

NUTRITIONAL DISORDERS

Nutritional Diseases

- An adequate diet should provide:
 - Energy in the form of carbohydrates, fats and proteins.
 - Essential (as well as non essential) amino acids and fatty acids to be utilized as building blocks for synthesis of structural and functional proteins and lipids.
 - Vitamins and minerals, which function as co-enzymes or hormones in vital metabolic pathways or, as for the case of Ca &P, as important structural components.

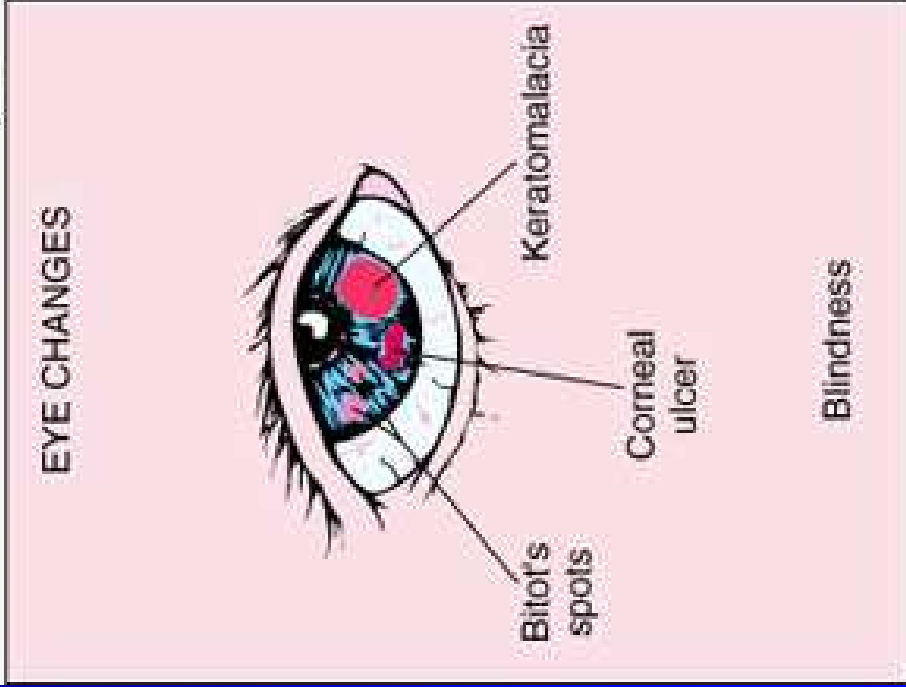
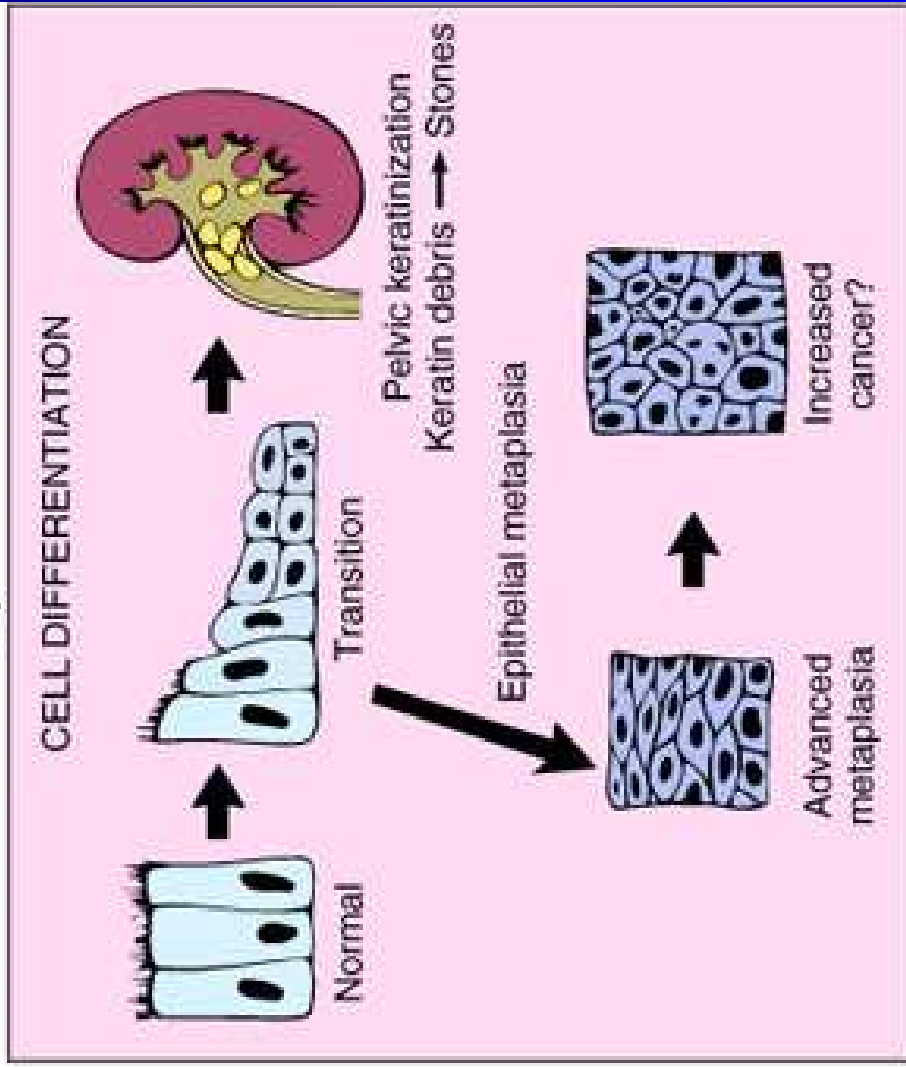
MAIN CATEGORIES OF NUTRITIONAL DISORDERS

