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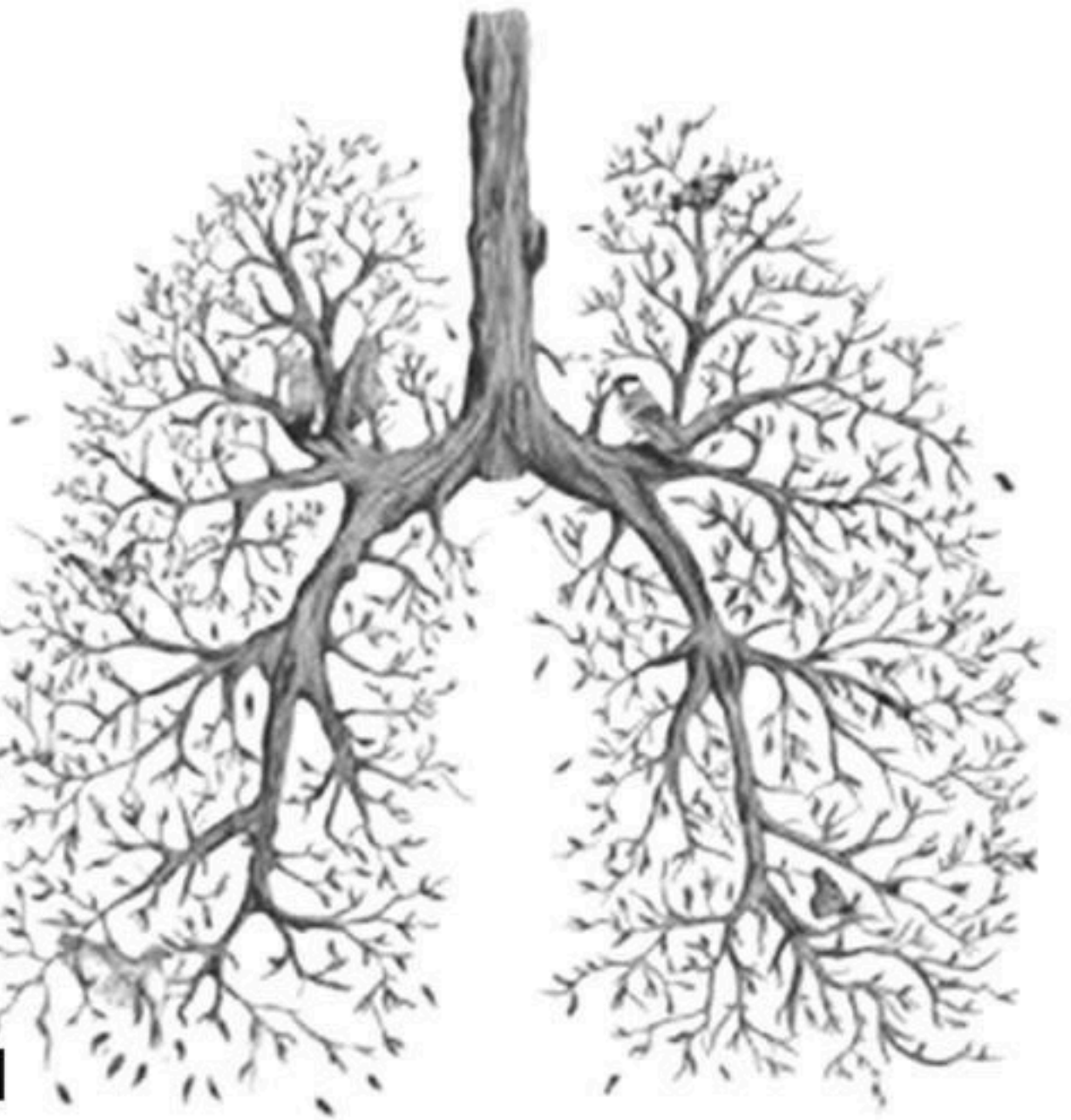
Medical Committee
The University of Jordan

Community Medicine



Slides ■
Sheet □

Slide #: 14

Doctor: Ahmad Al-Bataineh

Date:

Nutrition during Pregnancy and Lactation

Krause's *Food & Nutrition Therapy*

Factors Affecting Conception

- Extreme underweight or overweight
- Nutritional status
- Environmental toxins
- Elevated plasma homocysteine and deficiency of vitamin B_{12}
- Excessive caffeine intake

Practices incompatible with pregnancy

- Smoking
- Caffeine
- Illicit drugs
- Alcohol (causes Fetal Alcohol Syndrome)
- Nutrient megadoses

