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Chemistry and the Brain

The human brain, such a remarkable organ, is responsible for every aspect of our existence. From motor function, sensory input, to basic life support the brain controls them all using nothing but chemicals to produce electric currents through neural pathways.

Specifically regarding behavior these chemicals can cause voluntary movement, involuntary movement, affect mood, arousal, regulate sleep or eating, learning and memory. That is right at this very moment chemicals in your brain are causing electrical impulses to help you read, learn and remember, whether or not you are sleepy or alert and if that burger you just saw on television made you hungry. All these things are controlled in the brain by chemicals.

First, voluntary movements; acetylcholine or ACh is found all throughout your body. According to Weiten, "[ACh] is the only transmitter between motor neurons and voluntary muscles" (Weiten). This means that every motion we thinking about doing or every activity we do uses ACh. Reading this article is using ACh to move your eyes across the words or to move your hand to control the mouse on your computer. Additionally Weiten says that ACh is linked

to learning, attention, and arousal, as well as memory (Weiten). This link to memory has been cause for some studies around Alzheimer's memory loss but results seem to indicate that the level of ACh is not the pivotal point.

Another category of chemical found in the neural pathways is monoamines which include serotonin and dopamine. This category of chemical is also used in voluntary movements but is associated with other aspects of psychological health than ACh. Dopamine for example is also linked with Parkinson's disease, commonly seen in older adults marked with tremors and less voluntary control. In addition to Parkinson's disease monoamines have been linked to depression and schizophrenia. Patients who suffer from depression may actually suffer from a decreased level of serotonin or norepinephrine while schizophrenia is commonly associated with abnormal synapses addressing dopamine (Weiten).

Next we will discuss endorphins. If you have ever been playing a sport, or working hard in the yard or around the house and noticed hours later that you were bleeding or had a cut on your finger that had scabbed over but have no recollection of the event or the pain that you thought for sure you would have felt, then you have experiences endorphins. Endorphins are the body's natural painkillers. From a chemical structure stand point it is interesting to note that our endorphins act much like painkillers and were originally discovered by curiosity derived from the effects of morphine. Interestingly enough our own natural painkillers, as Weiten says, "resemble opiates in structure and effects" (Weiten). In addition to regulating pain is appears

that our bodies use endorphins or our own opiates to also regulate eating and our responses to stress.

In the world of psychological health there are two types of doctors: Psychologists and Psychiatrists. The main difference between the two is that a Psychiatrist has been to medical school as has the ability or privilege of writing prescriptions for medication. There are a number of applications for chemicals in the form of drugs in the treatment of many psychological conditions. We will discuss a few of them in the coming paragraphs.

First a very interesting topic, a method of treating addiction using classical conditioning (you have all probably heard of Pavlov's Dogs), the Aversion Therapy. Aversion therapy put simply is creating a negative response or reaction to a stimulus that is the identified problem. For example an alcoholic might seek treatment from a mental health professional who pairs an emetic (a drug that elicits vomiting) with an alcoholic beverage. Naturally feeling ill and throwing up is not a pleasant experience, thus the pairing of a negative response (feeling ill and vomiting) with the problem stimulus. While this approach is not widely used it is something that is available to prisoners on a volunteer bases and has seen some success with sex offenders. In these instances the offender is shown images their responses monitored. The images that elicit an arousal response are then also paired with an electric shock. Again we see aversion through negative response (electric shock) with problem stimuli.

Previously we discussed the chemicals that exist in the brain and their effects on behavior as well as some of the problems that can occur when those chemicals experience problems. Mental health professionals can also use varying types of drugs to interact with those chemicals in an effort to balance the problems. We see this with anti-anxiety drugs like Valium, Xanax both of with are brand name. These drugs have been effective though their effects are short term.

There are other drugs with can also assist patients with psychotic symptoms. These Anti-Psychotics are helpful in about seventy percent of patients and traditionally reduce the activity of dopamine (Weiten).

As you can see the world of chemistry and specifically its application to modern medicine and the treatment of mental disorders is beneficial and vital to our ability to treat with current treatments as well as to develop advanced or alternative treatments. Additionally you can conclude that without chemistry in our lives we would, and all life with us, cease to exist.

Works Cited

Weiten, Wayne. *Psychology: Themes & Varitions*. Belmont: Wadsworth, 2011. Print.