

Conception Fetal Development

LVN-RN Track Instructional Module

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Preconception: Health Care Overview

Defined as a set of interventions aiming to identify

- Risks to a woman's health
 - Medical
 - Behavioral
 - Social

Components of preconception health care

- Routine physical examination
- Health screening
- Education

Preconception: Healthy Diet / Supplements

Good nutrition

- Overweight
- Underweight

Limit caffeine

Avoid fish high in mercury

Folic acid

- 0.4 mg daily
- **Extremely important before conception as well as afterward**

Avoid excessive doses of vitamins

- **Toxic to fetus**

Medications: Discuss with PCP

Anticonvulsants

Opioids

Antidepressants

Other prescribed
medications

Avoid these
over-the-counter
medications

- Decongestants
- NSAIDs
 - Aspirin
 - Ibuprofen
 - Naproxen

Preconception: Self-Care

Avoid risky behaviors

- Alcohol
- Illicit drugs
- Tobacco/Nicotine
 - Cigarettes
 - E-cigarettes
- Second-hand smoke
- Environmental toxins

Practice safe behaviors

- Exercise / adequate rest / relaxation
- Safe sex
- Seatbelt usage
- Smoke and carbon monoxide detectors
- Dental health
- Sunscreen

Contraception Cessation

Fertility awareness and barrier methods

- Stop utilizing

Monthly hormonal contraception

- Stop: utilize a barrier method for 2-3 months before attempting conception

Depo provera

- Stop and track cycles
- Conception may take several months up to a year

IUD

- Must be removed
- Utilize barrier method for 2-3 months before attempting conception

Ovulation: Signs and Symptoms

Increased sensitivity to odors

Cervical mucus changes – thin, clear

Change in basal body temperature

- Slight decrease before ovulation
- Marked increase after ovulation

Libido increases

Breast tenderness

Elements

Ovum and Sperm Lifespan

- Ovum
 - 12 to 24 hours after ovulation
- Sperm
 - 3 days
 - Rarely up to 5 days

Optimal Intercourse Timing

- Daily for the 6 days prior to ovulation
- Day of ovulation

Fertilization (Conception)

A sperm enters the nucleus of an oocyte

Fertilized oocyte – zygote

Zygote contains diploid number of chromosomes

Chromosomes: 22 pairs + 1 pair sex chromosomes: XX or XY–23 pairs

Fertilization normally takes place in the fallopian tube

Early Cell Division

Around day 5 post conception:
blastocyst

- Two components
 - Embryoblast
 - Develops into the embryo
 - Trophoblast (outer surface)
 - Assists implantation
 - Develops into part of the placenta

Multiples: More than one developing embryo

- Monozygotic
 - Results from one fertilized ovum that divides into two or more embryos
 - Identical
- Dizygotic
 - Results from fertilization of more than one ova
 - Fraternal

Implantation: 8-10 days after ovulation

Progesterone from the corpus luteum

- Stimulates the endometrium
- Thickens and increases vascularization

Enzymes secreted by the trophoblast

- Digest the endometrial surface to enable implantation

Pregnancy Signs

Presumptive: Mom

Amenorrhea

Nausea/vomiting

Breast changes

Fatigue / frequent urination

Sensitivity to odors /
cravings / moodiness

Probable (Likely but not definite): Provider

Cervical and genital changes:
Chadwick's sign / Goodell's sign

Softening of the lower uterine
segment: Hegar's sign

Skin hyperpigmentation
(nipples, areolae, face)

Uterine and abdominal growth

Positive pregnancy test

Positive Signs – Pregnancy

Definitive

Auscultation of fetal heartbeat

- 10 to 12 weeks' gestation

Fetal movement – palpated/observed

Transvaginal ultrasound visualization

- Detect sac at 4-4.5 weeks
- Cardiac movement at 5.5-6 weeks

Pregnancy Tests

hCG (human chorionic gonadotropin) production begins at implantation

Assessment: the presence / level of hCG

- Urine: tests for presence
- Serum: tests for quantitative level

Detected 7-8 days after conception

hCG Levels

Higher

Higher hCG levels

- Multiples
- Ectopic
- Molar pregnancy
 - The embryo does not develop or is abnormal with a placenta that grows into grape-like cysts
- Genetic abnormality
 - Ex: Trisomy 21 – Down syndrome

