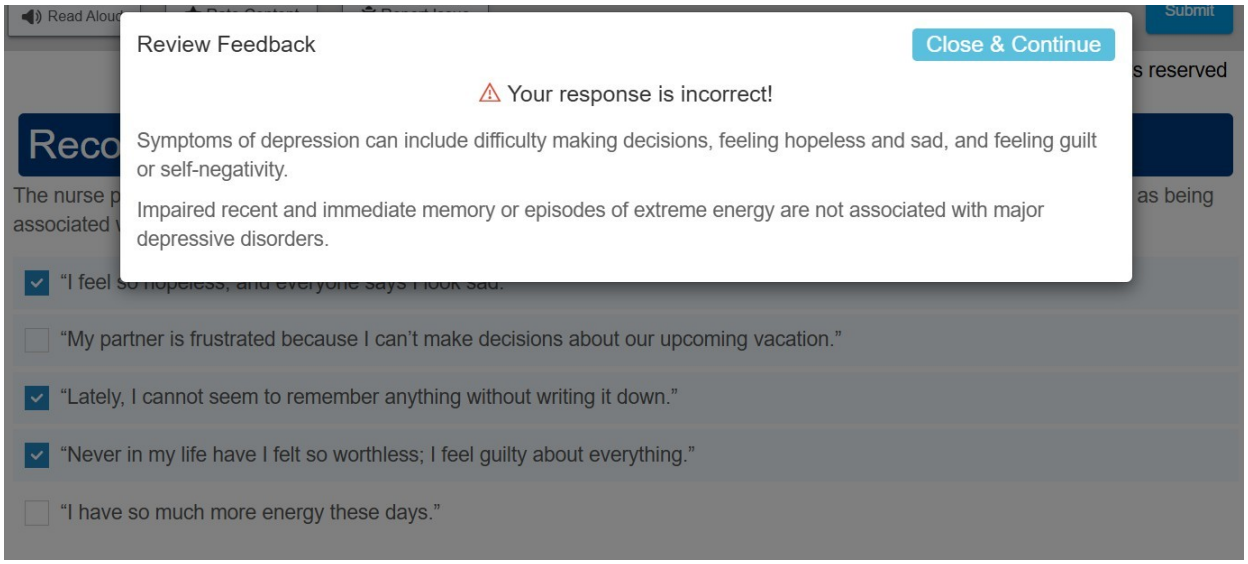
# NR 507 Edapt Week 5 Depression

## Introduction to Depression

Major depressive disorder is a mood disorder characterized by depressive symptoms that last longer than 2 weeks. Though the exact cause is unknown, depression can be influenced by genetic and environmental factors. Stressful life events, such as giving birth or experiencing emotional trauma, can also impact the development of depression. Recent research has tied depression to decreased activity of the prefrontal cortex (Buelt, 2023). The prefrontal cortex controls attention, memory, mood, and personality.




## Tricyclic Antidepressants

The nurse practitioner (NP) prescribes a tricyclic antidepressant for a client with newly diagnosed major depressive disorder (MDD). Which statement should the NP include when providing client education?

- "Your symptoms should improve over the next 3–4 months."
- "Most clients notice a change in their mood within 36 hours after the first dose."
- "This medication will take 2–4 weeks to reach a therapeutic blood level."
- "Generally, 5–7 days are needed for the medication to start working."

It takes 2 to 4 weeks for tricyclic antidepressants to reach a therapeutic blood level.

Within 36 hours and 5 to 7 days are both too short for a therapeutic blood level of the drug to be achieved. Improvement in depression should be demonstrated sooner than 3 to 4 months.

## Acetylcholine and Mood

Which statement best explains how acetylcholine impacts mood?

- Acetylcholine binds to receptors on the presynaptic neuron.
- Acetylcholine contributes to normal muscle contraction.
- Acetylcholine targets both serotonin and norepinephrine systems.
- ✓ Acetylcholine regulates neural circuits in the hippocampus and prefrontal cortex.

## Normal Physiology of Serotonin and Norepinephrine

Serotonin and norepinephrine are chemical messengers that, along with dopamine and acetylcholine, play a crucial role in communication between nerve cells (neurons) in the brain. These neurotransmitters are involved in various physiological processes and are particularly relevant to the understanding of depression. Click each section below to learn more about the normal physiology of neurotransmitters.

**Serotonin:**

**Synthesis and Release:** Serotonin is synthesized in the neurons from the amino acid tryptophan. Once synthesized, serotonin is stored in vesicles within the nerve terminals.
**Release and Reuptake**: When a nerve impulse reaches the end of a neuron, serotonin is released into the synapse (the gap between neurons). After release, some of the serotonin binds to receptors on the postsynaptic neuron, transmitting the signal. The remaining serotonin is taken back up into the presynaptic neuron through a process called reuptake, where it can be recycled.
**Receptors**: Serotonin binds to specific receptors on the postsynaptic neuron. There are various subtypes of serotonin receptors (e.g., 5-HT1, 5-HT2), and their activation can have different effects on mood, emotion, and other physiological functions.

