal Development: Miscarriage

- About 45% or more pregnancies end in miscarriage, that is, spontaneous abortion.
- Most miscarried fetuses have severe defects, such as missing chromosomes, that make further development impossible.
- Ninety percent of fetuses that survive the danger of miscarriage are born normal.

Risk Factors

- **Age**
- **Nutrition**
  - Malnourished newborns have smaller brain cells and are more vulnerable to illnesses than well-nourished newborns.
  - Malnutrition in early prenatal development may lead to serious physical defects (e.g. folic acid)
  - Malnutrition in the last few months may lead to low birth weight and small heads.
Risk Factors

- Age
- Nutrition
- Stress
  - In animals, stress results in smaller offspring prone to behavioral problems.
  - In humans, extreme maternal stress may be related to lower birth weight and children with emotional problems and behavioral disorders.

Risk Factors

- Age
  - Pregnancy most likely to result in a healthy baby if mother is in her 20’s.
  - Older mothers have increased risk of miscarriage and stillbirth and are more liable to give birth to Down syndrome children.
  - Younger mother are at greater risk for inadequate diets and prenatal care and are more likely to have children with behavioral problems.

Hazards to Prenatal Development: Teratogens

- Teratogens are any agents from the environment that can cause harm to the developing fetus.
- Many harmful agents cause damage only if exposure occurs during a sensitive period of prenatal development.
- Critical factors that influence the degree of harm a teratogen will cause:
  - The amount and length of exposure
  - Individual differences in susceptibility