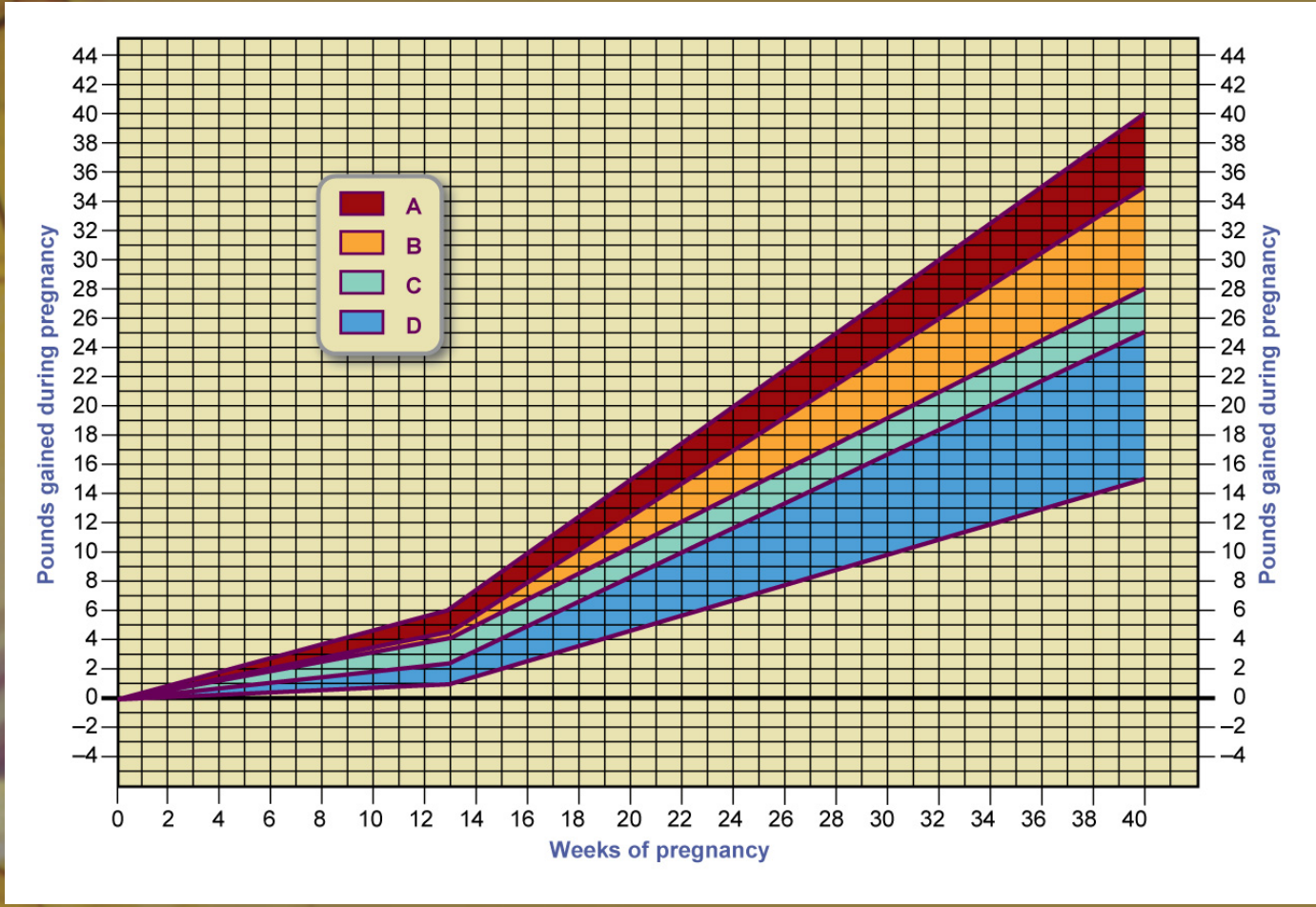
Distribution of Weight Gain During Pregnancy

WEIGHT IN POUNDS	
7.5–8.5	Fetus
7.5	Stores of fat and protein
4.0	Blood
2.7	Tissue fluids
2.0	Uterus
1.8	Amniotic fluid
1.5	Placenta and umbilical cord
1.0	Breasts
28–29 pounds	

Recommended Weight Gain During Pregnancy

- Normal weight women 11-16 kg
- Underweight women 13-18 kg
- Overweight women 7-11 kg
- Teenagers 16-18 kg

Pounds Gained During Pregnancy



Females who are of normal weight before their pregnancy should aim for a weight gain in the *B* to *C* range (25 to 35 lb) during the pregnancy. Underweight females should gain in the *A* to *B* range (28 to 40 lb). Females who are over weight before pregnancy should gain in the D range (15 to 25 lb).

