The ENDOCRINE SYSTEM WEBINAR
Clinical Pearls

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COMMUNICATION SYSTEM
Endocrine System, Nervous System

1. Communication
2. Response coordination
3. Stress management

- The Nervous System – FAST RESPONSE, neurotransmitters, short lived
- The Endocrine System – SLOW RESPONSE, bloodstream, longer lasting

- They nervous and endocrine systems work together to detect external and internal signals, transmit and integrate information, and maintain homeostasis..

The endocrine system is a series of glands that produce and secrete hormones that the body uses for a wide range of functions:

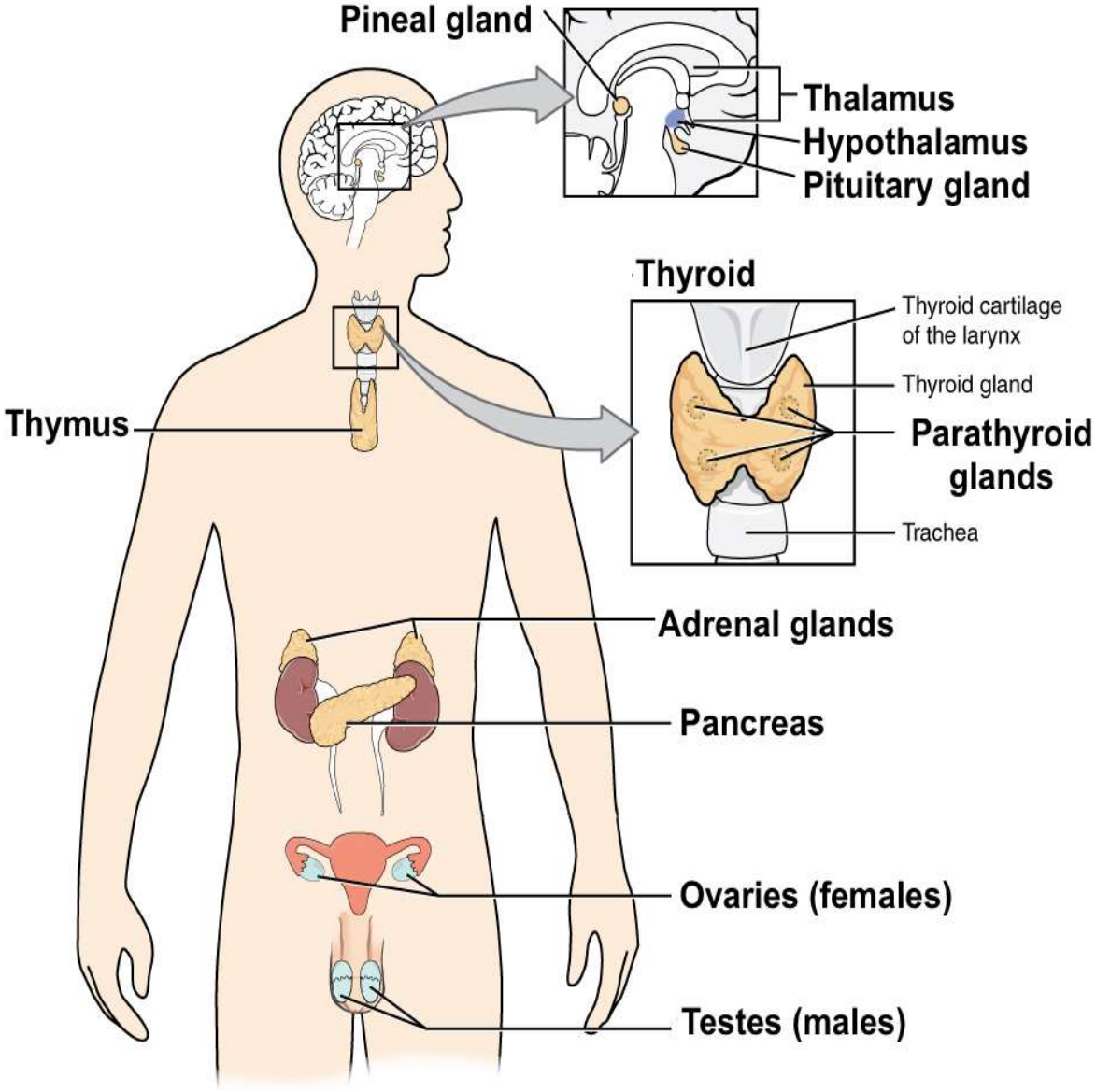
1. Orchestration and Regulation – hypothalamus, pituitary, pineal glands in brain

