


# Autonomic Nervous system and Immune system:

## Is there a relationship between them?

Mohammed T. Numan, MD  
Associate Professor  
University of Texas  
Houston, Texas



# Questionnaire filled by patients with autonomic dysfunction symptoms



UTHealth | Medical School  
The University of Texas  
Health Science Center at Houston

Patient Label

NEUROCARDIOGENIC SYNCOPE and DYSAUTONOMIA CENTER at UT HEALTH  
and MEMORIAL HERMANN HOSPITAL  
CLINICAL QUESTIONNAIRE

<b>JOINTS/MUSCLES</b>						
Pain or aches in joints	0	1	2	3	4	N/A
Pain or aches in muscles	0	1	2	3	4	N/A
Feeling of weakness	0	1	2	3	4	N/A
Pain trigger points	0	1	2	3	4	N/A
<b>ENERGY/ACTIVITY</b>						
Fatigue, sluggishness	0	1	2	3	4	N/A
Apathy, lethargy	0	1	2	3	4	N/A
Hyperactivity	0	1	2	3	4	N/A
Sleep disturbance	0	1	2	3	4	N/A
Exercise intolerance (sports, activities)	0	1	2	3	4	N/A
<b>METABOLIC/IMMUNOLOGIC</b>						
Mitochondrial disorder	0	1	2	3	4	N/A
Diabetes	0	1	2	3	4	N/A
Thyroid disorder	0	1	2	3	4	N/A
Autoimmune condition	0	1	2	3	4	N/A

# Patients presenting with dysautonomia are not uncommon to have:

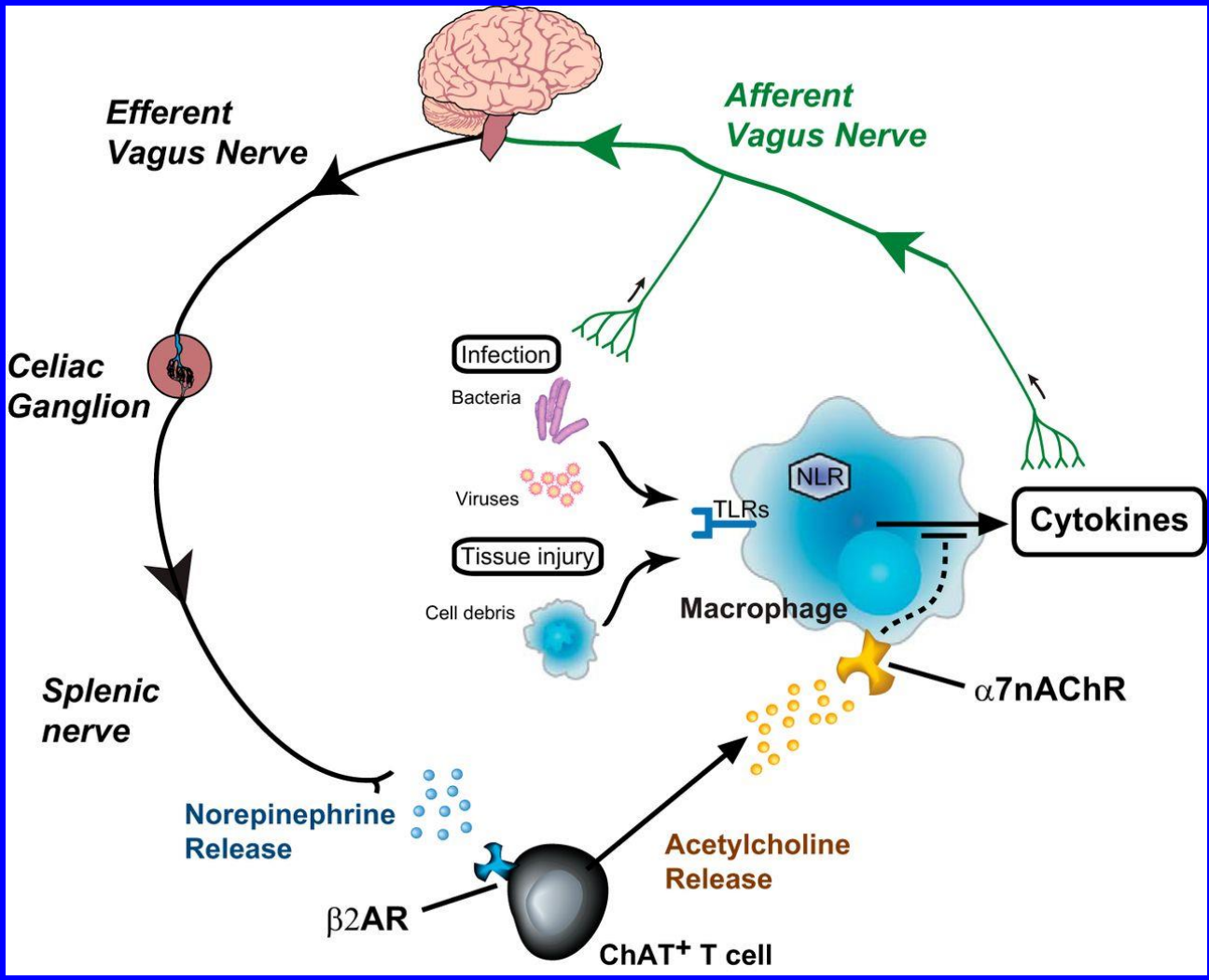
- Some patients will have Hashimoto's thyroiditis
- Inflammatory bowel disease (Crohn's, ulcerative colitis..)
- Rheumatoid arthritis
- Anaphylaxis and allergies
- Celiac disease
- SLE or mixed auto-immune disease

## **During laboratory tests we found several patients with positive bio-markers of immune-mediated process:**

- Elevated Serum Cytokines (tissue necrosis factor, Interleukins 6, 8 and 13)
- Elevated Rheumatoid factor
- Positive ANA
- Positive anti-thyroid antibodies with normal TSH and T4
- Anti GAD in few
- Anti-Folic acid antibodies in very few..

# Autonomic-Immune investigational facts and research

- Nucleotide receptors for cytokines and prostaglandins are expressed by sensory neurons in the periphery ( Chiu IM et al. Nature Neuroscience 2012)
- Some of the immune cells (CD4 and macrophages) express receptors or neurotransmitters, including dopamine, Ach and norepinephrine which can regulate leukocyte activity and differentiation. (Kipnis et al. Journal of Neuroscience 2004)
- Autonomic nerves innervate lymphoid tissue (spleen and lymphnodes) and regulate immune response. (Straub et al. Arthritis Rheum 2008)
- “inflammatory reflex”: Afferent signals transmitted through the vagus nerve are processed in the CNS and culminate in efferent vagus nerve activity that regulates macrophage cytokines release in spleen. (Tracey KJ et al. Nature 2002)
- In rats: electrical stimulation of the vagus nerve significantly reduces systemic TNF levels while surgical ablation of the vagus nerve has opposite effect. (Borovikova et al. Nature 2000)
- Central activation of vagus nerve-to-spleen circuit ameliorates colitis process. (Ji H et al. Mucosal Immunology journal 2014)



Sundman E, Olofsson PS. Neural control of the immune system. *Adv Physiol Educ.* 2014 Jun; 38(2): 135–139