Lower

Miscarriage

Ectopic

False positive or false negative

- Anticonvulsants
- Diuretics
- Tranquilizers
- Various conditions

Embryo: 2-8 weeks' gestation

Organs and body structures form and develop

Heart

- 5th gestational week
 - Forms
- 6th gestational week
 - Begins to beat
 - Circulates blood

Beginning development of other structures

- Brain
- Spinal cord
- Gastrointestinal tract

Facts about Embryo and Fetus

Embryo

Exposure to teratogens at this developmental stage can lead to severe consequences

Fetus

A developing human is referred to as a fetus from week 9 to birth

Major structures continue to develop and grow

- Not as sensitive to environmental toxins

Placenta

It becomes fully functional between the 8th and 10th weeks gestation

Fetal side / maternal side

Membrane

- Separates fetal and maternal blood, prevents their mixing

Placental membrane

- Separates fetal and maternal blood, prevents mixing of the two
- Chorionic villi and placental membrane

Placental Facts

Hormones

- Estrogen
- Progesterone
- Human placental lactogen (hPL)
 - Support the pregnancy
 - Promote preparation for delivery

Metabolic functions and gas exchange

- By diffusion
 - Provides nutrients and O₂
 - Removes fetal waste products and CO₂

Other Placental Facts

Viruses, such as rubella and cytomegalovirus, **can** cross the placental membrane and enter the fetal circulation

Glucose easily passes across the placental membrane

- **Insulin does not**

Drugs **can** cross the placental membrane

- Drugs with an FDA pregnancy category of C, D, or X should be avoided
- When planning a pregnancy
- During a pregnancy

Amniotic Sac

Two embryonic membranes

- Amnion: inner membrane
- Chorion: outer membrane

The embryo and amniotic fluid are contained within the sac

The membranes stretch to accommodate the developing fetus and increasing amount of amniotic fluid

Amniotic Fluid

Acts as a cushion for the fetus

Allows freedom of fetal movement

Provides a consistent thermal environment

Volume

- 24 to 36 weeks' gestation
- 500-1000 mL

Essential for fetal lung development

Umbilical Cord

Features

- Connects fetus to placenta
- Insertion: usually the center of the placenta
- Average length: 55 cm
- Wharton's jelly in the cord protects the umbilical vein and arteries

Fetal Circulation

Umbilical vessels

- **Umbilical vein: 1**
 - Carries oxygenated blood and nutrients from the placenta to the fetus
- **Umbilical arteries: 2**
 - Carry blood to be oxygenated and waste products from the fetus to the placenta

Characteristics of fetal circulation

- The ductus venosus, foramen ovale, and ductus arteriosus direct a large volume of blood flow away from the lungs

