

PowerLecture:

Chapter 44

Human Reproduction and Development

Section 44.0: Weblinks and InfoTrac

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Videos: CNN

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➤ Anatomy and Physiology, 2004, Vol. 8, *IVF Anniversary* (2:24)

Impacts, Issues: **Mind-Boggling Births**

- Multiple births increased by 60% in last 20 years
- Higher multiple births (triplets or more) have quadrupled
- A woman's fertility peaks in mid-20s, and declines almost 1/2 by age 49
- The number of women over 40 having children has doubled in the past decade

Impacts, Issues: **Mind-Boggling Births**

- Fertility drugs increase chances of multiple birth
 - Higher risk of miscarriage
 - Premature delivery or cesarean section
 - Newborn weight is lower
 - Mortality rates are higher

Impacts, Issues: **Mind-Boggling Births**

Section 44.1: Weblinks and InfoTrac

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➤ Anatomy and Physiology, 2004, Vol. 8, *Prostate Cancer Prevention* (1:33)

Human Gonads

- Primary sexual organs where genes are packaged into gametes
 - Male - testes
 - Female - ovaries
- Secrete sex hormones
 - Regulate secondary sexual traits

Male Reproductive System

Male reproductive system

Reproductive Organs

Semen = Sperm + Secretions

- Secretions from epididymis aid sperm maturation
- Seminal vesicle secretes fructose and prostaglandins

- Prostate-gland secretions buffer pH in the acidic vagina
- Bulbourethral gland secretes mucus

Prostate Cancer

- Second leading cause of death in American men
- Detection
 - Digital rectal exam by physician
 - Blood tests for prostate-specific antigen (PSA), a tumor marker

Testicular Cancer

- About 5,000 U.S. cases per year
- Can be detected by self exam
 - Men should check testes monthly
 - Check for hardening, lumps
 - Changes should be reported to physician

Section 44.2: Weblinks and InfoTrac

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Videos: CNN

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- Anatomy and Physiology, 2003, Vol. 7, *Sperm Count and Age* (1:27)

Male Reproductive System

Sperm Travel Route

Route sperm travel

Spermatogenesis

- Spermatogonium ($2n$) divides by mitosis to form primary spermatocyte ($2n$)
- Meiosis produces haploid spermatids
- Spermatids mature to become sperm

Spermatogenesis

Spermatogenesis

Other Testicular Cells

- Sertoli cells
 - Line the seminiferous tubules
 - Nourish the developing sperm
- Leydig cells
 - Lie between the seminiferous tubules
 - Secrete testosterone

Male Hormonal Control

Male Hormonal Control

Male Hormonal Control

Hormonal control of sperm production

Section 44.3: Weblinks and InfoTrac

See the latest Weblinks and InfoTrac articles for this chapter online

Female Reproductive Organs

Female Reproductive Organs

Female reproductive system

Female Reproductive Organs

Menstrual Cycle

- The fertile period for a human female occurs on a cyclic basis
- Menstrual cycle lasts about 28 days
- Follicular phase and luteal phase

Menstrual Cycle

Section 44.4: Weblinks and InfoTrac

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Oocytes Arrested in Meiosis I

- Girl is born with primary oocytes already in ovaries
- Each oocyte has entered meiosis I and stopped
- Meiosis resumes, one oocyte at a time, with the first menstrual cycle

Menarche to Menopause

- First menstruation, or menarche, usually occurs between ages 10-16

- Menstrual cycles continue until menopause, in a woman's late 40s or early 50s

Ovarian Cycle

Ovarian Cycle

Ovarian function

Female Hormonal Control

Female Hormones

Hormones and the menstrual cycle

Female Hormones

Follicular Phase

Female Hormones

Ovulation and luteal phase

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Cycle Overview

Cycle Overview

Menstrual cycle summary

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Fertilization

- Sperm penetrates to egg cytoplasm
- Secondary oocyte undergoes meiosis II; forms mature egg
- Egg nucleus and sperm nucleus fuse to form diploid zygote

Fertilization

Fertilization

Section 44.7: Weblinks and InfoTrac

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- Anatomy and Physiology, 2004, Vol. 8, *IVF Anniversary* (2:24)

- Anatomy and Physiology, 2002, Vol. 6, *Test-Tube Baby Defects* (2:42)

Birth Control Options

- Prevent fertilization
- Prevent ovulation
- Block implantation

Abortion

- Removal of blastocyst, embryo, or fetus
- First trimester abortions are painless, and relatively complication free
- Later abortions are more difficult and more controversial

In Vitro Fertilization

- 15% of US couples are unable to reproduce due to infertility or sterility
- In vitro fertilization:
 - Oocyte is removed and fertilized in petrie dish with sperm
 - After cleavage, cell cluster is placed into uterus

Section 44.8: Weblinks and InfoTrac

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Videos: CNN

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- Biology, 2003, Vol. 7, *Global AIDS* (2:18)

Safer Sex

- Use a latex condom
- Limit partners
- Get to know a prospective partner before sex
- Be alert to signs of ailments of the genitals
- Avoid abuse of alcohol and drugs

Bacterial STDs

- All can be cured with antibiotics
- Syphilis
- Gonorrhea
- Chlamydial infection
 - Most common reported STD in U.S.

