Anti-Aging Effect of Growth Hormone

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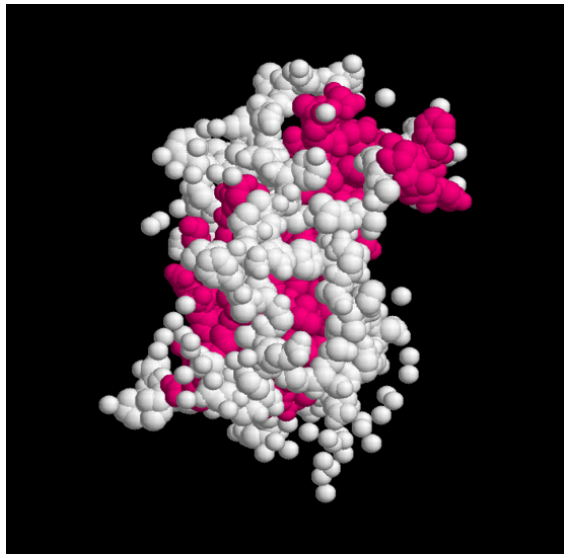
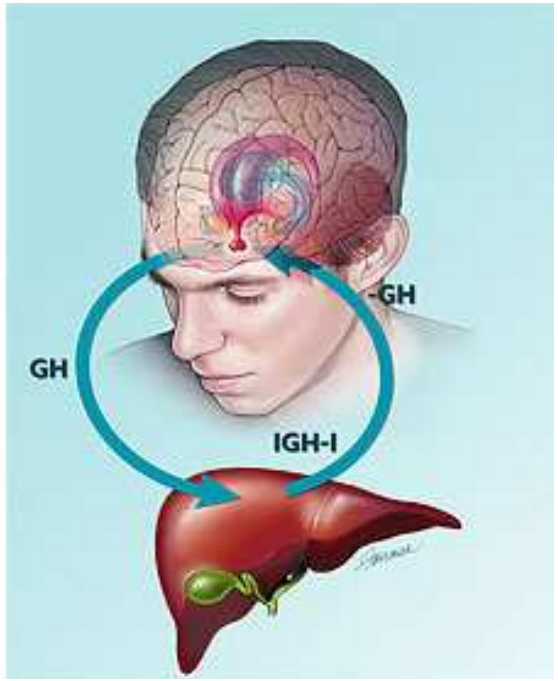
What is Growth Hormone (GH)

- A polypeptide (191 amino acids)
- Synthesized, stored & secreted by pituitary gland
- Growth hormone is anabolic (build-up)
- Direct effects
- Indirect effects
  - IGF-1 (insulin-like growth factor-1)
    - Produce by liver
    - Decrease with age – “somatopause”





Physiology of Growth Hormone

- GH is responsible for growth during childhood
- For repair & regeneration of tissues throughout adult lives

