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Dopamine

Dopamine is a neurotransmitter made in your brain. It plays a role as a "reward center" and in many body functions, including memory, movement, motivation, mood, attention and more. High or low dopamine levels are associated with diseases including Parkinson's disease, restless legs syndrome and attention deficit hyperactivity disorder (ADHD).

What is dopamine?

Dopamine is a type of monoamine neurotransmitter. It's made in your brain and acts as a chemical messenger, communicating messages between nerve cells in your brain and your brain and the rest of your body.

Dopamine also acts as a hormone. Dopamine, epinephrine and norepinephrine are the main catecholamines (a label based on having part of the same molecular structure). These hormones are made by your adrenal gland, a small hat-shaped gland located on top of each of your kidneys. Dopamine is also a neurohormone released by the hypothalamus in your brain.

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What's the role of dopamine in my body?

Dopamine plays a role in many body functions.

As a neurotransmitter, dopamine is involved in:

- Movement.
- Memory.
- Pleasurable reward and motivation.
- Behavior and cognition.
- Attention.
- Sleep and arousal.
- Mood.
- Learning.
- Lactation.

As a hormone, dopamine is released into your bloodstream. It plays a small role in the "fight-or-flight" syndrome. The fight-or-flight response refers to your body's response to a perceived or real stressful situation, such as needing to escape danger.

Dopamine also:

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- Causes blood vessels to relax (at low doses, it acts as a vasodilator) or constrict (at high doses, it acts as a vasoconstrictor).
- Increases sodium (salt) and urine removal from your body.
- Reduces insulin production in your pancreas.
- Slows gastrointestinal (GI) (gut) content movement and protects your GI lining.
- Reduces lymphocyte activity in your immune system.

How does dopamine make someone feel happy?

Dopamine is known as the “feel-good” hormone. It gives you a sense of pleasure. It also gives you the motivation to do something when you’re feeling pleasure.

Dopamine is part of your reward system. This system is designed, from an evolutionary standpoint, to reward you when you’re doing the things you need to do to survive — eat, drink, compete to survive and reproduce. As humans, our brains are hard-wired to seek out behaviors that release dopamine in our reward system. When you’re doing something pleasurable, your brain releases a large amount of dopamine. You feel good and you seek more of that feeling.

This is why junk food and sugar are so addictive. They trigger the release of a large amount of dopamine into your brain, which gives you the feeling that you’re on top of the world and you want to repeat that experience.

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How might I feel if I have the right amount of dopamine?

If you have the right balance of dopamine, you feel:

- Happy.
- Motivated.
- Alert.
- Focused.

How might I feel if I have a low dopamine level?

If you have a low dopamine level, you might feel:

- Tired.
- Unmotivated.
- Unhappy.

You may also have:

- Memory loss.
- Mood swings.
- Sleep problems.
- Concentration problems.
- A low sex drive.

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How might I feel if I have a high dopamine level?

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If you have a high dopamine level, you might feel:

- Euphoric.
- Energized.
- A high sex drive.

The negative side of having high levels of dopamine include:

- Having trouble sleeping.
- Having poor impulse control.
- Being more aggressive.

What health conditions are associated with high or low dopamine levels?

Many diseases are associated with high or low levels of dopamine. There's still much to be learned. For example, does a high or low level of dopamine cause disease or does disease cause a change in the dopamine level? Can the answer be both? Adding to the confusion is that the function of a single neurotransmitter like dopamine can't be viewed in isolation of other neurotransmitters or other chemicals in your brain or body. Many interact with each other. There's a lot going on.

All that being said, there are still diseases in which the dopamine levels are high or low.

Diseases associated with low levels of dopamine:

- Attention deficit hyperactivity disorder (ADHD).
- Parkinson's disease.
- Restless legs syndrome.

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Diseases associated with high levels of dopamine:

- Mania.
- Obesity.
- Addiction.

Diseases associated with both high and low levels of dopamine:

- Schizophrenia. Some symptoms of schizophrenia can possibly be caused by having too much dopamine in certain areas of your brain — delusions and hallucinations. Other symptoms are possibly caused by not having enough dopamine in another part of your brain — lack of motivation.

What are dopamine agonists?

Dopamine agonists are drugs that mimic the natural neurotransmitter dopamine. Dopamine agonists bind to and activate the dopamine receptors on nerve cells in your brain, causing nerve cells to react in the same way as they would to natural dopamine.

Dopamine agonists are used to treat Parkinson's disease, depression, restless legs syndrome, attention deficit hyperactivity disorder, low sex drive and hyperprolactinemia.

