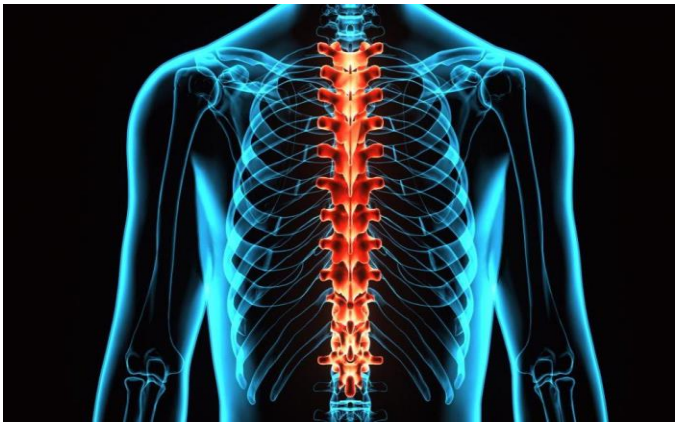
BRAC UNIVERSITY
Inspiring Excellence
School of Pharmacy

PHARMA HIGHLIGHTS

ISSUE 91 | APRIL 2022

Spinal Implants Enable Paralyzed People to Walk Again



A group of Swiss scientists has offered paralysis patients faith by inventing implanted brain computer interface technology that enables them to regain motor control and walk again. When a person decides to walk, the brain transmits instructions to the legs through the spinal cord nerves. When the spine is injured, the signals are frequently too feeble to stimulate mobility. Because a totally severed spinal cord interrupts the electrical impulses from the brain that instruct parts of the body below the lesion how to balance and move, it typically results in irreversible paralysis. According to the WHO, between 250 000 and 500 000 people worldwide experience a spinal cord injury (SCI) each year, with the majority of cases ending with paralysis. It will be a blessing for individuals who are paralyzed to eventually restore voluntary mobility and make their own lives a bit easier. After incorporating an electronic spinal implant technology into paraplegic people with serious spinal cord damage, patients were capable of walking again. It was implanted around the men's spines and enhanced brain-to-leg signal transmissions. The method involves implanting electrode devices between the vertebrae and the spinal cord membrane in the epidural area of the men's spines. The brain's movement impulses will then be collected and decoded into movement commands. When asked, the gadget transmits activity-specific electrical pulses to different neurons that have been cut off from the central nervous system, enabling paralyzed people to transmit stimulus and commands to their legs.

Within hours of inserting the flexible, multi-electrode device into their vertebrae, patients were capable of standing, walking, using bicycle pedals, and kicking their legs in a swimming pool during the clinical trial. The FDA has classified the implantable as a "breakthrough device," emphasizing the importance of getting this technology to those who really deserve it. This is not a treatment option for spinal cord injuries. Yet, it is an effective way to improve the wellbeing of individuals. It will encourage people and provide them the capacity to stand up and take action. It is not enough, but it is a huge step forward.

Written by: Swastika Karmaker (ID: 18346089)