Direct Effect

GH

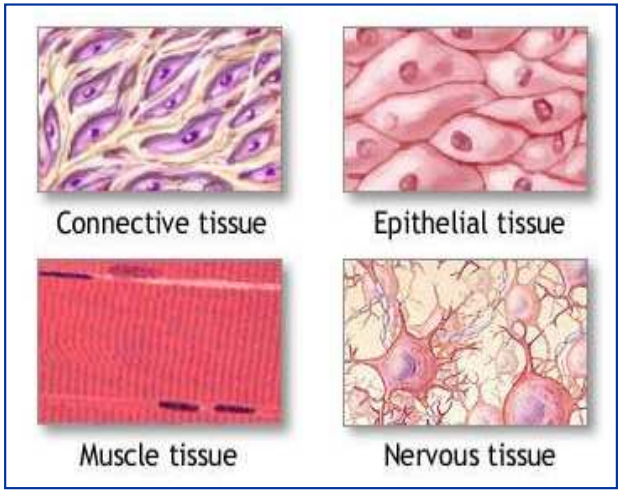
Buttock and thigh region

Belly region

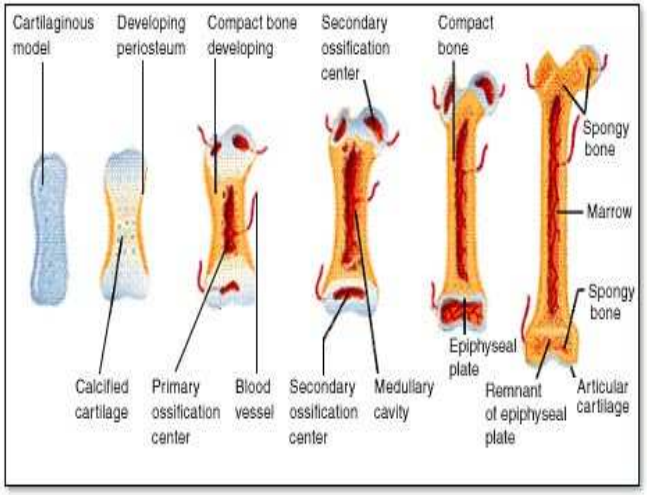
Indirect Effect

IGF-1

Repair & Regeneration of Tissues



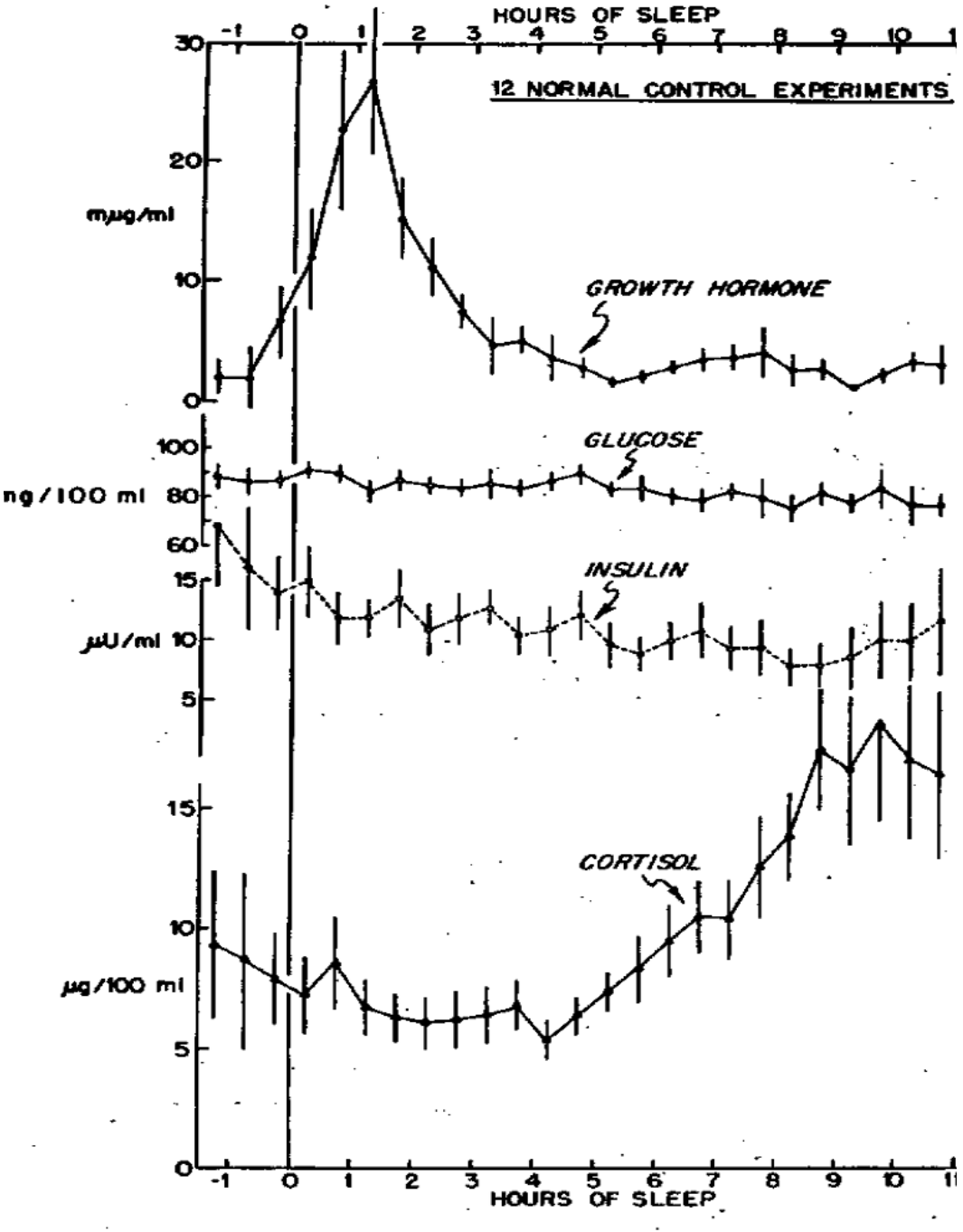
Promotes Bone Growth



Breakdown Excess Body Fats

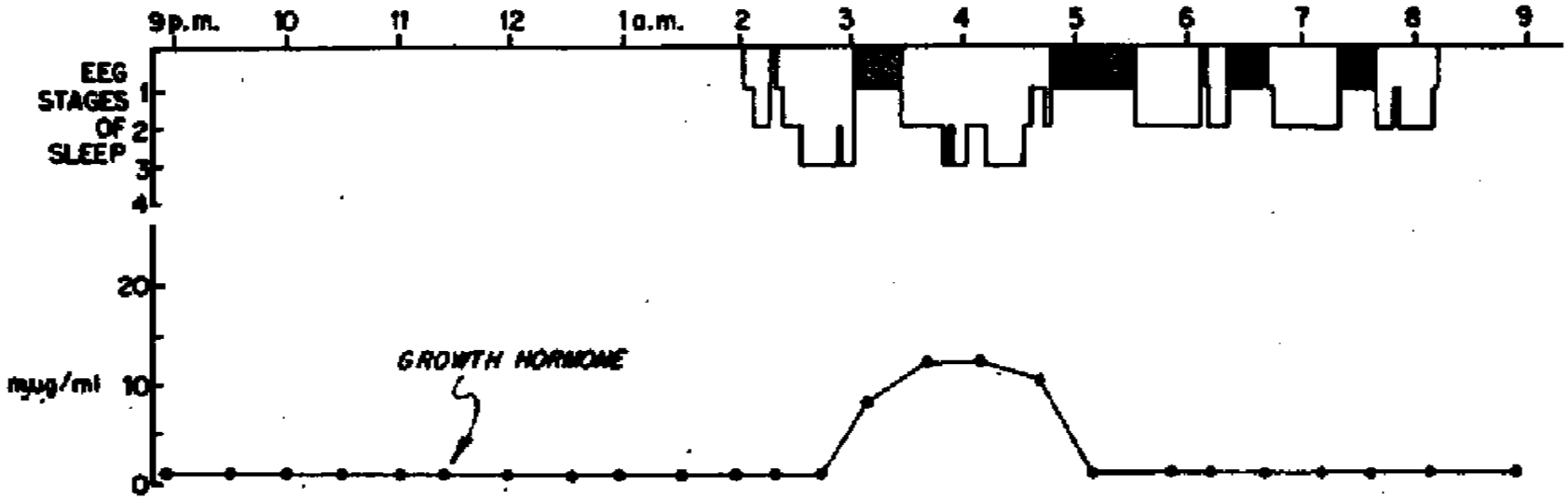
Secretion Patterns of GH

- **Release several large pulses of GH each day**
  - **Peak blood GH levels range from 5 to 45 ng/mL**
