



Alhamdulillah

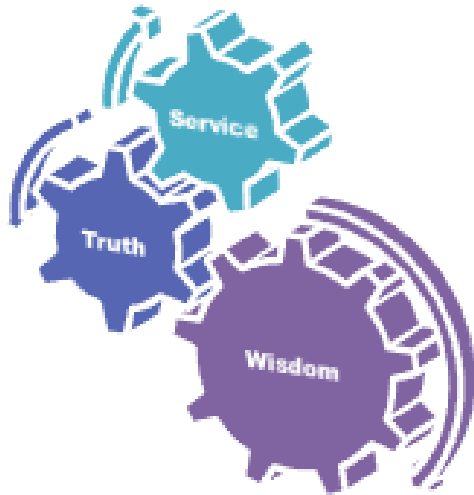
وَأَمَّا مَا يَنْفَعُ النَّاسَ فَيَمْكُثُ فِي الْأَرْضِ

but as for that which benefits the
people, it remains on the earth.

Quran 13:17 (Surah ar-Ra'd)



MOTTO AND VISION

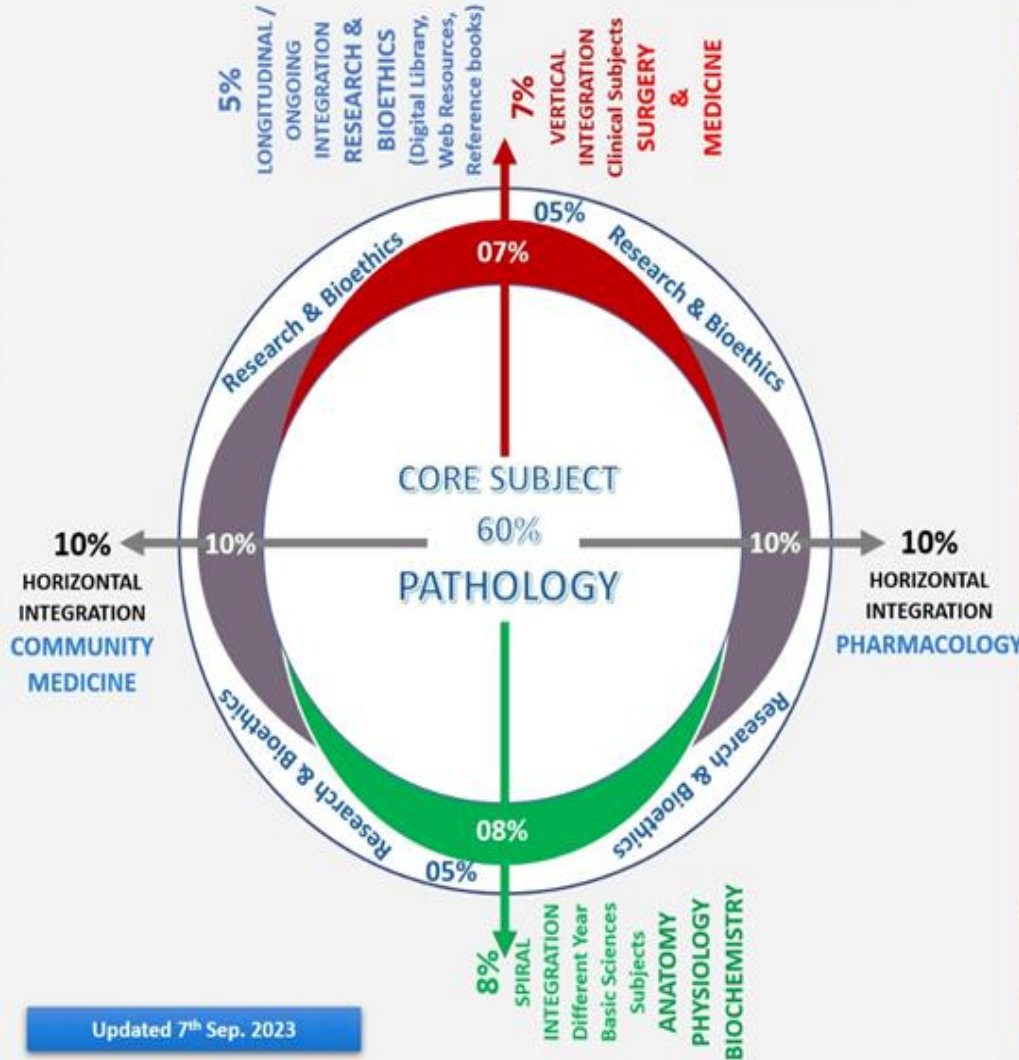


To impart evidence based research oriented medical education

To provide best possible patient care

To inculcate the values of mutual respect and ethical practice of medicine

Prof. Umar's Clinically Oriented Integration Model For Basic Sciences Interactive Lectures



Updated 7th Sep. 2023

Model 3rd Year Pathology LGIS (≈30 slides)

Core Subject – 60% (≈ 18-20 slides)	
Pathology (≈ 18-20 slides)	
Horizontal Integration – 20% (≈ 5-6 slides)	
Same Year Subjects	<ul style="list-style-type: none"> Pharmacology (10%) (≈ 2-3 slides) Community Medicine (10%) (≈ 2-3 slides)
Vertical Integration – 07% (≈ 2-3 slides)	
Clinical Subjects	<ul style="list-style-type: none"> Medicine (3-5%) (≈ 1-2 slides) Surgery (3-5%) (≈ 1-2 slides)
Spiral Integration – 08% (≈ 2-3 slides)	
Different Year Basic Sciences Subjects	<ul style="list-style-type: none"> Anatomy (1-3%) (≈ 1-2 slides) Physiology (1-3%) (≈ 1-2 slides) Biochemistry (1-3%) (≈ 1-2 slides)
Longitudinal / Ongoing Integration – 05% (≈ 1-2 slides)	
