



# تفريغ ميديسينال

Sex hormon \_\_\_\_\_ محاضرة:

Rahaf Zyoud \_\_\_\_\_ الصيدلانية:



لجان الرفعات



# Female Sex Hormones (Estrogens and Progestins)

## ➤ Control:

➤ Follicle –Stimulating Hormone (FSH) stimulate the production of Estrogens.

➤ Luteinizing Hormone (LH) stimulate the production of Progestins.





# Steroidal Estrogenic Drugs

- **Estradiol:**

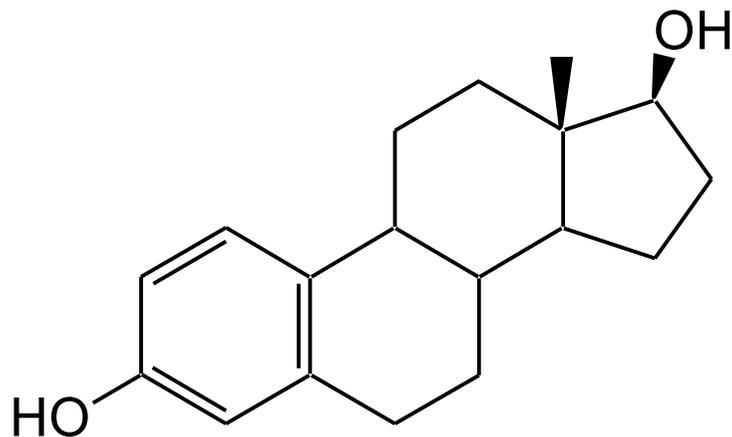
- Most active natural estrogen.
- Very short duration of action due to first pass metabolism.
- Mainly used for local effect on the uterus.

حتى لو اخذته ب Route عنى  
ال و orally مع يتكسر بالتريمات  
ال Liver

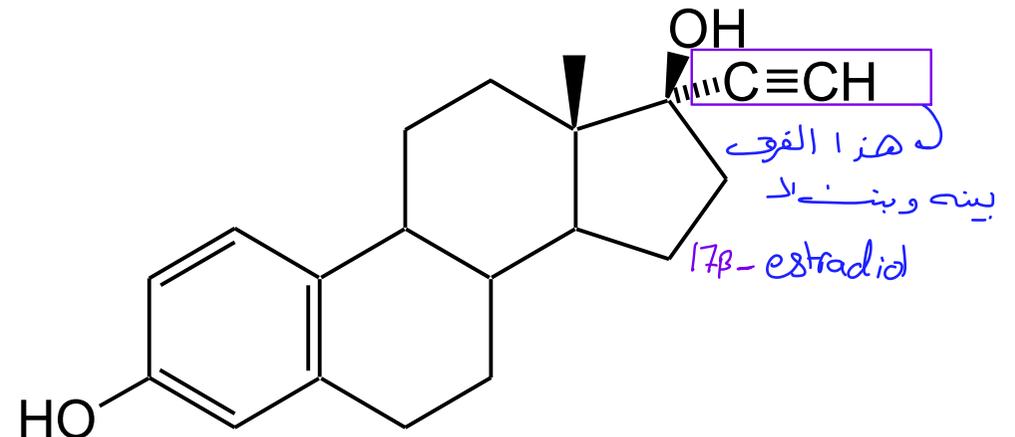
- **Ethinyl estradiol (17- $\alpha$ -ethynylestradiol).**

- 15- 20 more potent than estradiol orally. →

مع يبطل يغير ال metabolism بسرعة  
زى ال estradiol



17 $\beta$ -estradiol



Ethinyl estradiol

(Steroidal Semisynthetic estrogen)