2. Metabolic Rate – thyroid, parathyroid, thymus – (skin and kidneys for Vit D activity)

3. Energy Metabolism – pancreas, liver, adrenal cortex, fat cells, stomach, intestines

4. Adrenal function – adrenal glands, kidneys

5. Reproduction – female ovaries and uterus, male testes and prostate, breast tissue


Pineal gland
Thalamus
Hypothalamus
Pituitary gland
Thyroid
Thyroid cartilage of the larynx
Thyroid gland
Parathyroid glands
Trachea
Thymus
Adrenal glands
Pancreas
Ovaries (females)
Testes (males)

Relationship between Hypothalamus releasing hormones and hormones they stimulate

Releasing Hormone	Stimulated Hormone
Thyrotrophin-releasing hormone (TRH)	Stimulates the release of thyroid-stimulating hormone (**TSH**) and **PROLACTIN** from the anterior pituitary. Kidney disease, hypothyroidism, certain Rx can lead to elevated prolactin, which decreases testosterone
Corticotropin-releasing hormone (CRH)	Stimulates ACTH release from pituitary
Gonadotropin-releasing hormone (GnRH)	Stimulates release of LH and FSH from pituitary
Growth hormone-releasing hormone (GHRH)	Stimulates secretion of growth hormone from pituitary, somatotropin. Control lipids, proteins and carbohydrates metabolism.
Somatostatin	Inhibit secretion of GH from anterior pituitary and TSH. In addition, somatostatin is produced in the pancreas and inhibits the secretion of

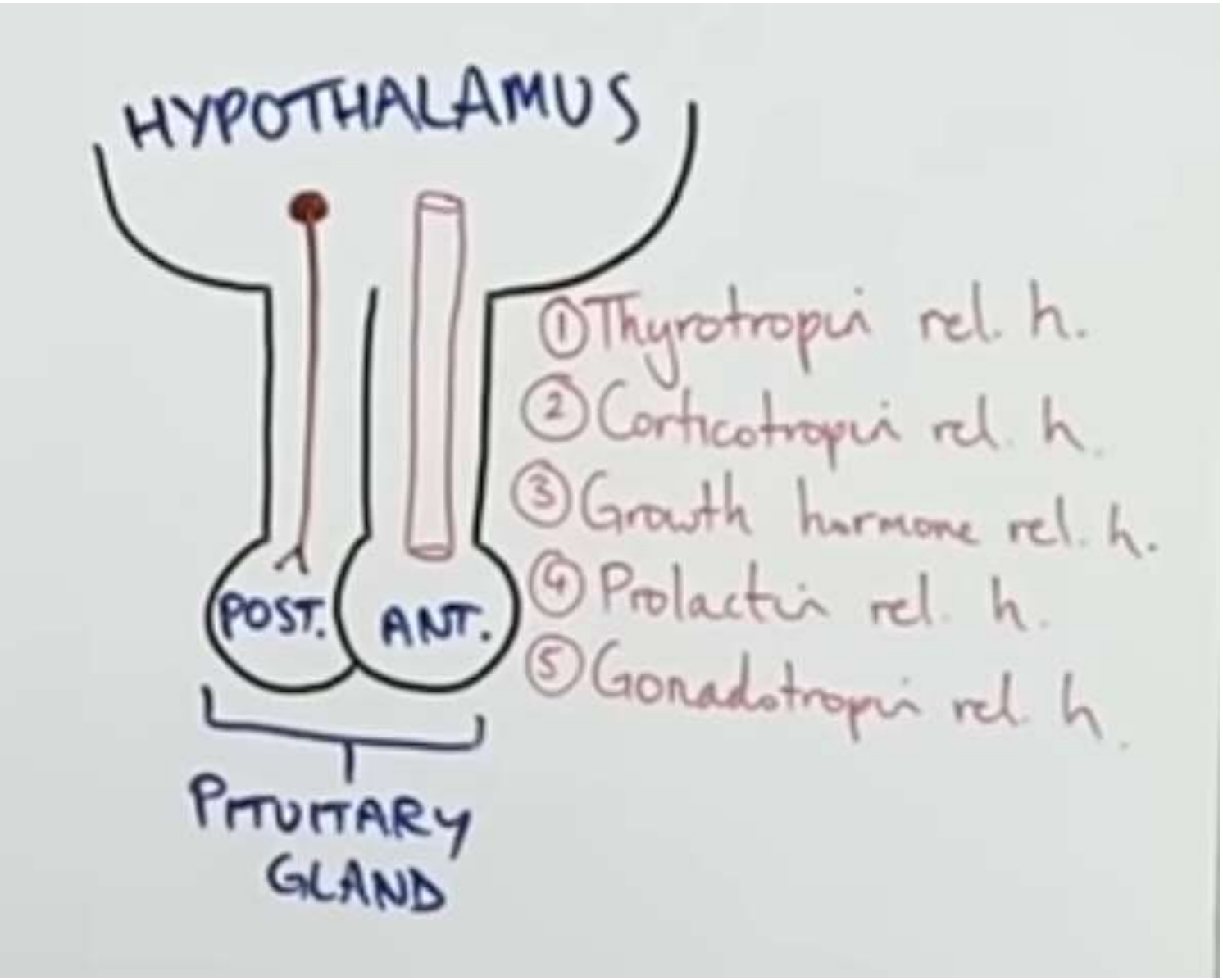
Seven Stimulating Hormones of the Anterior Pituitary

