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Insight

De-stressing from Distress - 1

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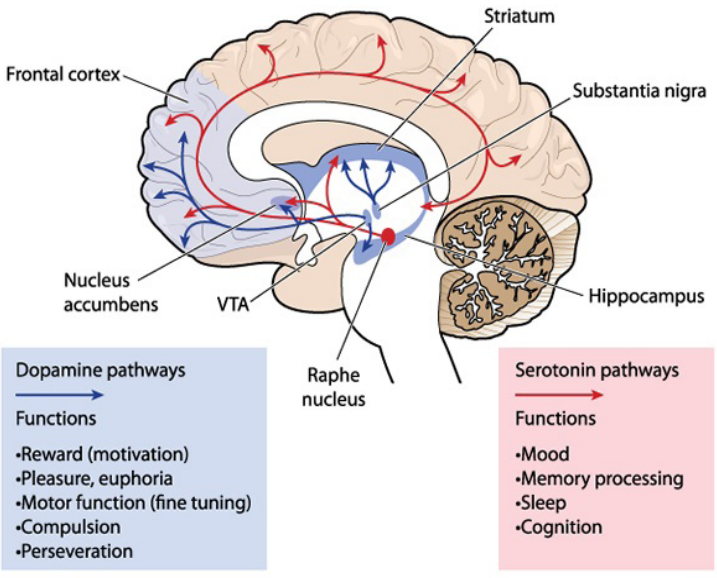
In this developing world, stress has become one of the major causes leading to health deterioration. In our normal functioning bodies, there are chemical molecules that help regulate stress and carry out the day to day functions by acting as messengers between the brain and rest of the body. Neurotransmitters are a group of chemical molecules that relay information from different parts of the body to the brain, within the brain and from the brain to the body. Neurotransmitters carry out this information relay in the nervous system by carrying messages from one neuron to next.

Serotonin and Dopamine are two neurotransmitters that are primarily responsible for managing stress in our body. These are specifically amine neurotransmitters because of the presence of amino group (-NH2) in their chemical structure. Dopamine is a chemical associated with happiness and serotonin is known to regulate our mood.

Serotonin being a neurotransmitter is used to transmit messages between nerve cells. It is formed in the intestines and the brain. It is also found in platelets. As it occurs widely throughout the body, it is thought to influence a variety of body and psychological functions. Along with being a neurotransmitter, it is thought to be active in constricting smooth muscles, and it contributes to well-being and happiness, among other things. As the precursor (a starting material for making a new molecule) for melatonin, it helps regulate the body's sleep-wake cycles and the internal clock. It is thought to play a role in appetite, the emotions and cognitive functions. Low levels of serotonin are known to be linked to poor memory and low mood, craving for sweet or starchy foods, difficulty sleeping, low self-esteem, anxiety & aggression.

Dopamine is a neurotransmitter, meaning it sends signals from the body to the brain. Dopamine plays a role in controlling the movements a person makes, as well as their emotional responses. The amount of dopamine in the brain is vital for both physical and mental well-being. Essential brain functions that affect mood, sleep, memory, concentration, and motor control are influenced by the dopamine levels in a person's body.

Decrease in the levels of these neurotransmitters coupled with elevated levels of stress can give rise to major depressive disorders. Dopamine deficiency has shown to have symptoms such as trouble sleeping or disturbed sleep, low energy, an inability to focus, fatigue etc. The most common conditions linked to a dopamine deficiency include depression, schizophrenia, hallucinations & Parkinson's disease.



Both serotonin and dopamine known to us as feel good chemicals of our body are extremely important in regulating our cognitive functions. Mental health being at the forefront of today's problems, the importance in understanding the functioning of these chemicals is essential in tackling MDD.

Image source-

https://www.news-medical.net/health/Role-of-Dopamine-in-Pain.aspx

In The News

De-stressing from Distress - 2

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With the incidence of mental health disorders being at an all-time high, stress has proven to be a major contributing factor to these issues. Over the years, scientists have been able to discover drugs that help in managing chronic stress. These drugs are known as Antidepressants. Antidepressants are a class of drugs that help in relieving symptoms of major depressive disorders (MDD) and anxiety disorders.

As in case of several scientific achievements, discovery through serendipity (discovery through accident or a happy chance) was also seen when some of the first antidepressants were discovered. In 1952 Zeller discovered Iproniazid, a chemical compound used to treat tuberculosis. On similar lines the second major antidepressant Imipramine was originally used as an antihistamine (to treat inflammatory responses). What scientists observed in patients administered with Iproniazid and Imipramine was that they showed euphoria (feeling of happiness), they were more social, more energetic. Scientists soon realized their importance in the treatment of major depressive disorders. Thus, the first major antidepressants were discovered. Although useful in treating MDD, the early antidepressants i.e. Iproniazid and Imipramine showed heavy damage to liver and were soon discontinued after the discovery of other antidepressants.