- Vitamin deficiencies
- Protein-calorie malnutrition
- Obesity

SIGNS OF VITAMIN A DEFICIENCY

- Eye changes: xerophthalmia, Bitot's spots, keratomalacia, night blindness.
- Squamous metaplasia in respiratory and urinary tract predisposing to infection.

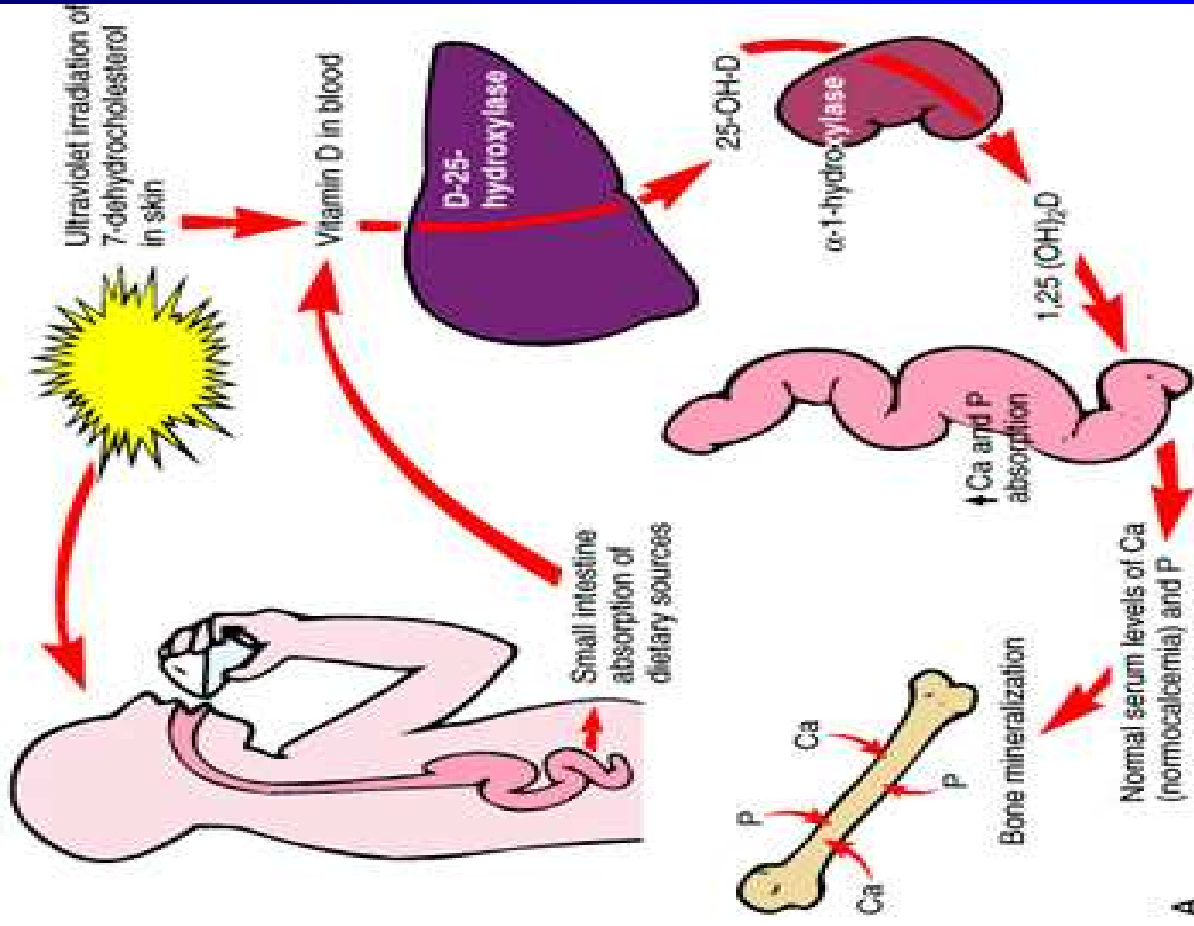
VITAMIN A DEFICIENCY