Stimulating Hormone	Description
Thyroid stimulating hormone (TSH)	Stimulates the thyroid to produce and secrete thyroid hormones
Follicle-stimulating hormone (FSH)	Promotes follicular development and estrogen synthesis in ovaries; sperm maturation-testes
Luteinizing hormone (LH)	Stimulates ovulation, formation of corpus luteum, estrogen and progesterone synthesis in ovaries. Stimulates testosterone in testes.
Adrenocorticotropic hormone (ACTH)	Stimulates synthesis and secretion of adrenal cortical hormones (cortisol, androgens, aldosterone).
Melanocyte-stimulating hormone (MSH)	Stimulates melanin synthesis.
Growth hormone (GH) or somatotropin, also known as human growth hormone (hGH or HGH)	Stimulates growth, cell reproduction, cell regeneration. Goes directly to long bones and the big muscles to stimulate growth. GH also stimulates production of IGF-1 (**Insulin-like growth factor 1**) and increases the

Two Pass-through Hormones of the Posterior Pituitary

Produced in HYPOTHALAMUS but stored and released into bloodstream through pituitary

Releasing Hormone	Stimulated Hormone
Oxytocin	Stimulates milk production and uterine contractions. Involved in pair bonding, arousal. Secretion depends on electrical activity of neurons in the hypothalamus. During orgasm, body releases dopamine, known as "the feel-good hormone," and oxytocin, "the love drug." These hormones increase feelings of happiness and other positive emotions, and they counteract the "stress hormone," cortisol. Being mindful throughout your day can help reduce stress, increase oxytocin levels, and improve overall well-being.
Vasopressin (ADH or antidiuretic hormone)	Stimulates water reabsorption in kidneys, constricts arterioles. Inadequate production of vasopressin during sleep causes frequent urination.


HYPOTHALAMUS
POST.
ANT.
PITUITARY GLAND
① Thyrotropin rel. h.
② Corticotropin rel. h.
③ Growth hormone rel. h.
④ Prolactin rel. h.
⑤ Gonadotropin rel. h.

