Child with a Metabolic Condition

Chapter 32

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Endocrine System

- Consists of glands that effect many aspects
- If endocrine balance is off: hypo or hypersecretion
- 3 functional parts
- Hormones are complex chemical substances released by endocrine glands

Endocrine System

Endocrine assessment

- Birth hx
- Height hx of family members
- Pubertal hx of parents
- Developmental milestones
- Height/weight/BSA/BMI
- Family hx of endocrine disorders
- Hx of brain tumors, head trauma, chemo, radiation to head or neck

Endocrine Glands

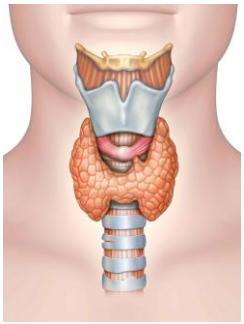
1. Pituitary Gland

- Somatotropin
- Follicle stimulating hormone (FSH)
- Luteinizing hormone
- Gonadotropin hormone
- Prolactin
- Thyroid stimulating hormone (TSH)
- Adrenocorticotropic hormone (ACTH)
- Melanocytes-stimulating hormone
- Luteinizing-releasing hormones
- Oxytocin
- Antidiuretic hormone (ADH)

Endocrine Glands

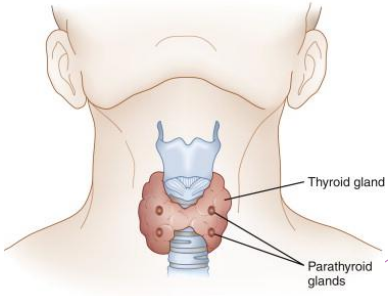
2. Thyroid

- Secretes
  - Triiodothyronine (T3), Thyroxine (T4), Calcitonin
- Regulates
  - Blood calcium concentrations and processes protein, fat, and carbohydrate catabolism
- Major role
  - Regulate basal metabolic rate
  - Regulates utilization of O2 and CO2



Endocrine Glands

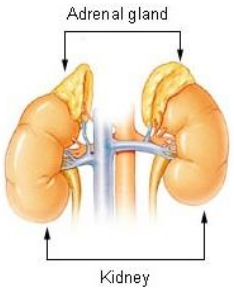
3. Parathyroid (4 total)
- Secretes
  - Parathyroid hormone (PTH)
- Major role
  - Regulate and maintain calcium levels
  - Influences potassium, phosphate, and magnesium levels



Endocrine Glands

4. Adrenal Gland

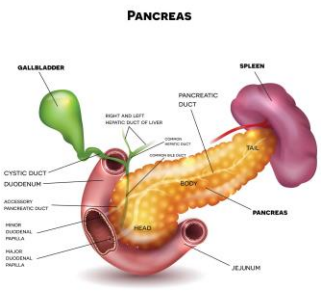
- Produces and releases
  - Mineralocorticoids or aldosterone
  - Sex hormones
    - Progesterone
    - Estrogen
    - androgens
- Medulla of adrenal gland produces
  - Epinephrine and norepinephrine
  - Cortisol and corticosteroid



Endocrine Glands

5. Pancreas

- Secretes
  - Insulin from beta cells
  - Glucagon from alpha cells
- Main role
  - Regulate blood glucose



Endocrine Glands

6. Ovaries

- Secrete
  - Progesterone and estrogen
- Main role
  - Body changes during puberty and pregnancy

7. Testes

- Secrete
  - Testosterone
- Main role
  - Sexual maturity

NCLEX Question

A preschool-aged child is gaining weight and is sluggish. Which endocrine gland should be evaluated for this child?

a. Thyroid

b. Pancreas

c. Pituitary

d. Parathyroid

Endocrine Gland Disorders

Syndrome of Inappropriate Antidiuretic Hormone (SIADH)

- What is it?
  - Overproduction and excretion of antidiuretic hormone (ADH) from _____ _____ gland
  - Results in kidneys absorbing more water, decreased urine output, increased fluid retention
- Cause
  - Head injury

Endocrine Gland Disorders

Syndrome of Inappropriate Antidiuretic Hormone (SIADH)

- SIADH leads to hyponatremia, why?
- S/Sx of hyponatremia?
- What would the assessment look like?
- What orders do you anticipate?

