


Hypermobility 102:

**Postural Orthostatic
Tachycardia Syndrome (POTS)
and Mast Cell Activation
Syndrome (MCAS)
Associated with Hypermobility
Spectrum Disorder**

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Slides are available on my web site:
<https://webspaces.clarkson.edu/~lrussek/hsd.html>




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DISCLAIMER

- I cannot provide individual medical advice in this presentation
- The information provided here is generally applicable to HSD/hEDS, but your personal situation may be different.
- You should discuss options with your healthcare provider before starting a new management approach.

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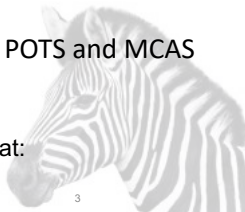
I will refer to these if you want more info

“HSD 101” Lecture Series

- 6/18/21 HSD 101: Basics of HSD/hEDS and self-care
- 6/25/21 HSD 102: POTS and POTS self-care, basics of MCAS
- 7/16/21: HSD 103: Pain management in HSD/hEDS
- HSD 104: Safe exercise selection and progression with HSD/hEDS
- HSD 105: HSD/hEDS in children and teens
- HSD 106: Gut issues in HSD/hEDS, POTS, MCAS
- HSD 107: Fatigue in HSD/hEDS and POTS
- HSD 108: Headaches, migraines, and TMJ pain in HSD, POTS and MCAS
- HSD 109: Breathing dysfunctions in HSD

Updated schedule, recordings, and slide handouts available at:
<https://webspace.clarkson.edu/~lrussek/hsd.html>

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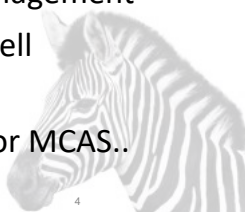
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Learning Objectives

At the end of this session, participants will be able to:

1. Recognize signs and symptoms of Postural Orthostatic Tachycardia Syndrome (POTS) as the most common form of dysautonomia
2. Describe self-management strategies for POTS
3. Identify medical approaches to POTS management
4. Recognize signs and symptoms of Mast Cell Activation Syndrome (MCAS)
5. Describe self-management approaches for MCAS..

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Why Discuss POTS, MCAS?

Why are we talking about POTS and MCAS in “Hypermobility 102”?

- POTS, MCAS and Hypermobility frequently co-exist as **“The Terrible Trifecta”**
- Together, HSD, POTS, and MCAS look like fibromyalgia
- Russek LN. Is it really fibromyalgia? Recognizing mast cell activation, orthostatic tachycardia, and hypermobility. *Orthopaedic Practice*. 2018;30(3):187-193. Available on-line at:
https://www.researchgate.net/publication/326426655_Is_It_Really_Fibromyalgia_Recognizing_Mast_Cell_Activation_Orthostatic_Tachycardia_and_Hypermobility..

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Dysautonomia & POTS

Why is it so common in HSD?

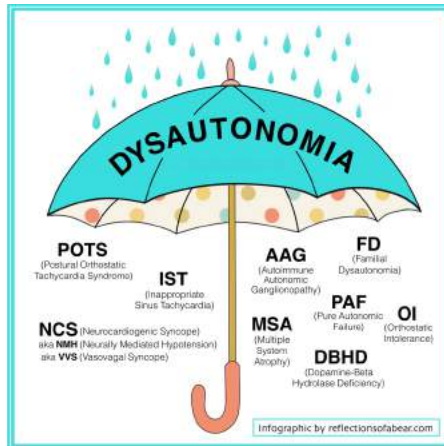


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Types of Dysautonomia



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If your body is able to compensate with increased heart rate:

- Postural Orthostatic Tachycardia Syndrome (POTS) – most common

If your body is NOT able to compensate with increased heart rate (e.g. 'just because' or due to meds such as anxiety meds):