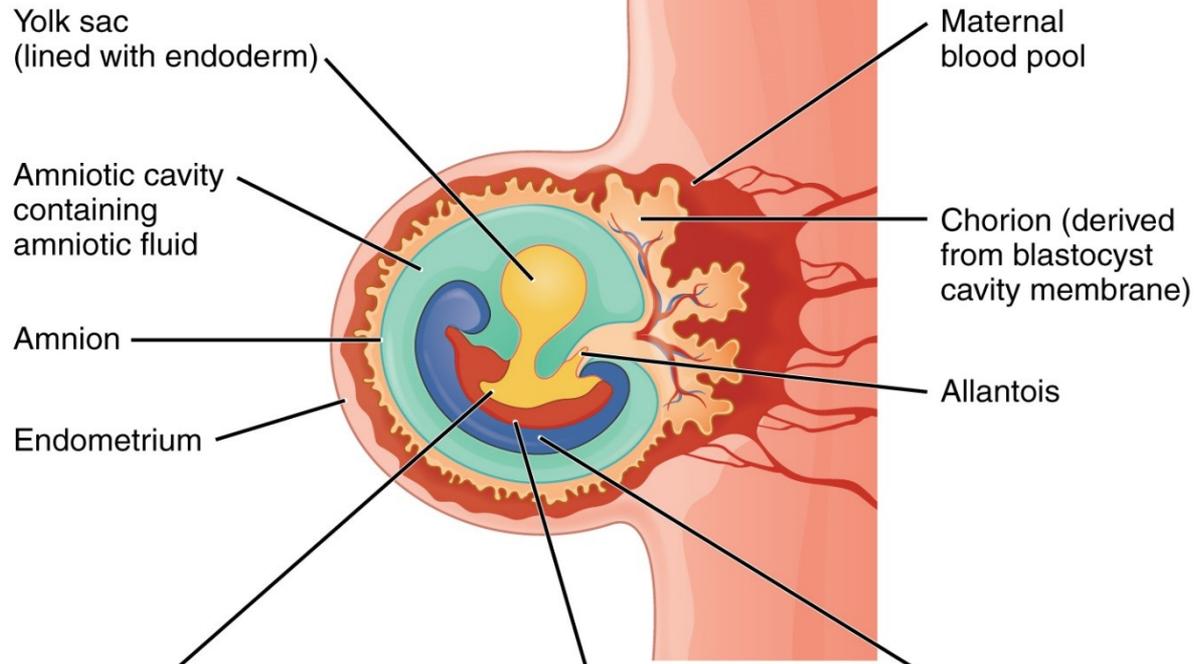
Appendices

- See Appendix A for formation of the zygote and its progression into the embryo
- See Appendix B for progression of the fetus
- See Appendix C for more information about fetal circulation

Appendix A

Formation of

Structures



Endoderm layer becomes:

- 1) Digestive system
- 2) Liver
- 3) Pancreas
- 4) Lungs (inner layers)

Mesoderm layer becomes:

- 1) Circulatory system
- 2) Lungs (epithelial layers)
- 3) Skeletal system
- 4) Muscular system

Ectoderm layer becomes:

- 1) Hair
- 2) Nails
- 3) Skin
- 4) Nervous system

Structures formed from the Primary Germ Layers

Ectoderm	Mesoderm	Endoderm
All nervous tissue	Skeletal, smooth, and cardiac muscle	Epithelium of digestive tract (except that of oral and anal cavities)
Epidermis of skin and epidermal offshoots (hairs, hair follicles, sebaceous and sweat glands, nails)	Cartilage, bone, and other connective tissues	Glands of digestive tract (liver, pancreas)
Cornea and lens of eye	Blood, bone marrow, and lymphoid tissues	Epithelium of respiratory tract, auditory tube, and tonsils
Epithelium of oral and nasal cavities, of paranasal sinuses, and of anal canal	Endothelium of blood vessels and lymphatics	Thyroid, parathyroid, and thymus glands
Tooth enamel	Serosa of ventral body cavity	Epithelium of reproductive ducts and glands
Epithelium of pineal and pituitary glands and adrenal medulla	Fibrous and vascular tunics of eyes	
Melanocytes	Synovial membranes of joint cavities	

Appendix B

Fetal Development

Summary of Fetal Development

Gestational Week	Length (crown to rump) and Weight	Fetal Development Characteristics
12	7-9 cm 20-45 gms	<ul style="list-style-type: none"> Placenta is complete Red blood cells produced in liver Organ systems and fetal circulation are complete Fingers and toes are discernible Fusion of palate and nasal septum are complete Eyelids are closed Fetal heart tones can be heard by Doppler
16	10-17 cm 55-120 gms	<ul style="list-style-type: none"> Lanugo is present on head Meconium is formed in intestines Teeth begin to form Sucking motions are made with mouth Skin is transparent External genitalia are developed to point that sex can be noted with ultrasound
20	19-25 cm 223-450 gms	<ul style="list-style-type: none"> Lanugo covers entire body Vernix caseosa covers the body Nails are formed Brown fat begins to develop Fetal movements are felt by the mother (quickening)