Endocrine Gland Disorders

Deficient anterior pituitary hormone: *Pituitary dwarfism*

- Child with dwarfism
  - Normal proportions, shorter overall stature
  - Growth of <2 in per year until preschool
  - Appear overweight
- When suspected, analysis of:
  - Bone age
  - Serum growth hormone
  - Previous growth plots

Endocrine Gland Disorders

Deficient anterior pituitary hormone: *Pituitary dwarfism*

- Assessment
  - Linear growth retardation with normal skeletal proportions
  - Normal intelligence/mental age/cognitive processing
  - Delayed puberty
  - Lab eval of GHD
- Interventions
  - HGH injection
  - Earlier tx=greater chance of response
  - Emotional support
  - Positive reinforcement

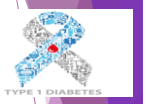
Endocrine Gland Disorders

Deficient anterior pituitary hormone: *Pituitary dwarfism*

- Nursing considerations
  - Thorough assessment dental anomalies
    - Jaw may have growth retardation
    - Permanent teeth may not erupt properly
  - Emotional support
    - Child AND family
    - Local/national support groups

Disease Process of Metabolic System

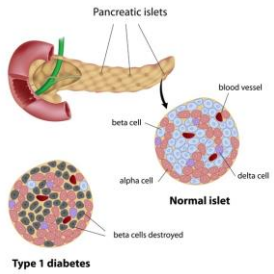
Diabetes Mellitus Type 1 (T1D)



- *No* insulin produced by pancreas
- Classified as *insulin dependent*
- Life-long insulin injections or pump
- Dx between infancy and young adulthood
- Due to increasing childhood obesity, type 2 is surpassing type 1 for children

Disease Process of Metabolic System

- T1D
- Cause
- Autoimmune attack on beta cells
- Autoantibodies present for up to 9 years before symptoms show
- First presentation is usually _____



Disease Process of Metabolic System

Diabetic ketoacidosis (DKA)

- Lack of glucose to cells
  - Why?
- Adipose and muscle tissue broken down in attempt to provide cells with glucose
- Fats convert to energy, liver produces ketones

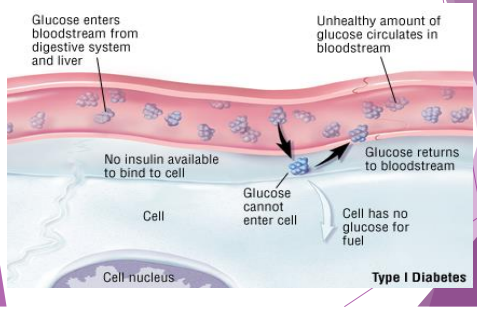
Disease Process of Metabolic System

Diabetic ketoacidosis (DKA)

- Ketones accumulate; spill into urine → leads to metabolic acidosis
- Body attempt to compensate
- Body loses ability to compensate, ketones continue to increase

Disease Process of Metabolic System

- **DKA**
- Kids in DKA need PICU care
- What will you monitor?
- What education will you provide?



Disease Process of Metabolic System

T1D

- Assessment findings
  - Glycosuria
  - Elevated 8 hour fast
  - Polyphagia, polydipsia, polyuria
  - Malnourished appearance
  - Fatigue
  - Fruity breathe
  - Yeast infection
  - Dry, flushed skin
  - Confusion

Disease Process of Metabolic System

T1D

- Interventions
  - Priority: assess and tx for DKA
  - Stabilize acidotic state
  - Normalize electrolyte levels
  - Insulin drip initiated and titrated
  - Wean from IV to SubQ insulin
  - NO IV potassium until urine output established
  - Facility specific protocols to guide tx

Disease Process of Metabolic System

T1D

- Patient and family education
  - Blood glucose checks
  - Administer insulin
  - Pediatric Endocrinologist
  - Carb counting
  - Insulin pump
  - Long term care
  - Exercise

Disease Process of Metabolic System
Insulin Review

- Lispro (Humalog)
  - Rapid acting; clear
  - Onset: 5-15 min; Peak: 30-90 min; Duration: <4 hr
- Regular
  - Short acting; clear
  - Onset: 30 min; Peak: 2-3 hr; Duration: 6-8 hr
- NPH (Humulin)
  - Intermediate acting, cloudy
  - Onset: 1-2 hr; Peak: 6-12 hr; Duration: 18-26 hr
- Glargine (Lantus)
  - Long acting, clear, basal insulin
  - Onset: 4-6 hr; Peak: 14-26 hr; Duration: 28-36 hr

Disease of Metabolic System

T1D: Hypoglycemia

- Too much insulin, not enough eating
- Occurs anytime in child with DM
- Symptoms develop rapidly
- Life-threatening
- Severe hypoglycemia in hospitalized pts caused by what?