- **Largest & most predictable GH peaks occurs 1 hr after onset of sleep**
- **Peaks last 1.5 to 3.5 hrs before returning to basal levels**
  - **Basal GH levels are low (< 1 ng/mL)**



Effect of Sleep on GH Secretion

- **Onset of GH peak correlated with deep sleep (stage 3 & 4)**
- **Delay sleep will delay onset of GH peak**

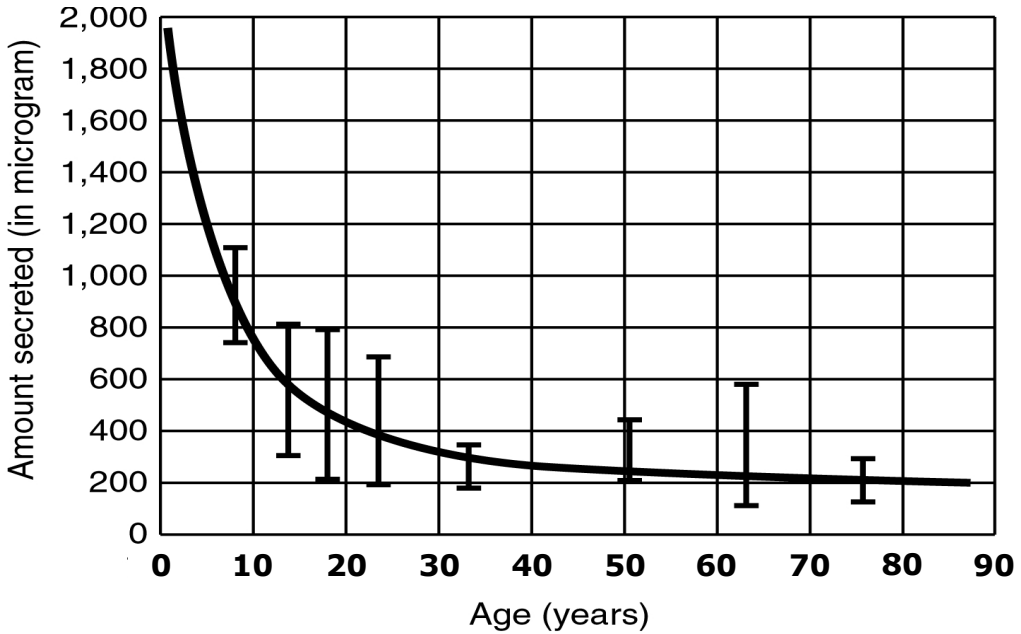


- **Secretion of GH during sleep is to repair & rejuvenate damaged tissues**
  - **Less competition on resources**

