Chapter 15. Corticosteroids

Syllabus: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone

15.1. CORTICOIDS OR CORTICOSTEROIDS

The steroidal hormones, which release form adrenal cortex are called as corticosteroids or corticoids. They are:

- **Mineralocorticoids** (release from ***Zona Glomerulosa***): Aldosterone, 11-deoxycorticosterone, 11-deoxy-17-oxycorticosterone)
- **Glucocorticoids** (release from ***Zona Fasciculata***): hydrocortisone, corticosterone, cortisone)
- **Sex hormones** (androgens; release from ***Zona Reticularis*)**: Testosterone, Oestrogen

1. Mineralocorticoids- Aldosterone-Electrolyte regulator

- ✓ **MOA:** acts on aldosterone receptor and enhance the expression of Na+ channel in renal tubules.
- ✓ Regulation of electrolyte and water
- ✓ By negative feedback system (low Na+ level and high K+ level), it enhances the resorption of sodium (Na+) by the renal tubules and excretion of potassium (K+) in the urine
- ✓ It also enhances the water reabsorption thus involves in regulation of blood volume and blood pressure

2. Glucocorticoids- "Cortosol"

Classification:

- ➢ **Short Acting**: Hydrocortisone (Cortisol; naturally occurring), cortisone, prednisone, prednisolone
- ➢ **Intermediate Acting**: Triamcinolone, Fluprednisolone
- ➢ **Long Acting**: Betamethasone, Dexamethasone

MOA: act on Glucocorticoid Receptor (type of Nuclear Receptor)→ Gene transcription

Physiological Action:

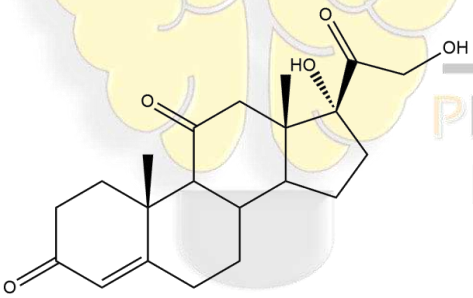
- ➢ they are essential for life, regulating metabolism and responses to stress
- ➢ increase the blood glucose level (Glycogenolysis and gluconeogenesis),
- ➢ Increase catabolism of fat (Lipolysis) and proteins,

- Reduce inflammatory and immune response
- Delayed the wound healing
- Promoting absorption of sodium and water from renal tubules (minor effects)
- Secretion is controlled through a negative feedback system involving the hypothalamus and anterior pituitary.
- It is stimulated by ACTH from the anterior pituitary and by stress. Cortisol secretion shows marked circadian variation peaking between 4 a.m. and 8 a.m. and being lowest between midnight and 3 a.m. When the sleeping waking

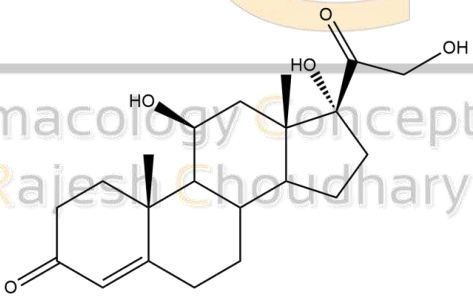
Uses:

- ✓ Hormone Replacement Therapy (Addison's Diseases).
- ✓ Reduce the inflammatory response in asthma and rheumatoid condition.
- ✓ Used as an immunosuppressant in systemic lupus erythematosus.
- ✓ Used in cerebral oedema to reduce the swelling.
- ✓ Used to supress the nausea and vomiting during cancer chemotherapy.

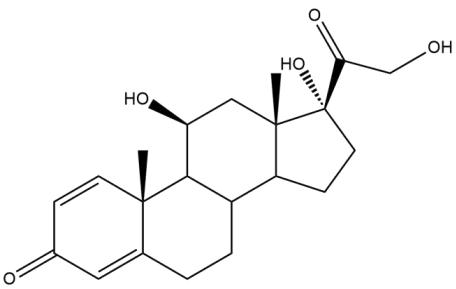
15.2. Medicinal Chemistry of Selected Drugs