Factors Affecting Pregnancy Outcome

- Historical perspective
- Perinatal mortality and birth weight
- Maternal size
- Maternal weight gain during pregnancy
- Obesity
- Adolescence
- Multiple births

Nutritional Risk Factors in Pregnancy

- **Risk Factors presented at the onset of pregnancy**

*Age 15 years or younger

35 years or older

*Frequent pregnancies: three or more during a 2 year period

*Poor obstetric history or poor fetal performance

*Poverty

*Bizarre or faddist food habits

*Abuse of nicotine, alcohol, or drugs

*Therapeutic diet required for a chronic disorder

*Weight: less than 85% of standard weight

more than 120% of standard weight

Nutritional Risk Factors in Pregnancy cont'd:

- Risk factors occurring during pregnancy

*Low hemoglobin and/or hematocrit

Hemoglobin less than 12.0 gm

Hematocrit less than 35.0 mg/dl

*Inadequate weight gain

Any weight loss

Weight gain of less than 1 kg per month after the first trimester

*Excessive weight gain: grater than 1 kg per week after the first trimester

Risk Factors for Pregnant Teens

- Maternal age, especially <16 years old
- Pregnancy less than 2 years after onset of menarche
- Poor nutrition, low prepregnancy weight, poor weight gain
- Infection or sexually transmitted disease
- Preexisting anemia
- Substance abuse: smoking, drinking, and drugs
- Poverty; lack of social support or education
- Rapid repeat pregnancies
- Lack of access to age-appropriate prenatal care
- Late entry into health system
- Unmarried status

Nutritional Supplementation During Pregnancy

- Special Supplemental Nutrition Program for Women, Infants and Children (WIC)
- Supplements for high-risk pregnancies
- Poor understanding of dietary adequacy
- Prenatal supplements
- Folate and iron

Physiologic Changes of Pregnancy

- Blood volume and composition
  - Blood volume increase
  - Red cell volume increase
  - Nutrient concentration changes
- Cardiovascular and pulmonary function
  - Increased cardiac output
  - Increased pulse rate
  - Cardiac hypertrophy
  - Decreased blood pressure
  - Increased oxygen requirements
  - Enhanced efficiency with gas exchange

Physiologic Changes of Pregnancy–cont'd

- Gastrointestinal function
  - Nausea and vomiting
  - Anorexia
  - Constipation
  - Heartburn
- Renal function
  - Higher glomerular filtration rate
  - Increased nutrient excretion
  - Leg and ankle edema
- Placenta
  - Surface size affects infant nutriture and birth weight

Effects of nutrient deficiencies on pregnancy outcome

- Energy — Low infant birthweight
- Folate — Miscarriage and NTD (spina bifida)
- Vitamin A — Congenital malformations
- Vitamin D — Low infant birthweight
- Iron — Stillbirth, premature birth, and LBW
- Iodine — Cretinism (varying degree of mental and physical retardation in the infant)
- Zinc — Congenital malformations

Energy Needs During Pregnancy

- Metabolism increases 15%
- DRIs add 340 to 360 kcal/day during the second trimester and another 112 kcal/day in the third trimester
- Effects of exercise
- Consequences of energy restriction

Key Macronutrients in Pregnancy

- Protein
- Carbohydrate
- Fiber
- Lipids

Key Vitamins in Pregnancy

- Folic acid:prevention of NTDs (Spina bifida)
- Choline
- Vitamin B_6
- Ascorbic acid
- Vitamins A, D, E, and K

Key Minerals in Pregnancy

- Calcium
- Phosphorus
- Iron
- Zinc
- Copper
- Sodium
- Magnesium
- Fluoride
- Iodine

Daily Food Guide for Females

Daily Food Guide for Females			
	Minimum Number of Servings		
Food Group	Nonpregnant 11- to 24-Year-Olds	Nonpregnant 25- to 50-Year-Olds	Pregnant or Lactating 11- to 50-Year-Olds
Protein, foods	5*	5*	7†
Milk products	3	2	3
Breads, grains	7	6	7
Whole-grain	4	4	4
Enriched	3	3	3
Fruits, vegetables	5	5	5
Vitamin C rich	1	1	1
b-carotene rich	1	1	1
Folate rich	1	1	1
Other	2	2	2
Unsaturated fats	3	3	3

Modified from *Nutrition during pregnancy and the postpartum period: a manual for health care professionals*, 1990, California Department of Health Services, Maternal Child Health Branch.
*Equivalent in protein to 5 oz of animal protein; at least three servings per week should be from the vegetable proteins.
†Equivalent in protein to 7 oz of animal protein; at least one of these servings should be a vegetable protein.