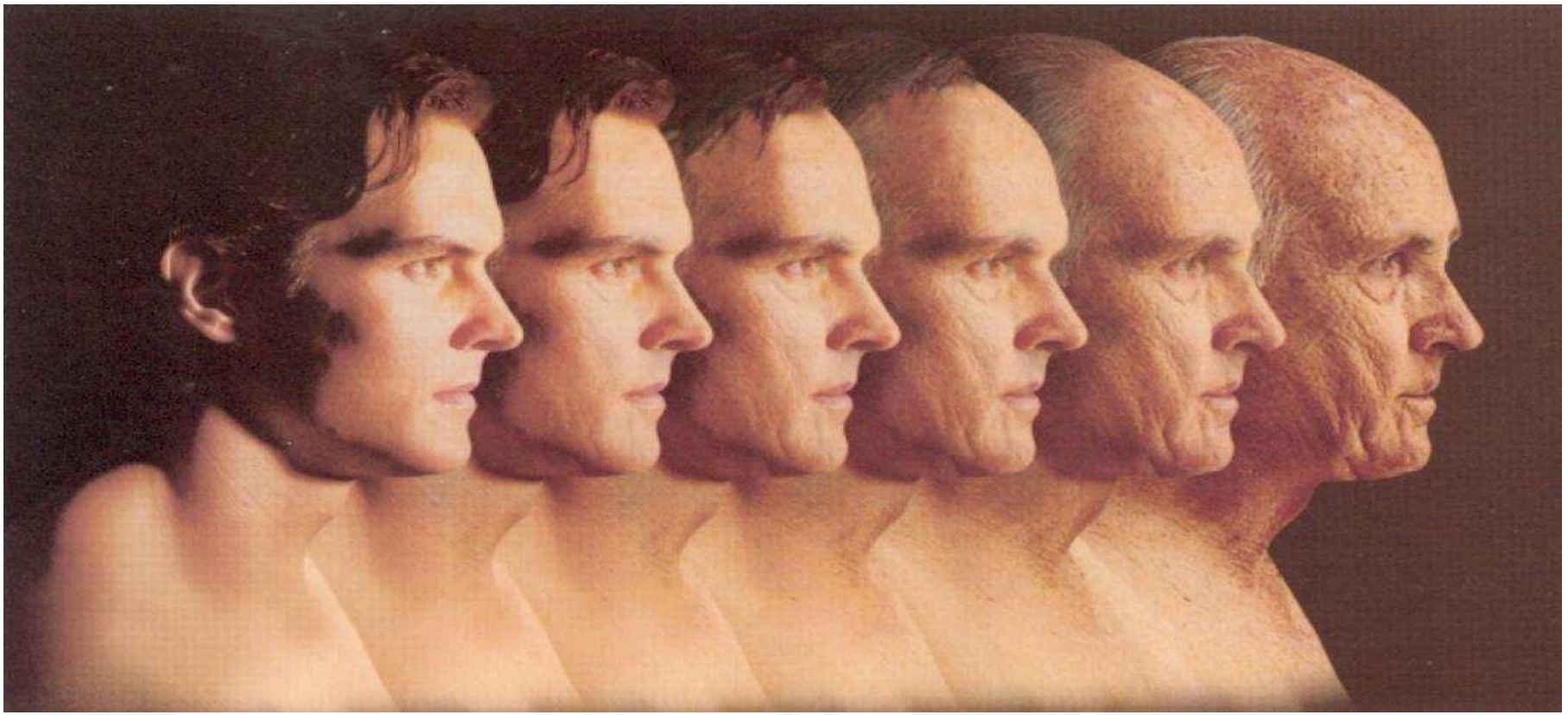
GH Secretion Changes With Age

- **Basal levels highest in early childhood**
- **Amplitude & frequency of peaks greatest during puberty**
  - **Children & adolescents average 8 peaks/day**
  - **Adults average 5 peaks/day**
- **Basal levels, frequency & amplitude of peaks decline throughout adult life**

From age 30, we no longer produce enough GH to repair all damages occurring in our bodies