صنفا ال 2 فيهم ال steroidal structure

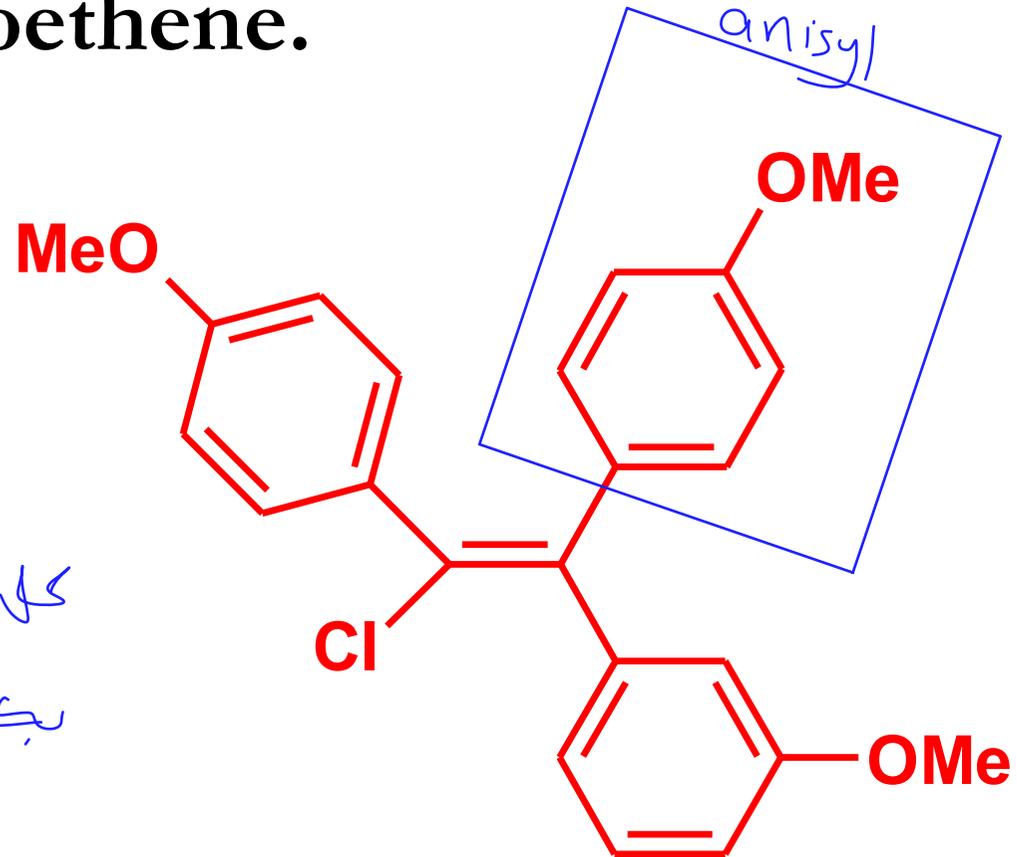


# Nonsteroidal Estrogens

## 2.Chlortrianisene:

Tris(p-anisyl)chloroethene.

Active orally



کل ایک کثیرا عتصم لائے  
بجوتوا agonist

# Estrogen Antagonists → estrogen receptor block جازي ح

- Triphenylethylene antagonists:

- They are related to stilbene in structure.
- Antagonist bind strongly to the receptors.

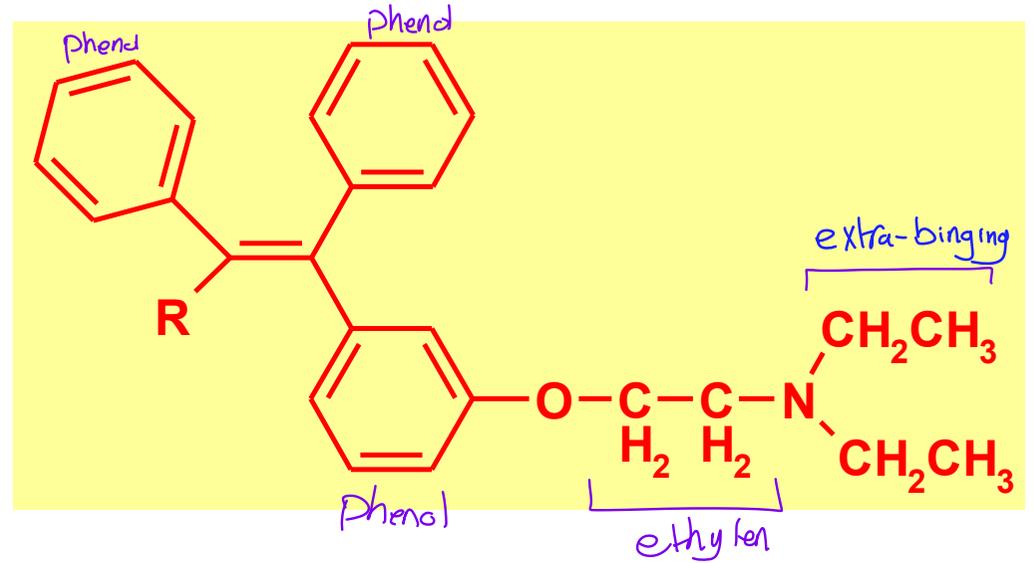
- Aromatase inhibitors:

- Steroidal or nonsteroidal.
- Block conversion of androgens to estrogens.

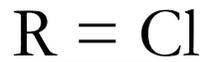
- Uses: Treatment of estrogen dependent cancers.

# Antiestrogens

## Triphenylethylene antagonists



### 1. Clomiphene (clomid)



It acts as ovulation stimulant by increasing gonadotrophin hormone (GRH).  
محفز للإباضة

### 2. Tamoxifen (Nolvadex):



Used in treatment of early & advanced breast cancer in postmenopausal women.

# Progestins

- Progesterone is the major natural progestin.
- **Secretion:** By the ovary mainly the corpus luteum during the second half of the menstrual cycle.

- **Physiological Effects:**

- Development of the endometrium.

- Development of the mammary gland during pregnancy.

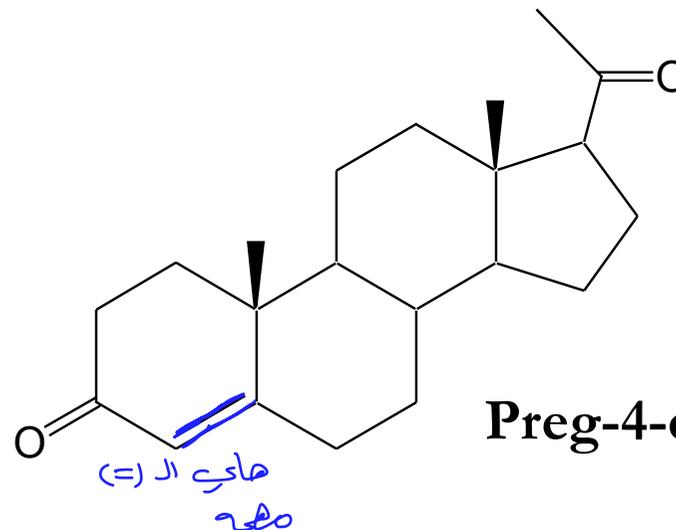
بعد الولادة  
ح تقل درج بصر



- Milk secretion starts when its level decrease with birth.