Recommended Food Intake During Pregnancy

- Calcium
  - Dairy products
  - Supplements
- Fluids
  - 8 to 10 glasses daily

Nutritional Care During Pregnancy

Summary of Nutritional Care During Pregnancy

1. Energy intake to meet nutritional needs and allow for about a 0.4-kg (14-oz) weight gain per week during the last 30 weeks of pregnancy
2. Protein intake to meet nutritional needs, about an additional 25 g/day; additional 25 g/day/fetus if more than one fetus
3. Sodium intake that is not excessive but is no less than 2-3 g/day
4. Mineral and vitamin intakes to meet the recommended daily allowances (folic acid and possibly iron supplementation is required)
5. Alcohol omitted
6. Caffeine in moderation: less than 200 mg/day—equivalent of 2 cups of coffee

Non-Nutrient Effects/Issues

- Alcohol (causes Fetal Alcohol Syndrome)
- Caffeine
- Artificial sweeteners
- Contaminants: exposure to methyl mercury caused Minamata Syndrome which happened to villagers of Minamata in 1953 in southern Japan who ate contaminated fish with methyl mercury. This syndrome caused death of one third of affected villagers. Mercury was transported across the placenta and also appeared in breast milk of mothers consuming contaminated fish. Many infants and children suffered permanent brain damage