Research & Bioethics (≈ 1-2 slides)	



Androgens & Anabolic Steroids (LGIS)

Reproduction Module 4th YEAR MBBS 2024

Sources:

BERTRAM G. KATZUNG BASIC & CLINICAL
PHARMACOLOGY 15TH EDITION

DR.MUHAMMAD ZAHEER SHEIKH



LEARNING OBJECTIVES

At the end of the lecture, students should know:

- Enumerate Androgenic preparation
- Describe uses and adverse effects of androgenic preparations.
- Discuss Pharmacokinetics and Pharmacodynamics of Anti-Androgens



pic from www.crickblog.com



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ANDROGENS & ANABOLIC STEROIDS

Two major functions of testis:

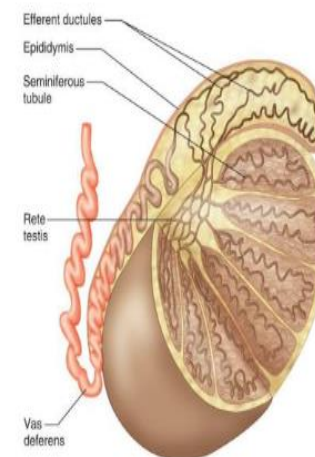
- ❖ Spermatogenesis
- ❖ Production of androgenic hormones

✓ ***Testosterone***

✓ ***Dihydrotestosterone***

✓ ***Androstenedione & Dehydroepiandrosterone***

Testis & seminiferous tubules



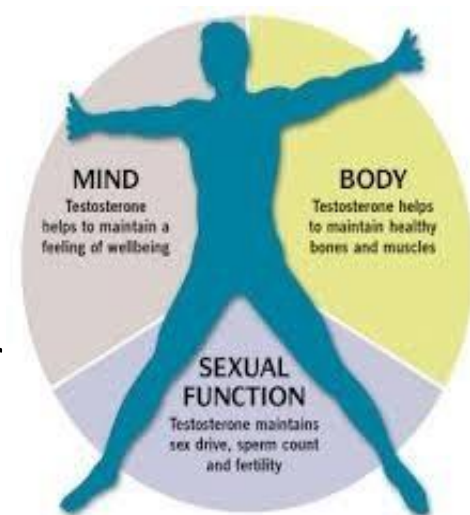
Spiral Integration

TESTOSTERONE –PYSIOLOGICAL EFFECTS

ANABOLIC EFFECTS

- ❖ Pubertal spurt of growth at puberty both boy & girl
- ❖ Rapid bone growth, both in thickness & length.
- ❖ Skeletal growth stimulated & **epiphysial closure accelerated**
- ❖ Decreased bone resorption
- ❖ Positive nitrogen balance, increase protein synthesis or decrease .protein breakdown
- ❖ Increase in appetite

