Advanced Syntonic Phototherapy
Endocrinology

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The Nervous System and the Endocrine System Putting It All Together

Central Nervous – brain and spinal cord

Peripheral Nervous System

somatic nervous system – external system, conscious, voluntary

Autonomic Nervous System – internal system, mainly involuntary

Sympathetic – response to stress
activates glands/organs of endocrine system
activation leads to increased heart rate, breathing, pupil dilation

Parasympathetic – recovery for activities the sympathetic causes

The Nervous System and the Endocrine System Putting It All Together

Electrical components of the nervous system and chemical components of the endocrine system >> influence behavior

The Endocrine System

the glands/organs of the endocrine system release hormones

the hormones they release affect almost every cell, organ and function of our bodies

The Endocrine System

Major Glands of the Endocrine System

Hypothalamus

Pituitary

Thyroid and Parathyroids

Adrenals

Pineal Body

Reproductive Organs

the Pancreas has a role in hormone production but also works with the digestive system

Hypothalamus

It is the link between the nervous system and the endocrine system via the pituitary gland

It therefore controls the pituitary gland

Medial Supraoptic region contains the Suprachiasmatic Nucleus

Suprachiasmatic Nucleus function is for circadian rhythm

Projections to areas of the sympathetic motor system are carried by the hypothalamospinal tract and activate the sympathetic motor pathway

Pituitary Gland

Located at the base of the brain just below the hypothalamus

Considered the most important part of the endocrine system

Known as the Master Gland – it makes hormones that control several other endocrine glands

Anterior – releasing and inhibiting hormones
here dopamine is a prolactin-inhibiting hormone

Posterior – hypothalamic – hypophyseal tract

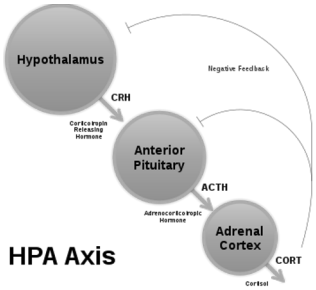
Thyroid and Parathyroids

Thyroid hormone
plays a key role in development of the brain and nervous system

Production and release of thyroid hormones
controlled by the pituitary gland
increases tonus of striped and smooth muscles thereby affecting convergence, accommodation and binocularity
overactivity may lead to exophthalmos (Graves disease)

Parathyroids – calcium regulation, carbohydrate metabolism
underactivity > carbohydrate metabolism disrupted > cataracts

Hypothalamic – Pituitary – Adrenal axis (HPA axis)



CRH stimulates secretion of ACTH
ACTH acts on Adrenal Cortex
to produce mainly cortisol
Cortisol in turn acts back on the hypothalamus and pituitary
to suppress ACTH and CRH
in a negative feedback cycle

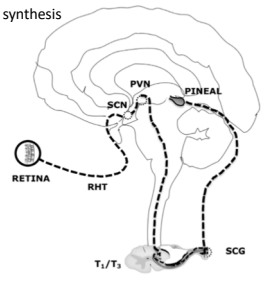
Adrenal (Suprarenal) Glands

One on top of each kidney
Outer cortex – produces steroid hormones including cortisol
Inner medulla – produces epinephrine and norepinephrine
enhances sympathetic nervous system – fight or flight
rapid response to stress

The Pineal Gland

The primary function of the pineal gland is to secrete melatonin
Known as the master conductor of the physiology of the brain and body
Mainly made up of pinealocytes that produce melatonin but also glial cells
Sometimes called the "third eye" as it may be derived from photoreceptor cells
(its cells are similar to those of the eye)
Controlled by neurons sensitive to light which originate in the retina and end in hypothalamus

Neural control of pineal melatonin synthesis
RHT: retinohypothalamic tract
SCN: suprachiasmatic nucleus
PVH: paraventricular nucleus.
SCG: superior cervical ganglion



5 Functions of the Pineal Gland

Production of Melatonin

Cardiovascular Health - melatonin produced by the pineal gland can have a positive impact on your heart and BP

Female Hormones - light exposure and related melatonin levels may have an effect on a woman's menstrual cycle

Mood Disorders - a lower pineal gland volume may increase your risk of developing schizophrenia and other mood disorders

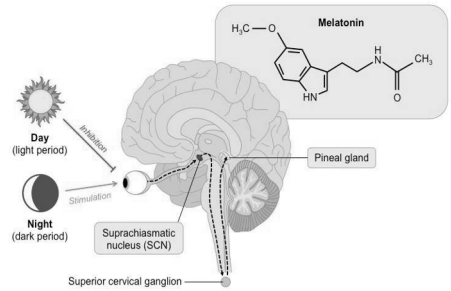
Cancer - a recent study on rats found evidence that lowering pineal gland function through overexposure to light led to cellular damage and increased risk for colon cancer
Blind women were half as prone to develop breast cancer
Blind men were less likely to suffer prostate cancer

Pineal Gland

Has no blood-brain barrier

Plays an unrecognized role in spatial navigation as people with impaired pineal gland function can decline in their sense of direction

In reptiles and birds the pineal gland is close to the skin and needs no interaction with the eye to register day/night cycle



Melatonin Receptors

Highest density of receptors in the SCN, anterior pituitary and retina

Melatonin enhances $GABA_A$ receptor function in SCN which may be responsible for the regulatory effects of melatonin on mammalian circadian time-keeping and it's sleep-inducing effects

Melatonin receptors are differently expressed in different tissues (SCN, hippocampus, cerebellum, medulla, midbrain, neocortex, hypothalamus)

physiological significance of melatonin receptors in some brain regions is still unknown

Melatonin protects against oxidative stress

Free radical scavenger

Stimulates the synthesis of anti-oxidative enzymes

Inhibits activity of free radical generating enzymes

Shining a Light on the Importance of Darkness

ALAN – Artificial Light at Night

The core stimulus-response of the endocrine system to ALAN relies on four main components:

- the pineal gland
- the hypothalamic-pituitary-adrenal (HPA) axis
- the hypothalamic-pituitary-gonadal (HPG) axis
- the hypothalamic-pituitary-thyroid axis (HPT)

The elaborated hormonal responses generated by these axes to ALAN exposure might be mediated by transcriptional regulation of gene expression *via* epigenetic modifications

The incidences of breast and prostate cancers show close association with light pollution particularly in urbanized and industrialized regions

Syntonic Phototherapy

Pineal Gland stimulation and suppression

Stimulate with Mu-Upsilon
Suppress with Alpha- Delta
Omega to reduce motor output