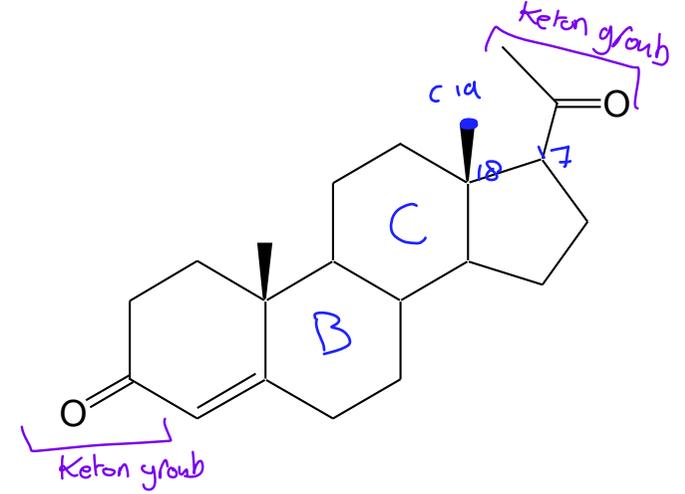
- Thermogenic action.

خلال ال development ح ترتفع درجه الحرارة



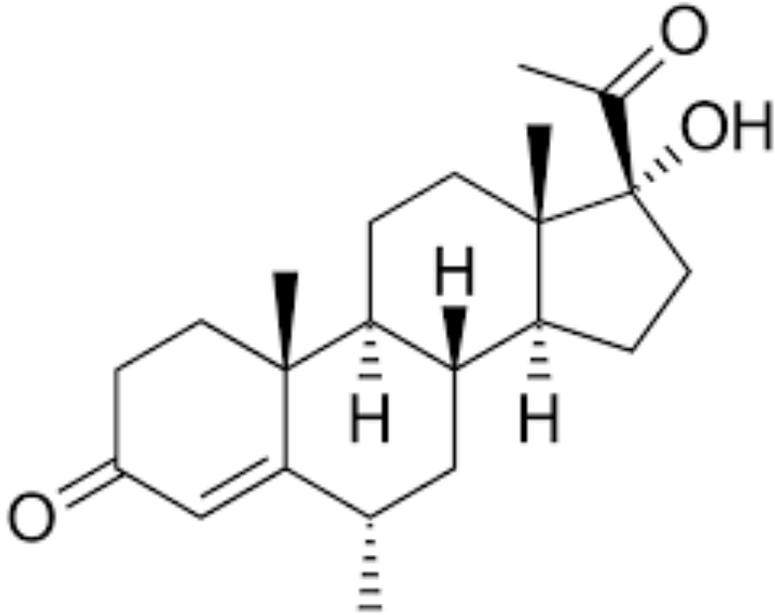
Preg-4-ene-3,20-dione.

# SAR



- Steroidal nucleus **essential** for activity.
- Have **some androgenic** activity. → *Male*
- Removal of the 19 CH<sub>3</sub> **increase** activity. → *for Progestin*
- Unsaturation of ring B or C **increase** the activity. → *زيادة النشاط (=) ح*
- Removal of the keto function **remove androgenic** activity.

# Progestogenic Drugs

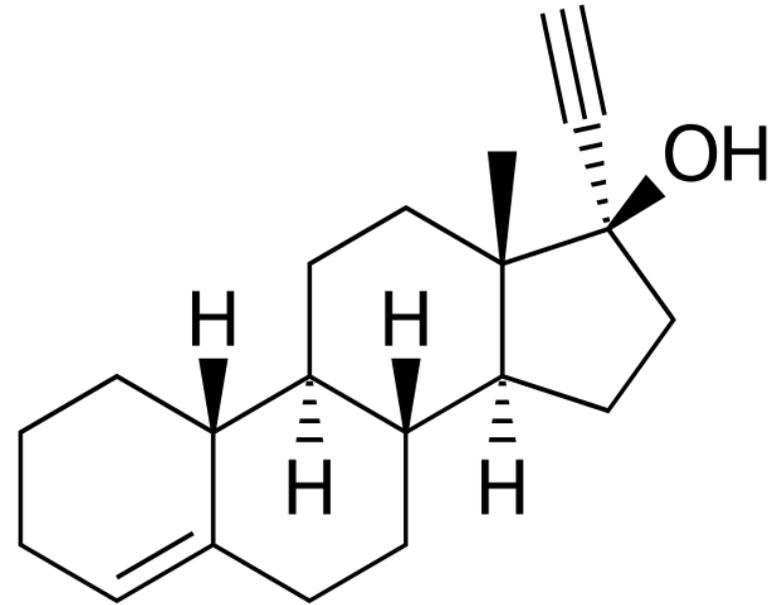


## 2. Medroxyprogesterone (provera)

Uses: Oral contraceptive. *موانع حمل*

*Androgenic activity ✓*

*لأنه لا يحتوي على 2 keto groups*



## Lynestrenol:

Semisynthetic progestin with pure progestogenic activity.

