



# Unipolar depression: neurochemical explanations

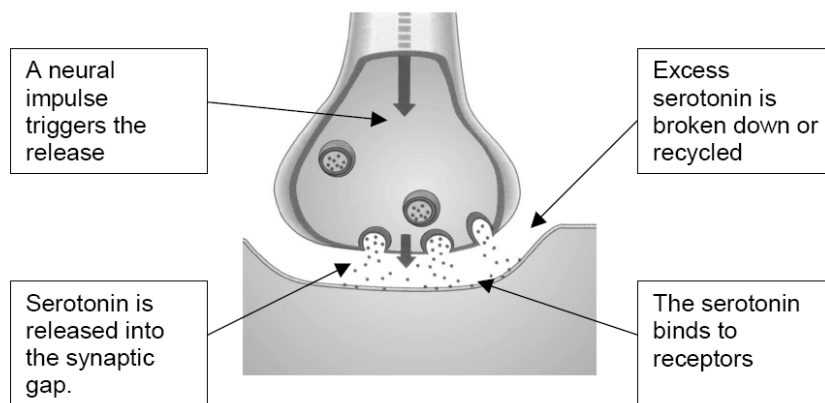
## Module 4 13.7.1 mood disorders

### This activity will help you to...

- Understand how neurochemical processes may be implicated in mood disorders
- Assess and evaluate the neurochemical approach to understanding depression

## Synaptic transmission and depression

One theory about the causes of depression is that an imbalance or deficiency of certain neurotransmitters is to blame. Neurotransmitters are chemical messengers that allow nerve cells to communicate with each other. The diagram below depicts the junction between two nerve cells. Packets of serotonin (a neurotransmitter) molecules are released from the presynaptic neurone into the space between the two nerve cells (the synaptic gap). These molecules may then be taken up by serotonin receptors on the postsynaptic nerve cell and thus pass along the chemical message. Excess molecules are taken back up by the presynaptic cell and reprocessed.



**What might go wrong with the process of synaptic transmission that would result in a person having lower than normal serotonin activity?**

Three different neurotransmitters have been thought to be implicated in mood disorders. They are noradrenaline (NA), serotonin (5-HT) and dopamine (DA).

**Noradrenaline** is used in many brain systems that are involved with emotion and mood. Decreases in noradrenaline lead to low mood, increases have the opposite effect.

**Serotonin** regulates the activity of noradrenaline. If serotonin levels drop, then noradrenaline levels can fluctuate more widely than they should.

**Dopamine** is a neurotransmitter that is important for reinforcement. Activities that increase dopamine levels make people feel good.

**Based on this information, how many hypotheses about the causes of mood disorders can you come up with?**

Discoveries about the functions of different neurotransmitters in mood and emotion regulation have led to three main hypotheses about the role on brain chemistry in depression.

### **The Catecholamine Hypothesis**

Mood disorders are caused by abnormally high or low levels of Noradrenaline (NA). If NA levels drop too low, the result is depression. If NA levels climb too high, the result is mania. Bipolar disorders are caused by regular, extreme fluctuations in NA levels.

### **The Permissive Amine Hypothesis**

Mood disorders are caused by NA abnormalities, but the real culprit is serotonin (5-HT). 5-HT is necessary to regulate NA activity, so if 5-HT levels drop sufficiently, NA levels are allowed to fluctuate to the extent that they cause abnormalities in emotion, such as depression.

### **The Dopamine Hypothesis**

Depression is caused by a deficiency in dopamine (DA). If the brain is either unable to produce enough dopamine, or is partially insensitive to the action of dopamine, then a person will find it difficult to get any reinforcement. Consequently, their ability to enjoy things will suffer, and they may lose interest in things.

### **What you need to do...**

Using the research materials available, try to evaluate each of these hypotheses. Write a short commentary about each, explaining how the evidence supports or challenges it. Finally, write a short overall conclusion in which you evaluate the neurochemical theory of mood disorders.

### **You may find the following questions useful in guiding your research:**

- Is there any direct evidence to suggest that depressed patients have abnormal levels of neurotransmitters in their brains?
- How do antidepressant drugs work? Which is the most effective? What might this suggest about the causes of depression?
- Why might it be that depressed patients run a higher than average risk of abusing alcohol or other drugs, such as cocaine and heroin?