Other effects: ↓ HDL, ↑ erythropoiesis by stimulating renal erythropoietin secretion & by direct action on haeme synthesis



Spiral Integration



Classification of androgens

- NATURAL
 - Testosterone
 - Dihydrotestosterone
 - Androstenidone
 - Dehydroepiandrosterone (DHEA)
 - Dehydroepiandrosterone sulfate (DHEAS)



- SYNTHETIC ANDROGENS
- Testosterone
- Testosterone cypionate
- Testosterone enanthate
- Testosterone propionate
- Fluoxymesterone
- Methyltestosterone
- Dromostanolone propionate

Core Subject



Mechanism of action of testosterone

- Intracellular receptor transduction mechanism



Anabolic steroids

- Synthetic androgens with higher anabolic and lower androgenic activity
- Drugs include
 - nandrolone
 - oxymetholone
 - stanozolol
 - methandienone
 - oxandrolone
 - oxymesterone
 - norethandrolone



Pharmacologic actions of anabolic steroids

- Anabolic effects are similar to testosterone
- Therapeutic doses , anabolic action more prominent
- Higher doses and prolonged treatment , androgenic effect become more and more prominent



- **Effects of anabolic steroids**
 - Anabolic effect
 - Progestational effect (norethandrolone)
 - Androgenic effect
 - Increase well being & appetite



Uses of anabolic steroids

- Osteoporosis
- Catabolic states
- Suboptimal children growth
- Hypoplastic , hemolytic and malignancy associated anemias
- Renal failure
- CA breast
- To enhance physical activity in athletes



Adverse effects of anabolic steroids

- Testicular atrophy , impotence , sterility , gynecomastia
- Inhibition of ovulation , hirsutism , voice deepening , alopecia , acne
- Short stature
- Increased aggressiveness
- Use in pregnancy – virilization
- Increased risk of coronary heart disease in athletes



Pristyn Care

Hirsutism in Women : How to deal with it?

SYMPTOMS OF HIRSUTISM



Hirsutism Symptoms

Hirsutism, a condition characterized by excessive growth of dark hair on the face, chest, back, arms, and legs, is often caused by an imbalance of hormones. It can be a sign of a more serious condition, such as polycystic ovary syndrome (PCOS), and can lead to emotional distress and self-esteem problems. The following are the most common symptoms of this condition:

Acne

Acne is a common skin condition that can be caused by an imbalance of hormones. It is often characterized by the presence of pimples, blackheads, and whiteheads on the face, chest, and back.

Hoarse and Deepening Voice

Hoarseness and deepening of the voice are common symptoms of hirsutism. This is often caused by an imbalance of hormones, which can lead to the growth of the vocal cords and the deepening of the voice.

Increased Muscle Mass and Sexual Problems

An increase in muscle mass and sexual problems are also common symptoms of hirsutism. This is often caused by an imbalance of hormones, which can lead to the growth of muscle mass and the development of sexual problems.

BULK SUPPLEMENTS
www.bulk-supplements.com

Vertical Integration

Contraindications anabolic steroids

- Prostate and breast CA
- Cardiac , renal , hepatic disease
- Pregnancy
- Drug interactions:
 - Anabolic steroids and glucocorticoids (potentiated effects)