*لأنه لا يحتوي على 2 keto groups  
Androgenic activity ✓*

# Uses:

حکمت بالفیدیو انه الاسئلة صاوح تكون

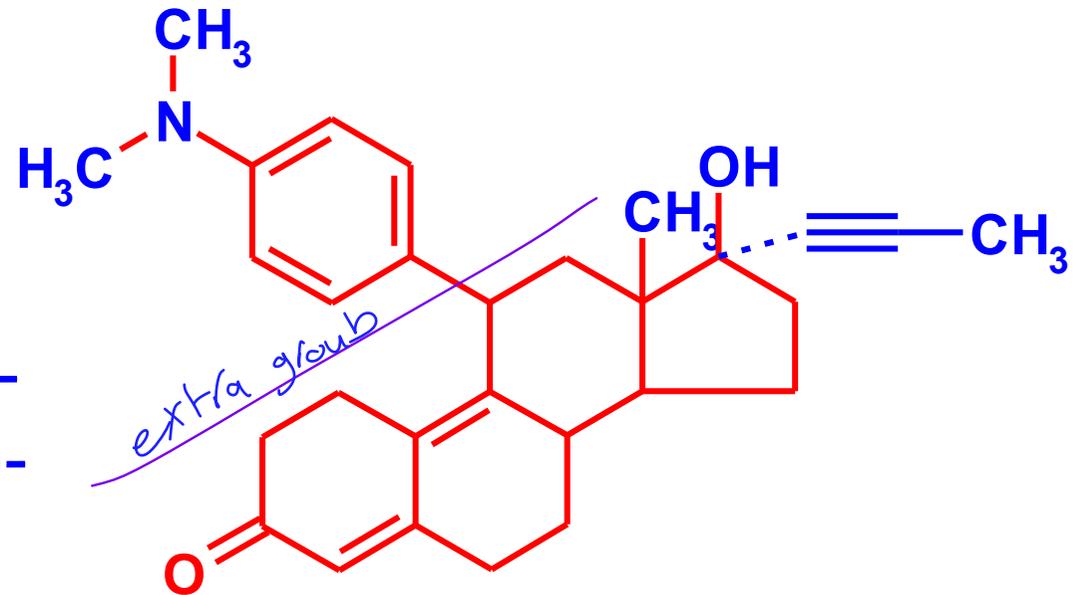
عليهم بس ارفوهم احتياجا

- **Contraceptive pills.**
- **Uterine bleeding.**
- **Prevention of abortion.**
- **Amenorrhea, dysmenorrhea, endometriosis.**
- **Suppression of lactation.**
- **Endometrial, renal and breast carcinoma.**
- **Enhance respiration (for Hypoventilation).**

# Progestin Antagonists

- 1. Mifepristone:
  - Compete with the progestin receptors.
  - Uses:
    - Abortifacient → اجهاض.
    - emergency contraceptive

11-β-(p-dimethylaminophenyl)-  
17-β-hydroxy-17-α-(1-propynyl)-  
estra-4,9-diene-3-one.



extra group → strongest binding → Antagonist effect

# Male Sex Hormones (Androgens)

## ➤ Control:

- Luteinizing Hormone (LH) or Interstitial Cell-Stimulating Hormones (ICSH) stimulate the production of Androgens.

# Androgenic Steroids – Physiological Activities

*Primarily two activities – Androgenic and Anabolic*

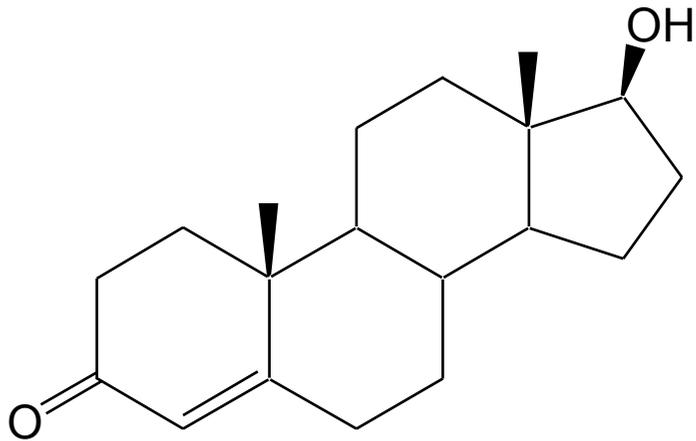
## Androgenic Activity

- Growth and development of male sex organs
- Important for male sex drive and performance
- Development of secondary sexual characteristics
- Important role in spermatogenesis

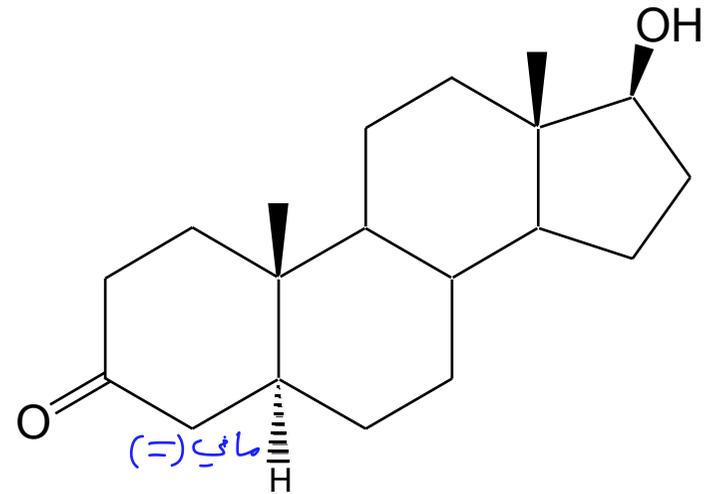
## Anabolic Activity

- Development of muscle mass
- Reverse catabolic or tissue-depleting processes

- **Natural Androgens:**

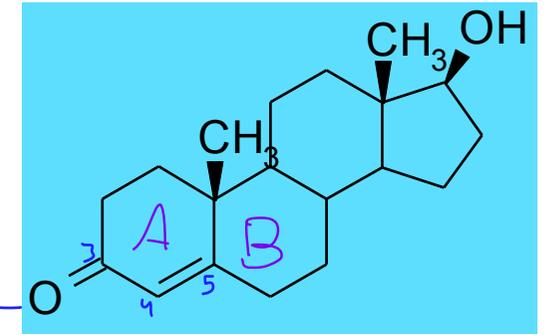


**Testosterone**  
**(Natural)**



**Dihydrotestosterone**  
**(Natural)**

# SAR in Androgens



بہ قدر اہلہا ب electronegative  
زیادہ OH مثلاً

- Steroid skeleton is **necessary**
- An **electronegative** (may not be oxygen) at 3 position is required
- A/B ring fusion should be either **trans** or presence of a double bond at position **4**
- Alkyl group (CH<sub>3</sub>) at 17 $\alpha$ -position is **necessary** for anabolic activity
- Alkyl group at 17 $\alpha$ - confers oral activity