SIGNS OF VITAMIN D DEFICIENCY

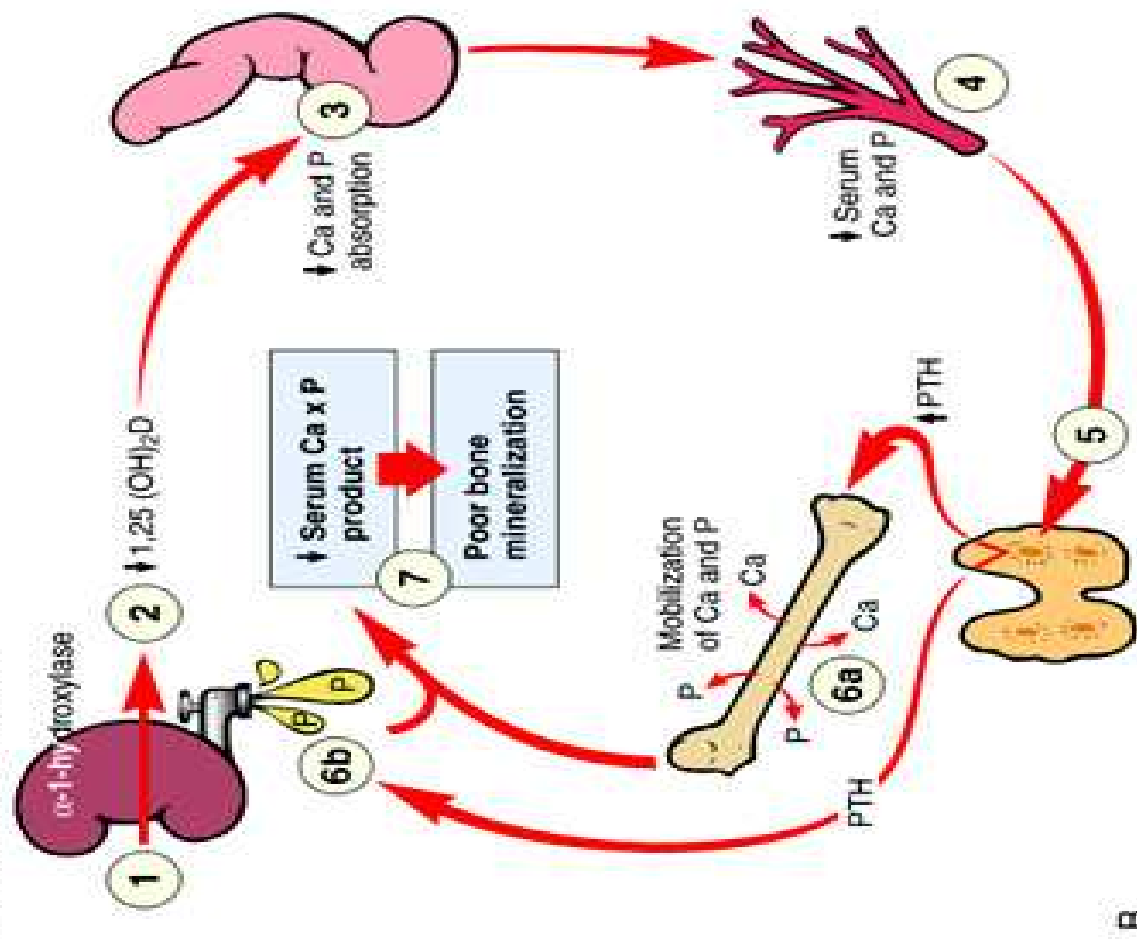
- Rickets (children)
 - * Leg deformities – bow legs.
 - * Thoracic changes – pigeon breast deformity, rachitic rosary, Harrison groove.
 - * Head – craniotabes and frontal bossing.
 - * Vertebrae – lumbar lordosis.
- Osteomalacia (adults)