Growth Hormone:
Hormone of Youth



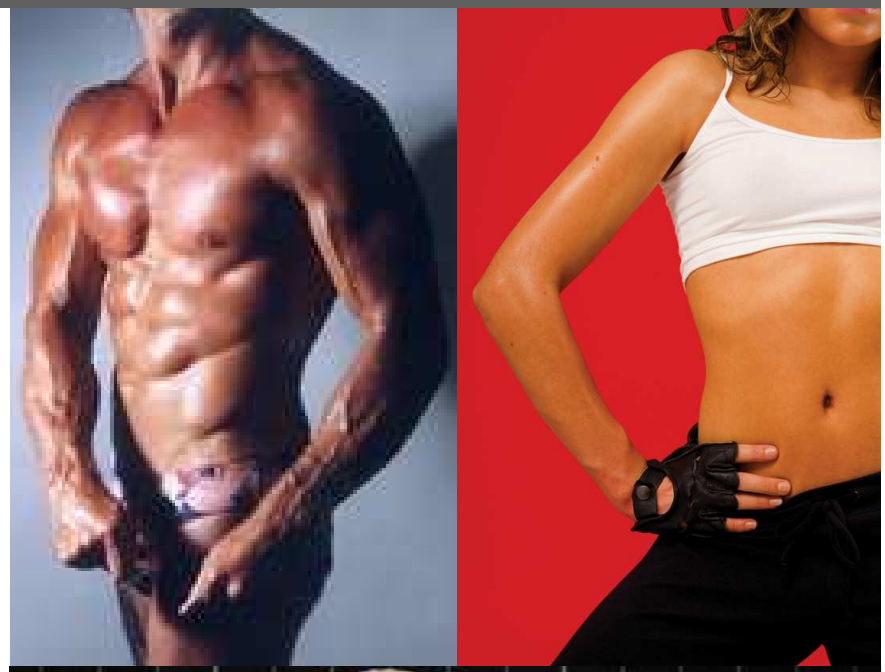
Impact On Body Fat

- **Reduce excess body fat and its distribution**
  - **Promote lipolysis**

Reduction of abdominal fat is most profound effect of GH replacement therapy

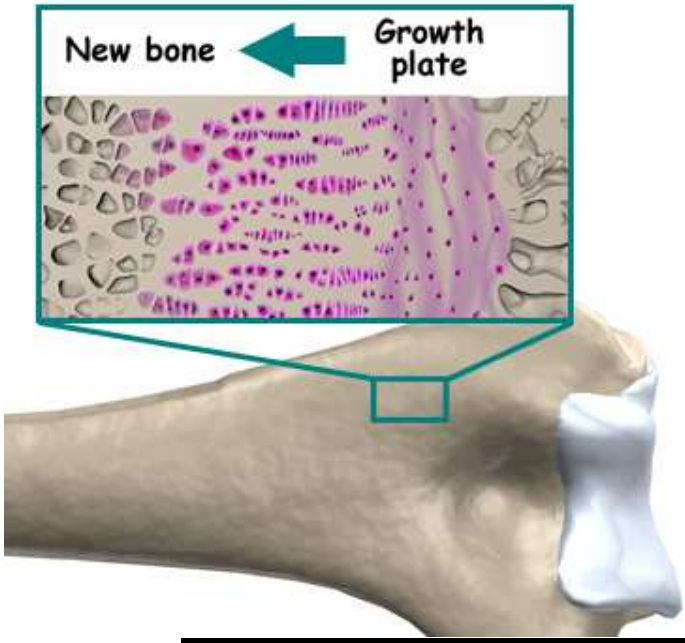
Impact On Body Mass

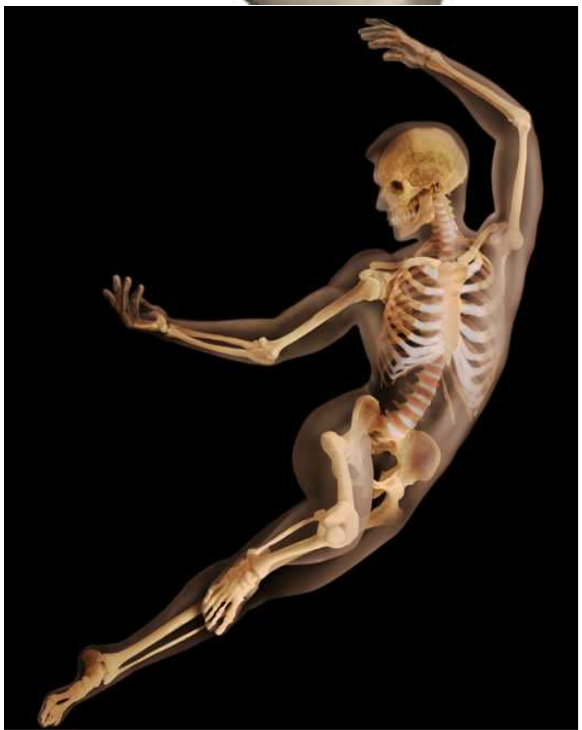
- **Increase muscle (lean) mass**
  - **Sarcomere hyperplasia**
  - **Increase protein synthesis**
- **Improve physical performance**
  - **If combined with moderate exercise**



