Other Hormones Essential for Normal Growth
Chapter 12 Lecture 13

I. Insulin

1) humans & other vertebrates: primary role in carbohydrate metabolism

2) growth ???
   - diabetic children — with normal GH titers: ↓ stature
   - diabetic mothers: infants with islet hyperplasia & hyperinsulinism — ↓ stature
   - hypophysectomized rat growth stimulated when fed ↑ carbohydrate diets
   - similar structures of insulin/GH & their receptors

   - insulin anabolic effects of GH
     - absence of insulin: ↑ protein catabolism
     - ↑ muscle cells glucose uptake, ↑ energy substrates protein anabolism
     - ↑ cellular uptake of amino acid

3) pathophysiology
   - high insulin: stimulates growth — low affinity to IGF receptors
   - hyperinsulinism: ↑ kidney & adrenal glands growth Xr:IGF receptors

II. Prolactin: similar structurally to GH & their receptors structurally similar

1) milk synthesis

2) enlargement of mammary glands
   - with estrogens/adrenal steroids — ductile branching
   - w/o estrogens: ↑ PRL in men — enlarged breasts

3) ↑ GH production in rat livers

4) ↑ lymphocytes production/T-cell dependent immune responses
   - human blood cells — autocrine lymphocytes proliferation

5) ↑ ovary & testes growth & function

6) amphibian tail & gill growth

7) salamander limb regeneration

8) lizard tail regeneration
III. Placental lactogen (PL): 181 AA sequence: 85% similar to GH

1) lacks significant growth promoting activity

2) lactogenic activity
   growth & induction milk protein synthesis in mouse mammary explants

3) immature or dwarfed mouse testes

4) PL takes over 2nd trimester due to choriogonadotropin on corpus luteum

5) development of mammary glands during pregnancy
   w/o milk secretion

6) ensure supplies of glucose, AA & minerals from maternal to fetus
   PL counters insulin effects in maternal circulation

7) stimulates fetal growth & development (rat/sheep studies)

IV. Nerve Growth Factors (NGF)

1) growth of peripheral sensory & motor neurons

2) released by target tissues
   nerve endings release factors — target tissues

3) snake venom/mouse submandibular glands
   T: submandibular glands

4) T & thyroxine regulates NGF synthesis
   male titers vs female titers?  male titers ↑10x

5) homology with proinsulin both to cell membranes
   RNA/protein/lipid synthesis
   polysome formation
   ribosome clusters connected by strands of mRNAs

**6) nonmitogenic — no mitosis effect of neurons

7) insulin & IGFs maintenance & survival of neurons
V. Erythropoietin (EP)
VI. Thymic Hormones
VII. Platelet-Derived Growth Factors (PDGF)
VIII. Epidermal Growth Factors (EGF)
IX. Angiogenic Factors