NORMAL VITAMIN D METABOLISM



A

VITAMIN D DEFICIENCY



B



SIGNS OF VITAMIN K DEFICIENCY

- Bleeding tendency.

SIGNS OF RIBOFLAVIN DEFICIENCY

- Cheilosis and glossitis.
- Angular stomatitis.

SIGNS OF NIACIN DEFICIENCY

- Niacin deficiency causes pellagra (3 Ds):
 - * Dermatitis
 - * Diarrhea
 - * Dementia

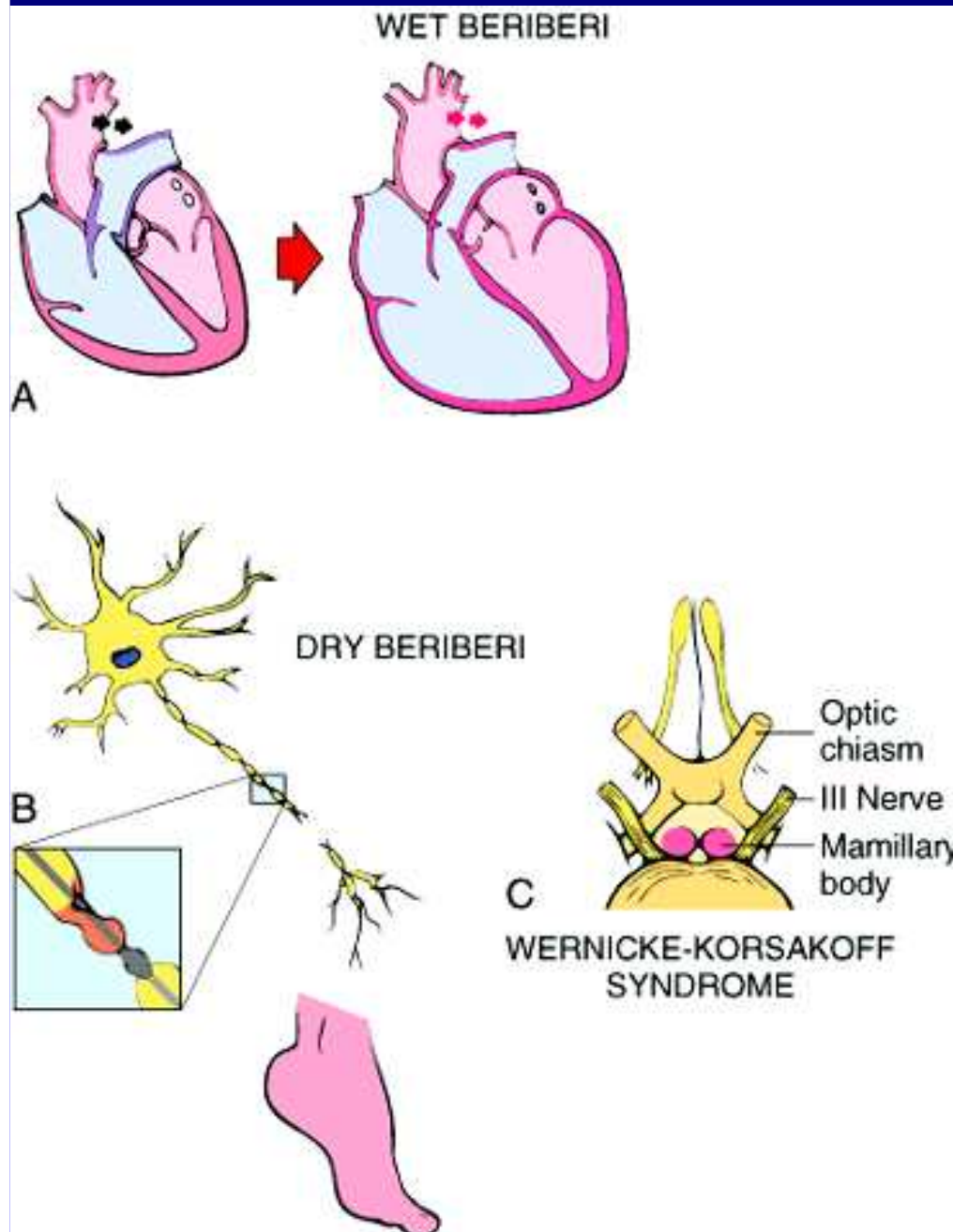
SIGNS OF PYRIDOXINE (B6) DEFICIENCY

- Deficiency is rare in humans and usually subclinical. It cannot be distinguished from other avitaminoses, particularly niacin deficiency.

SIGNS OF THIAMINE DEFICIENCY

Deficiency causes

- wet beriberi, characterized by edema due to heart failure (Cardiomyopathy).
- dry beriberi, characterized by neurologic disturbances: CNS and peripheral nerve changes
 - Korsakoff syndrome – psychosis with confusion, confabulation and loss of memory.
 - Wernicke encephalopathy – mental confusion with ophthalmoplegia, nystagmus and ataxia.



