Endocrine II

1. Major Organs
    1. Pituitary
        1. overview
            1. aka “hypophysis”
            2. 9 major hormones!
            3. infundibulum or stalk connects to hypothalamus via tract
        2. anterior pituitary
            1. anterior lobe = adenohypophysis
            2. gut derived, endocrine
            3. hormones
                1. GH “growth hormone”- bones & muscle
                    1. GHRH -”growth hormone-releasing hormone”
                    2. GHIH - “growth hormone-inhibiting hormone”, (somatostatin)
                    3. IGF- “insulin-like growth factors”, (somatomedins), mediate growth effects
                2. TSH “thryoid stimulating hormone”
                    1. TRH “thyrotropin releasing hormone”
                3. ACTH- “adrenocorticotropic hormone”
                    1. CRH “corticotropin releasing hormone”
                    2. stress response integration
                4. Gonadotropins
                    1. FSH “follicle stimulating hormone” - gamete production
                    2. LH “luteinizing hormone”- gonadal hormone production
                5. Prolactin- similar to growth hormone
                    1. PRH “prolactin releasing hormone”
                    2. milk production in females
        3. posterior pituitary
            1. posterior lobe + infundibulum (stalk) = neurohypophysis
            2. derived from nervous tissue
            3. stores & releases hormones from hypothalamus
            4. vascular connection- releasing & inhibiting hormones from hypothalamus
            5. hormones (released from hypothalamic neurons)
                1. oxytocin- smooth muscle contraction
                2. ADH “antidiuretic hormone”(vasopressin)- inhibits urine formation
    2. Thyroid
        1. thyroid hormone- metabolism
            1. TSH
            2. TRH
        2. calcitonin
            1. inhibits osteoclasts
            2. stimulates calcium uptake
    3. Parathyroid
        1. PTH
            1. stimulates osteoclasts
            2. enhances Ca^{++} reabsorbtion by kidneys
            3. enhances Ca^{++} reabsorbtion by gut
    4. Adrenal glands
        1. cortex
            1. mesoderm derived
            2. steroid secreting
            3. hormones
                1. aldosterone- reduces secretion of Na^{+}, kidney
                    1. 4 mechanisms control release
                2. glucocorticoids
                    1. cortisol
                        1. gluconeogenesis (glucose from fats & proteins)
                    2. cortisone
                    3. corticosterone
                    4. anti-inflammatory & anti-immune effects
                3. gonadocorticoids
                    1. androstenedione
                    2. converted to T, & DHT in peripheral tissues
        2. medulla
            1. nervous derived
            2. link to sympathetic nervous system
            3. chromaffin cells
                1. epinephrine & norepinephrine
    5. Pancreas
        1. insulin
        2. glucagon
        3. refer to figure
    6. Pineal
        1. melatonin production
        2. daily cycle: high @ night = drowsiness & vice versa
        3. eye to suprachiasmatic nucleus = biological clock
    7. Thymus
        1. thymosin- T-lymphocyte maturation
    8. Gonads

1. ovaries
2. testes

9. Other hormone producing tissues & organs (Table 9.2? in text)
    1. prostaglandins- local
        1. vasoconstriction
        2. labor contractions
        3. inflammation & pain
        4. stomach secretions
        5. fever
    2. placenta
        1. hCG human chorionic gonadotropin- maintains pregnancy
        2. hPL- human placental lactogen- milk production
        3. relaxin- softens pubic symphysis
    3. skin
        1. produces cholecalciferol (provitamin D3)
        2. activated by kidneys to form vitamin D3
        3. stimulates active transport of dietary Ca^{++} across intestinal cell membranes
    4. gut
        1. gastrin
            1. stimulates stomach to release HCl (hydrochloric acid)
        2. secretin
            1. inhibits secretory in activity in stomach
            2. stimulates release of bicarbonate-rich juice from pancreas
        3. CCK-cholecystokinin
            1. stimulates release of enzyme-rich juice from pancreas
            2. bile from gall bladder
    5. kidney
        1. erythropoetin (EPO)- stimulates rbc production in response to hypoxia
    6. heart
        1. ANP- atrial natriuretic peptide- inhibits Na^{+} reabsorbtion in kidney
    7. adipose tissue
        1. leptins secreted in response to fat & glucose
        2. signal satiation to CNS; suppress appetite
        3. may trigger onset of puberty
10. Receptors
    1. recall the radio analogy
        1. same song means different things to different people
    2. different receptors on different tissues respond differently to same hormone
    3. e.g., epinephrine locks into adrenergic receptors
        1. β1 receptors <u>dilate</u> coronary arteries
        2. β2 stimulate insulin secretion by pancreas, dilate lung vessels & bronchioles
        3. β3 lipolysis by fat cells
        4. α1 receptors <u>constrict</u> visceral & skin vessels
        5. α1 receptors on blood platelets stimulate clotting

2. Developmental Aspects of Hormones
    1. development
        1. glands develop as outpocketings of gut tissue
    2. puberty
        1. testosterone
        2. estrogen
    3. aging
        1. overall decline in endocrine activity
            1. e.g., hypothyroidism
            2. adult onset diabetes
            3. reduced melatonin- sleeplessness
                1. reduced immunity
            4. reduced GH- muscle atrophy
    4. menopause
        1. ovaries lose responsiveness to gonadotropin
        2. declining estrogen production
        3. "loss of control"
            1. anovulatory ovarian cycles
            2. multiple ovulations: leads to more twins in older moms