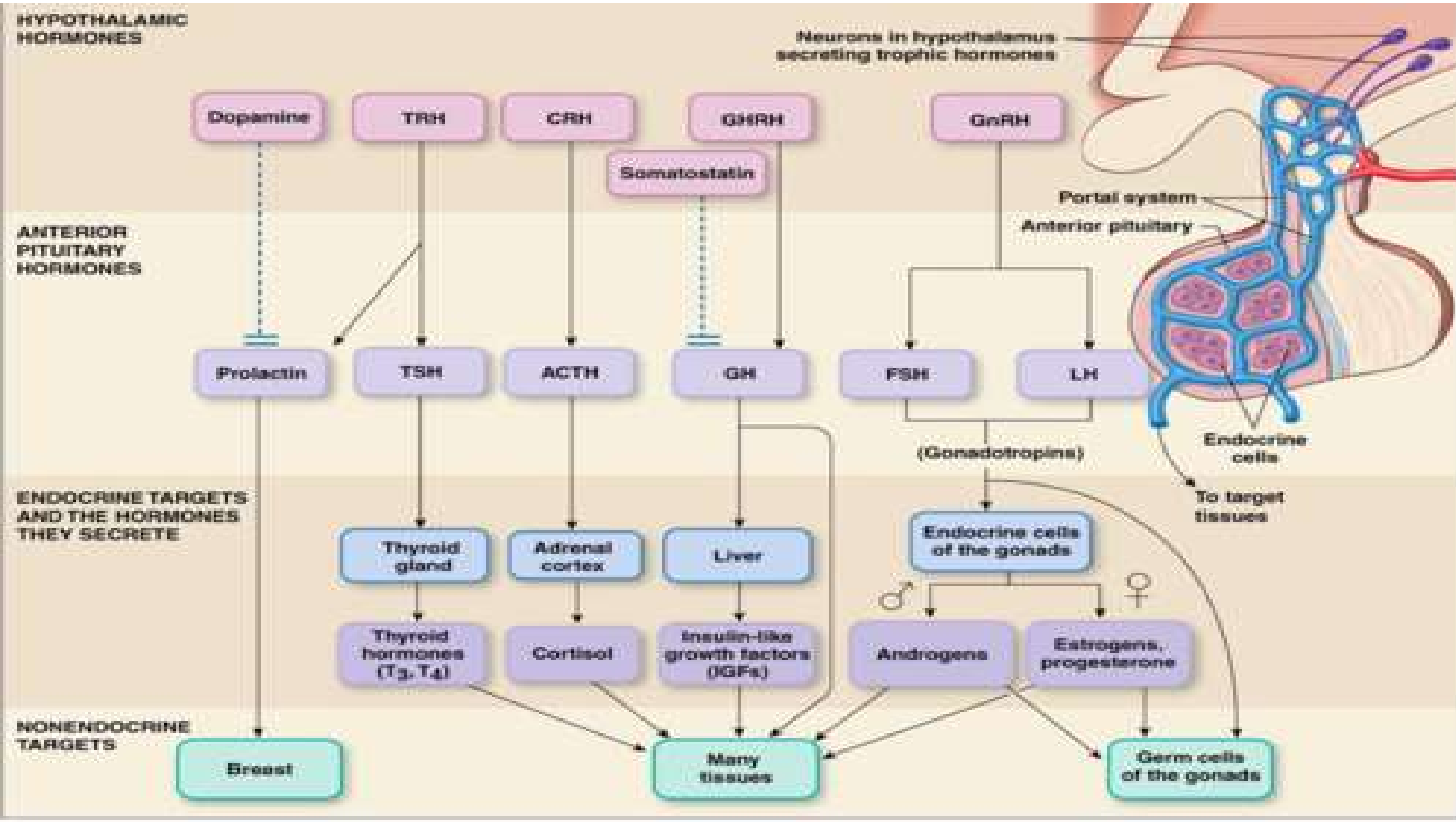
Importance of Manganese on Pituitary Function

Manganese is required for normal thyroid function and is involved in the formation of thyroxin. Tissue mineral analysis (TMA) studies have revealed low manganese levels in hypothyroid patients. Due to the antagonistic effect of insulin, parathyroid hormone (PTH), and estrogen on thyroid function, absorption or utilization of manganese may be impaired when levels of these hormones are elevated.
The adrenal hormones are known to affect the tissue distribution of manganese as well as to alter its metabolism.

Reproductive function in manganese deficient patients is characterized by defective ovulation, ovarian and testicular degeneration, and increased infant mortality.

Mn-zyme

1.Watts DL: Indications of parathyroid activity in hair tissue mineral patterns. T.L.F.D., Oct. 1989.
2. Watts DL: The nutritional relationships of the thyroid. /. Orthomol. Med. 4,3, 1989.
3. Failla ML: Hormonal regulation of manganese. In: Manganese in Metabolism and Enzyme Function. Schrammk, V.L., Wedler, F.C., Eds. Academic Press, N.Y., 1986.


HYPOTHALAMIC HORMONES
Neurons in hypothalamus secreting trophic hormones
Dopamine
TRH
CRH
GHRH
GnRH
Somatostatin
Portal system
Anterior pituitary
ANTERIOR PITUITARY HORMONES
Prolactin
TSH
ACTH
GH
FSH
LH
(Gonadotropins)
Endocrine cells
To target tissues
ENDOCRINE TARGETS AND THE HORMONES THEY SECRETE
Thyroid gland
Adrenal cortex
Liver
Endocrine cells of the gonads
♂
♀
Thyroid hormones (T_3, T_4)
Cortisol
Insulin-like growth factors (IGFs)
Androgens
Estrogens, progesterone
NONENDOCRINE TARGETS
Breast
Many tissues
Germ cells of the gonads

SIGNAL TRANSDUCTION CASCADE

(process how signal is transmitted through a cell)

1st vs 2nd MESSENGER MOLECULES

First messengers are extracellular ligands/factors, often **hormones or neurotransmitters**, such as epinephrine, growth hormone, and serotonin. Earl Wilbur Sutherland Jr., discovered second messengers, for which he won the 1971 **Nobel Prize.**

Second messenger molecules include **cyclic AMP**, cyclic GMP, inositol triphosphate, diacylglycerol, and calcium.