wet beriberi, characterized by edema due to heart failure

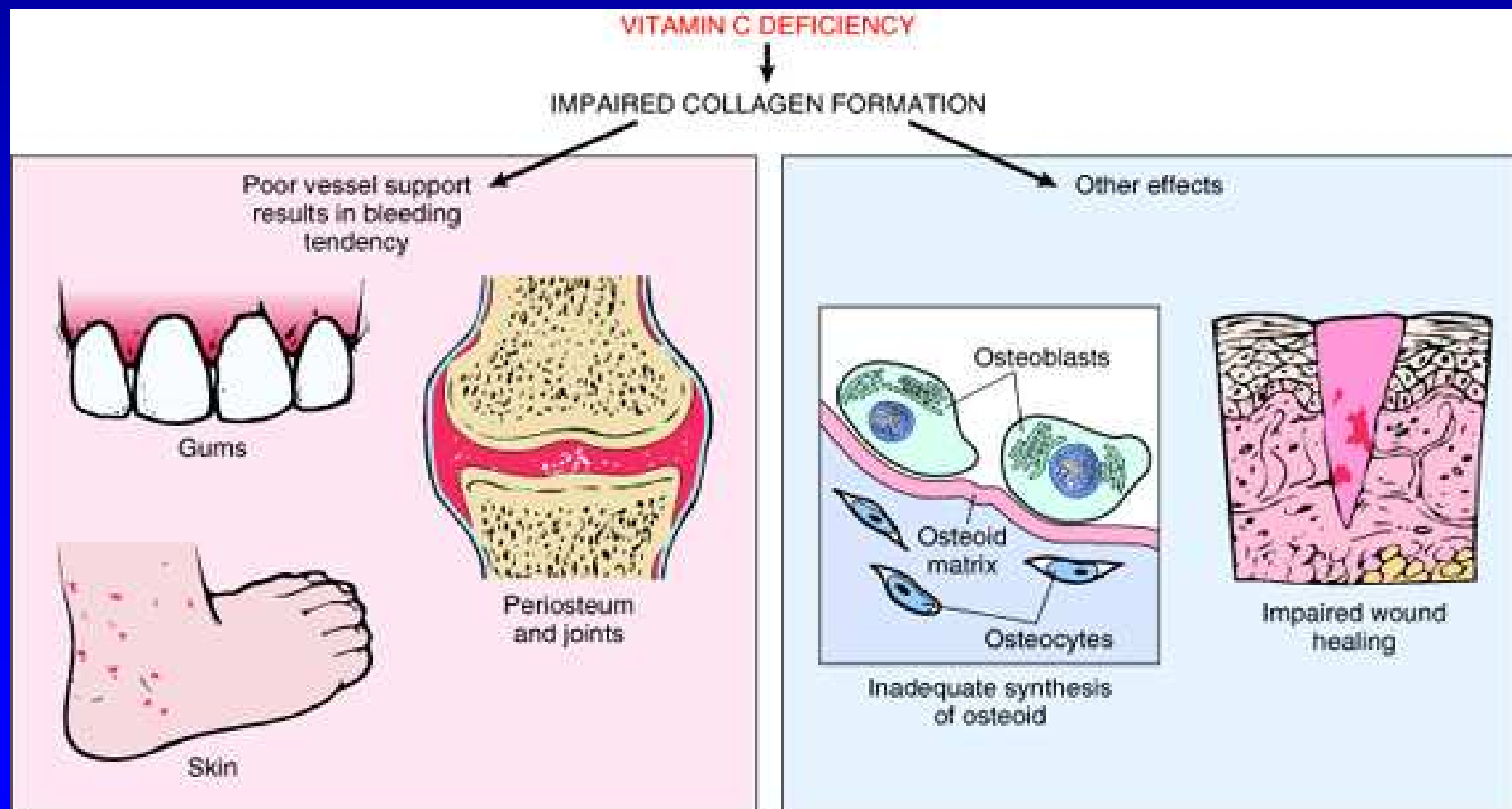
dry beriberi:

Korsakoff syndrome – psychosis with confusion, confabulation and loss of memory.

- Wernicke encephalopathy: – mental confusion with ophthalmoplegia, nystagmus and ataxia.

SIGNS OF VITAMIN C DEFICIENCY

- Vitamin C deficiency causes scurvy, which presents with:
 - * Vascular pattern – gingival bleeding, petechiae and echymoses
 - * Skeletal changes – soft bones, growth retardation
 - * Delayed wound healing



Malnutrition

- Primary: related to diet.
- Secondary: related to:
 - Nutrient malabsorption.
 - Impaired nutrient utilization or storage.
 - Excess nutrient losses.
 - Increased need for nutrients.

Malnutrition

- Under nutrition in affluent societies may be due to:
 - Ignorance and poverty.
 - Chronic alcoholism.
 - Acute and chronic illnesses.
 - Self-imposed dietary restrictions.
 - Other less common causes: malabsorption syndromes, genetic diseases, specific drug therapies, and total parenteral nutrition.

Protein-energy Malnutrition

- Inadequate intake of protein and calories.
- Two main clinical syndromes:
 - Marasmus.
 - Kwashiorkor.

WHAT IS MARASMUS?

