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BIOELECTRONIC MEDICINE – A REVIEW

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ABSTRACT

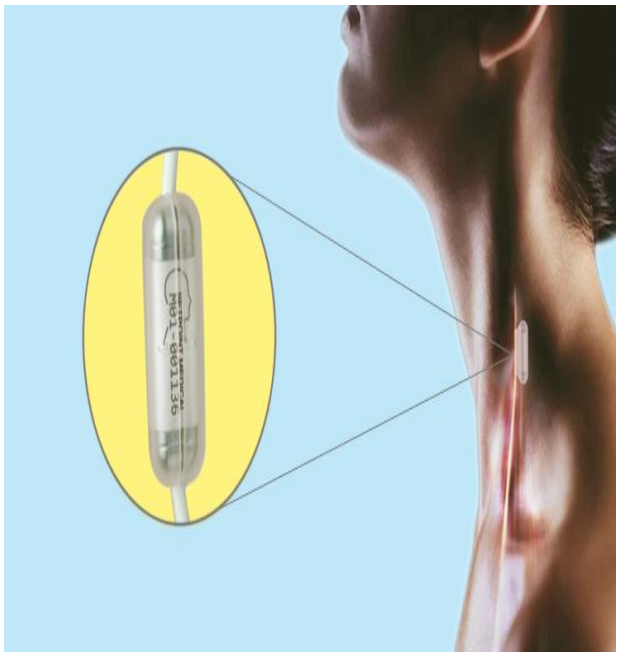
Bioelectronic medicine, the convergence of molecular medicine, engineering, neuroscience and computing, has produced medical discoveries that are potentially on track to transform clinical treatment for a range of inflammatory diseases and motor disabilities.[1] Bioelectronic Medicine (BEM) can revolutionize how we practice medicine and dramatically improve the outcomes of healthcare. It employs electrical, magnetic, optical, ultrasound, etc. pulses to affect and modify neurological behavior which in turn impacts body functions as an alternative to drug-based interventions. Furthermore, it provides the opportunity for targeted and personalized treatments of neurological based diseases and conditions in closed-loop control systems. Bioelectronic medicine aims to dramatically improve the outcomes and reduce the cost of healthcare whereas current pharmacological drug treatment of selective diseases may be supplemented or replaced by electrical impulses delivered by devices that adapt to actual patient needs.[2,3]

KEYWORDS: Bioelectronic medicine, neural reflex, biotechnology, inflammatory disease, closed-loop, bioelectronic interfaces.

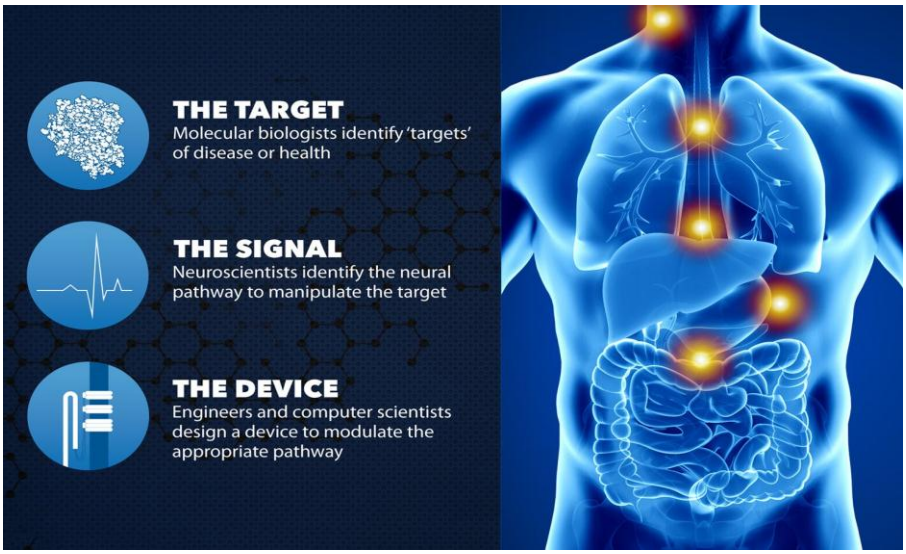
INTRODUCTION

With the rapid rise in technology for the precision detection and modulation of electrical signalling patterns in the nervous system, a new class of treatments known as bioelectronic medicines seems within reach.[4] Bioelectronic medicines are a tiny implanted device treating disease by changing the electric pulse in nerves to and from specific organs.[5] Bioelectronic medicine is an emerging field of therapeutics aiming to treat dysfunction and disease using implantable devices that can be attached to individual peripheral nerves anywhere in the viscera, extending beyond early clinical examples in hypertension. Such device will be able to decipher and modulate neural signalling patterns, achieving therapeutic effects that are targeted at single function of specific organs.[5,6]