Sutherland discovery - epinephrine alone not successful, but had to trigger a second messenger, cyclic AMP, for the liver to convert glycogen to glucose

Cyclic AMP (Cyclic adenosine monophosphate)

Metabolism, gene regulation, regulation of neurotransmitter synthesis, growth factors, and immune function are some examples of the numerous biological processes that utilize cAMP
Understanding the cAMP pathway gives rise to therapeutic possibilities within the signal transduction system to fight against diseases such as cancer, diabetes, heart failure, inflammation, neurological disorders, myocardial atrophy, and mood disorders

The chief role of cyclic AMP in several tissues is to facilitate or promote the **mobilization of glucose and fatty acid reserves**. In the liver, glucagon and the catecholamines cause an increase in the intracellular level of cyclic AMP by stimulating adenyl cyclase.

SOMATOSTATIN - somatotropin release-inhibiting factor (SRIF)

While there is no data relating to under-production of somatostatin, there are documented cases of OVER-PRODUCTION of somatostatin referred to as **SOMATOSTATINOMA**.

Somatostatin produces predominantly **neuroendocrine inhibitory effects** across multiple systems. It is known to inhibit GI, endocrine, exocrine, pancreatic, and pituitary secretions (GH), as well as modify neurotransmission and memory formation in the CNS.

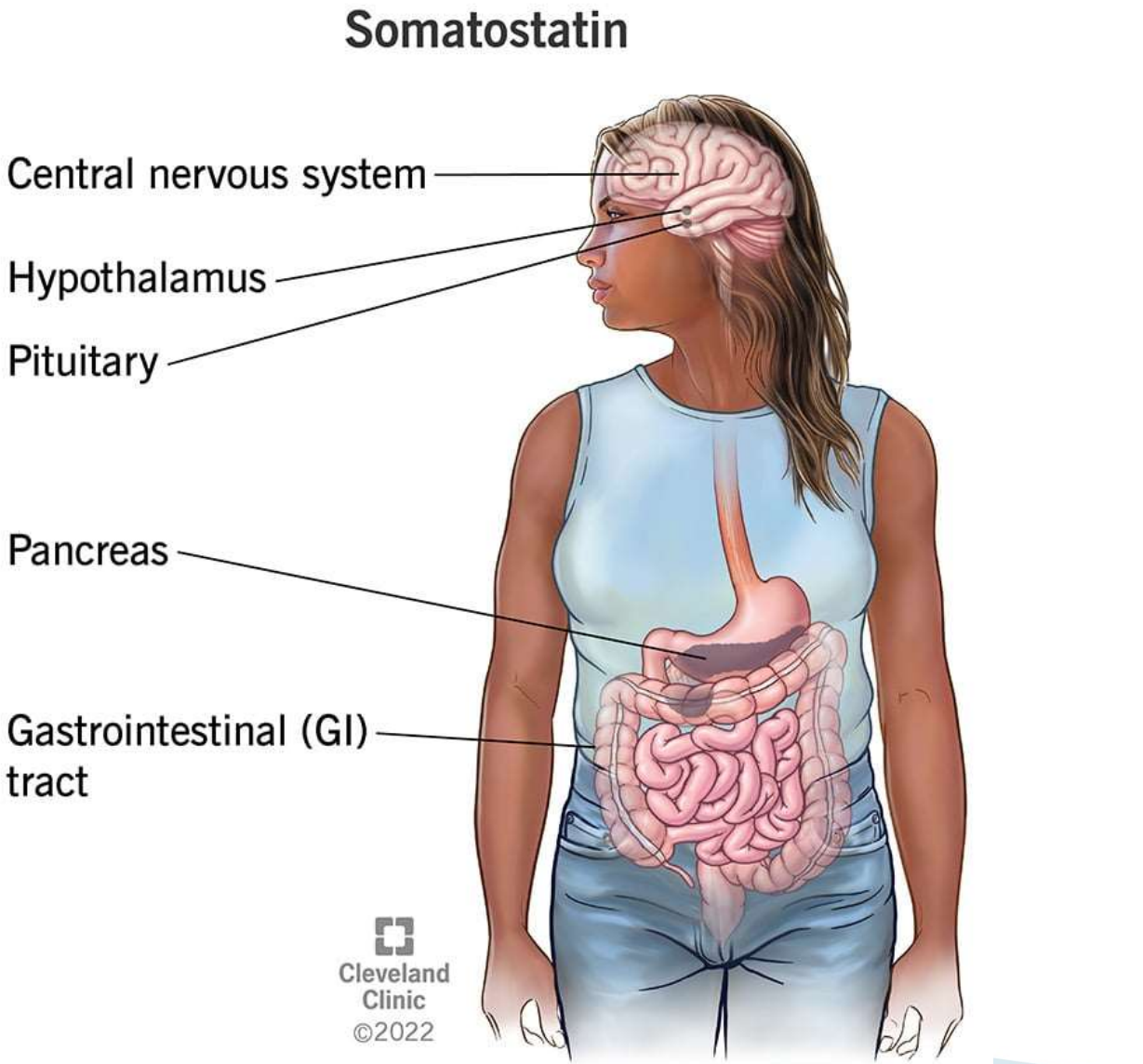
Somatostatin acts by inhibiting cAMP pathway, cAMP response element-binding protein (CREB) phosphorylation, and CREB transcription potency. Mol Endocrinol.