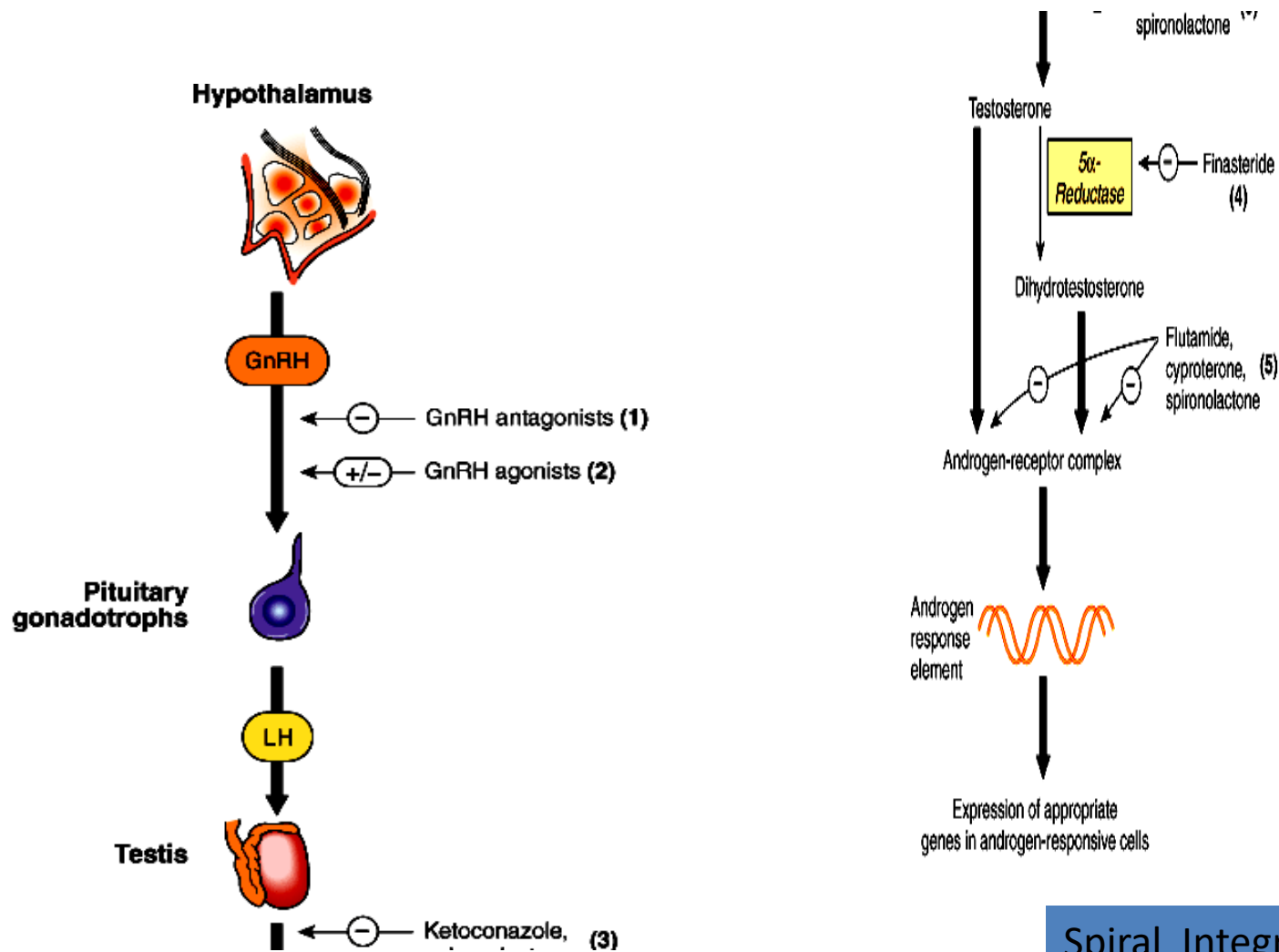
Anti-androgens Classification

- **GnRH antagonists**
 - Ganerelix
 - Cetrorelix
 - Adarelix
 - Degarelix
- **GnRH agonists (continuous administration)**
 - Leuprolide
 - Goserelin
 - Naferelin
 - Buserelin
- **Testosterone and its metabolites synthesis inhibitors**
 - Ketoconazole
 - Spironolactone
 - Abiraterone

Core Subject



- **Decreased conversion of testosterone into dihydrotestosterone (5 alpha reductase inhibitors)**
 - Finasteride
 - Dutasteride
- **Androgen receptor blockers**
 - Cyproterone acetate
 - Flutamide
 - Spironolactone
 - Bicalutamide
 - Nilutamide



