

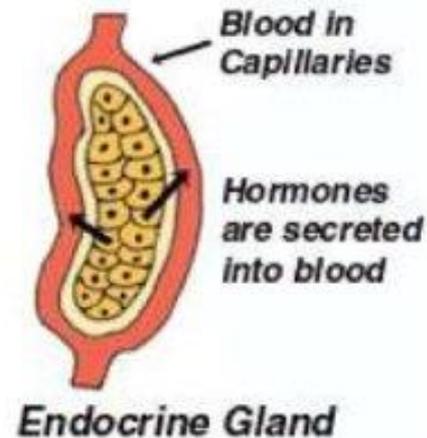
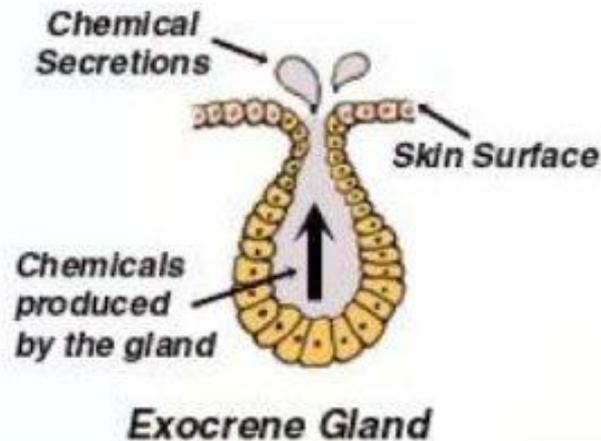
Therapeutants in Aquaculture: Hormones

Hormone

- Hormones is a chemical substance which is produced in one part of the body, enters the circulation and is carried to distant target organs and tissues to modify their structures and functions.
- The word hormone is derived from a Greek word “Hormacin” which means to “Excite”.
- Hormones catalyse and control diverse metabolic processes, despite their varying actions and different specificities depending on the target organ.

Hormone secretion

- Hormones in animals are often transported in the blood.
- **Endocrine hormone** molecules are released directly into the bloodstream, while **exocrine hormones** are released directly into a duct, and from the duct they either flow into the bloodstream or they flow from cell to cell by diffusion.



Effect of Hormones

- Hormones have the following effects on the body:
 1. Stimulation or inhibition of growth
 2. Activation or inhibition of the immune system
 3. Regulation of metabolism
 4. Preparation of the body for fighting, fleeing, and other activities.
 5. Preparation of the body for a new phase of life, such as puberty, parenting.
 6. Control of reproductive cycle.
 7. It also regulate the production and release of the other hormones.

Classification of Hormones

1. Peptides and proteins
2. Amino acid derivatives
3. Steroids

1. **Peptides hormones** are synthesized in endoplasmic reticulum, transferred to the Golgi and packaged into secretory vesicles to exports. Eg-Oxytocin

2. **Amino acid derivatives:**

amino acid – derived hormones (ending in '-ine') are derived from tyrosine and tryptophan and include **epinephrine** and **norepinephrine** (produced by the **adrenal medulla**). Amino acid-derived hormones also include **thyroxine** (produced by the thyroid gland) and melatonin (produced by the pineal gland)

- Two other amino acids are used for synthesis of hormones:
- Tryptophan is the precursor to serotonin and the pineal hormone melatonin.
- Glutamic acid is converted to histamine.

3. **Steroids hormone:**

- Steroids are lipids and, more specifically, derivatives of cholesterol. Examples include the sex steroids such as **testosterone** and adrenal steroids such as **cortisol**.

Hormones used in Aquaculture

Hormones used in Aquaculture are of 4 categories

1. Gonadotropins (LH,HCG,PMSG)
2. Gonadotropin releasing hormones (GnRH), or Letenizing hormone releasing hormone (LHRH/LRF) and their analogues (GnRH-A/LHRH-A/LRF-A)
3. Steroids
4. Others drugs-Prostaglandins and Antiestrogens

Gonadotropins hormone (GtH)

- Two Gonadotropin hormones (GtH) are being reported in fish
 1. GtH I
 2. GtH II
- ✓GtH I- play vital role in follicle development and vitellogenesis.
- ✓GtH II- ovulation and spawning

- **Luteinizing Hormone (LH):** its role in controlling the function of ovaries in females and testes in males, which are known as the gonads.
- **Human Chorionic Gonadotropin (HCG):** secreted by the Langerhans cells of the chorionic villi of human placenta.
- It appears in the blood and urine during early pregnancy.
- Primary function of HCG is to maintenance of pregnancy and stimulation of gonad.
- HCG has different brand name-Prolan, APL (Ayerst Lale), Sumaach, Antuitrin-s, (CIBA,Organon,Bayer), Gonatropin etc.
- Dose: 100-2000 IU/kg fish

Pregnant Mare serum Gonadotropin (PMSG):

- PMSG is secreted by the endometrial cups of the the uterus of a pregnant mare.
- It appears in the blood on 40th days of pregnancy, remains high until 120th day.
- Administration of PMSG induced the ovulation and spawning in fish.
- Dose: 500 IU/ Kg of fish

Puberogen:

It contains 63% FSH and 34% LH.

Dose: 50-200 IU/kg body wt for female and 20-25 IU/kg body wt for male

GnRH Analogues

- **Ovaprim:**

- Synthetic compound manufactured by Syndel laboratories inc.
- It consist of Salmon gonadotropin releasing hormone analogue(sGnRH-A) and contained domperidone which is dopamine antagonist.
- Dose: 0.5 mg/kg of fish

- **Ovatide:**

- It is a synthetic compound launched by Hemmopharma, Bombay.
- Also a combination of GnRH analogue with dopamine antagonist pimozide.
- Dose: 0.2 ml/ kg body wt for male and 0.4 ml/kg body wt for female

- **Ovapel:**

- Developed by University of Godollo in Hungary.
- It is prepared in pellet form
- Dose: 1-2 pellet/kg body wt

- **WOVA-FH:**

- It is also a synthetic gonadotropin releasing hormone analogue prepared and marketed by WOCKHARDT, Mumbai, India.
- Dose: 0.5 ml /kg body wt

Steroid Hormones

1. **Cortico steroids hormones**-11-deoxycortico sterone acetate (DOCA)
2. **Progestins**-17a-hydroxy-20b-dihydro progesterone

Dose: 1 -5 mg/fish

100 mg DOCA/kg fish-Gold fish

At present neither corticosteroids nor progestins are utilized commercially for inducing spawning in fish.

Other drugs

- **Prostaglandins:**

- Prostaglandins have been shown to be involved in the follicular rupture during ovulation.
- Dose: 10 mg/kg body wt

- **Antiestrogens:**

- Antiestrogens are synthetic compounds that can compete with estrogen for binding on estrogen receptors.
- There is a decrease in estradiol level during final maturation and ovulation.
- Estradiol has been shown to have negative feed back inhibition on gonadotropin release.
- Lowering of estradiol is hence found enhance gonadotropin secretion.

- Two example of antiestrogens drugs are

1. **Clomiphene**

2. **Tamoxifen**

Both drugs help in inducing ovulation and spawning

Dose: 0.1 -10 mg/kg body wt