

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