https://pubmed.ncbi.nlm.nih.gov/9178746/#:~:text=Somatostatin%20acts%20by%20inhibiting%20the%20cyclic%203'%2C5'%2Dadenosine,Mol%20Endocrinol

SOMATOSTATIN

Somatostatin, an inhibitor of ACTH secretion, decreases cytosolic free calcium and voltage-dependent calcium current in a pituitary cell line. J Neurosci.
https://pubmed.ncbi.nlm.nih.gov/2430073/#:~:text=pituitary%20cell%20line-,Somatostatin%2C%20an%20inhibitor%20of%20ACTH%20secretion%2C%20decreases%20cytosolic%20free%20calcium,J%20Neurosci

Somatostatin (SST) potently inhibits insulin and glucagon release from pancreatic islets. Endicronology
https://pubmed.ncbi.nlm.nih.gov/10614629/#:~:text=Somatostatin%20(SST)%20potently%20inhibits%20insulin,to%20regulate%20pancreatic%20endocrine%20function


Somatostatin
Central nervous system
Hypothalamus
Pituitary
Pancreas
Gastrointestinal (GI) tract
Cleveland Clinic
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Glucose stimulates somatostatin secretion in pancreatic δ-cells by cAMP-dependent intracellular Ca^{2+} release

- Somatostatin secretion from pancreatic islet δ-cells is stimulated by elevated glucose levels.
- In pancreas, somatostatin is powerful intra-islet inhibitor of insulin glucagon secretion, gastrin and pancreatic enzymes. In GI tract, somatostatin reduces gastric secretion.
- Somatostatin receptor antagonists could restore counterregulatory glucagon secretion.
- Forskolin has an effect on cytoplasmic cAMP levels in pancreatic islet cells
- GlucoResolve (Biotics Research) contains Forskolin

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6719402/#:~:text=Somatostatin%20secretion%20from%20pancreatic%20islet,have%20only%20partially%20been%20elucidated

HYPOTHALAMUS – EMOTIONS

The hypothalamus also plays an important role in emotion.
Lateral parts of the hypothalamus is involved in emotions such as pleasure and rage.
The median part is associated with aversion, displeasure, and a tendency to uncontrollable and loud laughing.
The hypothalamus has more to do with the expression (symptomatic manifestations) of emotions than with the genesis of the affective states.

How can I reset my hypothalamus naturally?

Foods rich in **polyphenols** may help improve the functioning of the hypothalamus. Several vitamins, including vitamin **C**, **thiamine**, and vitamin **B12**, may also aid the functioning of the hypothalamus.

Somatostatin vs Dopamine balance

Dopaminergic suppression of pancreatic somatostatin secretion

Dopamine regulates pancreatic glucagon and insulin secretion via adrenergic and dopaminergic receptors Translational Psychiatry

https://www.nature.com/articles/s41398-020-01171-z

Dopaminergic Regulation of Insulin Secretion from the Pancreatic Islet Molecular Endicronology

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3725340/#:~:text=Exogenous%20dopamine%20inhibits%20insulin%20secretion,the%20regulation%20of%20insulin%20secretion

MIND-BODY CONNECTION

Mind–body research moves towards the mainstream European Molecular Biology Organization
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1456909/

Most scientists who became interested in this field said their efforts to investigate aspects of the mind–body connection were met with skepticism and even derision from the scientific mainstream. Esther Sternberg, a rheumatologist, a Senior Investigator in Neuroscience at the NIH, in 1980 studied the strange case of a man who developed severe scleroderma—an autoimmune disease—after taking an experimental epilepsy drug, which raised serotonin levels.