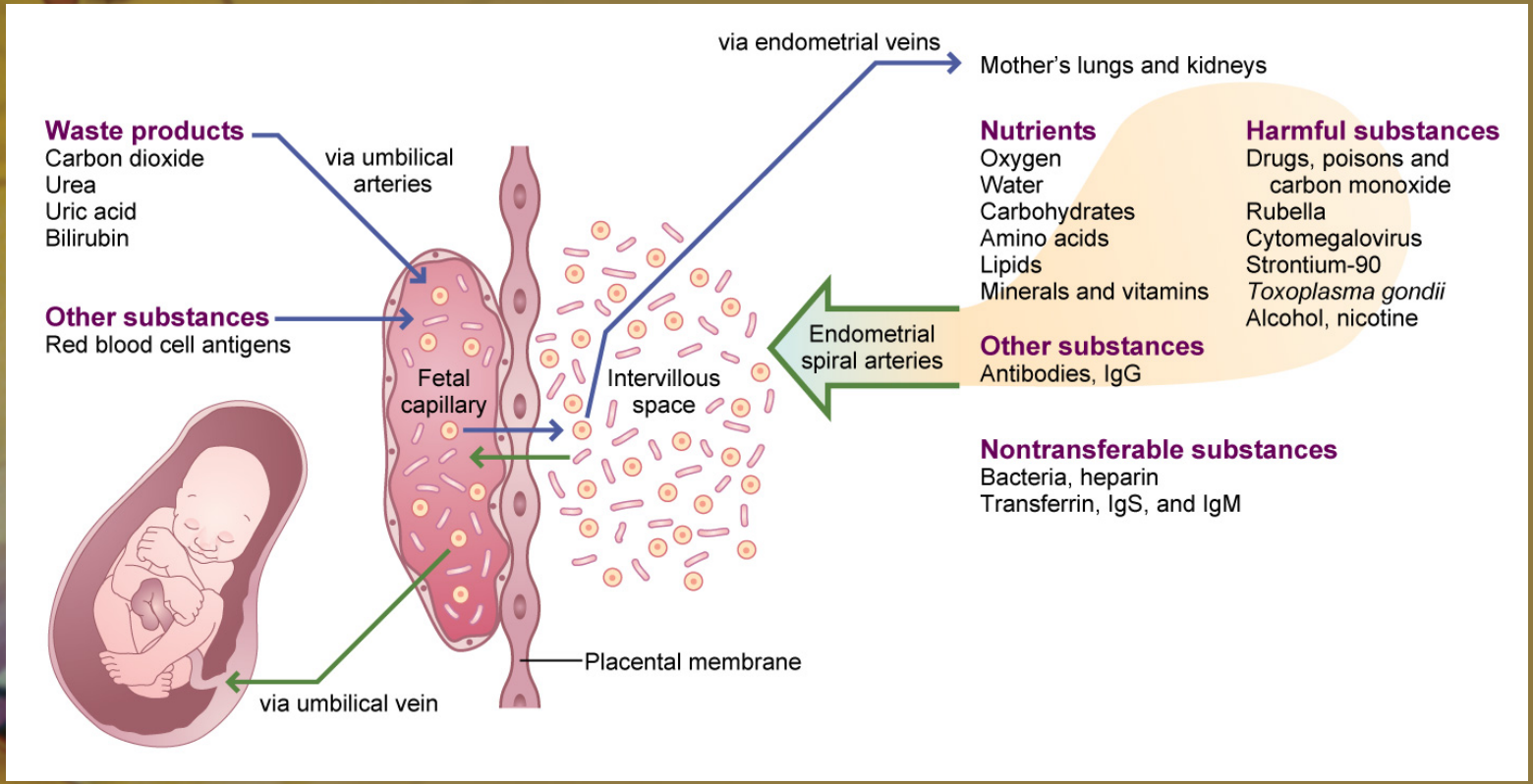
Non-Nutrient Effects/Issues

- Polychlorinated biphenyls (PCBs), used as plasticizers and heat exchange fluid. In Kyushu, Japan in 1968 a number of pregnant and lactating women ingested cooking oil contaminated with PCBs. As a result, they had small-for gestational-age infants with dark skin, eye defects, and other abnormalities.
- *Listeria monocytogenes*
- Beliefs, aversions, avoidances, cravings. A food craving is an intense desire to consume a specific food such as chocolate.
- Pica: **Pica** is characterized by an appetite for substances that are largely non-nutritive, such as paper, clay, metal, chalk, soil, glass, or sand.

Fetal Alcohol Effects

From Streissguth AP et al: Teratogenic effects of alcohol in humans and laboratory animals, *Science* 209:353, 1980.

Transfer of Substances Across the Placental Membrane



Diet-Related Complications of Pregnancy

- Nausea and vomiting
  - Usually during first trimester
- Heartburn
  - Common during later pregnancy
- Constipation and hemorrhoids
  - Common during latter stages
- Edema and leg cramps
  - Usually during third trimester

Higher-Risk Complications of Pregnancy

- Hyperemesis gravidarum:
  Hyperemesis gravidarum is extreme, persistent nausea and vomiting during pregnancy that can lead to dehydration. Nearly all women have some nausea or vomiting (morning sickness), particularly during the first 3 months of pregnancy.
  - Incidence: 2% of obstetric population
  - Management: rest and rehydration
- Pregnancy and preexisting diabetes mellitus

Higher-Risk Complications of Pregnancy–cont'd

- Gestational diabetes
  - Incidence: 5% to 10% of obstetric population
  - Diagnosis
  - Management
- Pregnancy-induced hypertension (PIH)
  - Incidence: 5% to 8% of obstetric population
  - Preeclampsia
  - Eclampsia
  - Diagnosis
  - Management

Risk factors associated with gestational diabetes

- Family diabetes
- Previously unexplained stillbirths
- Large babies weighing 4 kg or more
- Habitual abortions
- Birth of babies with multiple congenital defects
- Excessive obesity

Lactation Overview

- Physiology of lactation
- Nutritional requirements of lactation

Benefits of Breast-Feeding

Infant

Decreases incidence and/or severity of infectious diseases

- Bacterial meningitis
- Bacteremia
- Diarrhea
- Respiratory tract infection
- Necrotizing enterocolitis
- Otitis media
- Urinary tract infection
- Late-onset sepsis in preterm infants

Benefits of Breast-Feeding – cont.

Decreases rates of:

- Sudden infant death syndrome
- Types 1 and 2 diabetes
- Lymphoma
- Leukemia
- Hodgkin's disease
- Overweight and obesity
- Hypercholesterolemia
- Food allergies
- Asthma

Neurodevelopment

- Enhances performance on cognitive development tests
- Provides analgesia during painful procedures (heel stick for newborns)
- Promotes mother-child bonding