اد (A, B) rings لازم ہوتے ہیں trans سے لڑا مانگنا trans لازم

ہیون فیہ (=) ک (رقم 4

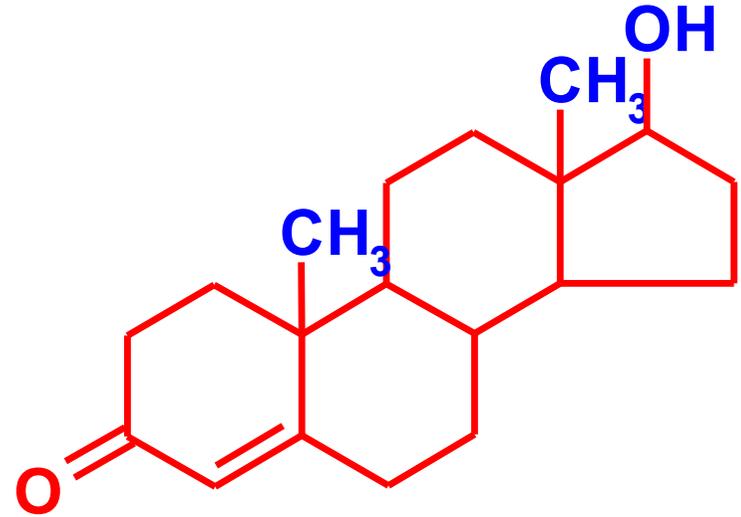
لہ جو فیہ ہیکہ ▲ مش

مثلاً حسیہ علیہا CH<sub>3</sub>  
ک 17 ج یطیب  
+ anabolic activity  
اعطیہ orally

# *Androgens & anabolic agents*

## 1. Testosterone:

17- $\beta$ -hydroxy-androst-4-ene-3-one



## Medical Uses:

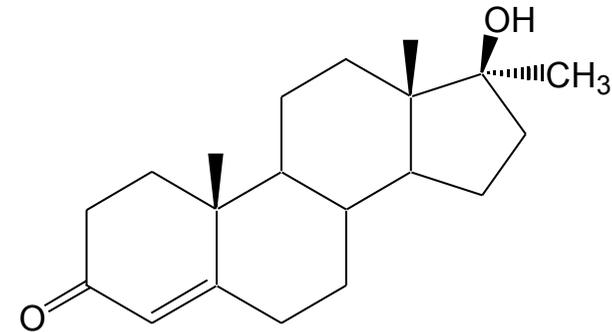
1. Treatment of hypogonadism {decreased functional activity of the gonads, thus resulting in lower amounts of testosterone}.
2. Androgens possess anabolic activity.
3. Treatment of breast cancer in menopausal women.
4. Dysmenorrhea but of no advantage over Progestins & estrogens.

# Androgenic Drugs

## • 2. 17 $\alpha$ -methyltestosterone:

(17- $\beta$ -hydroxy-17- $\alpha$ -methyl-androst-4-ene-3-one)

- Orally active. فے ایٹھا ہی 17
- Prolonged action. First pass metabolism سے پہلے گبر
- Androgenic and anabolic effects.

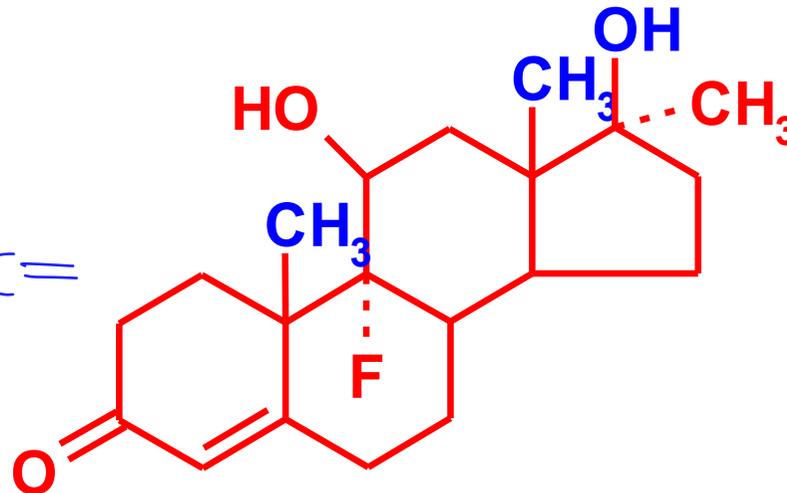


17 $\alpha$ -Methyltestosterone  
(Semisynthetic)

## 3. Fluoxymestrone:

10 times more potent than testosterone.

فے ایٹھا ہی 17  
F  
Potency  
فزاہت ال



# Anabolic Steroids

- Class of steroid hormones related to the male hormone – testosterone
- Increase protein synthesis within cells which results in growth of muscle *بزيادة حجم ال muscle*
- Also have androgenic properties which include the development and maintenance of male's characteristics
- Have both <sup>①</sup> medical and sport performance <sup>②</sup> uses *لبناء العضلات*





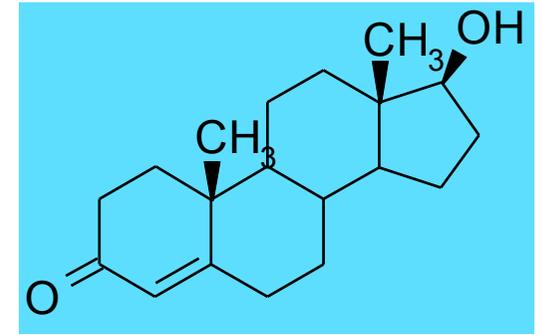
# Synthetic Anabolic Steroids:

## 1. Norethandrolone

Orally active.