MIND-BODY CONNECTION

Candace Pert Molecules of Emotions - Neuropeptides

Correlation between Pineal Activation and Religious Meditation Observed by Functional Magnetic Resonance Imaging Nature Proceedings

https://www.nature.com/articles/npre.2007.1328.1

Psilocybin Research currently underway in many countries

The Role of Hypothalamic Neuropeptides in Neurogenesis and Neuritogenesis

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4737468/

During early developmental periods, rapid proliferation, differentiation, and migration of new progenitor cells occur especially in the hippocampus, subventricular zone, and olfactory bulb. Recent studies suggest that **newborn** neural cells may be found in the hypothalamus and they produce various neuropeptides

Dr. Candace Pert, Molecules of Emotions

For Pert the body's "information system" has two major elements-the chemical substances known as neuropeptides and the receptors into which they fit. Neuropeptides are produced by nerve cells in the brain, and when they lock into their receptors, which are attached to other cells in the body, they make something happen (or prevent it from happening).

NEUROPEPTIDES

50 to 60 neuropeptides have been identified, each of them as specific as the beta-endorphin neuropeptide. In other words, the DNA produces all these neuropeptides, which all traverse down axons and all wait for the right electro-physical events. We have here an enormously complex system which is kept straight by the high specificity of the neuropeptides and their receptors.

https://candacepert.com/articles/the-wisdom-of-the-receptors-neuropeptides-the-emotions-and-the-bodymind/

Neuropeptides are constantly changing their configuration that reflect the changes in our emotional state. Therefore when our emotional and mental state is out of balance, these neuropeptides may create physical symptoms that appear in the body.

Each thought is associated with a particular emotion, and if that emotion builds prevalence it will build up **more** of these neuropeptides. Imagine it gets stronger each time it is triggered. A meta-analysis of about a hundred smaller studies confirms that when this emotion build up is experienced long term there arises the risk of a whole range of diseases. Some of these can include heart disease, headaches, asthma, arthritis, skin disorders, etc. When that emotion is triggered, a peptide is released within the physical body.

Each receptor is specific to one peptide, or protein. For example, when we have feelings of anger, sadness, guilt, excitement, happiness, joy or nervousness, each separate emotion releases its own flurry of neuropeptides. Those peptides surge through the body and connect with those receptors which change the structure of each cell as a whole.

Where this gets interesting is when the cells actually divide. If a cell has been exposed to a certain peptide more than others, the new cell that is produced through its division will have more of the receptor that matches with that specific peptide. Likewise, the cell will also have less receptors for peptides that its mother/sister cell was not exposed to as often

if you have been bombarding your cells with peptides from negative thoughts, you are literally programming your cells to receive more of the same negative peptides in the future. What's even worse is that you're lessening the number of receptors of positive peptides on the cells, making yourself more inclined towards negativity. Every cell in your body is replaced about every two months. So, the good news is, you can reprogram your pessimistic cells to be more optimistic by adopting positive thinking practices, like mindfulness and gratitude.

Every thought you have causes an emotion or feeling which creates neurochemical changes in your mind/body, some temporary and some lasting. This is important to realize because it means that what you think can affect how you feel. And by the same token, if you are feeling poorly, you can change that by changing how you think. Even though we often can't control the trigger or circumstance.

We can control our thoughts and emotions, in turn affecting our behavior/actions and result/state. For instance, when people consciously practice gratitude, they get a surge of rewarding neurotransmitters, like dopamine, and experience a general alerting and brightening of the mind, probably correlated with more of the neurochemical norepinephrine.

•SUPPORTS THE STRESS RESPONSE, NATURALLY: Have you ever felt overwhelmed by everything on your to-do list? Do you ever feel like you can't accomplish anything because you are so stressed?

•PROMOTES RELAXATION WITHOUT DROWSINESS: While other stress relief solutions promote relaxation, some may leave you feeling drowsy. De-Stress was formulated to not only help you relax when feeling stressed, and calm you when you're anxious, it does so without making you feel drowsy! De-Stress supplies a specially produced, all natural milk protein hydrolysate, concentrating a specific peptide, and demonstrating significant anxiolytic activity.