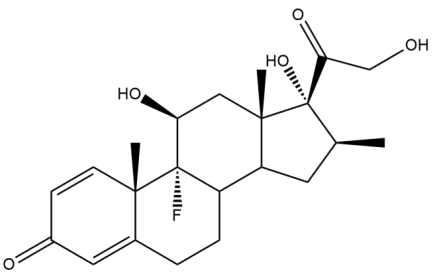
Cortisone



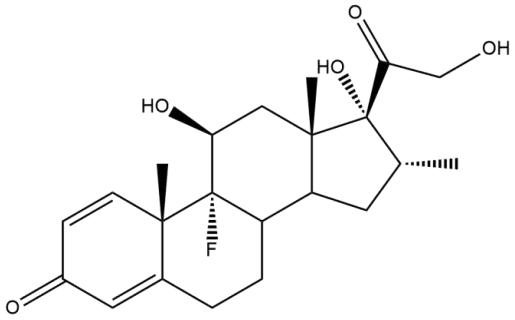
Hydrocortisone



Prednisolone

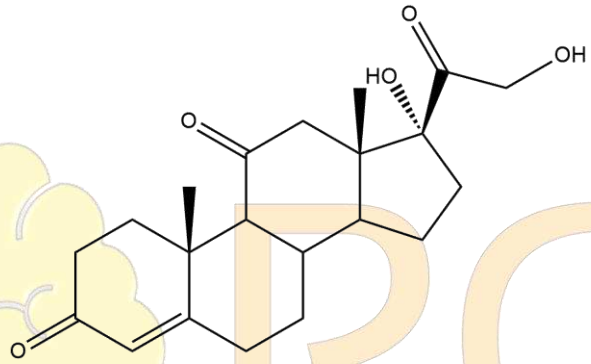


Betamethasone



Dexamethasone

A) Cortisone

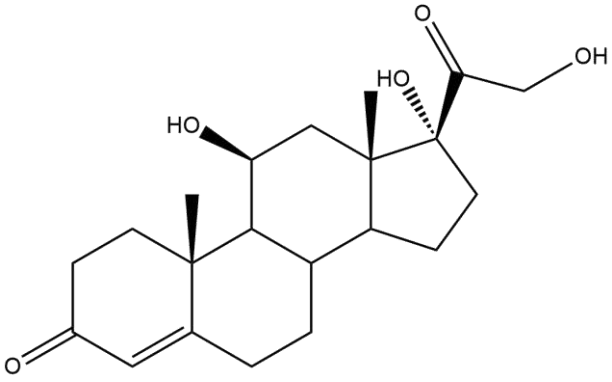


17α, 21-dihydroxy pregn-4-en-3, 11, 20-trione

Uses:

- ✓ Recommended in hormone replacement therapy
- ✓ Used as an anti-inflammatory and anti-allergy agent
- ✓ Useful in tissue transplantation
- ✓ Useful in lymphopoiesis

B) Hydrocortisone

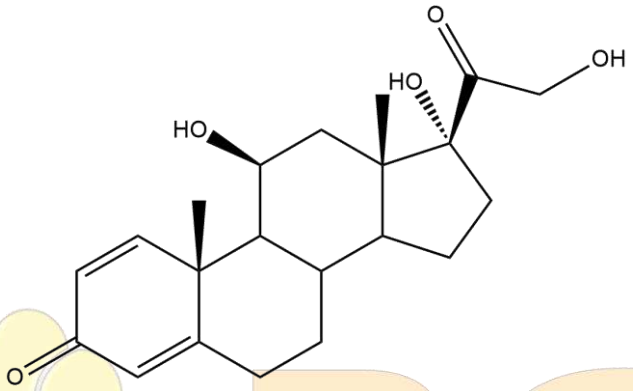


11β, 17α, 21-trihydroxy pregn-4-en-3, 20-dione

Uses:

- ✓ Recommended in hormone replacement therapy (400-800 ug/kg daily in 2 or 3 divided dose)
- ✓ Used in autoimmune and inflammatory disease

C) Prednisolone

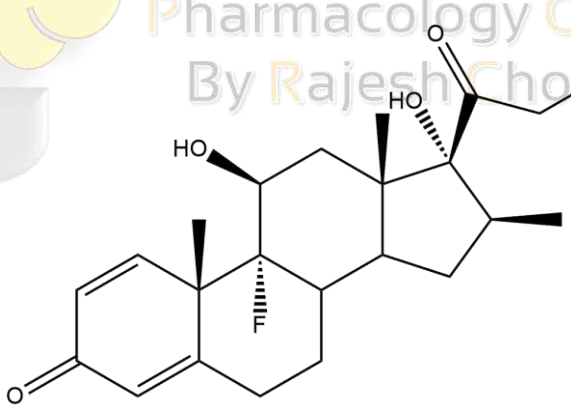


11β, 17α, 21-trihydroxy pregn-1,4-dien-3, 20-dione

Uses:

- ✓ Recommended in hormone replacement therapy.
- ✓ Used as an anti-inflammatory and anti-allergy agent

D) Betamethasone

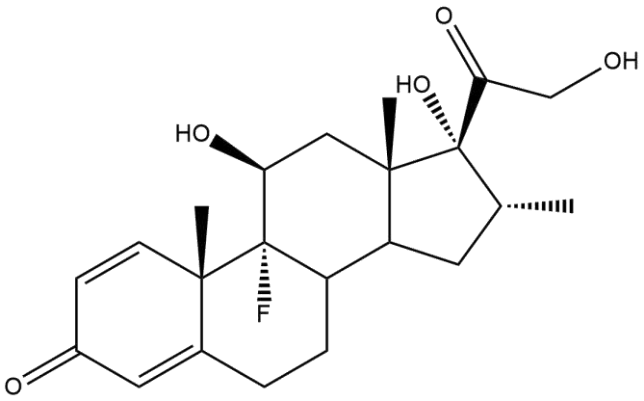


(9α-fluoro-16 β methyl)-11β, 17α, 21-trihydroxy pregn-1,4-dien-3,20-dione

Uses:

- ✓ Topically ointment (0.1%) antiallergic and anti-inflammatory for eyes and ears
- ✓ Used in asthma

E) Dexamethasone



(9α-fluoro-16α methyl)-11β, 17α, 21-trihydroxy pregn-1,4-dien-3,20-dione

Uses:

- ✓ Used in asthma and other inflammatory and allergic condition
- ✓ Used to supress the swelling in tumours of spine and brain treat