Anabolic effects.

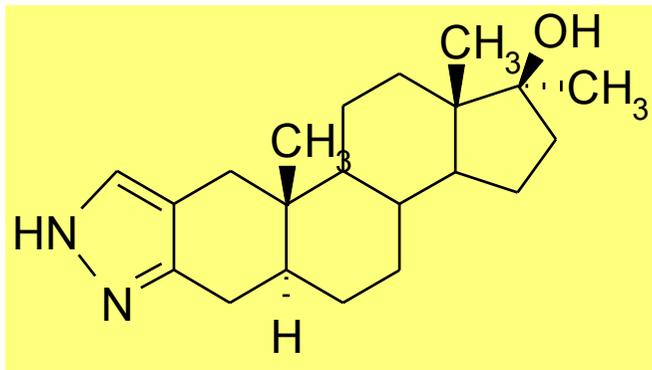
C-10  $\text{CH}_3$  group removed eliminate androgenic effect.



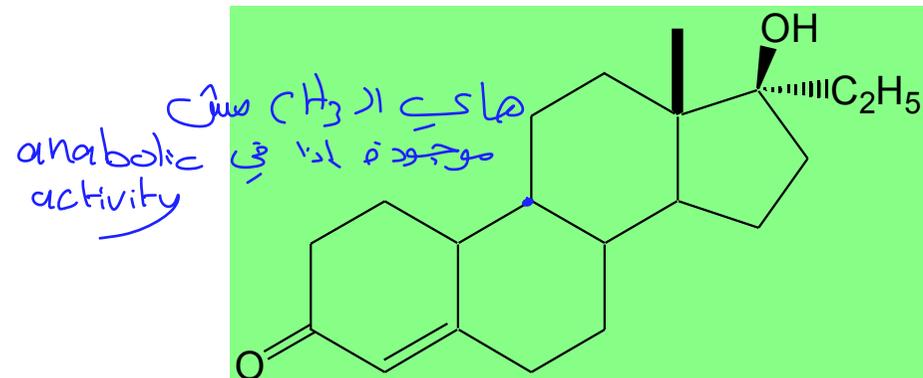
## 2. Stanozolol

Orally active.

Anabolic effects.



**Stanozolol**



**Norethandrolone**  
(Synthetic-Pure anabolic)

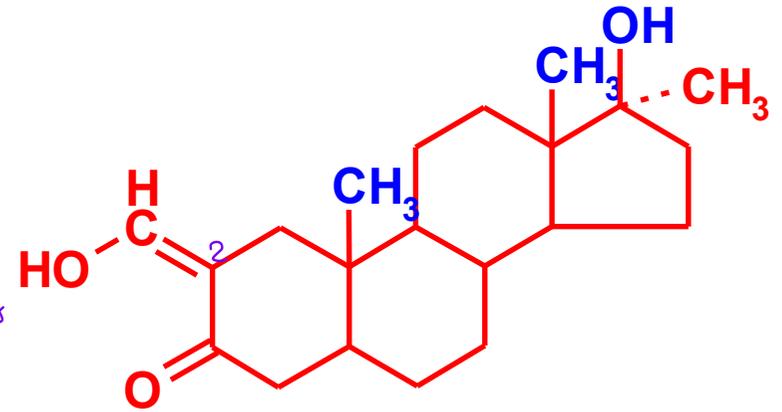
حکمت مشحون حصے میں اس اہم  
اسی لا structure تدریسا بلیم

# Anabolic agents

## 3. Oxymetholone:

17- $\beta$ -hydroxy-17- $\alpha$ -methyl-2-(hydroxymethylmethylene)androstan-3-one.

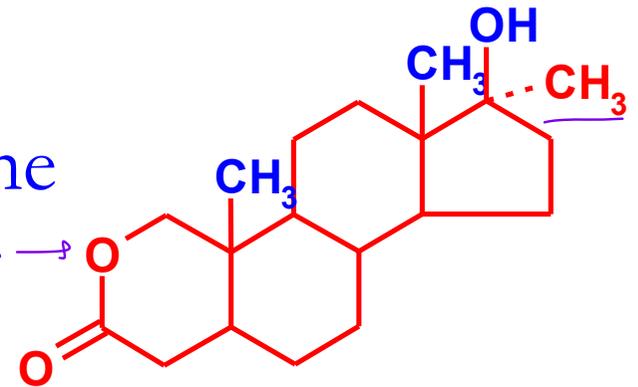
بال C صفت  
hydroxymethyl  
فزاہت ال عابولہ



## 4. Oxandrolone:

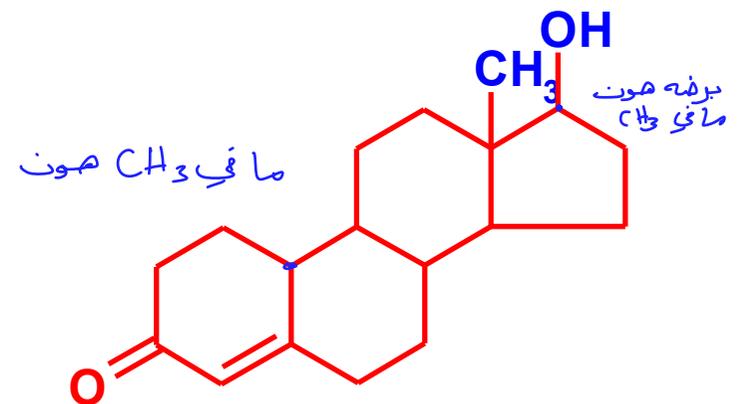
17- $\beta$ -hydroxy-17- $\alpha$ -methyloxandrostan-3-one