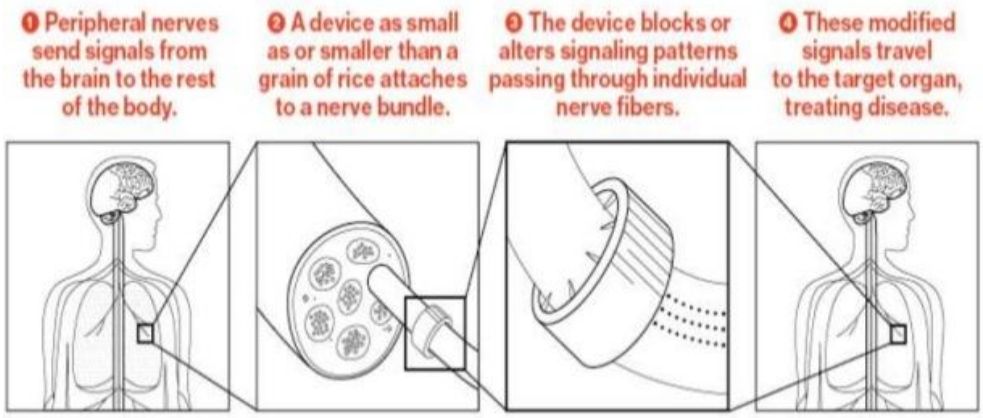
Understanding the neural code is essential to this process of understanding the underlying mechanisms and will be essential to developing new methods and technologies to treat disease and injury with bioelectronic medicine.[7] Bioelectronic medicine is increasingly becoming applied in clinical trials. Patients suffering from rheumatoid arthritis were implanted with a vagus nerve stimulator to activate the inflammatory reflex showed significant improvement of clinical signs and symptoms.[8] In another clinical study of Crohn's inflammatory bowel disease, electrical vagus nerve stimulation improved clinical and endoscopic signs of disease.[9]



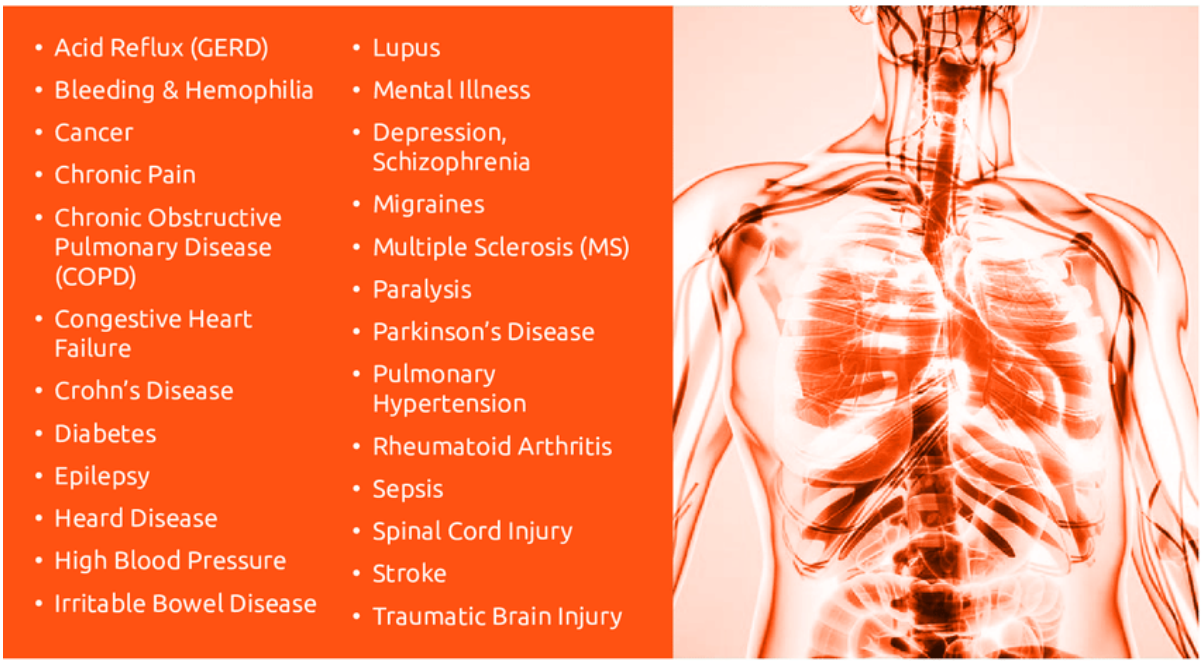
Mechanisms



HOW IT WORKS



EXAMPLES OF DISEASE THAT ARE POTENTIAL TARGET FOR BEM



Advantage

1. The introduction of various revolutionary techniques in medicine field makes less pain in approach to cure disease.
2. The implant provides targeted treatment by controlling the neural signals going to specific organ.
3. Device would have minimal or zero side effects.
4. It will avoid or overcome the problems faced by conventional dosage forms.

Disadvantage

1. Costly process; if a single part of chip is damaged the total technique will be meaningless.
2. Installation of an implant may cause harm to our body.
3. Chances to get electrical shock.

CONCLUSION

- Bioelectronic medicine is a growing field where major advancements in treatment and diagnosing are being achieved. Therapies based on neural stimulation and applications of electric fields are currently used to improve patients quality of life.
- However, these therapies still require a multidisciplinary approach to produce less invasive techniques. In order to achieve this, development of nanotechnology materials and new methodologies will greatly contribute to this field offering new therapeutic tool that create great impact over the future medicine and pharmacology.[12]

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