- Orthostatic hypotension/intolerance (OI) is also common.
 - Tinkle et al, 2017

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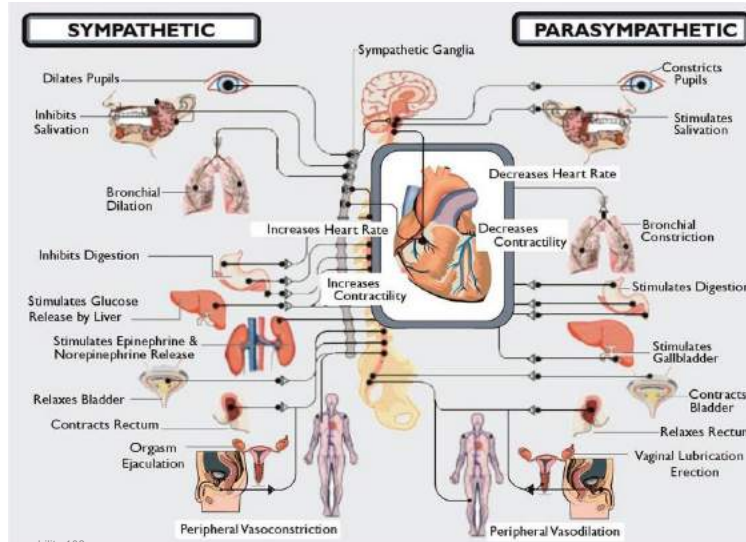
Prevalence of POTS

- Prevalence not known, as it is often undiagnosed
- Diagnosis often requires ≥ 4 years, 7 MDs
- Maybe 0.5-3M in US
 - This is more than all MS and Parkinson's together
- Maybe 1% of all teenagers
 - 52% have onset ≤ 18 years old..
- (Stiles, 2017)

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The Autonomic Nervous System

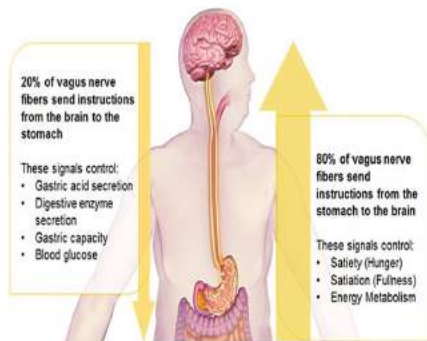


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<http://www.dysautonomiainternational.org/page.php?ID=122>

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Vagus Nerve and Dysautonomia



- Vagus nerve:
 - Controls autonomic function (sympathetic/parasympathetic activity)
 - Communicates from the body to the brain
- Vagus nerve function is disrupted in POTS

• Anjum, 2018

<https://www.facebook.com/IBSHelpisHere/photos/pcb.326199840910720/326199620910742/>

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DYSAUTONOMIA CAN IMPACT THE WHOLE BODY

BRAIN fatigue brain fog migraines vertigo fainting lightheadedness	HEART tachycardia bradycardia palpitations chest pain	STOMACH bloating nausea vomiting pain
MOUTH dry mouth tooth decay difficulty swallowing	BLOOD VESSELS hypotension hypertension poor perfusion	INTESTINES impaired motility constipation diarrhea pain
EYES dryness sluggish pupils sensitivity to light greyed out vision	IMMUNE CELLS increased allergies inflammation	GALLBLADDER reduced motility inflammation pain
SKIN dryness reduced sweating increased sweating	BLADDER frequent urination retention nocturia pain	

...and MUCH more!

WWW.DYSAUTONOMIAINTERNATIONAL.ORG

DYSAUTONOMIA INTERNATIONAL
 AWARENESS ADVOCACY ADVANCEMENT

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POTS Looks Like...

Healthy Person after shower

Dysautonomia Patient after shower

exhaustion brain fog
 red patches of skin loss of vision
 tachycardia
 pre-syncope
 leg swelling
 blood pooling