Over the years several other antidepressants such as selective serotonin reuptake inhibitors (SSRIs) have been discovered. When neurons send signals to one another, they release a little bit of a neurotransmitter so that the message can be delivered. These neurotransmitters have to be taken back up by the neurons so they can send the next message. This process of reusing these neurotransmitters is called "reuptake". In a person struggling with depression, the areas of the brain that regulate mood and send messages using serotonin might not function properly. SSRIs increase the availability of serotonin by blocking this reuptake process. This allows serotonin to collect between neurons so messages can be transmitted more efficiently. They are called "selective" serotonin reuptake inhibitors since they are known to specifically target serotonin.

Although having proven useful in the field of medicine, antidepressants are not be to be taken lightly. Like any potent medication, antidepressants carry their own set of side effects and must only be included in the treatment regimen when prescribed by a doctor. Antidepressants may not work in all cases of MDD depending on a plethora of reasons and hence should be well discussed with the doctor. These are chemicals that essentially alter brain chemistry and hence should be looked into only after exhausting other forms of treatments that do not require direct chemical intervention. Scientists and doctors have often described exercise and yoga to be proven effective in increasing levels of endorphins and neurotransmitters in the brain. Cognitive Behavioral Therapy (CBT) seeks to help people change how they think about their situations. CBT focuses on "current or present" problems and difficulties and focuses on problem solving. Light therapy, Acupuncture and B vitamins supplementation are other treatments that have proven to help people with anxiety and depression.

Through The Lens

Identify this flower that blooms through the year.

Science In Daily Life

No Pain? No Sweat!

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There are so many diseases haunting us in today's world. As technology upgrades to fight the existing ones, the diseases too "upgrade" to more horrific and dangerous ones, immune to the cures known to mankind. This being said not all diseases need to be cured in order for the patient to continue living their life, and with the right precautions they may become an integrated part of the patient's life. One such disease that I would like to write about, owing solely to its interesting nature, is CIPA.

CIPA is a rare hereditary disease wherein the patient is incapable of feeling pain and lacks the ability to sweat normally (anhidrosis). Another name given to it, is "hereditary sensory and autonomic neuropathy type IV (HSAN IV)". This name goes on to

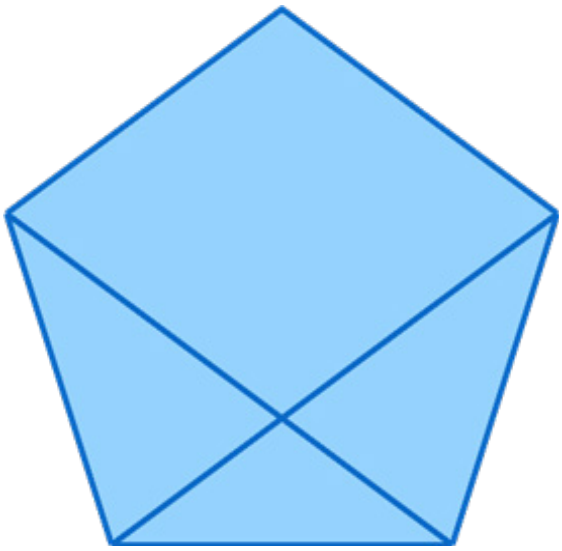
explain more about the disease and its cause, hereditary suggesting that it is transferred from parent to offspring. Sensory neuropathy means that it targets and affects the nerves that control sensation in specific. Autonomic neuropathy is a group of symptoms caused by different triggers, indicating that there is damage to the nerves that manage day to day body functions. One of these functions include sweating, thereby leaving the patient suffering from it unable to sweat.

Since it is a hereditary disease it is present since birth, and its detection too is mostly done in one's early stage of life. Its primary form of discovery is when the parents observe their child not reacting to pain as one normally should do. At first the parent may write it off as a mild natured child, but after some time they tend to notice how the child does not react to a hot flame burning its hand, or does not avoid situations which may cause the child to feel pain.

CIPA cannot be identified by an MRI or blood test, it is best identified by a genetic test, which can be performed at birth, or during one's course of life. It is identified by an abnormality in the gene named NTRK1, which is located on chromosome 1. This gene is responsible for directing the body to develop mature nerves, and encoding for the growth of nerves. Hence a defect in this gene leads to underdeveloped nerves. People suffering from it show the lack of sweat glands along with underdeveloped nerves.

