

THE PHYSIOLOGY OF ANXIETY

The brain must be well balanced so the Central Nervous System (CNS), the body and the peripheral nervous system (PNS) can communicate properly to regulate the appropriate release of hormones and neurotransmitters.

The difference between a hormone and a neurotransmitter depends on where the molecule is released. A hormone is produced by an endocrine gland and released into the bloodstream and finds its target cells some distance from its site of release.

A neurotransmitter is released from a nerve terminal. An electrical impulse travels to the end of a nerve cell, stimulates the terminal of the cell to secrete a chemical signaling molecule at a synapse. Target cells receive the signaling molecule and produce biochemical responses.

Epinephrine / adrenaline is released by the adrenal gland into the bloodstream as a hormone and goes to the heart or the lungs.

Norepinephrine / noradrenaline is released as a neurotransmitter by neurons in the brain from a stimulated presynaptic nerve cell and acts on neighboring postsynaptic cell.

Anxiety is a problem with hormone and neurotransmitter balance. The brain responds to neurotransmitters that send messages to it about how to think, feel, act, and respond. When brain chemistry is out of balance, the body's communication systems become altered, leading to anxiety and other issues.

It's often impossible to determine whether poor neurotransmitter balance is a result of life experience or genetics. Both can occur in anyone living with anxiety, and in some cases a combination of both may be responsible for anxiety. (Calmclinic.com)

Neurotransmitters and Anxiety

Neurotransmitters and the adrenal glands buffer stress and help us cope. But stress depletes the body's adrenal glands and, if it exceeds the body's capabilities, the balance between body and mind becomes hampered, and our ability to deal with stress becomes diminished. This is what leads to anxiety.

Many key neurotransmitters have been linked to anxiety, including gamma-aminobutyric acid (GABA), Serotonin and Norepinephrine.

GABA is an inhibitory neurotransmitter that aids in relaxation and sleep. In the brain, GABA helps balance excitation with inhibition. Several studies have shown the hormone progesterone to have anxiolytic (anti-anxiety) effects by acting on GABA receptors in the brain.

Serotonin (5-hydroxytryptamine, 5-HT) carries signals along and between nerves. It constricts blood vessels and acts as a neurotransmitter. It is mainly found in the brain, bowels, blood platelets and serum. Serotonin constricts smooth muscles, transmits impulses between nerve cells, regulates cyclic body processes and contributes to wellbeing and happiness. Many regard serotonin as the chemical responsible for maintaining mood balance, and a deficit of serotonin leads to depression.

Norepinephrine constricts blood vessels and increases blood pressure and blood glucose levels. Anxiety is strongly correlated to the imbalance of norepinephrine and epinephrine within the sympatho-adrenal system (SAS) that comprises one part of the autonomic nervous system (ANS). The SAS is a combination of both hormonal and neural systems that utilizes specific hormone messengers (e.g., norepinephrine) to regulate autonomic bodily processes such as blood pressure, body temperature, force of our heartbeats, and our heart rates.

Hormones and Anxiety

Hormones affect brain chemistry, neurotransmitter production and balance. If they are out of balance, anxiety may result. Following stressful events, the hormone **adrenaline (epinephrine)** is released by the adrenal glands into the bloodstream. It is the body's natural fight-or-flight-mechanism. It generates the primitive response that can keep us alive in moments of trauma or danger. It slows down digestion, increases awareness, and diverts blood flow to important areas like the brain and muscles.

The event signals a shut-off mechanism in the brain, which prevents further adrenaline release. Chronic long-term stress can damage receptors in the brain, resulting in a disrupted shut-off mechanism that may damage the body's ability to control adrenaline. If adrenaline release mechanisms and regulation systems become disrupted, sudden adrenaline surges can occur, resulting in Panic Disorder and other types of anxiety.

When stressed, the human body manufactures the stress hormone **cortisol**. All hormones are made from essentially one parent hormone and, to keep up with stress, the body preferentially makes cortisol. Therefore, all other hormones suffer, chiefly progesterone, which is the calming hormone. So, the more stressed an individual is, the more suppressed progesterone production becomes, often exacerbating anxiety.

In a healthy cycling woman, hormones **estrogen** and **progesterone** exist in harmony, rising and falling at set times in a woman's cycle to control menses and keep her feeling well. With stress and age, progesterone levels drop. With estrogen dominance, there isn't enough progesterone to keep up with the amount of estrogen. Progesterone counterbalances the effects of estrogen and, whereas estrogen has an excitatory effect on the brain, progesterone

is calming. This accounts for increased anxiety in women during peri-menopause and menopause. If anxiety occurs at this point, it is most likely caused by that drop in progesterone.