→ ہار substitution داخل ال Ring



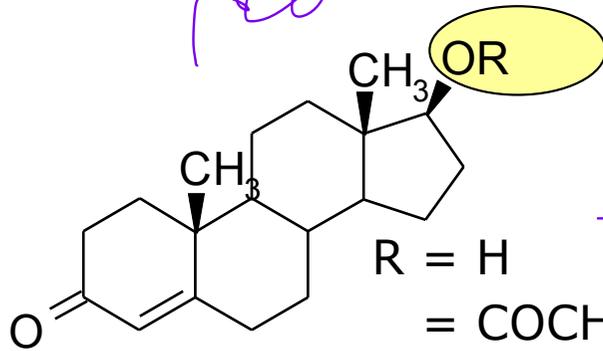
## 5. Nandrolone: (nortestosterone)

Used as ester (decanoate or phenylpropionate)

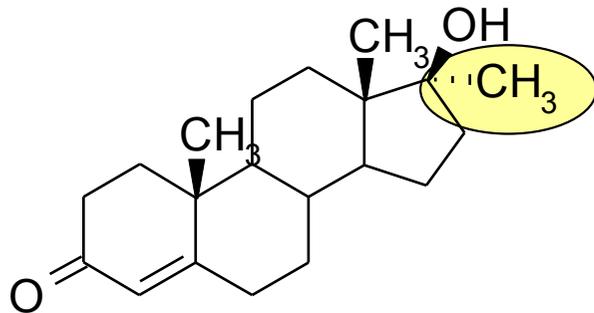


ساختار تستوسترون

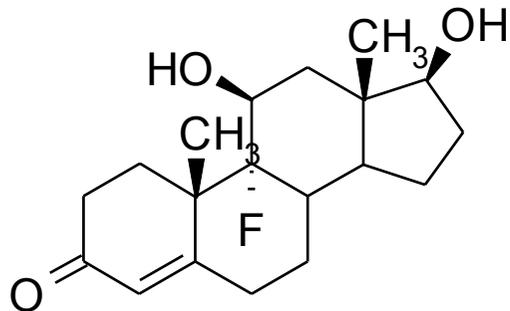
# SAR in Androgens



	<u>Anabolic</u>	<u>Androgenic</u>
<b>Testosterone</b>	<b>1</b>	<b>1</b>
<u>esters (injectable)</u>		
R = H	-	
= COCH <sub>2</sub> CH <sub>3</sub>	propionate	
= CO(CH <sub>2</sub> ) <sub>5</sub> CH <sub>3</sub>	enanthate	
= COCH <sub>2</sub> CH <sub>2</sub> (C <sub>5</sub> H <sub>9</sub> )	cypionate	



<b>17<math>\alpha</math>-methyl Testosterone</b>	<b>1</b>	<b>1</b>
(oral)		

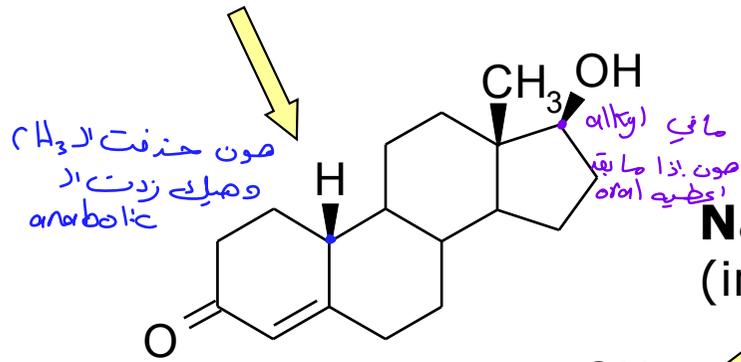


<b>Fluoxymesterone</b>	<b>1</b>	<b>1</b>
(oral)		

