Casual Friday Presents

Postural Orthostatic Tachycardia Syndrome (POTS) pt 2

FM Strategies: Physiology, Pathology, Interventions.

A BIOGENETIX CLINICAL PRESENTATION

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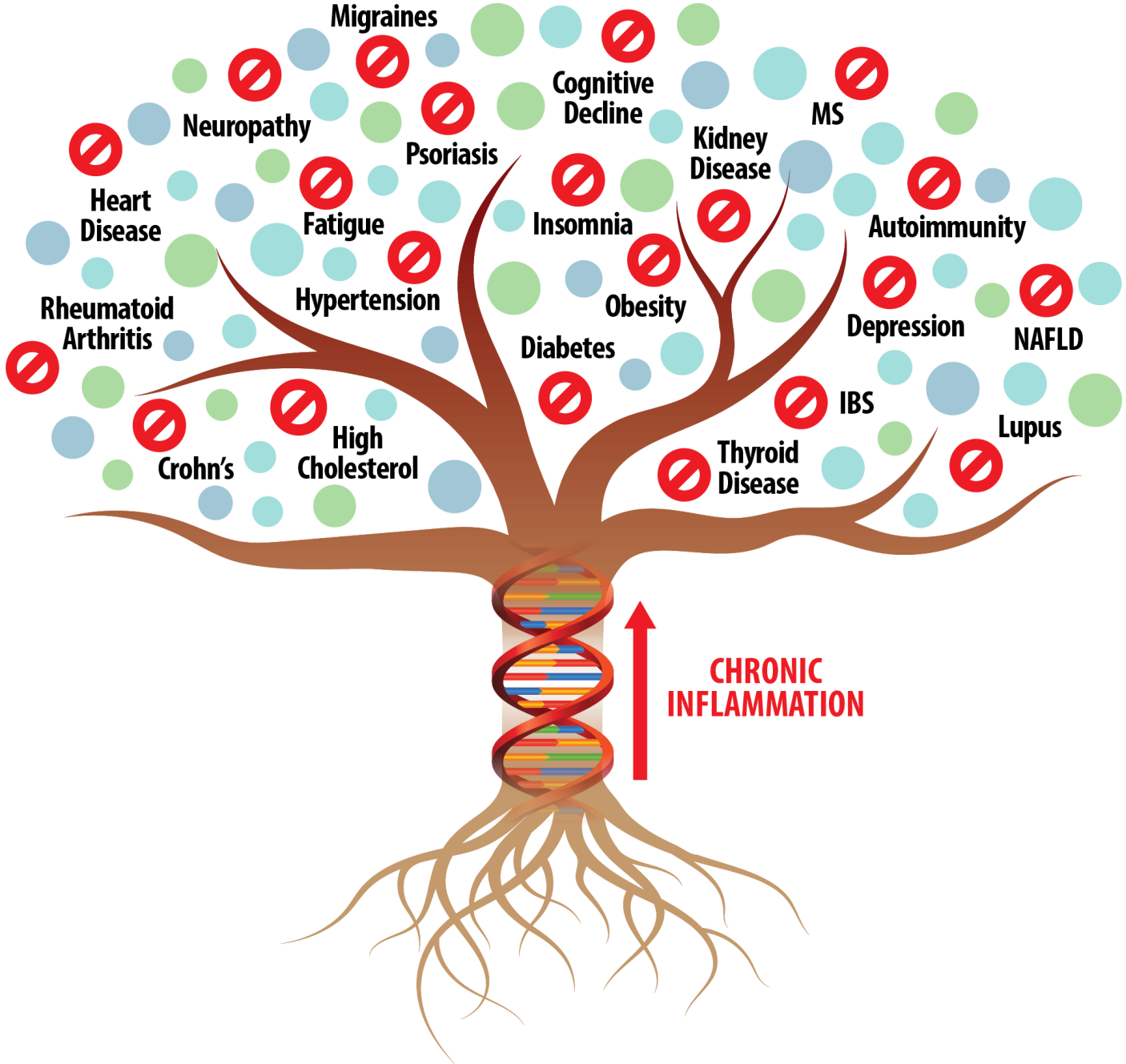
Migraines
Neuropathy
Psoriasis
Cognitive Decline
MS
Kidney Disease
Heart Disease
Fatigue
Insomnia
Autoimmunity
Hypertension
Obesity
Depression
NAFLD
Rheumatoid Arthritis
Diabetes
IBS
Lupus
Crohn's
High Cholesterol
Thyroid Disease
CHRONIC INFLAMMATION