**Norepinephrine:**

**Synthesis and Release**: Norepinephrine is synthesized from the amino acid tyrosine. Like serotonin, it is stored in vesicles in the nerve terminals.
**Release and Reuptake**: Upon a nerve impulse, norepinephrine is released into the synapse. It then binds to receptors on the postsynaptic neuron. The unbound norepinephrine is also subject to reuptake into the presynaptic neuron for recycling.
**Receptors**: Norepinephrine primarily acts on adrenergic receptors, of which there are alpha and beta subtypes. The activation of these receptors can have various effects on mood, alertness, and other physiological responses.

**Dopamine:** Dopamine is another important neurotransmitter in the brain, and it plays a crucial role in various physiological processes, including mood regulation, motivation, reward, and motor control. While dopamine is not as directly linked to depression as serotonin and norepinephrine, it still plays a role in our understanding of mood disorders.
**Synthesis and Release**: Dopamine is synthesized from the amino acid tyrosine, and its synthesis takes place within the neurons. Once synthesized, dopamine is stored in vesicles in the nerve terminals.
**Release and Reuptake**: When a nerve impulse reaches the end of a neuron, dopamine is released into the synapse. Dopamine binds to receptors on the postsynaptic neuron, transmitting the signal. Unbound dopamine can be taken back up into the presynaptic neuron through reuptake for recycling.

**Receptors:** Dopamine acts on several types of receptors, classified into D1-like (including D1 and D5) and D2-like (including D2, D3, and D4) receptors. The activation of these receptors can have different effects on mood, motivation, and other physiological functions.

**Acetylcholine:** Acetylcholine is a neurotransmitter that plays a crucial role in various physiological functions, including muscle contraction, memory, and the regulation of the autonomic nervous system. While acetylcholine is not as prominently studied in the context of depression as serotonin, norepinephrine, and dopamine, it does play a role in balancing the other chemical messengers.
**Synthesis and Release**: Acetylcholine is synthesized in nerve terminals from choline and acetyl coenzyme A. After synthesis, acetylcholine is stored in vesicles within the nerve terminals.
**Release and Reuptake**: When a nerve impulse reaches the end of a cholinergic neuron, acetylcholine is released into the synapse (also known as the cholinergic synapse). Acetylcholine binds to receptors on the postsynaptic neuron, leading to various physiological responses. Acetylcholine that remains in the synapse can be broken down by the enzyme acetylcholinesterase, and the resulting products are taken back up into the presynaptic neuron for recycling.
**Receptors:** Acetylcholine acts on two main types of receptors: muscarinic receptors and nicotinic receptors. Muscarinic receptors are G protein-coupled receptors, while nicotinic receptors are ligand-gated ion channels. Both types of receptors are widely distributed throughout the body and brain.

## Pathophysiology of Major Depressive Disorder

Interruptions in the function of serotonin, norepinephrine, and dopamine play a significant role in the development of depression because these neurotransmitters regulate many brain functions, including mood, attention, sleep, appetite, and cognition. These neurotransmitters are known collectively as monoamines because they have one amine group. Once identified, researchers developed the monoamine deficiency theory, which indicates that the underlying basis of depression is low levels of serotonin, norepinephrine, and dopamine
**Depression is complex, and neurotransmitter imbalances are just one aspect of the multifaceted nature of this condition. Other factors, including genetics, environmental influences, and neuroplasticity, also contribute to the development and persistence of depressive symptoms.**

**Serotonin:**

It is suggested that a deficiency in serotonin transmission contributes to the development of depressive symptoms, including obsessions and compulsions.

This theory is supported by the effectiveness of selective serotonin reuptake inhibitors (SSRIs), a class of antidepressant medications that increase the availability of serotonin in the synapse.

**Norepinephrine:**

Norepinephrine also plays a role in mood regulation, and alterations in its levels or function have been implicated in depression, increasing anxiety, and disrupting attention.

Some antidepressant medications, such as norepinephrine reuptake inhibitors (NRIs) or serotonin-norepinephrine reuptake inhibitors (SNRIs), target both serotonin and norepinephrine systems.

**Dopamine:**

While dopamine's involvement in depression is not as straightforward as serotonin and norepinephrine, research suggests that dysregulation of the dopamine system may contribute to depressive symptoms by altering attention, motivation, and pleasure.

Some studies propose that an imbalance between dopamine and other neurotransmitters, like serotonin, might play a role in the pathophysiology of depression.

Changes in the function of specific dopamine receptors, especially D2 receptors, have been implicated in depression.

**Acetylcholine:**

Acetylcholine is involved in regulating neural circuits associated with mood and emotion, particularly in brain regions such as the hippocampus and prefrontal cortex.