Impact On Skeleton

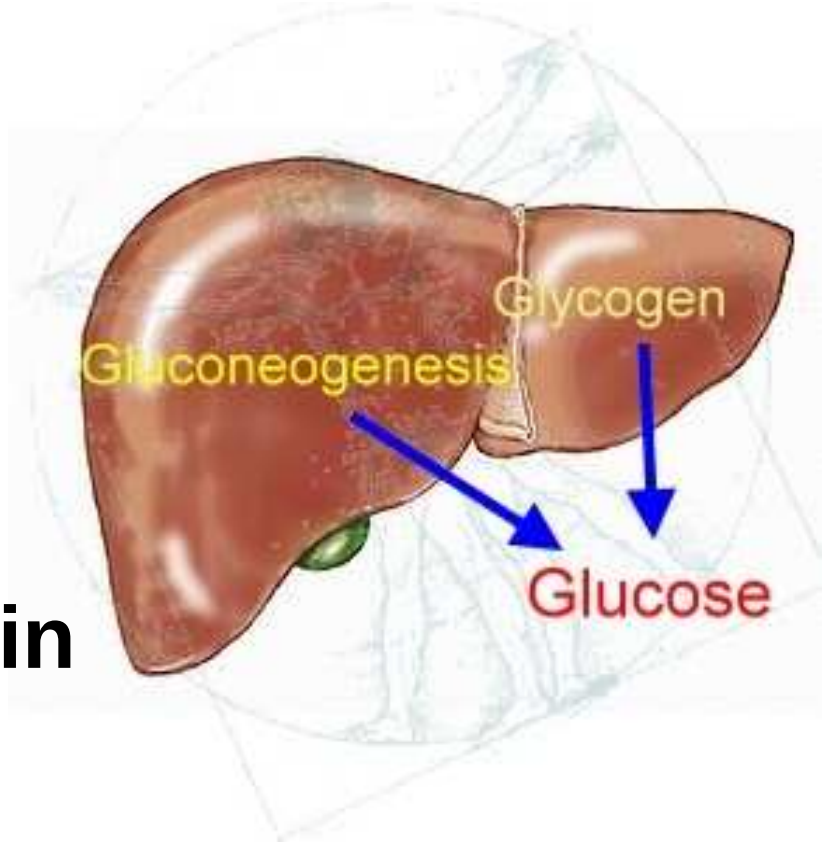
- **Elongation of long bone during puberty stage**
- **Stimulate the formation of cartilage**
- **Stimulate production of bone marrow cells**
- **Increase bone density**