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Postural orthostatic tachycardia syndrome (POTS) is a common form of autonomic dysregulation characterized as an excessive tachycardia upon standing in the presence of orthostatic intolerance.[1][2][3] Current adult diagnostic criterion requires a heart rate increase of greater than or equal to 30 bpm within the initial 10 minutes of standing or head-up tilt (HUT) in the absence of orthostatic hypotension.[4][5] POTS predominantly affects premenopausal females (5 to 1) between 15 and 50 years of age, manifesting with symptoms of fatigue, headache, palpitations, sleep disturbance, nausea, bloating, among others.[2][6][3] A multitude of pathophysiologic mechanisms including but not limited to disproportionate sympathoexcitation, volume depletion, autoimmune dysfunction, cardiac and physical deconditioning point to a heterogeneously complex etiology.[3][5][7] Most significantly, the debilitating nature of POTS predisposes patients to a high degree of functional impairment and decreased quality of life,[8] emphasizing the need for further investigation into the understanding and management of this increasingly prevalent clinical syndrome.

*Tachycardia: HR >100bpm at rest
*Orthostatic: relating to standing up straight

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Proposed etiologies:

1. Neuropathic
2. Hyperadrenergic
3. Hypovolemic
4. Autoimmune
5. Deconditioning

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Symptoms, patient experience:

1. tachycardia
2. palpitations
3. anxiety
4. tremor
5. sweating
6. orthostatic intolerance
7. Hyperadrenergic activity

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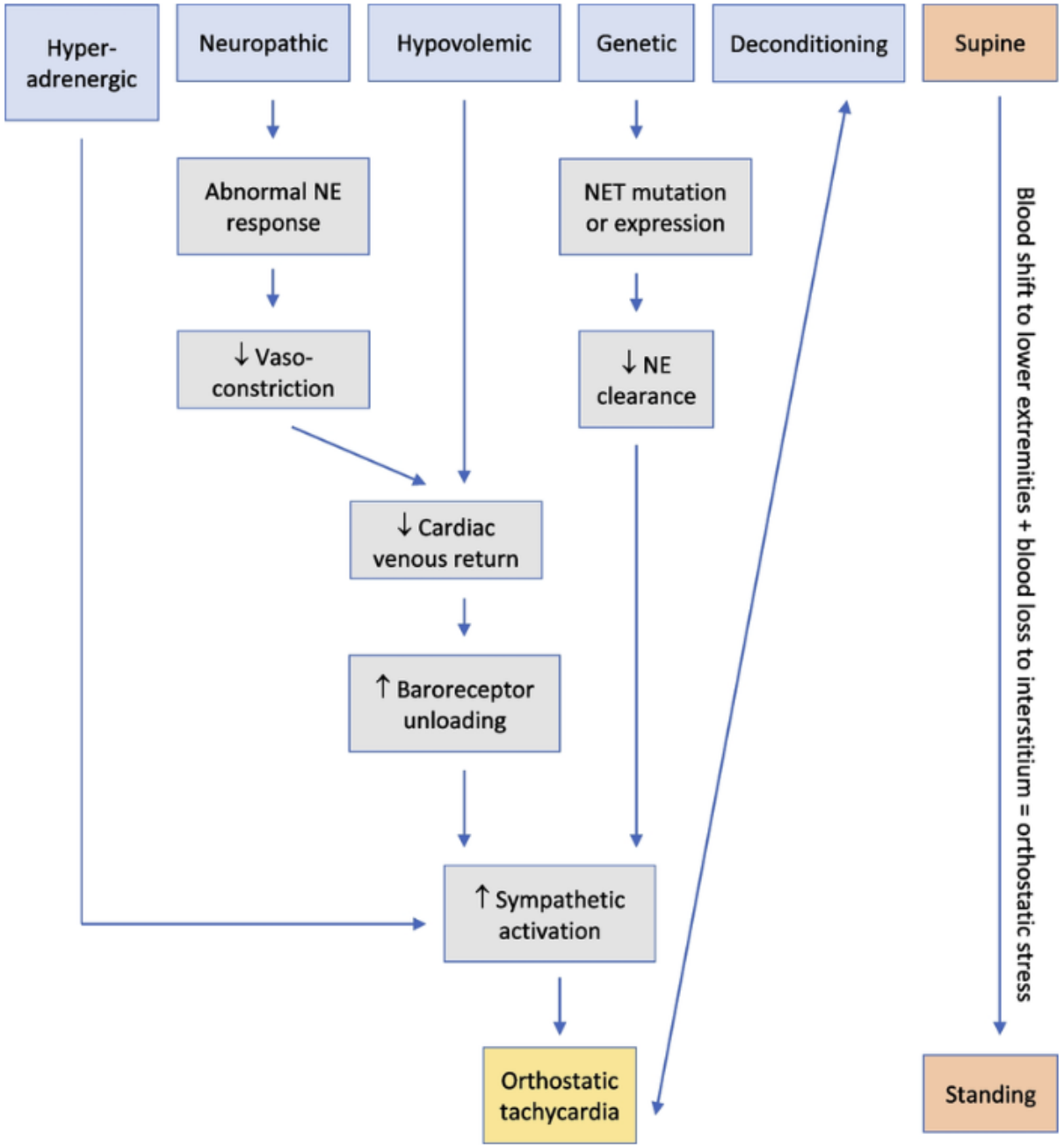