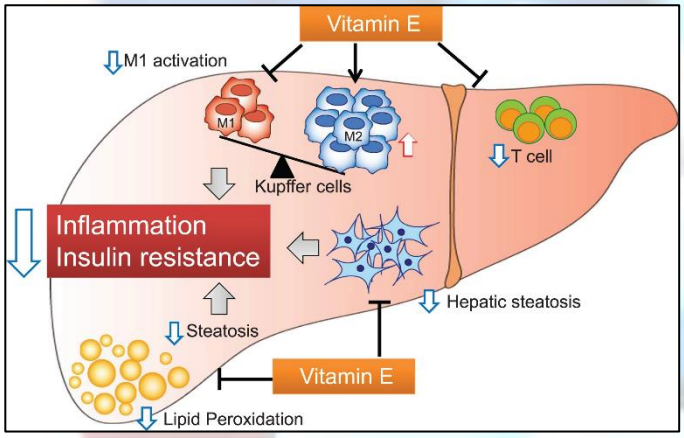
Microneedles in Migraine

Migraine is a type of painful, disabling condition which is caused due to pulsatile attacks of headache in a severe intensity. Mostly seen to occur during puberty which last upto the age 35-45 years. Women are more prone to migraine (5%-25%) than men (2%-10%). Migraine attacks usually occur lasting from 4-72 hours. The patient's daily activities are greatly hampered when they are under attack. The common symptoms of migraine are instability, headache, lightheadedness, brainstem symptoms like dysarthria, dysphagia, and impaired tongue motility and other symptoms. While searching for the causes of migraine it was found that 65% patients have a family history of migraine, while 39% out of 100 were found to meet the criteria of IHS for basilar type migraine. Among other conventional methods of treatment of migraine, microneedle is the most effective

and experimental one. Drug delivery can be done from oral, intravenous, intramuscular routes. But microneedles include the use of a micro sized needle in the delivery of drugs. It includes facilitated delivery of drugs, reduce time and unnecessary cost, and can be produced customized pharmaceutical formulations by optimizing their design to meet patients' individual needs regarding their age, weight, organ function and severity of the disease. Also due to direct active transportation of the drugs, it reduces the skin injury and skin infection. It also has the advances of complex structure formation and one step fabrication. Moreover, it is not limited to specific polymeric materials. Although the use of microneedles in the drug delivery of migraine is still not in practice but considering the advantages of migraine, it should be in practice to provide painless drug delivery.

Written by: Mahreen Islam Ima (ID: 20146054)

Role of Vitamin E in Non-Alcoholic Fatty Liver Disease



Non-Alcoholic Fatty Liver Disease (NAFLD) is caused by metabolic disorders like obesity, insulin resistance, hypertriglyceridemia, and type 2 diabetes mellitus (T2DM). The two hypotheses related to the NAFLD pathogenesis, states that insulin resistance leads to hepatic steatosis and oxidative stress leads to steatohepatitis and fibrosis. Vitamin E is one among the lipid soluble micronutrients used for treating NAFLD. Among eight different forms of Vit-E, α-tocopherol is the only one used in the human body. α-tocopherol gives both its antioxidant and non-antioxidant effects by hindering the activities of monocyte reactive oxygen species and cytokine. NAFLD produces excess fatty acids (FFAs) by damaging the antilipolytic action of insulin which increase delivery of FFAs to the liver and de novo lipogenesis. This ultimately results in insulin resistance. To prevent this, the α-tocopherol form of Vit-E activates adiponectin promoter which improves the insulin sensitivity.

Liver macrophages, Kuffer cells (KCs) are responsible for secreting inflammatory mediators like TNF-α, IL-1β, and IL-6 which also causes insulin resistance and leads to NAFLD. Moreover, excessive hepatic lipid accumulation induced by KCs and polarization of M1/M2 macrophages promote hepatic inflammation and fibrosis. However, Vit-E by suppressing the hepatic recruitment of T cells causes decrease in the proportion of M1 macrophages (produces pro-inflammatory cytokines) and increase in M2 macrophages (produces anti-inflammatory cytokines). Besides, Vit-E also suppresses hepatic lipid accumulation and peroxidation. All these things together prevent hepatic steatosis, inflammation, and fibrosis.

Again, oxidative stress during NAFLD produces excess reactive oxygen species (ROS) that enhances lipid peroxidation and increases levels of cytokines like TNF-α, TGF-β, Fas ligand, and IL-8. Lipid peroxidation, inflammatory cytokine TNF-α and oxidative stress all together cause progression of NAFLD. In this case, Vit-E exhibits the antioxidant properties by donating the hydrogen atom from the hydroxyl group in the tocochromanol aromatic ring. This way, Vit-E neutralizes the radicals and the ROS. In short, Vitamin E proves one of the potent micronutrients that prevent NAFLD by many means. To avoid any hazards, all safety concerns must be addressed before beginning treatment for NAFLD with Vitamin-E.

References:
Nagashimada, M., & Ota, T. (2019). Role of vitamin E in nonalcoholic fatty liver disease. IUBMB life, 71(4), 516–522. https://doi.org/10.1002/iub.1991

Written by: Angelina Samantha Halder (ID: 20146035)