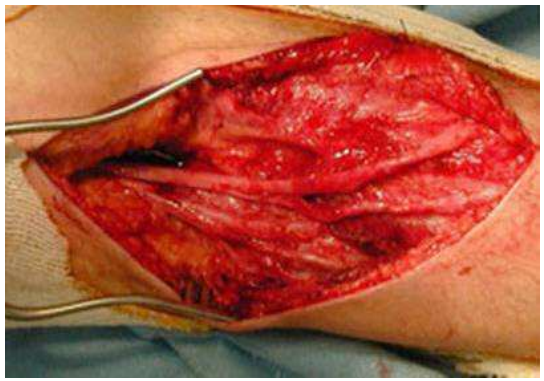
Impact On Fuel Homeostasis

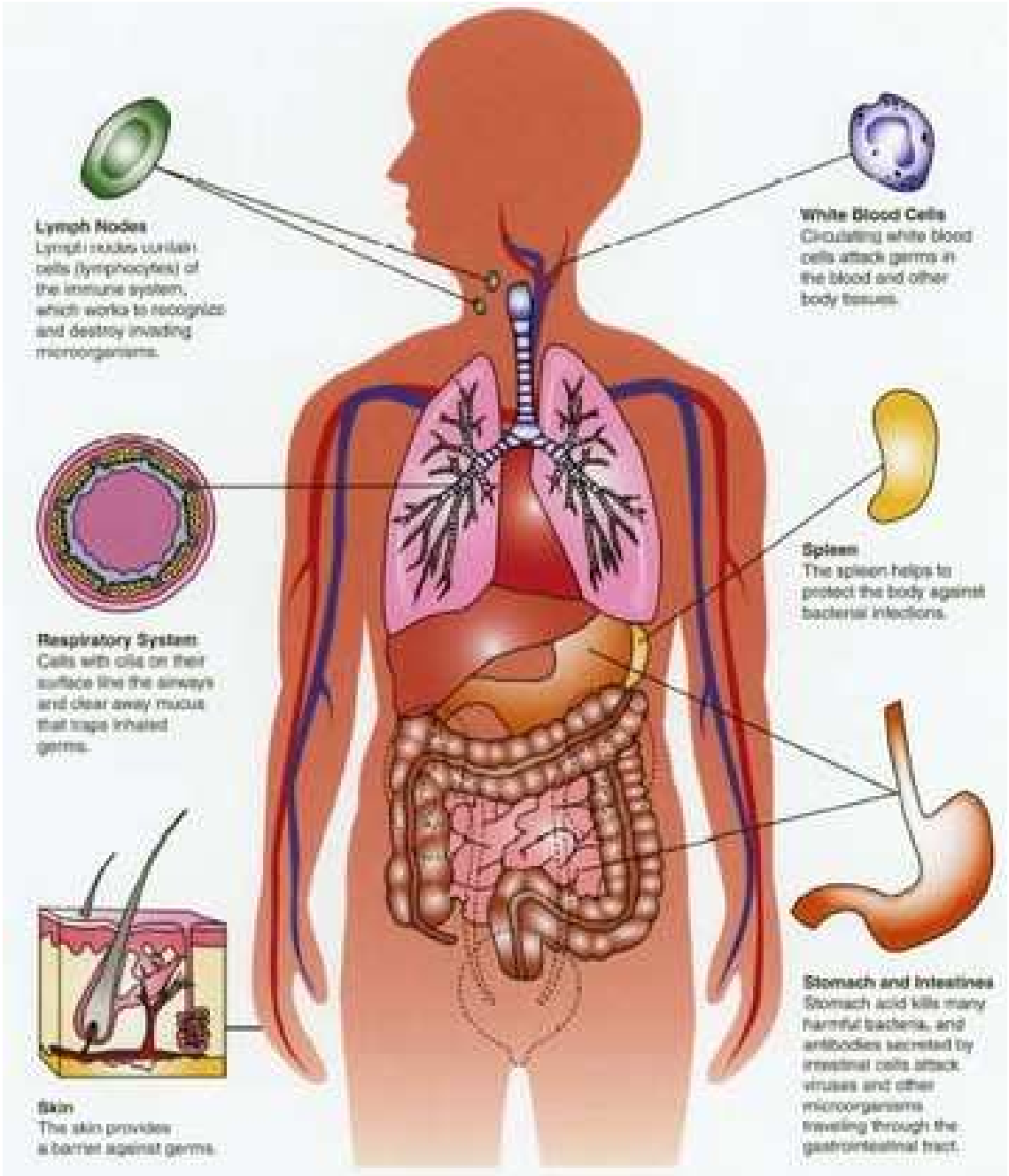
- **Reduce liver accumulation of sugar**
  - **Prevent fatty liver**
- **Promote glyconeogenesis in liver**
  - **Better control of blood glucose**



Impact On Immune System

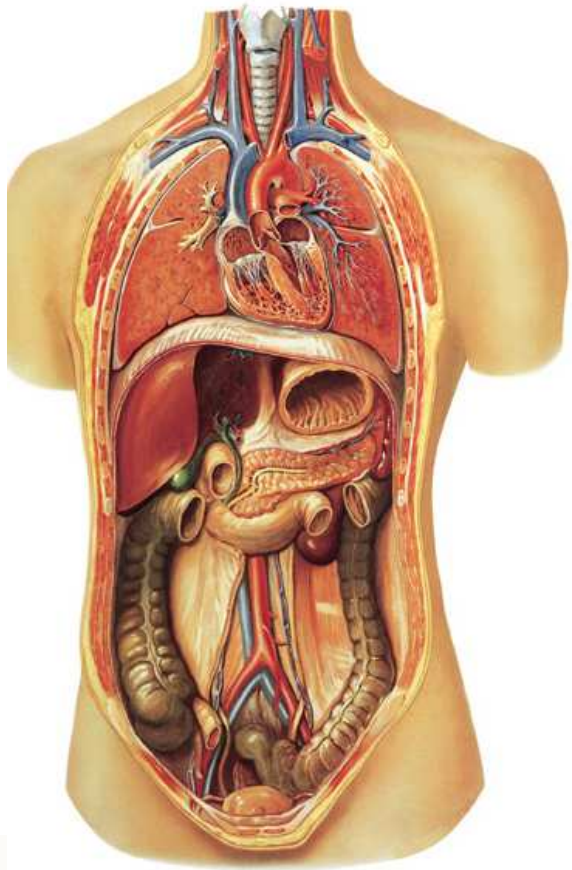
- **Strengthen immune system**
- **Faster wound healing with lower infection rate**





Impact On Internal Organs

- **Stimulating growth of all internal organs**
  - **Except brain**



- **Brain**
  - **Improve memory**
  - **Reverse cognitive decline**

Impact On Aging

- **GH replacement therapy can reverse manifestations of aging by at least 5 to 15 years**
- **More importantly is to delay manifestation of aging**