***NET mutation** refers to a mutation in the **norepinephrine transporter (NET)** gene, **SLC6A2**.

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https://www.researchgate.net/figure/Convergence-of-common-POTS-pathophysiological-theories-partially-adapted-from-Arnold-et_fig1_334175297

Review > Heart Rhythm. 2022 Nov;19(11):1880-1889. doi: 10.1016/j.hrthm.2022.07.014.
Epub 2022 Jul 16.

Postural orthostatic tachycardia syndrome as a sequela of COVID-19

Cameron K Ormiston [1], Iwona Świątkiewicz [2], Pam R Taub [3]

Affiliations + expand

PMID: 35853576 PMCID: PMC9287587 DOI: 10.1016/j.hrthm.2022.07.014

Abstract

Postural orthostatic tachycardia syndrome (POTS) is a complex multisystem disorder characterized by orthostatic intolerance and tachycardia and may be triggered by viral infection. Recent reports indicate that 2%-14% of coronavirus disease 2019 (COVID-19) survivors develop POTS and 9%-61% experience POTS-like symptoms, such as tachycardia, orthostatic intolerance, fatigue, and cognitive impairment within 6-8 months of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. Pathophysiological mechanisms of post-COVID-19 POTS are not well understood. Current hypotheses include autoimmunity related to SARS-CoV-2 infection, autonomic dysfunction, direct toxic injury by SARS-CoV-2 to the autonomic nervous system, and invasion of the central nervous system by SARS-CoV-2. Practitioners should actively assess POTS in patients with post-acute COVID-19 syndrome symptoms. Given that the symptoms of post-COVID-19 POTS are predominantly chronic orthostatic tachycardia, lifestyle modifications in combination with the use of heart rate-lowering medications along with other pharmacotherapies should be considered. For example, ivabradine or β-blockers in combination with compression stockings and increasing salt and fluid intake has shown potential. Treatment teams should be multidisciplinary, including physicians of various specialties, nurses, psychologists, and physiotherapists. Additionally, more resources to adequately care for this patient population are urgently needed given the increased demand for autonomic specialists and clinics since the start of the COVID-19 pandemic. Considering our limited understanding of post-COVID-19 POTS, further research on topics such as its natural history, pathophysiological mechanisms, and ideal treatment is warranted. This review