Spiral Integration



- **GnRH antagonists:**

- Gonadotropin releasing hormone is inhibited by the GnRH antagonists, resulting in diminished release of gonadotropins (LH, FSH)
- Ultimately synthesis of testosterone and its active metabolites are inhibited

- **Use:**

- CA prostate (adarelix, degarelix)
- Controlled ovarian stimulation (ganerelix, cetrorelix)

- **Adverse effects:**

- Gynecomastia
- Nausea, headache, drowsiness
- Less hematocrit
- Weakness
- depression



- **GnRH agonists**

- **Uses:**

- Prostatic cancer
 - Initial flare up can be treated with a combination of GnRH agonists and flutamide or bicalutamide

- **Adverse effect:**

- Hot flushes , sweats , edema , guneacomastia , decreased libido , decreased hematocrit , muscle weakness



Testosterone synthesis inhibitors

- **KETOCONAZOLE:**

- Mechanism of action:

- displace testosterone from protein sites
 - Inhibits 450 c 17 , 17-20 lyasedecreased dehydrotosterone , androstenedione

- Uses:

- CA prostate

- Adverse effects:

- Gynecomastia , loss of hair and libido , oligozoospermia



- **Abiraterone:**
 - It inhibits 17 hydroxylase enzyme and thus inhibits the conversion of progesterone and pregnenolone into dehydroepiandrosterone and androstenedione
 - With resultant testosterone synthesis inhibition
 - Use:
 - CA postate



Decreased conversion of testosterone to dihydrotestosterone

- **FINASTERIDE:**

- **Mechanism of action**

- Competitive inhibitor of 5 alpha reductase
- It is the enzyme that converts testosterone into dihydrotestosterone (active metabolite) in skin , hair , prostate , seminal vesicles , epididymis

- **Uses**

- BPH (reduce size of prostate)
- CA prostate
- Hirsutism
- Male pattern baldness

- **Adverse effects**

- Decreased libido , impotence , skin rashes

Core Subject



Androgen receptors blockers

- **FLUTAMIDE:**

- Competitive inhibitor of androgen receptors

- **Uses:**

- CA prostate
 - Hirsutism

- **Adverse effects:**

- Gynecomastia , breast tenderness , liver damage , GIT disturbance

Core Subject



- **CYPOTERONE AND CYPOTERONE ACETATE**
- **Mechanism of action**
 - Compete with dihydrotestosterone for receptor binding
 - Acetate has progestational activity , it suppresses the feedback enhancement of LH & FSH more anti-androgenic activity
- **Uses**
 - Female hirsutism
 - Masculinization in women
 - Precocious puberty in boys
 - Male pattern baldness
 - acne



- **SPIRONOLACTONE:**
 - Competitive inhibitor of aldosterone and androgen receptors
 - Also lowers 17 alpha hydroxylase thus reduced conversion of dehydrotestosterone and androstenedione into testosterone
 - Spironolactone used for treatment of **hirsutism**
 - **Adverse effects:**
 - Gynecomastia , hyperkalemia , hyponatremia , hypotension in large doses



- **Bicalutamide and nilutamide** are oral anti-androgens with similar anti-androgenic effects as previous drugs but less hepatotoxic



BIOMEDICAL ETHICS

Medical ethics is involved because of the crucial role of physicians in anti-doping policies and practices as well as developing and administering ergogenic substances or methods for athletes. This raises ethical questions regarding physician-patient relationship, principle of non-maleficence, privacy and confidentiality of patient, and fairness and justice in the macro allocation of resources. The aim of this paper is to discuss anti-doping practices and policies in the context of medical ethics.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5215887/>

Vertical Integration



RESEARCH ARTICLES

- Treatment of Anabolic-Androgenic Steroid Dependence: Emerging Evidence and Its Implications
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2875348/>
- Diagnosis and Management of Anabolic Androgenic Steroid Use
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6517163/>

Further Reading



How To Access Digital Library

- 1) Go to the website of HEC National Digital Library.
- 2) On Home Page, click on the INSTITUTES.
- 3) A page will appear showing the universities from Public and Private Sector and other Institutes which have access to HEC National Digital Library HNDL.
- 4) Select your desired Institute.
- 5) 5. A page will appear showing the resources of the institution

Further Reading