# SAR in Androgens

Anabolic

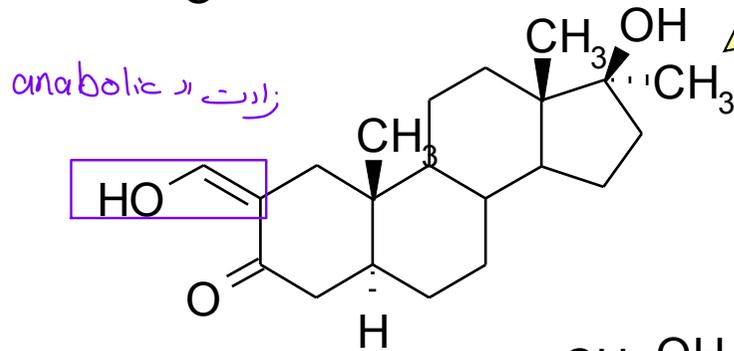
Androgenic



**Nandrolone**  
(injectable)

**2.5**

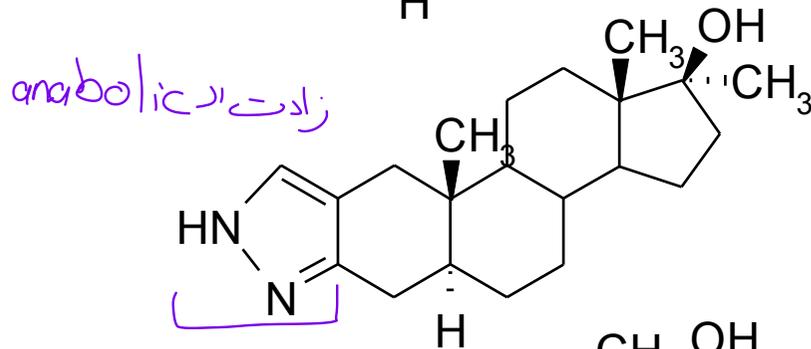
**1**



**Oxymetholone**  
(oral)

**2.5**

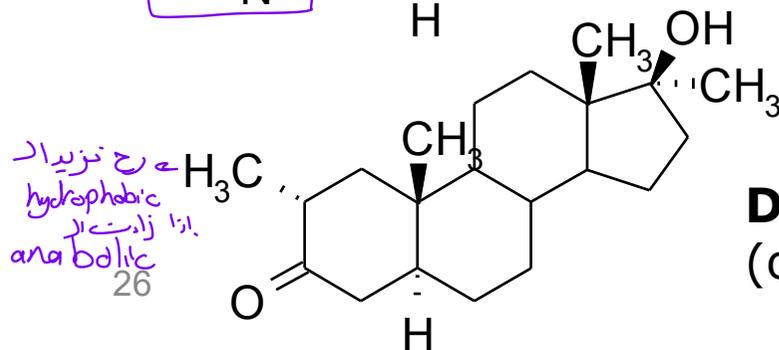
**1**



**Stanozolol**  
(oral)

**3**

**1**



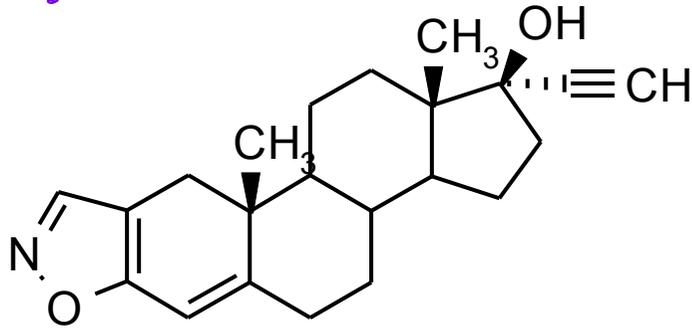
**Dromostanolone**  
(oral)

**4**

**1**

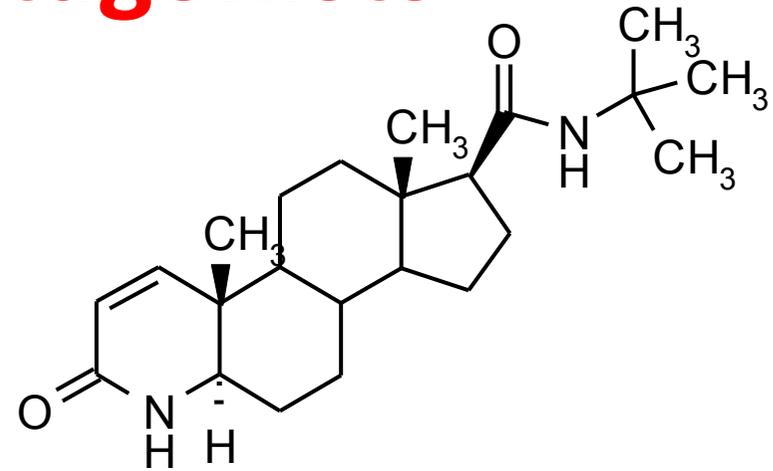
دکتر حسن  
مطوب

# Androgen Antagonists

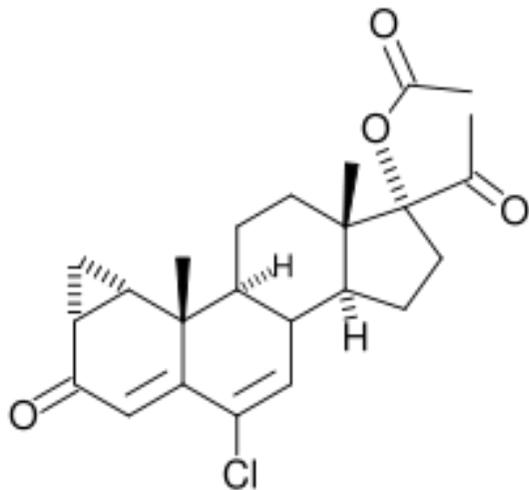


**Danazol**

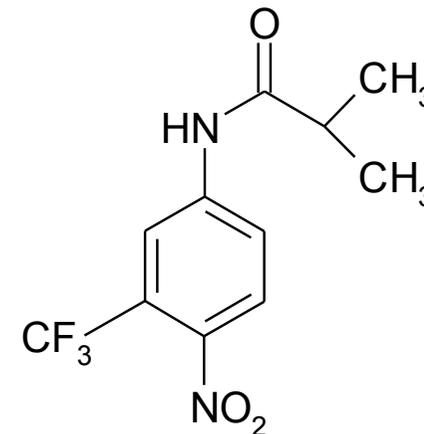
- Weak androgenic, anabolic, progestational & glucocorticoid action
  - (endometriosis)



**Finasteride (5  $\alpha$  reductase inhibitors)**  
They prevent conversion of testosterone into dihydrotestosterone (baldness)



**Cyproterone acetate**  
Has antiandrogenic and progestogenic activity.  
(prostate cancer)



**Flutamide**  
Non steroidal antiandrogen.  
(prostate cancer)

هنروري ٺكونا قاريني تهيزوا الا شياء اڪي بيعد Anabolic Activity ڪثير رڪزت عليهم

لا تنسوا زمينا ايهم من دعائكم