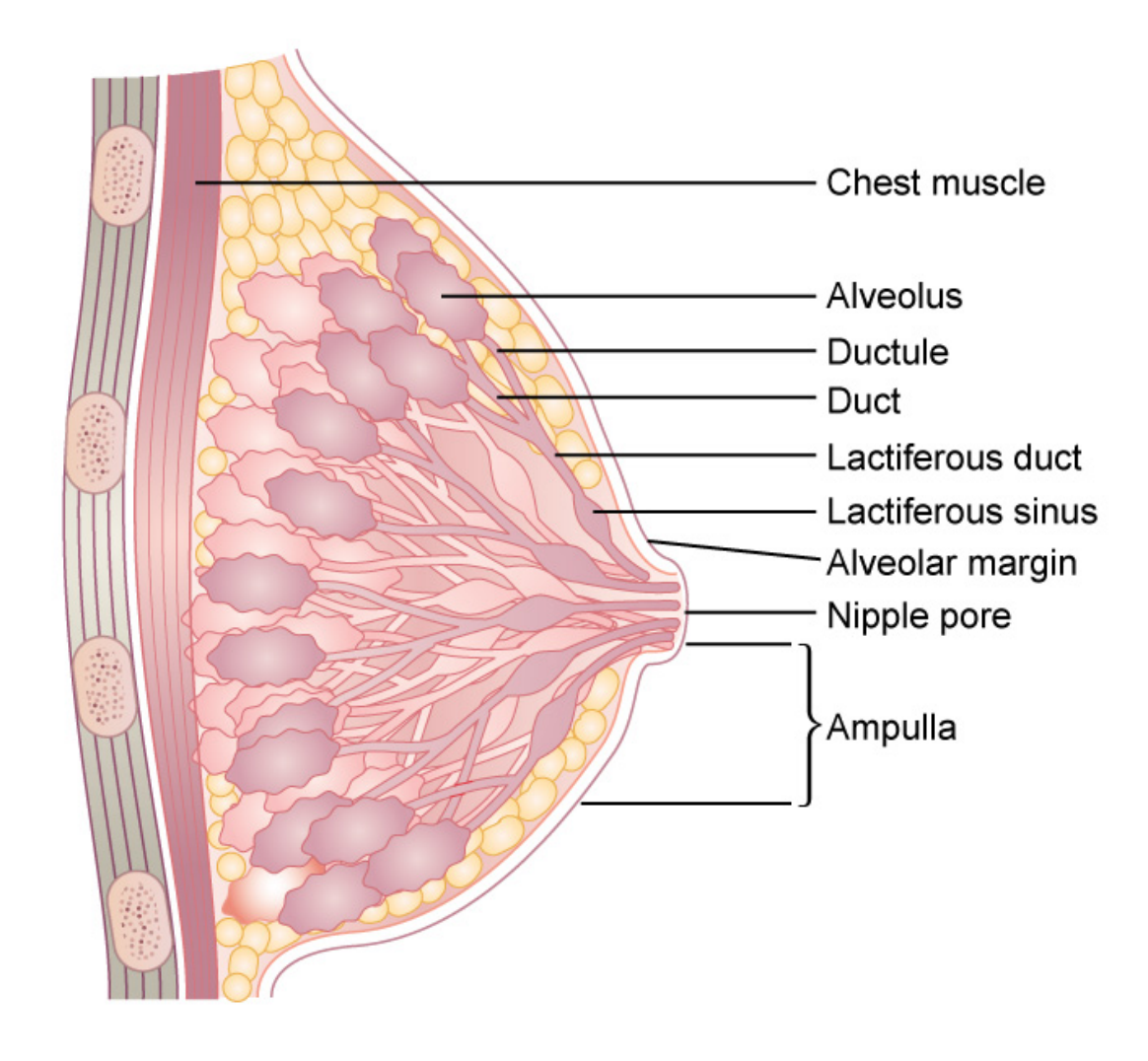
Benefits of Breast-Feeding – cont.