By far there is no known treatment for it, and one suffering from it will not feel pain, even though their body may be suffering from a possibly fatal injury due to an accident. Patients suffering from it need to avoid any injuries as much as possible, and even when they have the slightest fall, they must visit the doctor immediately for a full body checkup, to rule out complications like internal bleeding or the fracture of a bone.

Stimulate Your Grey



How many isosceles triangles are drawn in this regular pentagon?

Long, Long Ago

Cajal's Paradigm

Ruchi R. Modgekar, SYBSc, Biotechnology,

Elphinstone College.

The anatomists of the 19th century believed that the nervous system consisted of a mesh-like connection that carried out complex signaling. The possibility of having discrete cells in the nervous system was considered next to impossible.

In 1872, Camillo Golgi was a resident physician at a hospital in Milan. It was by sheer chance that he discovered a method for staining the cells of the nervous system while working in one of the kitchens (owned by the hospital) which he had transformed into a laboratory. Once while working in candle light, he accidently happened to spill Silver nitrate on the tissue of a cattle (left as waste). On observing under the microscope, he could clearly observe the cellular entities –silhouettes of cell bodies, dendrites and axons.

In 1887, the Spanish neuroanatomist Santiago Ramón y Cajal used Golgi's staining method but with a little modification. His method involved immersing tissues first in a fixative and then silver nitrate which helped in staining the tissues more deeply. He was the first person to state that the nervous system consisted of discrete cells that eventually led to the 'neuron doctrine' being accepted.

As a young boy, Santiago Ramón y Cajal had a keen interest in sketching and painting. He would often accompany his father (a surgeon) during surgeries and would record his observations in the form of drawings. He used to work in his kitchen lab where he observed stained nervous tissue from an embryo. It was his artistic skills that led to the creation of highly detailed and very accurate diagrams of his obser-

vations of the nervous tissue. These drawings have contributed immensely to our understanding of neuroanatomy today, leading to Cajal being regarded as the Father of modern Neuroscience.

Santiago Ramón y Cajal and Camillo Golgi jointly received the Nobel Prize in Physiology or Medicine for their work on nervous system in 1906.

Reference: The discovery of the neuron – Mo Costandi. https://neurophilosophy.wordpress.com

Image: The Pyramidal Cell in Cerebral Cortex by S. Cajal.

Thought Byte

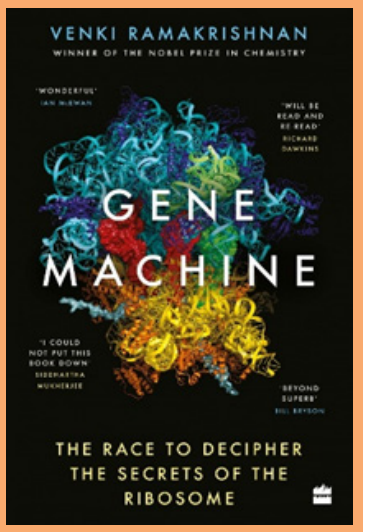
The Gene Machine: The Race to Decipher the Secrets of the Ribosome.

Author- Venki Ramakrishnan

Publisher- Basic Books

Year of Publication- 2018

Book review - Arjun Udupa, FYBSc, St. Xavier's College Autonomous, Mumbai



The author Venki Ramakrishnan won the coveted Nobel Prize in Chemistry for his work on deciphering the structure of the ribosome along with two other eminent scientists- Ada Yonath and Thomas Steitz.

The author ensures that there is adequate scientific knowledge imparted in a language that is easy to understand by those with a basic knowledge of Biology. He goes on to describe the role of competition among his scientific contemporaries, to be the first to decipher the structure of the ribosome. The highlight of the book in my opinion are the various and realistic accounts of the life of a scientist. Interestingly, Venki Ramakrishnan, was a physics graduate from Maharaj Sayajirao University in Baroda and went on to discover a key cellular component resulting in a Nobel in Chemistry. Considering the odds were not in his favour, his journey is all the more inspiring.

This book follows the tradition of scientists with landmark achievements penning their story; such as 'The Double Helix' by James Watson, 'A Crack In Creation' by Jennifer Doudna and 'In Search Of Memory' by Eric Kandel.

Stimulate Your Grey

Answer : 5 Triangles

Through the Lens

Answer : Common name: Lady Margaret Passion Flower

Botanical name: *Passiflora* 'Lady Margaret'

Family: *Passifloraceae* (Passion flower family)

This is a collaborative endeavour of the Department of Life Sciences, Sophia College - Autonomous, Mumbai and the Department of Life Science and Biochemistry, St. Xavier's College - Autonomous, Mumbai; under the DBT STAR college scheme

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