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The Heart's Hidden Brain — Unveiling Its Nervous System

Analysis by Dr. Joseph Mercola | December 28, 2024

STORY AT-A-GLANCE

- The heart's intracardiac nervous system (IcNS) is more complex than previously thought, featuring diverse neuronal types that contribute to its autonomous regulation of heart rhythm and function
- To study the IcNS, a recent study utilized zebrafish as a model organism due to their cardiac similarities to humans, providing valuable insights into human heart function
- Single-cell RNA sequencing has uncovered a variety of neurotransmitter receptors within the IcNS, indicating a sophisticated local control system capable of processing essential information for heart function
- Electrophysiological research has identified pacemaker-like neurons within the IcNS, which exhibit properties similar to central pattern generators, playing an important role in regulating heart rhythm
- Protecting the heart and its neural network through targeted lifestyle and dietary strategies is essential for preserving the IcNS's ability to efficiently regulate heart rhythm and maintain optimal cardiac function

Cardiovascular disease (CVD) remains the foremost cause of death among European Society of Cardiology (ESC) member countries, responsible for over 3 million fatalities each year.[1] Globally, CVD is also a leading cause of mortality, highlighting its profound impact on public health and underscoring the urgent need for innovative strategies to combat this pervasive issue.

The 2023 ESC Atlas of Cardiovascular Disease Statistics, published in the European Heart Journal,[2] emphasizes that CVD accounts for 11% of the European Union's total healthcare expenditure. Additionally, middle-income countries within the ESC framework experience a disproportionate burden, with higher mortality rates compared to their high-income counterparts.

Recent advancements[3] reveal that the heart is equipped with its own intricate nervous system, known as the intracardiac nervous system (IcNS), which regulates heart rhythm and function. This groundbreaking discovery challenges the traditional view that the heart is solely regulated by the central nervous system, paving the way for novel diagnostic and treatment strategies to reduce the prevalence and mortality of CVD.

Understanding the Heart's Nervous System — A Breakthrough in Cardiac Research

The heart's nervous system is a fascinating and complex network essential for maintaining its rhythm and function. Traditionally, most studies have focused on the central nervous system's control over the heart, but recent research highlights the importance of the IcNS, which acts as a localized "little brain," integrating and processing signals independently to regulate heart function.

The study, published in Nature Communications,[4] investigated the IcNS using adult zebrafish as the model organism due to their heart's structural similarities to humans, including their four-chambered organization connected by valves. The scientists aimed to map the neural connections within the heart and determine how they influence heart rhythms.

Using advanced techniques such as single-cell RNA sequencing and electrophysiological analysis, they found a surprisingly diverse neuronal network within the IcNS, which includes parasympathetic and sympathetic neurons, sensory neurons, local regulatory interneurons and motor neurons. Among these, a subset of neurons displayed properties similar to natural pacemakers found in the central nervous system.

These neurons, concentrated near cardiac valves and particularly within the sinoatrial plexus, displayed unique firing properties capable of generating and maintaining rhythmic activity. Electrophysiological tests confirmed their ability to sustain and modulate heart rhythms independently. Molecular analysis also uncovered distinct signatures within IcNS neurons, which challenged the traditional view of the system as a simple relay.[5]

Instead, the IcNS functions as a sophisticated network capable of processing and integrating information locally within the heart using a combination of different neurotransmitter receptors and neuronal pathways, including cholinergic, adrenergic, glutamatergic and GABAergic pathways. This enables the IcNS to regulate essential cardiac functions, such as contraction strength, heart rate and the speed at which electrical signals travel through the heart tissue.[6]

"The classification and characterization of the IcNS presented here serve as a valuable resource for further exploration into the mechanisms underlying heart functionality and the pathophysiology of associated cardiac disorders," the authors concluded.[7] These findings underscore the IcNS's use as a therapeutic target for treating conditions like arrhythmias and advancing cardiac care strategies.

Exploring the Connection Between the Heart and Brain

Going back to the European Heart Journal study introduced earlier, the researchers investigated the neural pathways linking the heart and brain to understand how they influence the body's responses. They specifically identified the nerve cells connecting the heart's pumping chambers (ventricles) to the brain region responsible for regulating breathing and heart rate.[8]

Using a mouse model, the study demonstrated how stimulating the heart-brain pathway triggered symptoms similar to fainting, including a sudden drop in heart rate, instability and collapse within seconds. These findings emphasize the pathway's essential role in autonomic balance, which governs involuntary actions such as heart rate, digestion and

respiratory rate. This bidirectional communication suggests that your heart actively participates in regulating your physiological state.

The mechanism behind this involves the area postrema, a region in the brain that monitors and adjusts vital functions without conscious effort. The nerve cells linking the heart to the area postrema create a feedback loop that ensures the body responds appropriately to various stimuli. For instance, during sudden stress or danger, this pathway triggers immediate changes in heart rate and breathing to help your body cope.