•SUPPORT FOR OCCASIONAL SLEEPLESSNESS: Ever felt like your mind was racing with thoughts and the last thing you could do was fall asleep? De-Stress is a great solution for relaxing your mind so that you can get the good night's sleep you want.

Lactium® is the natural solution for effectively managing stress, anxiety and sleep disorders

Lactium® is a hydrolysed milk protein containing a bioactive decapeptide with natural relaxing properties. This decapeptide, also called α-casozepin (S1-Cn) originates from the hydrolysis of trypsin of casein α S1, the main protein found in milk.

Lactium® is used to **naturally reduce the symptoms of anxiety, better managing negative emotions** caused occasionally or daily by anxiety and stress. Lactium® does not cause drowsiness, addiction, memory loss, sedation or dependence.

The amino acid sequence of α-casozepin and its secondary structure are very similar to benzodiazepines, as they have a sequence that is able to link the GABA receptor (of gamma-aminobutyric acid) to increase its inhibitory action. In contrast to benzodiazepines, Lactium® does not create dependence even in high doses, thus working effectively yet naturally.

Numerous studies have demonstrated **the efficacy of Lactium® in reducing stress** through physiological markers (blood pressure, heart rate, cortisol levels) and visual analogue scale of perceived stress. Lactium® can be taken by all members of the family, including children and pregnant women.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5331585/

A Double-Blind, Randomized, Placebo-Controlled Crossover Clinical Study of the Effects of Alpha-s1 Casein Hydrolysate on Sleep Disturbance

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6682925/

"We performed a randomized, placebo-controlled trial with a double-blind crossover design in a community-based sample of adults with low sleep quality, using a daily supplement of highly standardized ACH (Lactium®) for sleep profile improvement. The regimen of 300 mg/day of ACH for four weeks was able to significantly improve subjective sleep quantity and quality"

The effectiveness of DeStress has been the subject of **9 rigorous clinical studies,** conducted between 1999 and 2018 on more than 500 adult volunteers, all supervised by healthcare professionals. These studies were carried out according to the Clinical Best Practice Directive and under the supervision of official ethics committees, and used biological means to confirm the **positive impact of DeStress on the body** (blood pressure and heart rate).

Role of Lactium™ in Psychodermatology: The CERTAIN Trial[#] on Patients with Acne Vulgaris
https://www.hindawi.com/journals/drp/2022/2916317/

Human clinical studies

- An initial exploratory study over just 2 days found that Lactium (200 mg every 12 hours for a total of 3 doses) reduced increases in blood pressure, heart rate and stress hormones after a stress test (8).
- A second study in healthy adults (27 female and 25 male) showed that Lactium (150 mg every evening daily for 30 days) reduced the physical effects of a mental stress test as measured by blood pressure reactivity (9).
- In a group of women with stress related anxiety, sleep, or general fatigue Lactium (150 mg every evening daily for 30 days) was found to reduce stress related symptoms, particularly digestive, cardiovascular, intellectual, emotional, and social problems (10).
- And in people with problems sleeping Lactium (150 mg 1 hour before bed for 4 weeks) improved sleep quality and time to fall asleep after two weeks and daytime dysfunction after four weeks (11).
- A small study in athletes found that Lactium (150 mg per day for 4 weeks) prevented increases in the stress hormone cortisol that often occurs with intense physical training (12).
- https://www.scientificwellness.com/blog-view/lactium-for-stress-relief--259

DESTRESS

Anti-Stress
Increases the activity of GABA. It blocks specific signals in the central nervous system and calms the brain

Anti-Anxiety
Shown to reduce anxiety in stressed conditions

Increase Sleep Time and EFFICIENCY
More hours of sleep recorded at night and improvement in the ratio of total time spent asleep compared to time spent in bed, particularly after 4 weeks of use

Reduce Cortisol Release
Decreases plasma cortisol levels after acute stress and chronic anxiety, countering negative physiological effects of cortisol

Non-Addictive
Unlike benzodiazepine molecules, DeStress does not exhibit dependence or habituation

Non-Drowsy
As a natural bioactive, DeStress does not have any side effects or toxicity

PROTOCOL

FOUNDATION SPIRIT-MIND-BODY

- Spiritual, Religious practices, prayer, meditation, music
- Sleep
- DAYLIGHT exposure "Light the Medicine of the Future" by Jacob Lieberman
- Exercise
- Social circle, Relationships

PHYSIOLOGICAL

- De-Stress
- VHP
- TAURINE
- Mn Zyme
- Bio C Plus
- ADHS
- GlucoResolve