Examples of these dopamine agonist medications include:

- For Parkinson's disease: pramipexole (Mirapex®), ropinirole (Requip®), rotigotine (Neupro®), apomorphine HCl (KYNMOBI®).
- For depression: pramipexole (Mirapex).
- For low sex drive: pramipexole (Mirapex).

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- For hyperprolactininemia (excess hormone that makes breast milk): bromocriptine (Parlodel®), cabergoline (Dostinex®).

What are dopamine antagonists?

Dopamine antagonists are drugs that bind to and block dopamine receptors (on the receiving nerve cell) in your brain. This means they block or stop dopamine from being received by the next nerve cell. Many antipsychotic drugs are dopamine antagonists.

Dopamine antagonists are used to treat schizophrenia, bipolar disorder, nausea and vomiting,

Examples of dopamine antagonist medications include:

- For agitation in schizophrenia: aripiprazole (Abilify®), risperidone (Risperdal®), ziprasidone (Geodon®).
- For bipolar disorder: risperidone, olanzapine (Zyprexa®), ziprasidone.
- For nausea and vomiting: metoclopramide (Reglan®), droperidol (Inapsine®).

What are dopamine reuptake inhibitors?

Dopamine reuptake inhibitors are drugs that prevent dopamine from re-entering and being reabsorbed by the nerve cell that released it. This makes more dopamine available to more neurons in your brain.

Dopamine reuptake inhibitors are used to treat depression and narcolepsy, and to overcome addictions such as smoking, overeating and binge eating.

Examples of dopamine reuptake inhibitor medications include:

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- For depression: bupropion (Wellbutrin®).
- For narcolepsy: modafinil (Provigil).
- For cocaine addiction: bupropion, nomifensine, benztropine (Cogentin), mazindol.
- For stopping smoking: bupropion.

What is levodopa?

Levodopa is used to treat Parkinson's disease. Loss of dopamine is responsible for the movement symptoms seen in people with Parkinson's disease. To help levodopa reach your brain (as opposed to other parts of your body), levodopa is combined with carbidopa. Once it reaches your brain, it's converted into dopamine.

What's dopamine's role in addiction to recreational drugs?

Recreational drugs interfere with the way nerve cells in your brain send and receive messages. Drugs like marijuana and heroin mimic natural neurotransmitters. Other drugs, like amphetamine and cocaine, cause the release of large amounts of natural neurotransmitters or prevent the recycling of these neurotransmitters.

Recreational drugs overstimulate your brain's "reward center." Over time, with repeated drug exposure, a certain area of your brain becomes less sensitive and you don't get the same feeling of pleasure from anything else but the drug. Also, you'll often need to take larger and larger amounts of drugs to produce the same effect. At the same time, another area of your brain becomes more sensitive to the feelings of withdrawal, such as anxiety and irritability, as the

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relief from this discomfort. So, addiction is a vicious cycle that develops from multiple mechanisms.

Scientists now think that dopamine's role isn't to directly cause euphoria, but serves as a reinforcement for remembering and repeating pleasurable experiences. So, when drugs cause surges in dopamine, it's teaching your brain to remember the experience. Your brain links your drug use and all of your routines and other cues surrounding the drug event. It's a reason why you might crave drugs when returning to the location where you once used drugs long after you've quit.

How can I improve my dopamine levels in a natural way?

You may wish to try remedies that naturally increase dopamine. Further research is needed on the effects of food on neurotransmitters such as dopamine.

- Eat a diet that's high in magnesium and tyrosine-rich foods. These are the building blocks for dopamine production. Tyrosine is an amino acid. It's absorbed in your body and then goes to your brain, where it's converted into dopamine. Foods known to increase dopamine include chicken, almonds, apples, avocados, bananas beets, chocolate, green leafy vegetables, green tea, lima beans, oatmeal, oranges, peas, sesame and pumpkin seeds, tomatoes, turmeric, watermelon and wheat germ.
- Engage in activities that make you happy or feel relaxed. This is thought to increase dopamine levels. Some examples include exercise, meditation, yoga, massage, playing with a pet, walking in nature or reading a book.

A note from Cleveland Clinic

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Dopamine is a type of neurotransmitter and hormone. It plays a role in many important body functions, including movement, memory and pleasurable reward and motivation. High or low levels of dopamine are associated with several mental health and neurological diseases. Much research remains to be done to determine how dopamine works in relation to health conditions and how it interacts with other neurotransmitters, hormones and other chemicals. If you think you have symptoms of high or low levels of dopamine, see your healthcare provider. They'll review your symptoms, conduct any needed tests and help determine a proper plan of care if a medical condition is found.

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