Reproductive Endocrinology









Reproductive Endocrinology

- Hypothalamic hormones
 - Gonadotropin releasing hormone (GnRH)
 - stimulate release of
 - FSH = follicle stimulating hormone
 - LH = luteinizing hormone
 - from pituitary
- 'Gonadotropin' = gonad stimulating

Hypothalamic Surge/Tonic Centers



Neurosecretory neurons from surge and tonic centers deposit neurohormones into portal system Portal system delivers these hormones to the adenohypophysis

GnRH release is pulsatile



GnRH pulse generator in hypothalamus called <u>'circhoral clock'</u>

Circhoral pulses

One pulse every hour

Each LH peak coincides with a GnRH pulse

Adenohypophysis



Pituitary Glycoproteins

FSH - LH - TSH

Figure 5-8. Diagram of an Anterior Lobe Glycoprotein Hormone



Pituitary Hormones

- Follicle stimulating hormone
 - stimulates gametogenesis in males and females
- Luteinizing Hormone
 - stimulates steroidogenesis in males and females
- Prolactin
 - stimulates the synthesis of milk in mammalian females
 - maternal behavior in some species
- Oxytocin -
 - stimulates smooth muscle contraction
 - associated with birth and milk release

Negative Feedback Hypothalamus Pituitary GnRH Pituitary FSH/LH







Negative Feedback & Homeostasis



Negative feedback

1. peptide hormones

 alter G protein response

 2. steroid hormones

 E₂ and P₄ decrease transcription of ßFSH-mRNA and levels of ßFSH-mRNA
 P₄ causes decrease in GnRH release

Positive Feedback & Homeostasis



Permissive action of hormones

steroid hormones may act as permissive agents by
 increase number of receptors
 increase protein kinases
 increase inhibitors of cyclic nucleotides

Other Endocrine Organs

≻gonads

≻steroids

synthesis stimulated by LH
 derived from cholesterol

C D В A A, B, C and D designate specific rings. Numbers designate specific carbons.

Steroidogenesis



Progestagens

- Primary progestagen
 - Progesterone
- Secondary progestagens
 - **17** α -Hydroxyprogesterone (17 α -OHP)
 - **1** 20α -Hydroxyprogesterone (20α -OHP)
 - I Aka 20α -dihydroxyprogesterone
- Three nuclear receptors
 - PR-A; PR-B and new PR-C (humans to date)
- Membrane receptors (two distinct classes)
 - progesterone membrane receptor component
 - | (PGMRC; subtypes 1 and 2)
 - membrane progestin receptors
 - I (mPR; subtypes alpha, beta and gamma)



Androgens

Androgens two 1° androgens Testosterone (T) dehydrotestosterone (DHT) I two 2° androgens | Androstenedione (A4) Dehydroepiandrosterone (DHEA) One nuclear receptor I AR One membrane receptor? Characterization/no cloning and sequence to date



Estrogens

➤in vertebrates -

- three 1° estrogens (Oestrogens)
 Estradiol-17β (E2)
 - Estrial
 - ➤Estriol
 - ➤Estrone
- >Two nuclear receptors
 - ≻ERα
 - ≻ERβ
- One membrane receptorGPR30







Adrenal

Mineralocorticoids

aldosterone

Glucocorticoids

cortisol or corticosterone

Weak Androgens

Dehydroepiandrosterone (DHEA)

All derived from progesterone



Adrenal

Mineralocorticoids aldosterone Glucocorticoids cortisol or corticosterone Weak Androgens Dehydroepiandrosterone (DHEA) All derived from progesterone Major role in stress response



Adrenal Function



Steroidogenesis



Lipid based Hormones





Steroid hormones have a common molecular nucleus called the cyclopentanoperhydrophenanthrene nucleus. The molecule is composed of four rings designated A, B, C and D. Each carbon in the ring has a number, as shown in Figure 5-9.

Prostaglandins

Eicosanoids

Along with thromboxanes and prostacyclins
Lipid based hormones
20 carbon atoms,
5-carbon ring
Derived from arachidonic acid



Prostaglandins



First isolated from seminal fluid in 1935 by the Swedish physiologist Ulf von Euler and independently by M.W. Goldblatt believed to be from prostate Actually produced by the seminal vesicles Produced in virtually all tissues and organs autocrine and paracrine mediators act upon multiple cell types platelets, endothelium, uterine and mast cells Non-Steroidal Anti-Inflammatory Drug (NSAID) Target COX and other aspects of PGs pathways

Prostaglandins



THE OMEGA-6 PATHWAY THE OMEGA-3 PATHWAY



Prostaglandin blockers - NSAIDs



Unintended Consequences

■ FDA

more than 22,000 dogs have gotten sick

- some have died after taking non-steroidal anti-inflammatory drugs
 - I including Metacam, Deramaxx, Previcox and Rimadyl.



Make sure YOU are EDUCATED before I am MEDICATED. Ask for a Client Information Sheet It could save your pet's life.

http://www.dogsadversereactions.com/nsaid/nsaidspage.html

Diclofenac (NSAID) and Vultures

Unintended consequences Not all species the same Diclofenac Non-Steroidal Anti-Inflammatory Drug (NSAID) cause gout and renal failure in vultures of the Gyps genus In India 3 Gyps species lost over 99 percent of population in a decade Still sold in Africa

Used for cattle



http://envfor.nic.in/divisions/wildlife/vulture_plan.htm

Thyroid

thyroxin (T₄) or triiodothyronine (T₃)
iodine as a central component
alters metabolism
nuclear receptor in mitochondria



Thyroid

Two lobes in the neck
Two hormones
Thyroxine (T4)
Triiodothyronine (T3)
Require iodide for synthesis
Major role in development and control of metabolism



Thyroid follicle