Acrocyanosis
Stiles, 2017

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Causes of POTS

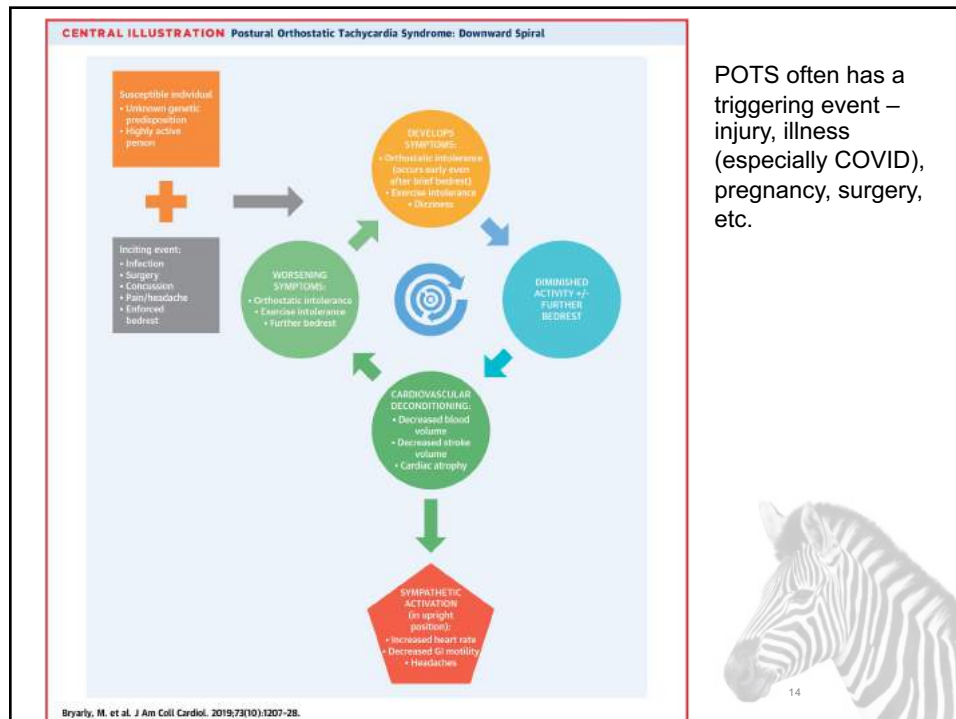
- Other conditions, e.g., hEDS, IBS
- Viral infection, illness, certain vaccinations
- Trauma, surgery, pregnancy
- Intensive psychosocial stress
- Mast cell activation
- Severe deconditioning or bedrest
- Puberty
- Sometimes the initial cause is unknown..

Wells, 2018; Fedorowski, 2019



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Characteristics of POTS

- In a sample of 779 people with POTS in the UK
 - 92% were female
 - 81% were 18-49 years old
 - Most common symptoms:
 - Fatigue: 91%
 - Dizziness & near-fainting: 90%
 - Palpitations: 86% (may present as anxiety)
 - Fainting or blackouts 58%
 - Brain fog, trouble concentrating 40%
 - 37% stopped working due to POTS
 - Of school age respondents, 50% missed 3 months or more of school..

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• Kavi, 2016



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POTS-Related Headaches

HSD 108:
Headaches

- Headaches and migraines are common in POTS: 41-96%
- Migraines most common in POTS
- Sleep-disturbance HA
- Coat-hanger HA
- POTS is commonly overlooked in patients with migraine
- (Cook, 2018; Wig, 2019; Fedorowski, 2019)

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POTS Diagnostic Criteria

- Tilt Table Test: Heart rate increases ≥ 30 bpm from lying down to tilted 60° or Stand Test (10 min)
 - ≥ 40 bpm for children
- Symptoms worsen with standing and improved lying down
- Symptoms last ≥ 6 months
- Absence of other obvious cause of orthostatic symptoms or tachycardia (e.g., active bleeding, acute dehydration, medications).

Raj et al, 2013



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Common POTS Triggers

- Excess heat (hot weather, showers, etc.)
- Eating – especially refined carbohydrates & sugar
- Rapid position changes, sitting/standing up quickly
- Dehydration
- Time of day (especially mornings)
- Menstrual period (for women)
- Deconditioning, prolonged bed rest, illness, pregnancy
- Alcohol (which dilates blood vessels)
- Inappropriate or unaccustomed exercise

<https://www.potsuk.org/symptoms..>

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Questions?