- Marasmus is a consequence of protein energy deficiency characterized by:
 - wasting of muscles and fat tissue (“skin and bone”).
 - Serum protein levels are normal, and there is no edema.
 - It can occur at any age and can be easily compensated by normalizing nutritional supply of proteins and other nutrients.

Protein-energy Malnutrition

Marasmus:

- Weight is less than 60% of normal.
- Loss of muscle mass and subcutaneous fat leading to emaciation.
- Usually there is associated anemia, multivitamin deficiencies, and immune deficiency (T-cell mediated immunity).
- Serum albumin levels are normal or slightly reduced.

WHAT IS KWASHIOKOR?

- Kwashiokor is a childhood protein energy deficiency associated with:
 - hypoalbuminemia and generalized edema.
 - Typically it occurs in children who have been weaned of the mother's breast when the second child was born.
 - It presents with:
 - edema
 - desquamation of skin,
 - discoloration of hair,
 - anemia
 - fatty liver.

Protein-energy Malnutrition

Kwashiorkor:

- Occurs when protein deprivation is relatively greater than the reduction in total calories.
- Weight is between 60% -80% of normal.
- Loss of visceral protein compartment leading to hypoalbuminemia, which results in significant edema.
- Usually there is sparing of muscle and subcutaneous fat.
- Associated skin lesions, hair changes, anemia, large fatty liver, atrophy and loss of small intestinal villi, apathy and listlessness, other vitamin deficiencies, and defects in immunity.

Kwashiorkor:



LIST OF DEFICIENCIES OF ESSENTIAL MINERALS

- Iron – hypochromic microcystic anemia.
- Iodine –hypothyroidism, goiter, growth retardation.
- Copper – abnormal collagen linking, neuromuscular disorders.
- Zinc – infertility, acrodermatitis enteropathica, growth retardation.
- Fluoride – dental caries.

Anorexia Nervosa and Bulimia

- Anorexia nervosa:
 - A self-induced starvation.
 - Clinically presents as severe PEM and effects on endocrine system: amenorrhea, hypothyroidism, decreased bone density, anemia, lymphopenia, hypoalbuminemia, and increased susceptibility to cardiac arrhythmia.
- Bulimia:
 - Eating large amount of food followed by induced vomiting.
 - Lead to amenorrhea (50%), hypokalemia (--> cardiac arrhythmia), aspiration pneumonia, esophageal and cardiac rupture.

Obesity

- How to measure fat accumulation:
 - Expression of in relation to height, body mass index (BMI: kg/m^2). Increased BMI is associated with increased health risk, and mortality rate.
 - Skin fold measurements.
 - Various body circumferences particularly the ratio of the waist-to-hip circumference.
- Distribution of fat has also an effect: central or visceral obesity is associated with more risk than excess accumulation of fat in subcutaneous tissue.

OBESITY

- Two basic types of obesity:

- * Lifelong obesity.

Also called hyperplastic obesity. Begins in childhood and is characterized by an increased number of adipocytes on peripheral parts of the body.

- * Adult onset obesity.