Workup Flow

Orthostatic Symptoms

↓

Confirm POTS

↓

Determine Physiologic Subtype

↓

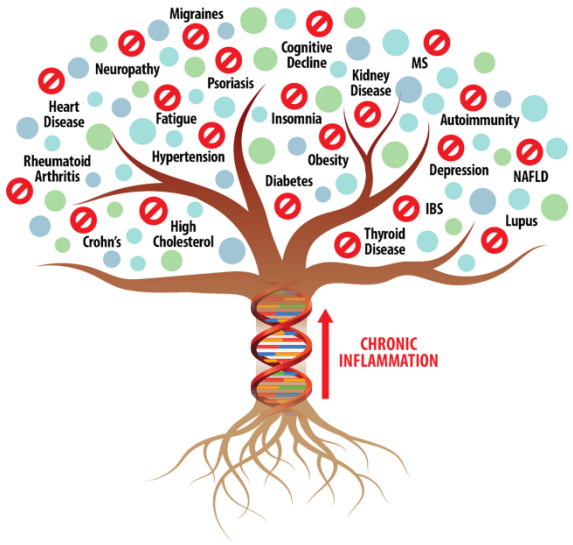
Search for Contributing Systems

↓

Prioritize Treatable Drivers

↓

Build Individualized Support Plan



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Auton Neurosci. Author manuscript; available in PMC: 2021 Nov 1.

Published in final edited form as: Auton Neurosci. 2021 Jun 5;235:102828. doi: 10.1016/j.autneu.2021.102828

Postural orthostatic tachycardia syndrome (POTS): State of the science and clinical care from a 2019 National Institutes of Health Expert Consensus Meeting - Part 1

Steven Vernino [a], Kate M Bourne [b], Lauren E Stiles [c,d], Blair P Grubb [e], Artur Fedorowski [f,g], Julian M Stewart [h], Amy C Arnold [i,j], Laura A Pace [k], Jonas Axelsson [l], Jeffrey R Boris [m], Jeffrey P Moak [n], Brent P Goodman [o], Kamal R

Postural orthostatic tachycardia syndrome (POTS) is a chronic and often disabling disorder characterized by orthostatic intolerance with excessive heart rate increase without hypotension during upright posture. Patients often experience a constellation of other typical symptoms including fatigue, exercise intolerance and gastrointestinal distress. A typical patient with POTS is a female of child-bearing age, who often first displays symptoms in adolescence. The onset of POTS may be precipitated by immunological stressors such as a viral infection. A variety of pathophysiologies are involved in the abnormal postural tachycardia response; however, the pathophysiology of the syndrome is incompletely understood and undoubtedly multifaceted.

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6. Potential pathophysiological mechanisms

Clinical observations may show a post-viral onset (Low et al., 1995; Schondorf and Low, 1993) suggesting the possibility of an immunological cause. Positive (though often non-specific) autoantibody tests are frequently seen among POTS patients, and about 20% report a history of an autoimmune disorder such as Hashimoto's thyroiditis, rheumatoid arthritis or Sjogren syndrome (¨ Blitshteyn, 2015; Shaw et al., 2019). In recent years, a focus of POTS research has been on autoantibodies to cardiovascular G-protein coupled membrane receptors (see below) (Blitshteyn, 2015; Dahan et al., 2016; Fedorowski et al., 2017; Gunning et al., 2019; Li et al., 2014; Ruzieh et al., 2017a; Schofield and Chemali, 2019; Vernino and Stiles, 2018; Wang et al., 2013; Watari et al., 2018; Xichun et al., 2020).

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Associations between immune dysfunction and POTS remains poorly understood. Both pediatric and adult POTS patients may report an infectious prodrome before the emergence of orthostatic symptoms (Boris and Bernadzikowski, 2018; Shaw et al., 2019). A variety of infectious pathogens have been proposed to be linked to POTS, including Epstein Barr virus (Pohlgeers and Stumbo, 2016; Yaxley, 2020), *Mycoplasma pneumoniae* (Kasmani et al., 2009), and recently SARS-CoV2 (Goldstein, 2020; Kanjwal et al., 2020; Miglis et al., 2020).

