

Endocrinology of Fish

MS I (Semester-II)

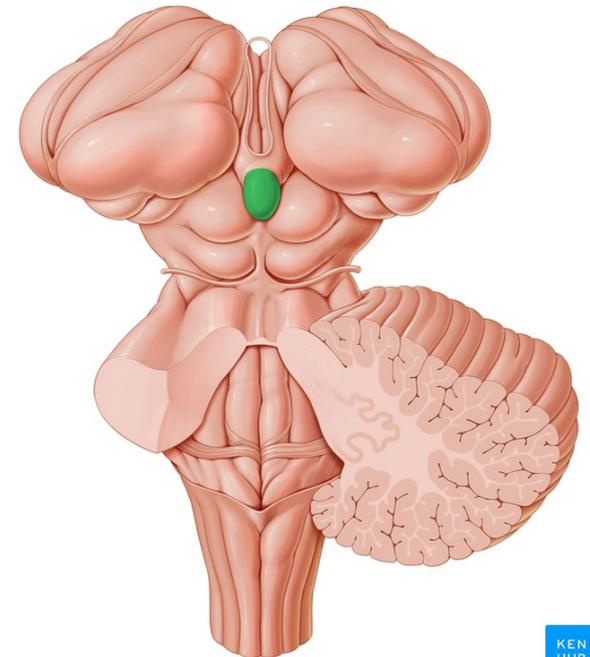
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Lecture – 07

Pineal Gland

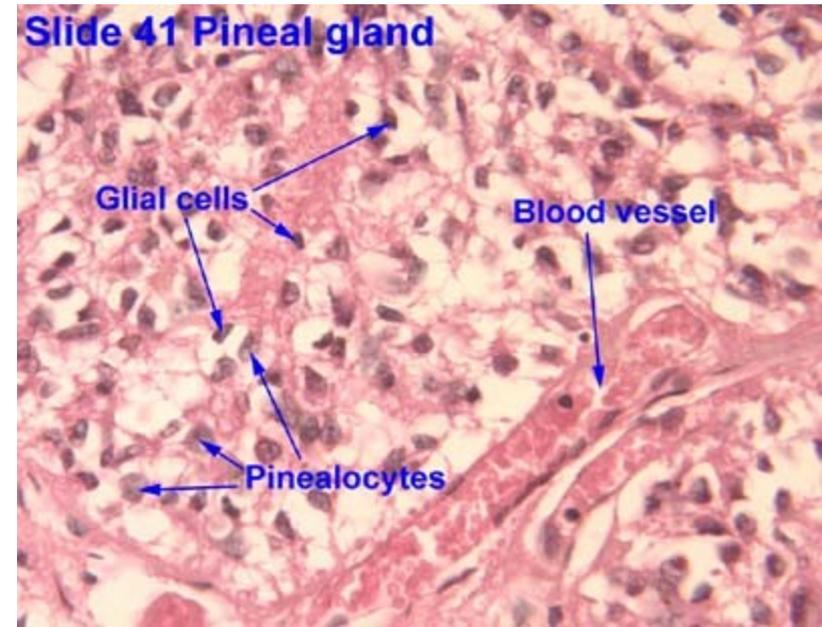
Pineal Gland

- pineal gland located beneath
- indole hormone melatonin
- strongly involved in the synchronization of diurnal and annual rhythms.
- melatonin production in the retina of the eye as well



Histology

- Three types of cells are considered the main content of the pineal gland
- pinealocytes (photoreceptor cells)
- glial (supporting) cells
- second order neurons (ganglion cells)



- pinealocytes are both photosensitive, containing photopigments, and secretory, producing chemical substances.
- photoreceptors of the pinealocytes have similarities with the cone photoreceptors of the retina

- pineal gland records gradual light intensity changes rather than the rapid changes that the retina can perceive .
- pineal pigments absorb light at longer wavelengths than the retina
- Photoreceptors of lower vertebrates presumably release neurotransmitters constantly during darkness

Melatonin

- Melatonin (N-acetyl-5-methoxytryptamine) is an indole hormone produced from the amino acid tryptophan.

Biosynthesis

- conversion of tryptophan into 5-hydroxytryptophan by the enzyme tryptophan hydroxylase (TPOH).
- Hydroxytryptophan is then decarboxylated by the aromatic amino acid decarboxylase to serotonin.
- Arylalkylamine N-acetyltransferase (**AANAT**) converts serotonin into Nacetylserotonin
- hydroxyindole-0-methyltransferase (HIOMT) methylates Nacetylserotonin to melatonin

Functions

- Melatonin diffuses into the blood stream directly after the synthesis.
- Melatonin is believed to be involved in behavioural, physiological and biochemical rhythmic activity.
- An indication of this is the diurnal variations in indole compounds (serotonin, 5-hydroxyindolacetic acid, 5-hydroxytryptophol and melatonin) in the pineal
- Melatonin levels are consistently higher during night time.

Functions

- Light inhibits the production of melatonin,
- while darkness removes this inhibition.
- The limiting factor is AANAT, which show cyclic activity with higher activity in darkness.
- Both the duration of the elevated nighttime level and the amplitude of plasma melatonin rhythm change in a fashion consistent with the seasonal change in photoperiod providing calendar information to the animal.