Viral STDs

- Cannot be cured
- Genital herpes
- Genital warts

- Human papillomaviruses (HPV)
- One strain can cause cancers

Pelvic Inflammatory Disease (PID)

- Complication of many bacterial STDs
- Increases likelihood of ectopic pregnancy
- Can cause sterility

AIDS

- Combination of disorders that follows infection with HIV
- No vaccine or cure
- HIV spreads through anal, vaginal, and oral intercourse and by intravenous drug use

AIDS Test

- Should know HIV status of potential partner
- A person can test negative and still have and transmit the virus
- Test detects antibodies that appear weeks to months after infection

Section 44.9: Weblinks and InfoTrac

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- Anatomy and Physiology, 2003, Vol. 7, *Conjoined Twins* (1:39)

Pregnancy

- Averages 38 weeks from fertilization
- Takes 2 weeks for blastocyst to form
- Weeks 3 to 8 - embryonic period
- Weeks 9 to birth - fetal period

Early Divisions

- Cleavage begins within 24 hours of fertilization

Day 5 - Blastocyst Forms

- Cell secretions produce a fluid-filled cavity in center of ball of cells
- Layers of blastocyst
 - Inner cell mass
 - Trophoblast
 - Blastocoel

Implantation Begins

- Blastocyst attaches to endometrium; begins to burrow into maternal tissues

Cleavage to Implantation

Cleavage and implantation

Human Chorionic Gonadotropin (hCG)

- Hormone secreted by the blastocyst
- Stimulates corpus luteum to keep making progesterone and estrogens
- This maintains endometrium, prevents menstruation

- Can be detected by week 3 with a home pregnancy test

Extraembryonic Membranes

Gastrulation - Day 15

- Primitive streak forms along one axis of the inner cell mass
- Cells migrate inward here to form endoderm and mesoderm

Implantation

First two weeks of development

Weeks 3-4

Weeks 3 to 4 of development

Section 44.10: Weblinks and InfoTrac

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Vertebrate Body Plan Emerges

Section 44.11: Weblinks and InfoTrac

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The Placenta

- Interlocking fetal and maternal tissues
- Performs digestive, respiratory, and urinary functions for the fetus
- Materials exchanged across membrane that separates bloodstreams

The Placenta

Structure of the placenta

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Embryonic Period

- Weeks 3 to 8
- By the close of embryo period
 - Appears human
 - Primordial tissues of all internal and external structures have formed

Fetal Period

- Weeks 9 to birth
- Fetus is initially about 1 inch long
- Fetus born before 22 weeks cannot survive
- Survival is poor before 28 weeks because lungs are not fully formed
- By 36 weeks, survival is 95 percent

Fetal Period

Fetal development

Section 44.13: Weblinks and InfoTrac

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Fetal Nutrition

- All nutrients for fetal growth and development must be delivered via the placenta
- Mother's diet affects fetal health
- Smoking may affect ability to absorb nutrients and to pass them to fetus

Teratogens

- Drugs and environmental factors that may induce deformities during development
- Effect depends upon time of exposure
- Most have no effect until after second week
- Thalidomide

Teratogens

Sensitivity to teratogens

Section 44.14: Weblinks and InfoTrac

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- Anatomy and Physiology, 2004, Vol. 8, *C-Section Choice* (1:24)

Birth (Labor)

- Cervical canal dilates
- Amniotic sac ruptures
- Uterine contractions drive fetus from uterus
- Placenta is expelled as afterbirth

Birth

Birth

Lactation

- During pregnancy, progesterone and estrogen stimulate gland development
- After birth, prolactin induces synthesis of enzymes for milk production
- Oxytocin triggers contractions

Lactation

Anatomy of the breast

Stages of Human Development - Prenatal

- Zygote - Single cell
- Morula - Solid ball of cells
- Blastocyst - Ball with fluid-filled cavity
- Embryo - 2 weeks to 8 weeks
- Fetus - 9 weeks to birth

Stages of Human Development - Postnatal

- Newborn - First 2 weeks after birth
- Infant - 2 weeks to 15 months

- Child – To 10-12 years
- Pubescent - At puberty
- Adolescent - Puberty to maturation
- Adult
- Old age

Stages of Human Development

Stages of Human Development

Proportional changes during development

Section 44.15: Weblinks and InfoTrac

See the latest Weblinks and InfoTrac articles for this chapter online

Human Fertility

- When does life begin?
 - Female eggs are alive
 - Male sperm are alive
- Life began more than 3.8 billion years ago
- Each gamete, zygote, and individual is a stage in the continuation of that beginning

Human Fertility

- About 14,800 newborns enter the world every hour
- Human growth is outstripping resources
- Unwanted pregnancies
 - In the US, about half of all pregnancies are unintended
 - Abortion