POTS patients (Vernino and Stiles, 2018) and their close relatives (Boris et al., 2020; Shaw et al., 2019) have a higher than expected prevalence of autoimmune disorders including celiac disease (Penny et al., 2016), Hashimoto's thyroiditis (Blitshteyn, 2015), Sjögren's syndrome (Goodman et al., 2017), and systemic lupus erythematosus (SLE) (Tang et al., 2004). Anecdotal reports and small open-label clinical studies (Weinstock et al., 2018) suggest a beneficial effect of intravenous immunoglobulin (IVIG) therapy in POTS, suggesting that immunomodulatory therapy can play a role in treatment, but there have been no controlled clinical trial data published to date.

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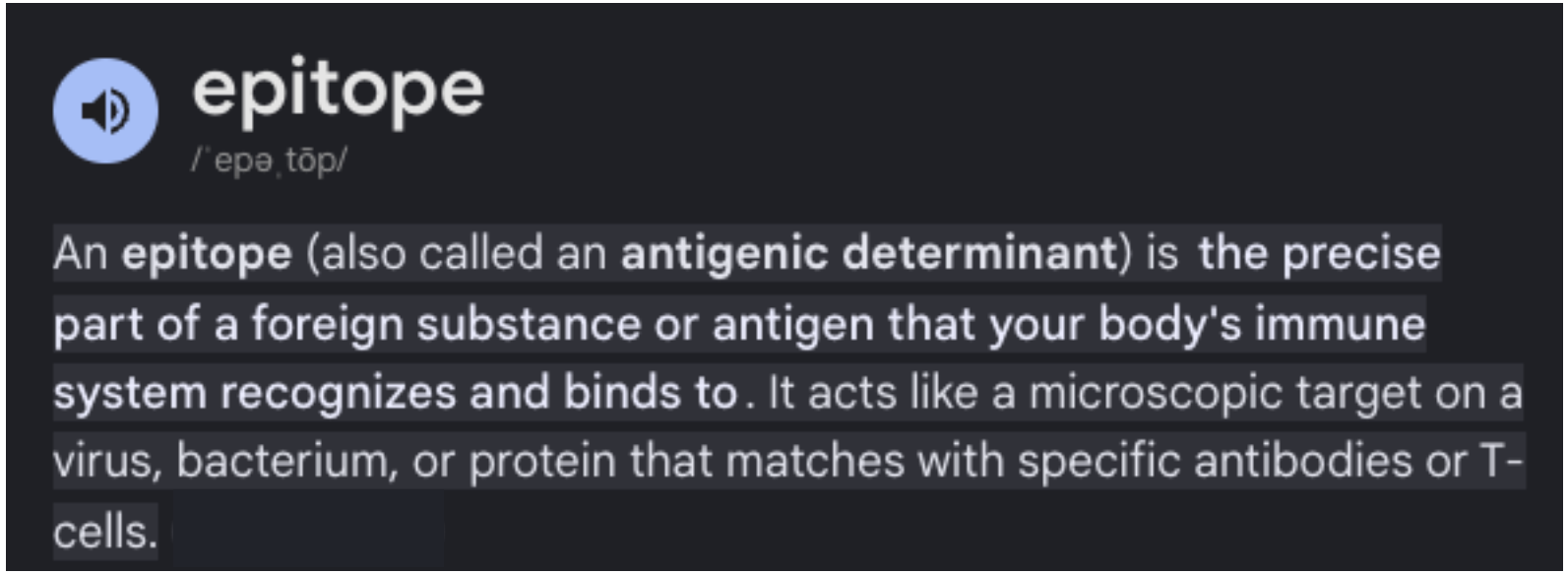
Serum immunoglobulins isolated from POTS patients have been reported to act as partial agonists to both α- and β-adrenergic receptors in vitro (Fedorowski et al., 2017; Li et al., 2014), a finding independently confirmed by several other groups (Vernino and Stiles, 2018) and expanded to include a wider range of G-protein coupled receptors (GPCRs) as targets (Kharraziha et al., 2020). These reports have employed transfected cell assays and enzyme-linked immunoassays, as well as functional tests utilizing rat cardiomyocytes and smooth muscle, to detect antibodies that target cellular receptors for norepinephrine (Fedorowski et al., 2017; Gunning et al., 2019; Li et al., 2014; Watari et al., 2018), acetylcholine (Fedorowski et al., 2017; Gunning et al., 2019; Li et al., 2015b; Watari et al., 2018), and angiotensin II (Xichun et al., 2020). In most of these studies, similarly reactive antibodies have been found in healthy control groups, although less frequently or at lower levels than in POTS patients. Preliminary studies using active immunization animal models have supported a potential role of the adrenergic autoantibodies in the pathophysiology of POTS (Li et al., 2019). Despite these observations, a causal role of these autoantibodies in POTS is not established.