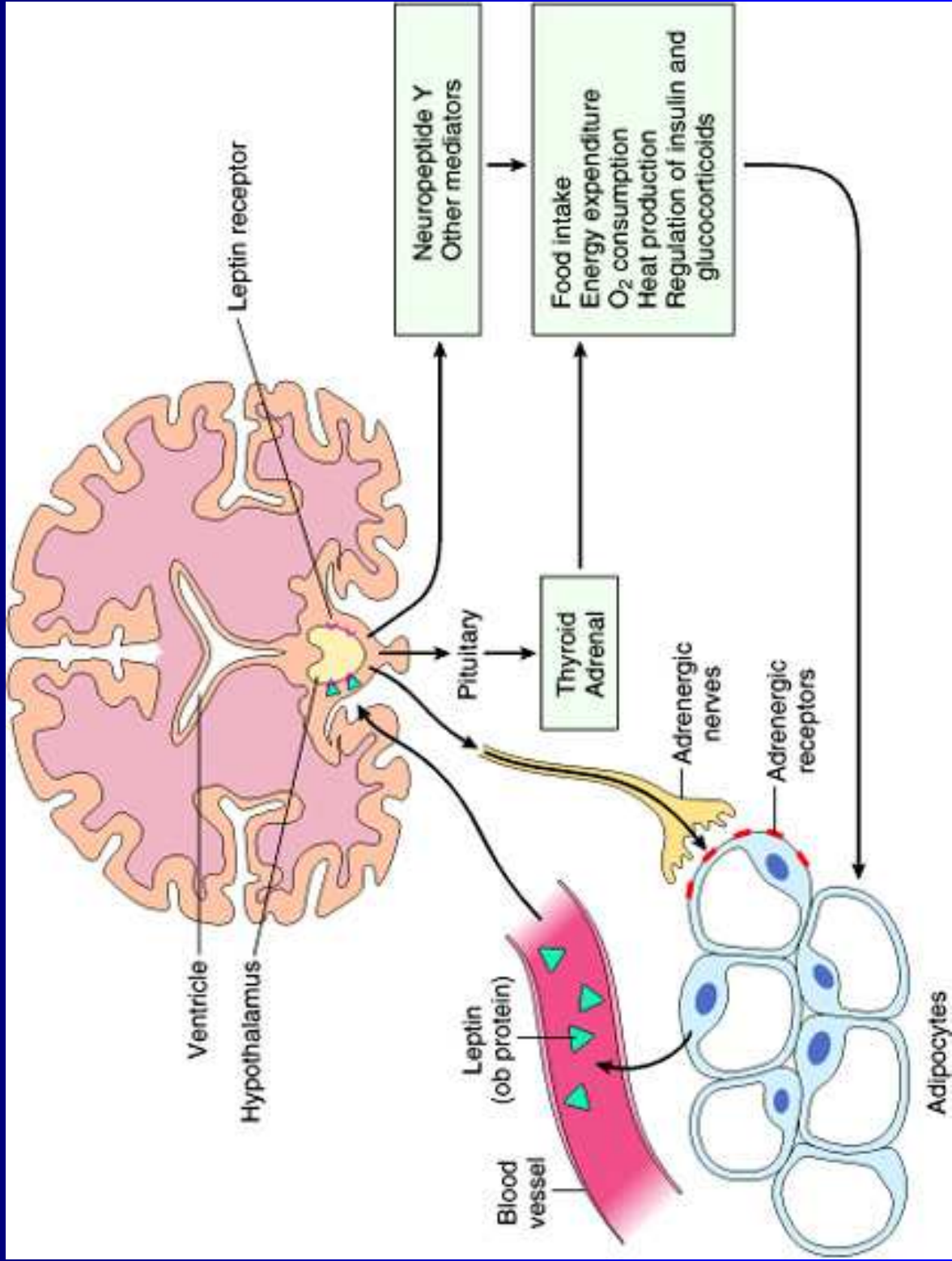
Also called hypertrophic obesity. It is characterized by an increased size of fat cells and central adiposity. Fat accumulates on the trunk.

HOW DOES THE BODY PREVENT THE DEVELOPMENT OF OBESITY?

- Balance between calorie intake and expenditure.
- The critical role in this regulation is played by Leptin. Leptin binds to leptin receptors in the hypothalamus, thus suppressing food intake and increasing expenditure of calories.

Obesity: Causes

- Role of the leptin hormone.
- Genetic factors (identical twins).
- Environmental factors (type of diet ~ emigrant Asians).



ADVERSE CONSEQUENCES OF OBESITY

- Hypertension
- Diabetes
- Osteoarthritis

Obesity: Associated Risks

- Hyperglycemia.
- Low HDL cholesterol.
- Atherosclerosis, coronary artery disease and myocardial infarction .
- Cholelithiasis
- hypoventilation syndrome (pickwickian syndrome)
- ? stroke
- ? cancer (breast, endometrial carcinoma).