Neuroimmune Dysfunction (Brain-Immune System Problems

In ME, the immune system and nervous system stay stuck in a chronic “sick mode”.

What’s going wrong:

• Brain inflammation (neuroinflammation). Imaging and spinal fluid studies suggest activated microglia (immune cells in the brain). This can lead to:

*Brain fog

*Sensory sensitivity (light, sound, touch)

*Head pressure or headaches

*Sleep that doesn’t refresh

Immune system stuck on “alert”. Many patients show:

*Elevated inflammatory cytokines (especially early in illness)

*Reactivation of viruses (EBV, HHV-6, enteroviruses in some)

*Poor NK cell function (immune cells that control viruses)

This creates the flu-like, poisoned feeling and contributes to post-exertional Neuroimmune exhaustion (PENE)

*An Autonomic nervous system injury or dysfunction. The autonomic nervous system (ANS) controls heart rate, blood pressure, digestion, temperature, etc. In ME it often becomes unstable due to immune-mediated nerve dysfunction.

Cardiovascular Dysfunction

ME has measurable problems with blood flow and circulation, especially when upright.

Key issues:

• Orthostatic intolerance (OI). When upright, the body fails to maintain proper circulation to the brain.

Types include:

*POTS (heart rate jumps)

*Neurally mediated hypotension (BP drops)

*Low blood volume

*Impaired vasoconstriction

This leads to:

*Dizziness

*Weakness

*Nausea

*Cognitive crash when standing

*Feeling better lying down

Reduced blood flow to the brain. Studies show lower cerebral blood flow, especially upright. This contributes directly to:

*Brain fog

*Sensory overload

*PENE after exertion

Small heart / low cardiac output (in some patients). Some research shows:

*Smaller left ventricle size

*Reduced stroke volume. This means less blood pumped per beat -less oxygen delivery - early exhaustion.

Endothelial dysfunction. The lining of blood vessels doesn't regulate dilation properly, impairing oxygen delivery to muscles and brain.

How These Systems Feed Each Other

This is a loop, not separate problems:

Immune Activation to Autonomic Nerve Dysfunction to Poor Blood Flow to Tissue Oxygen Stress to More Immune Activation

This loop helps explain:

*Why overexertion causes a delayed crash (PENE)

*Why symptoms are whole-body

*Why rest helps but doesn't cure

ME involves failure of regulation between:

*Brain

*Immune system

*Blood vessels

*Autonomic nervous system

The body gets stuck in a maladaptive survival response where energy production, circulation, and immune signaling are all dysregulated.

That's why symptoms include:

*Neurological (brain fog, sensory overload)

*Immune (flu-like feeling, sore glands)

*Cardiovascular (POTS, dizziness)

*Energy metabolism failure (PENE)

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