Disease Process of Metabolic System

- **T1D: Hypoglycemia**
- Treatment
  - 15-20 grams of carbs
  - Reassess in 15 min
  - Second dose of carbs if needed
  - Monitor vitals
  - Supervise until blood glucose stabilizes
  - Decreased LOC?
    - Dextrose 50% IV push (per order)
    - IV glucagon (per order)

Disease Process of Metabolic System

- Patient education
  - Pages 585-587 in text; orange boxes
- When to tell patients to call provider
  - Two blood glucose readings <70 OR >300
  - Low blood glucose requiring glucagon
  - Any levels of ketones in urine

Disease Process of Metabolic System

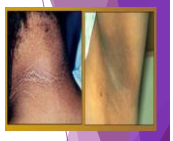
Diabetes Mellitus Type 2 (T2D)

- Non insulin dependent
- Typically seen in overweight/obese children
- Reaching epidemic proportions
- Genetic predisposition
- Environmental factors
- Developed insulin resistance
  - Body still produces insulin
  - Decreased sensitivity to its effects

Disease Process of Metabolic System

T2D

- Assessment
  - Hyperglycemia
  - May demonstrate acanthosis nigricans
  - HTN, sleep apnea, hyperlipidemia
- Treatment
  - Exercise
  - Weight loss
  - Oral hypoglycemic
  - Insulin

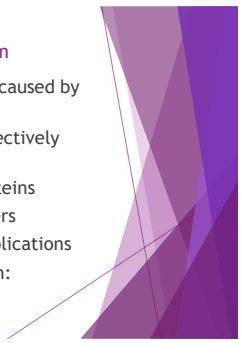


Disease Process of Metabolic System

- **T2D**
- Nursing interventions
  - Education
  - Lifestyle changes
  - Weight management
  - Blood glucose control
- Support systems
  - Juvenile Diabetes Research Foundation
  - American Diabetes Foundation
  - American Academy of Pediatrics

Inborn Errors of Metabolism

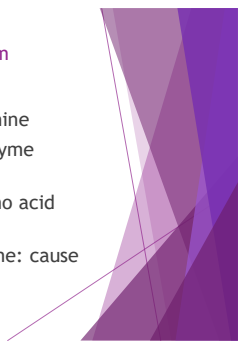
- Large class of rare genetic diseases caused by altered biochemistry
- Prevent body from properly and effectively turning food into energy source
- Caused by alteration in specific proteins
- Autosomal recessive genetic disorders
- Make dietary changes to avoid complications
- Lack of dietary changes can result in:



Inborn Errors of Metabolism

Phenylketonuria (PKU)

- Inability to metabolize phenylalanine
- Liver has deficient amount of enzyme phenylalanine hydroxylase
- Phenylalanine is an essential amino acid found in most protein
- Build up of phenylalanine over time: cause brain damage



Inborn Errors of Metabolism

Phenylketonuria (PKU)

- Assessment
  - Musty smelling urine
  - Deficiency of pigment melanin
  - Usually blonde hair/blue eyes
  - High risk for eczema
  - Photosensitivity
  - Fair skin

Inborn Errors of Metabolism

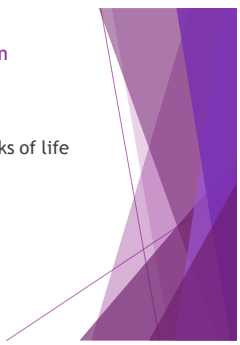
Phenylketonuria (PKU)

- Diagnosing
  - PKU test done at 24 hr old
  - Must be done *after* ingested some type of protein
    - Breast milk or formula

Inborn Errors of Metabolism

Phenylketonuria (PKU)

- Symptoms
  - Show symptoms within a few weeks of life
  - Older infants:
    - Failure to thrive
    - Lethargy
    - Neurological toxicity



Inborn Errors of Metabolism

Phenylketonuria (PKU)

- Interventions
  - Eliminate dietary phenylalanine
  - High protein foods should be avoided
  - Formula with enzymatic hydrolysate of casein should be used
  - As child grows: avoid eggs, flour, fish, legumes, nuts breads, cheese, poultry, meats, and foods containing phenylalanine