Summary of Fetal Development

Gestational Week	Length (crown to rump) and Weight	Fetal Development Characteristics
24	28-36 cm 680-820 gms	Eyes are developed. Alveoli form in lungs and begin to produce surfactant Footprints and fingerprints are forming Respiratory movements can be detected
28	35-38 cm 1200-1300 gms	Eyelids open Adipose tissue develops rapidly Respiratory system has developed to point where gas exchange is possible, but lungs are not mature
32	38-43 cm 1500-2500 gms	Bones are fully developed Lungs are maturing Increased amounts of adipose tissue are present

Summary of Fetal Development

Gestational Week	Length (crown to rump) and Weight	Fetal Development Characteristics
36	42-49 cm 1900-2900 gms	Lanugo begins to disappear The face and body have a wrinkled, loose appearance due to subcutaneous fat deposits Labia majora and minora are equally prominent Testes are in upper portion of scrotum Amniotic fluid decreases
40	48-52 cm 3000-3400 gms	Fetus is considered full term at 39 weeks All organs/systems are fully developed Skin is smooth The bones of the skull are ossified and nearly together at the sutures



Baby size during pregnancy



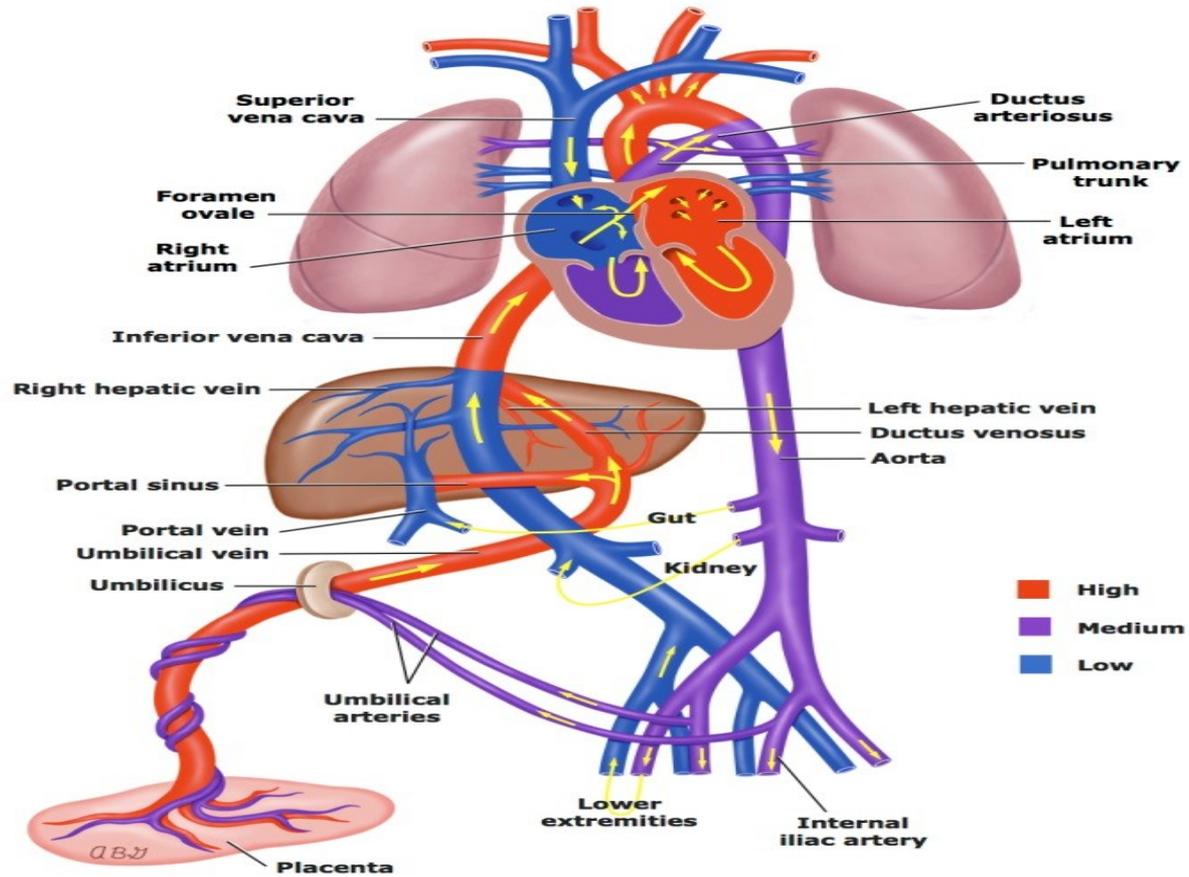
	4 weeks Poppy Seed		13 weeks Lemon		22 weeks Papaya		31 weeks Coconut
	5 weeks Apple Seed		14 weeks Nectarine		23 weeks Grapefruit		32 weeks Jicama
	6 weeks Sweet Pea		15 weeks Apple		24 weeks Ear of Corn		33 weeks Pineapple
	7 weeks Blueberry		16 weeks Avocado		25 weeks Rutabaga		34 weeks Butternut Squash
	8 weeks Raspberry		17 weeks Pear		26 weeks Lettuce		35 weeks Honeydew
	9 weeks Green olive		18 weeks Bell Pepper		27 weeks Cauliflower		36 weeks Swiss Chard
	10 weeks Kumquat		19 weeks Big Tomato		28 weeks Eggplant		37 weeks Winter Melon
	11 weeks Lime		20 weeks Artichoke		29 weeks Acorn Squash		38 weeks Pumpkin
	12 weeks Plum		21 weeks Carrots		30 weeks Cabbage		39-40 weeks Watermelon