epitope
/ˈepəˌtōp/
An epitope (also called an antigenic determinant) is the precise part of a foreign substance or antigen that your body's immune system recognizes and binds to. It acts like a microscopic target on a virus, bacterium, or protein that matches with specific antibodies or T-cells.

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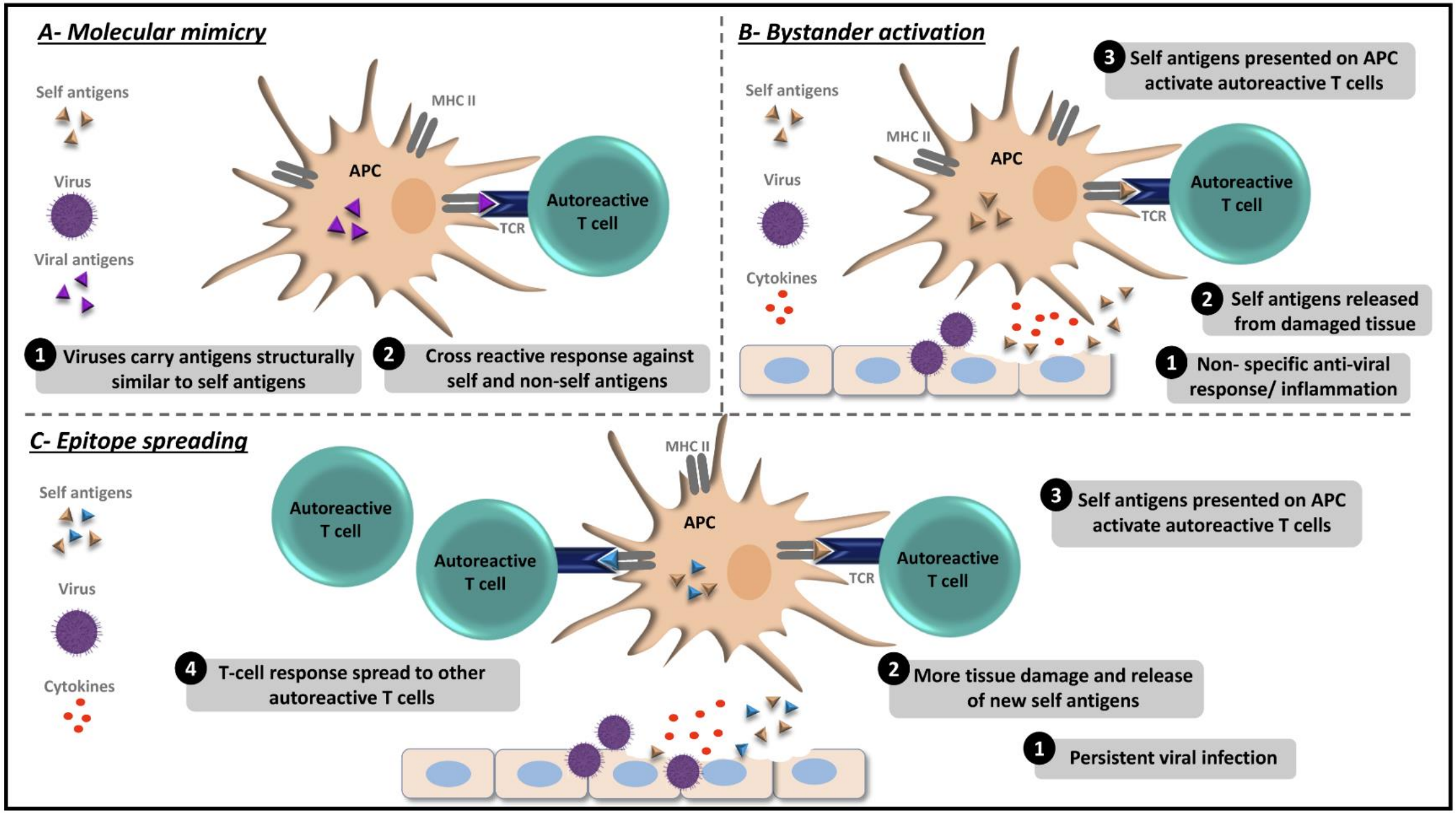