Furthermore, the study highlights the potential for developing new treatments based on these findings. Understanding how the heart and brain communicate opens the door to innovative approaches for preventing fainting episodes, especially in individuals with autonomic disorders. By targeting the specific nerve pathways identified in this research, medical interventions will more effectively manage and alleviate these conditions.[9]

Comprehensive Strategies to Protect Your Heart and Its Intricate Nervous System

Recent discoveries about the "heart brain" and its role in sustaining cardiac health and overall well-being underscore the importance of protecting both your heart and its intricate nervous system. To support overall heart health and ensure your IcNS remains robust and functional, consider these effective strategies:

Avoid vegetable oils and processed foods — Vegetable oils, also called seed oils, are a primary source of **linoleic acid**, a type of omega-6 polyunsaturated fat (PUFA). Excessive LA intake is associated with almost all chronic diseases, including high blood pressure, obesity, insulin resistance and diabetes.

LA gets embedded in your cell membranes, causing oxidative stress, and remains there for up to seven years. The oxidative linoleic acid metabolites (OXLAMs) are responsible for significant cellular damage, particularly to endothelial cells. This

damage contributes to vascular dysfunction, which is a key factor in the onset of cardiac arrest and heart attacks.

To protect your heart and its neural network, I recommend radically reducing your LA intake by eliminating vegetable oils from your cooking. Avoid processed foods, which are often loaded with seed oils, as well as restaurant meals, since most are prepared using these unhealthy oils.

Optimize your nutrient intake — Provide your heart the fuel needed for optimal function and neural signaling by consuming a diet rich in targeted carbohydrates (250 to 300 grams daily for most adults) tailored to your microbiome. Include at least 0.8 grams of protein per pound of lean body mass, and ensure one-third of your protein intake is collagen-based.

Enhance cellular energy through sun exposure — Sun exposure stimulates the production of nitric oxide (NO), which dilates blood vessels, lowers blood pressure and protects the endothelium. NO also plays a key role in supporting the intracardiac nervous system (IcNS) by improving neural signaling and maintaining its regulatory functions.[10] Additionally, sun exposure increases mitochondrial melatonin, boosting cellular energy production essential for the IcNS.

However, it's important to approach sun exposure with care, especially if your diet is high in vegetable oils. These oils migrate to your skin and oxidize when exposed to sunlight, causing inflammation and DNA damage, which makes you more prone to sunburn. If you're on a high-LA diet, I recommend avoiding intense sun exposure until you've reduced your seed oil intake for four to six months.

As you reduce your LA intake, slowly increase your time outdoors. You'll eventually be able to enjoy an hour or more during peak sunlight hours. Additionally, consider using pharmaceutical-grade methylene blue, under the guidance of a healthcare professional, to further support cellular energy processes.

Eliminate environmental toxins — Reduce exposure to electromagnetic fields (EMFs) and other environmental pollutants that interfere with your heart's electrical signaling

system. Use EMF protection devices and create a low-EMF sleep environment to maintain the integrity of your heart-brain communication.

Lower your insulin and blood sugar levels — Simple strategies to accomplish this include avoiding ultraprocessed foods and artificial sweeteners, significantly restricting your LA intake and getting regular exercise.

Address chronic stress — This raises both blood sugar and blood pressure, promotes blood clotting and impairs your repair systems. Cortisol, a key stress hormone, reduces endothelial cell production.

Optimize your gut health — Poor gut health leads to systemic inflammation, impairing the function of IcNS and increasing your risk of heart disease. Certain gut bacteria, particularly Oscillibacter, have also been associated with lower cholesterol levels and reduced heart disease risk.[11] These bacteria break down cholesterol into smaller molecules that don't raise heart disease risk.

Maintaining a diverse and balanced gut microbiome, especially fostering oxygen-intolerant bacteria like Akkermansia, strengthens intestinal defenses and overall health. The importance of gut health in heart disease prevention also extends beyond cholesterol management. Oxygen-intolerant bacteria produce beneficial short-chain fats that support intestinal health.

However, modern lifestyle factors like vegetable oil consumption and exposure to toxins like endocrine-disrupting chemicals (EDCs) in plastics disrupt this delicate balance, leading to increased endotoxin production and systemic inflammation. To bring your gut microbiome back on track and reduce inflammation, incorporate fermented foods, such as grass fed yogurt, sauerkraut, kimchi or kefir, into your diet and consider taking a high-quality probiotic.

Take coenzyme Q10 — This powerful antioxidant is essential for cellular energy production, making it particularly beneficial for the cardiac muscles, which have about 5,000 mitochondria per cell.[12] A study published in the journal Antioxidants (Basel)[13] says that CoQ10 helps reduce oxidative stress, lowers the risk of death from

cardiovascular causes and improves outcomes in patients undergoing coronary artery bypass surgery.

It also helps prevent the buildup of oxidized low-density lipoprotein (oxLDL) in arteries, reduces vascular stiffness and high blood pressure, improves endothelial function by cutting down on reactive oxygen species (ROS) and boosts NO levels.

Increase your magnesium levels — This mineral is vital for nerve conduction and maintaining heart rhythm, both of which are central to the IcNS's proper function.[14]

Sources and References

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