Mother

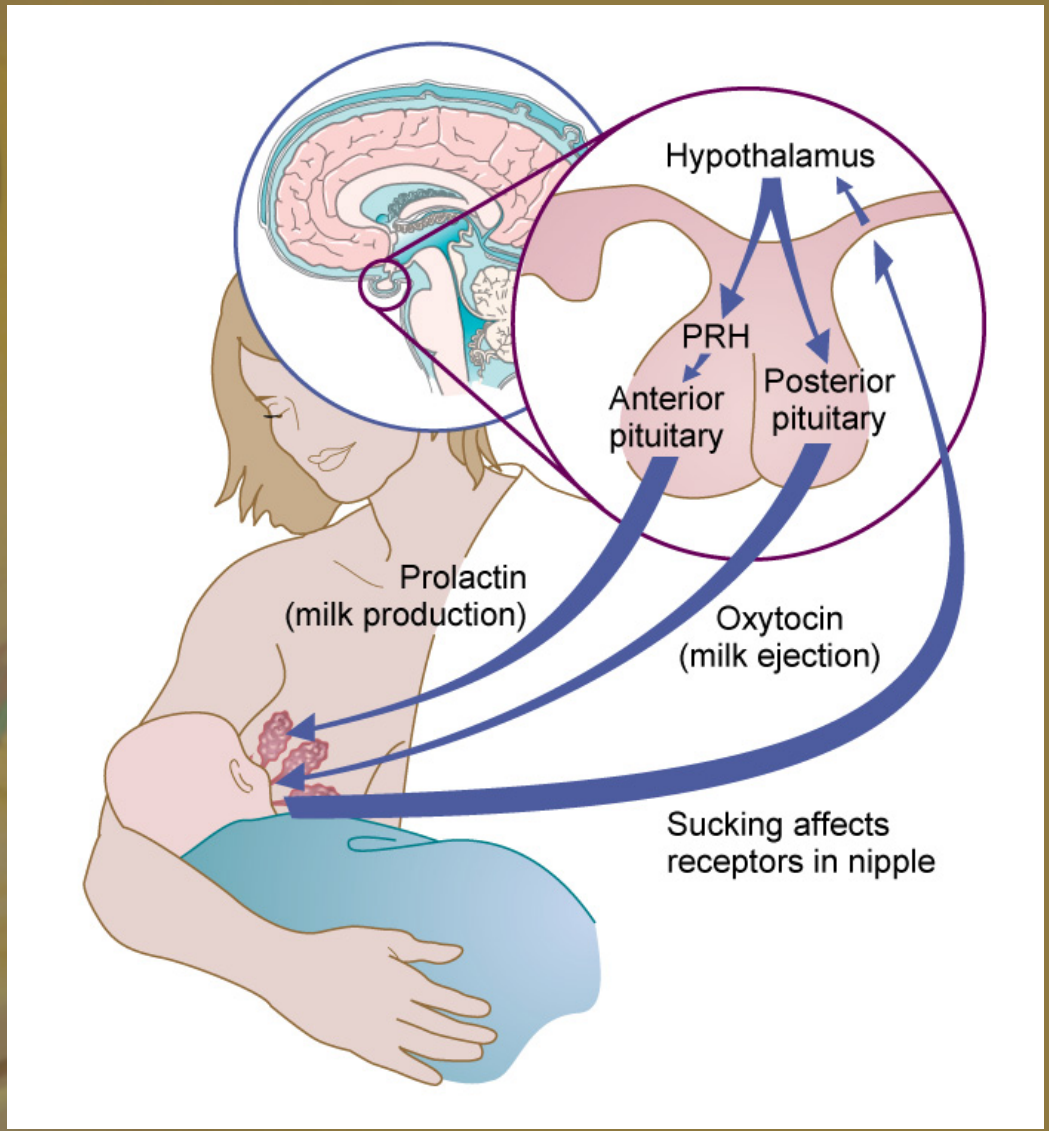
Decreases postpartum bleeding
More rapid uterine involution
Decreases menstrual blood loss
Increased child spacing
Earlier return to prepregnant weight
Decreases risk of breast and ovarian cancer
Possible decreased risk of postmenopausal hip fracture and osteoporosis

Adapted from American Academy of Pediatrics: Breastfeeding and the use of human milk, *Pediatrics,* 115:496, 2005.

The Mammary Gland



Physiology of Milk Production



Physiology of lactation

- Prolactin: a hormone secreted from the anterior pituitary gland that acts on mammary glands to initiate and sustain milk production.
- Oxytocin: a hormone secreted from the posterior pituitary gland that stimulates the uterus to contract and the mammary glands to eject milk.

Prolactin and Oxytocin activity

- An infant suckling at the breast stimulates the pituitary to release prolactin and oxytocin. Each of these hormones acts on the mammary glands.
- Prolactin encourages milk production
- Oxytocin stimulates milk ejection.
- Each of the hormones also acts on the reproductive organs:

  Prolactin inhibits ovulation.

  Oxytocin promotes uterus contractions.