https://www.mdpi.com/viruses/viruses-11-00762/article_deploy/html/images/viruses-11-00762-g001.png

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More from the authors:

Immune stressor
↓
aberrant immune response / autoantibodies in some patients
↓
ongoing, unresolved inflammatory burden
↓
receptors controlling vascular tone and autonomic signaling
↓
impaired vasoconstriction / altered sympathetic compensation
↓
venous pooling or inadequate effective circulation upright
↓
compensatory tachycardia

*Autoantibodies ≠ proof that POTS is an autoimmune disease, but when involved and uncontrolled, they can accelerate the mechanism.

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CYREX® Laboratories

Array 5 - Multiple Autoimmune Reactivity Screen

Multiple Autoimmune Reactivity Screen

Parietal Cell + ATPase IgG + IgA Combined	(CPT CODE : 83516)
Intrinsic Factor IgG + IgA Combined	(CPT CODE : 83516-59)
ASCA + ANCA IgG + IgA Combined	(CPT CODE : 83516-59)
Tropomyosin IgG + IgA Combined	(CPT CODE : 83516-59)
Thyroglobulin IgG	(CPT CODE : 83516-59)
Thyroid Peroxidase (TPO) IgG	(CPT CODE : 83516-59)
21 Hydroxylase (Adrenal Cortex) IgG + IgA Combined	(CPT CODE : 83516-59)
Myocardial Peptide IgG + IgA Combined	(CPT CODE : 83516-59)
Alpha-Myosin IgG + IgA Combined	(CPT CODE : 83516-59)
Phospholipid IgG + IgA Combined	(CPT CODE : 83516-59)
Platelet Glycoprotein IgG + IgA Combined	(CPT CODE : 83516-59)
Ovary/Testis* IgG + IgA Combined	(CPT CODE : 83516-59)
Fibulin IgG + IgA Combined	(CPT CODE : 83516-59)
Collagen Complex IgG + IgA Combined	(CPT CODE : 83516-59)
Arthritic Peptide IgG + IgA Combined	(CPT CODE : 83516-59)
Osteocyte IgG + IgA Combined	(CPT CODE : 83516-59)
Cytochrome P450 (Hepatocyte) IgG + IgA Combined	(CPT CODE : 83516-59)
Islet Cell Antigen (IA-2) Autoantibody	(CPT CODE : 83516-59)
Glutamic Acid Decarboxylase 65 (GAD 65) Autoantibody	(CPT CODE : 83516-59)
Myelin Basic Protein IgG + IgA Combined	(CPT CODE : 83516-59)
Asialoganglioside IgG + IgA Combined	(CPT CODE : 83516-59)
Alpha + Beta Tubulin IgG + IgA Combined	(CPT CODE : 83516-59)
Cerebellar IgG + IgA Combined	(CPT CODE : 83516-59)
Synapsin IgG + IgA Combined	(CPT CODE : 83516-59)

