Serotonin and the Impact of Drugs

How is serotonin regulated?

- **Serotonin is a chemical messenger that transmits signals between neurons**
- **Serotonin needs to bind to a receptor on the receiving neuron to deliver the signal**
- **There are 7 major families of serotonin receptors**
- **To remove serotonin, enzymes break down serotonin within the transmission space or serotonin is brought back into the neuron it was released from**
- **If the enzymes and reuptake pathways are not working correctly, the signals are dysregulated and the effects of serotonin may not be experienced as they should**

What does serotonin do?

- **Serotonin is mostly found in the intestines (~90%) to regulate bowel movements and digestion**
- **Serotonin in the brain helps regulate mood, sleep cycles, memory, pain perception and more!**

Prescription Medications & Serotonin

Selective Serotonin Reuptake Inhibitors (SSRIs)

- **These medications block the transporters of serotonin (SERT), preventing the serotonin in the transmission space from getting pulled back into the neurons**
- **This allows the body's own serotonin levels to stay higher for longer**
- **These medications also bind to the 5-HT2A receptors as antagonists, preventing the overstimulation of this main psychedelic receptor**
- **This class of medications includes fluoxetine, paroxetine, sertraline, escitalopram and citalopram**

Selective Serotonin Reuptake Inhibitors (SNRIs)

- **These medications work similarly to SSRIs but block the transporters of serotonin (SERT) and norepinephrine (NET) to prevent these molecules from getting pulled back into the neurons**
- **These medications do not bind to 5-HT2A receptors (the main psychedelic receptor)**
- **This class of medications includes venlafaxine and duloxetine**

Prescription Medications & Serotonin

Tricyclic antidepressants (TCAs)

- These medications block the transporters of serotonin (SERT) and norepinephrine (NET) to prevent these molecules from getting pulled back into the neurons
- These medications also bind to the 5-HT2A receptors as antagonists, preventing the overstimulation of this main psychedelic receptor
- This class of medications includes amitriptyline, nortriptyline desipramine, and clomipramine

Monoamine Oxidase Inhibitors (MAOIs)

- Monoamine oxidases are enzymes that break down important neurotransmitters such as serotonin, norepinephrine, and dopamine
- The inhibitors block the ability for the enzyme to breakdown these molecules so their effects last longer
- The medications phenelzine, tranylcypromine, and isocarboxazid irreversibly bind to the MAOs leading to significantly less transmitter breakdown and increasing the risk of undesriable effects

Serotonin and Psychdelics

What happens when you take psychedelics?

- **Psilocin/psilocybin and LSD bind to, and activate 5-HT2A receptors acting as an external source of serotonin**
- **MDMA binds to, and activates the 5-HT2B receptors acting as an external source of serotonin**
- **MDMA also binds to SERT (the serotonin reuptake transporter) making it work in reverse and causing release of more serotonin**
- **The overall outcome is an increase in the effects of serotonin which could be positive, negative or both**

What is Serotonin Syndrome?

- **This is a condition that occurs when there is too much serotonin in the body**
- **This condition can be experienced with regular doses of prescription medication and with as little as one dose**
- **Serotonin syndrome is a medical emergency requiring urgent medical attention**

Serotonin Syndrome

Recognize the Signs and Symptoms

- Confusion/disorientation
- Rigidity/Muscle spasms
- Irritability
- Tremor
- Anxiety
- Overreponsive reflexes
- High blood pressure
- Seizures
- Rapid heart rate
- Coma/Death

Resources

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