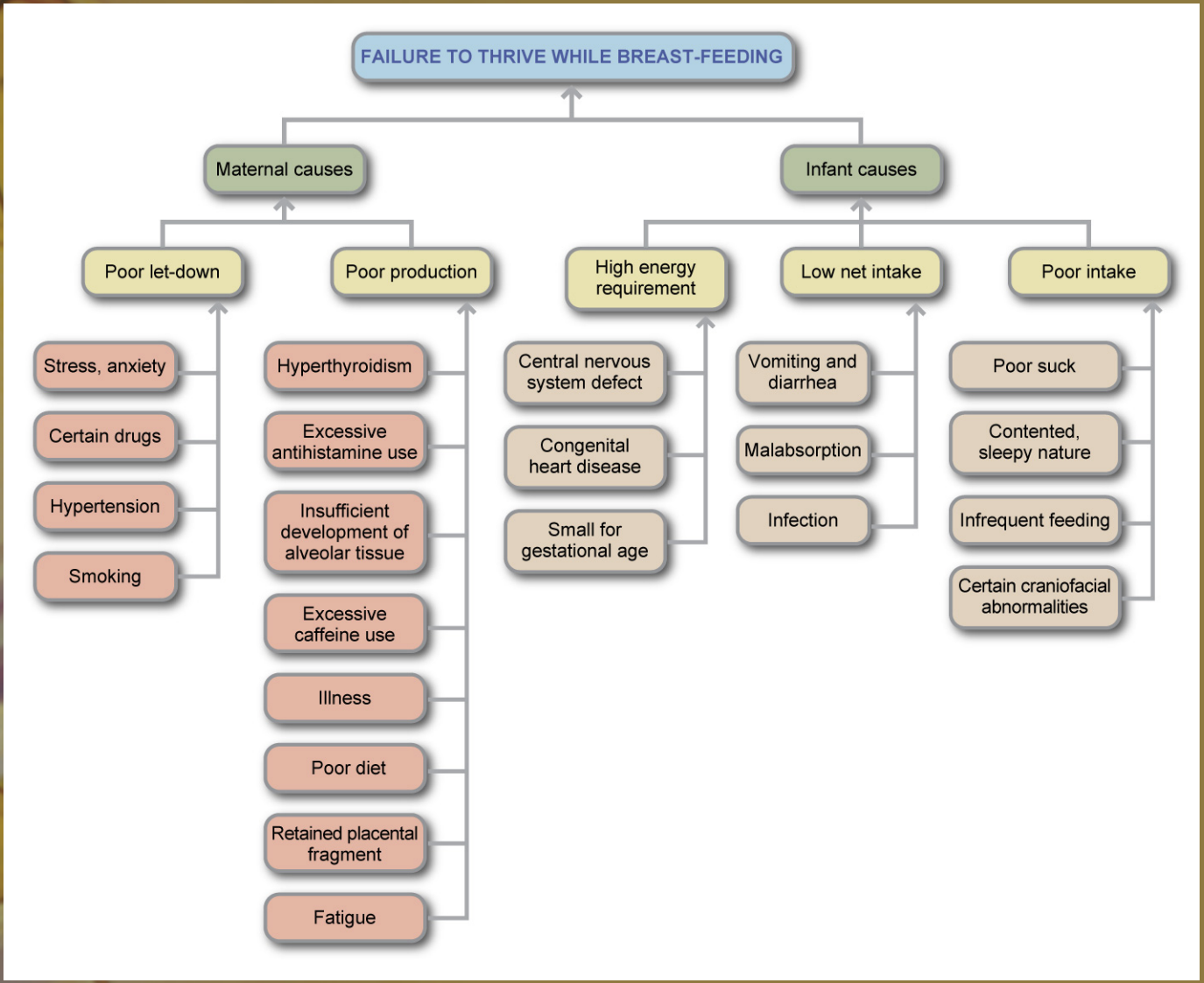
Breast-Feeding: Special Nutrient Needs

- Energy
- Protein
- Carbohydrates
- Lipids
- Vitamins
- Minerals

Breast-Feeding an Infant

- Preparation
- Technique
- Duration of breast-feeding
- Exercise and breast-feeding
- Transfer of drugs into human milk
- Failure to thrive in the breast-fed infant
- Other problems

Breast-Feeding Potential Problems



Breast-Feeding Problems and Solutions

Management of Breast-Feeding Problems	
Problem	**Approaches to Management**
Retracted nipple(s)	Before feeding the infant, roll the nipple gently between the fingers until erect.
Baby's mouth not open wide enough	Before feeding, depress the infant's lower jaw with one finger as the nipple is guided into the mouth.
Baby sucks poorly	Stimulate sucking motions by pressing upward under the baby's chin. Expression of colostrums often occurs, and the taste may stimulate sucking.
Baby demonstrates rooting but does not grasp the nipple; eventually cries in frustration	Interrupt the feeding, comfort the infant; the mother should take time to relax before trying again.
Baby falls asleep while nursing	If the infant falls asleep early in the feeding, the mother should awaken the infant by holding him or her upright, rubbing his or her back, talking to him or her, or providing similar quiet stimuli; another effort at feeding can then be made. If the baby falls asleep again, the feeding should be postponed.

Focal Points

- The Dietary Guidelines for Americans (see Chapter 12) provide an appropriate base for counseling women of reproductive age, but there is also need for individualized counseling.
- Whether defined problems are attributable to lack of resources, lack of nutrition knowledge, self-imposed dietary manipulations, genetic individuality, or a combination of these factors, solutions to defined problems during pregnancy and lactation can usually be found.
- A woman of reproductive age needs to know she gets but one chance to create the best baby she can; optimizing nutrition and her environment are critical ingredients.
- Breastfeeding remains the best source of nutrition for newborns, and new mothers need support to breastfeed as long as possible up to 12 months.