Appendix C

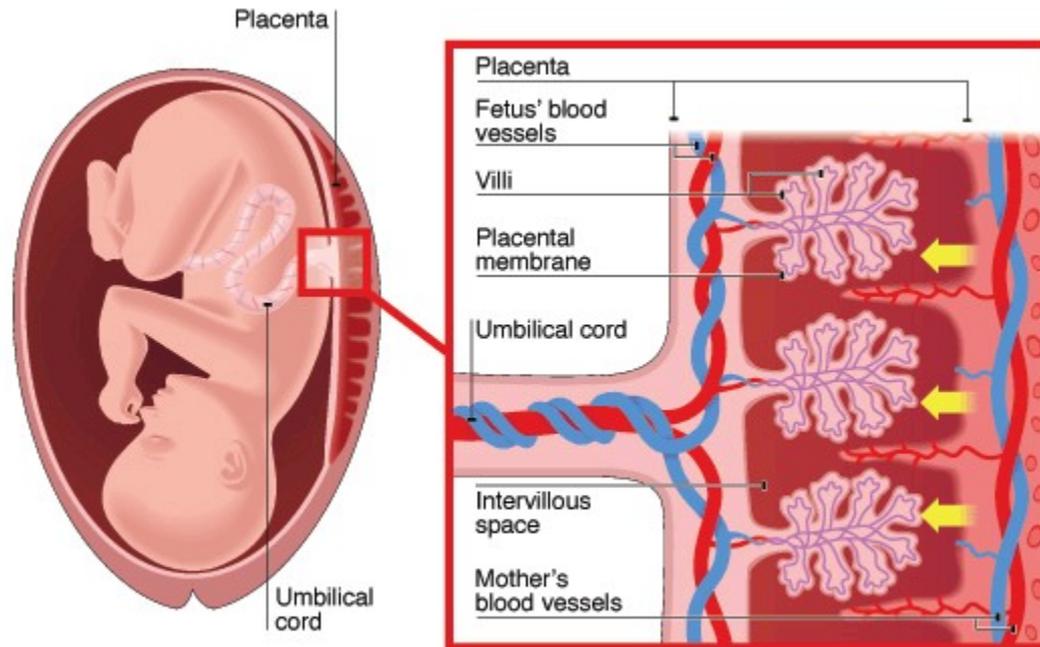
Fetal Circulation

Diagram

Fetal Circulation



Chorionic Villi and Placental Membrane



What's
next