No other single therapy can have same impact on aging body like GH do

Other Impact of Growth Hormone

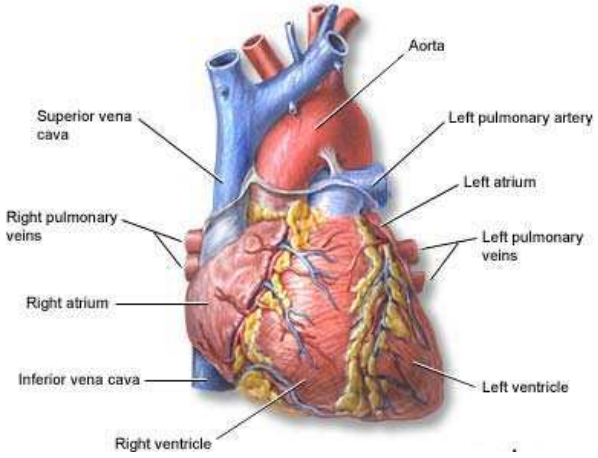
Firmer Breast

Reduce Wrinkles

Increase Libido

What Growth Hormone Can’t Do

- It can’t increase maximum lifespan
- It can’t eliminate effects of reduction of other hormones
- It cannot reverse damage to human tissues caused by glucose
- It can’t eliminate all of damages caused by sunlight
- It can’t undo effects of cardiovascular disease
  - It can slow its progression by improving one's cholesterol profile



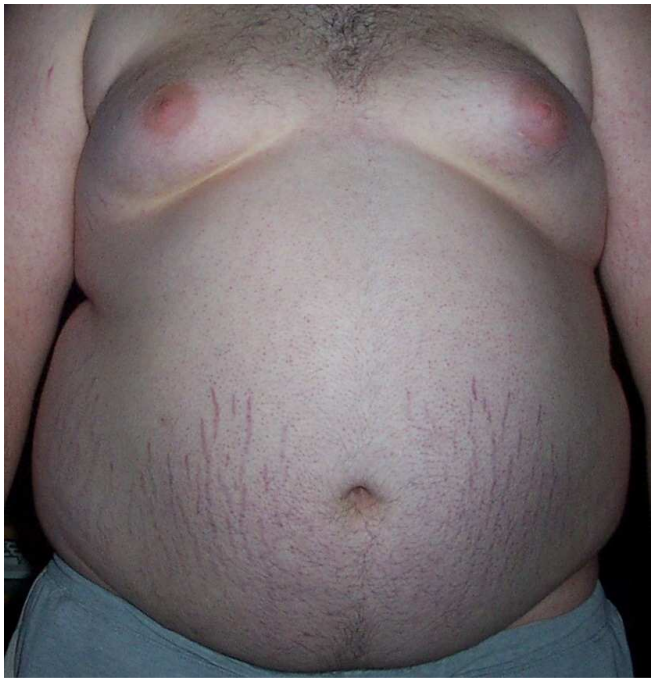
Prolonged Excess of GH

- **Thicken the bones of jaw, fingers & toes**
- **Pressure on nerves (carpal tunnel)**
- **Muscle weakness**
- **Insulin resistance**
- **Reduce sexual function**

- **Common cause: pituitary tumour**

Prolonged Deficiency of GH

- **In children**
  - **Growth failure & short stature**
  - **Delay sexual maturity**
- **In adult**
  - **Abdominal obesity**
  - **Decrease in muscle mass**
  - **Decrease energy level**
  - **Decrease quality of life**



Stimulators of GH Secretion

- GH releasing hormone
- Sleep
- Exercise
- Certain amino acids
- Low level of blood sugar
- Increase androgen secretion during puberty

Inhibitors of GH Secretion

- **Circulating concentrations of GH & IGF-1 (negative feedback)**
- **Glucocorticoids (stress hormones)**
- **Somatostatin**
- **Hyperglycemia**
- **Free fatty acids**
- **Estradiol or any estrogens (female sex hormones)**

GH Replacement Therapy

- **Benefits**
  - 88% increase in muscle strength
  - 81% increase in muscle size
  - 72% improvement in body fat loss
  - 83% improvement in exercise tolerance & endurance
- **GH is a control substance**
  - Recombinant form of HGH is used
- **Potential side effects if overdosed**
- **Very expensive**
  - US$10,000 - $30,000 per year

Use of GH Replacement Therapy

- **In adults with GH deficiency of**
  - children-onset (after completing growth phase)
  - adult-onset (hypothalamic or pituitary defects – *similar to aging*)
- **Treatment for remission of multiple sclerosis**
- **Treatment for fibromyalgia**
  - Chronic widespread pain & painful response to gentle touch
- **Treatment for Crohn's disease & ulcerative colitis**

Other Controversial Uses

- **Treatment to enhance weight loss in obesity**
- **Treatment to reverse aging in older adults**
- **Treatment for bodybuilding or athletic enhancement**
- **To increase milk production in cattles**

GH Replacer vs GH Releaser

Exogenous GH

versus

Endogenous GH

- **GH Releaser**
  - **New frontier in GH Therapy**
  - **No known side effects**
  - **No risk of “over-dosing” of GH**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