** Ovary and Testis are tested together to avoid any confusion arising out of potential cross-reactivity.*

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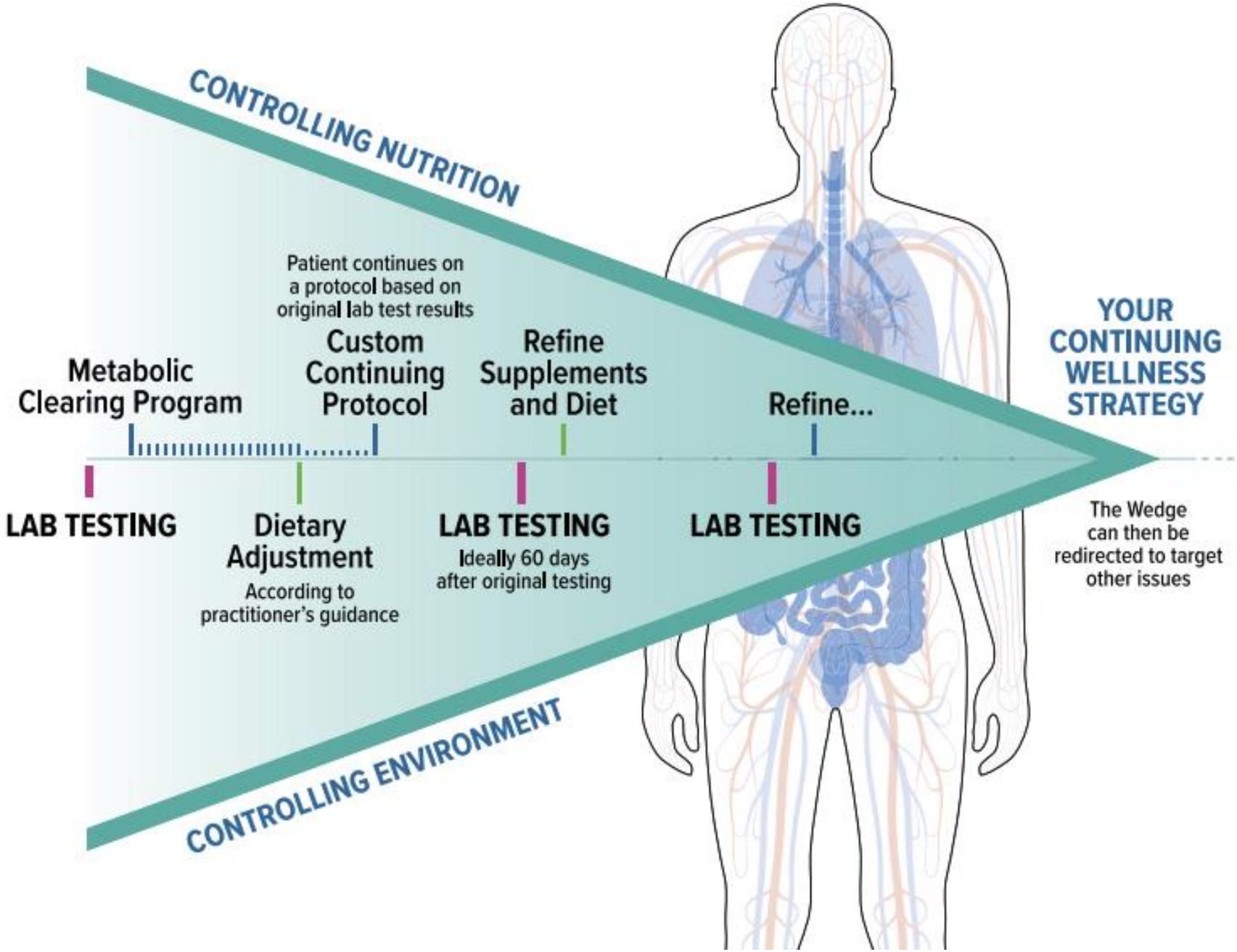
CONTROLLING NUTRITION
Patient continues on a protocol based on original lab test results
Metabolic Clearing Program
Custom Continuing Protocol
Refine Supplements and Diet
Refine...
YOUR CONTINUING WELLNESS STRATEGY
LAB TESTING
Dietary Adjustment
According to practitioner's guidance
LAB TESTING
Ideally 60 days after original testing
LAB TESTING
The Wedge can then be redirected to target other issues
CONTROLLING ENVIRONMENT

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Lifestyle Considerations

1. Increased fluid and salt intake
2. Smaller meals
3. Lower carb, higher protein
4. Gluten and other sensitivities
5. Caffeine balance
6. Alcohol avoidance
7. Elevated sleeping (orthostatic reconditioning, GERD control)
8. Compression-wear
9. Cardio and strength training

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We Want to Hear from You!

Give us your Casual Friday feedback
with this short 5-question survey.

biogenetix.com/survey

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