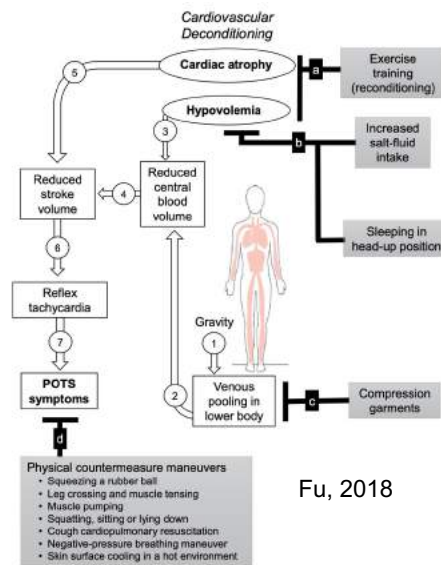


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Overview of POTS Management



Fu, 2018

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POTS Self-Management

- Reassurance & awareness
- Increased fluid AND salt intake; salty snacks
 - Electrolyte liquids (e.g., Propel™, Liquid IV™, Ultima™ etc.)
- Manage fatigue:
 - Pacing
 - Graded exercise program, “Start low, go slow”
 - Lie down with feet elevated
 - Reconsider meds if taking beta blocker (e.g., propranolol)
- Sleep Hygiene
 - (More in a moment)
- Raise head of bed (to increase blood volume)
- Acknowledge & manage anxiety.. Raj, 2013; Cutitta, 2018, Fu, 2018



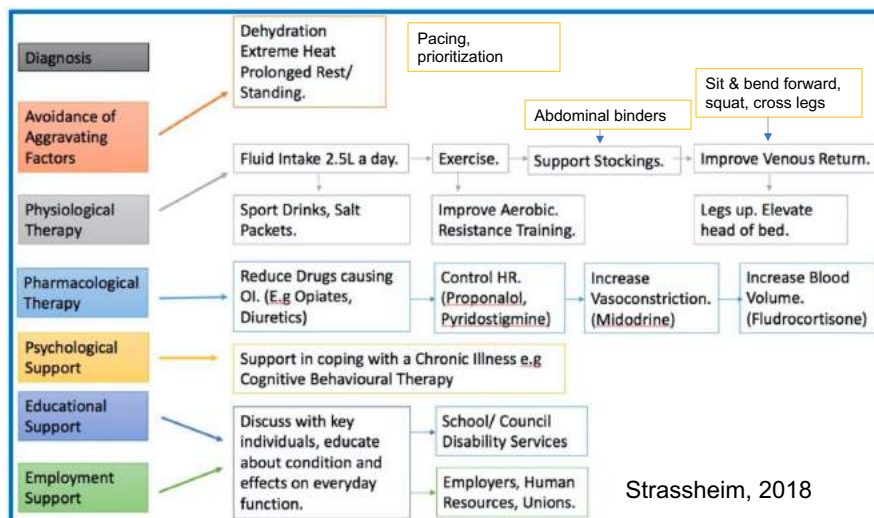
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Managing Fatigue

HSD 107:
Fatigue in
HSD & POTS



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Managing Poor Quality Sleep

- Address pain interfering with sleep
 - Positioning for decreased pain
 - General pain management
 - Mindfulness meditation/relaxation
- Sleep hygiene
 - Cool, dark room; winding down routine; avoid screens 1-2 hrs before bed
- Physiological quieting, relaxation training
- Regular exercise
- Good information at <https://sleep.org> ..



HSD 107:
Fatigue in
HSD & POTS

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Decrease Blood Flow Changes

- Change positions slowly; contract muscles before movement, fidget
- Squat, sit with knees tucked, cross legs (squeezes blood out of legs & abdomen). Forceful coughing.
- Avoid hot environment (including long showers/baths), large meals, alcohol
- Skin cooling: cold showers, spray..
 - Raj, 2013; Cutitta, 2018, Fu, 2018







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Compression Garments for POTS

8-15 mmHg	15-20 mmHg	20-30 mmHg	30-40 mmHg
Mild Compression <small>(Low Tension)</small> 	Moderate Compression <small>(Medium Tension)</small> 	Firm Compression <small>(High Tension)</small> 	Extra Firm Compression <small>(Maximum Tension)</small> 


MILD COMPRESSION (8-15 mmHg)
Best for healthy legs with few or no visible symptoms. For proactive and preventative wear.

MODERATE COMPRESSION (15-20 mmHg)
Best for legs with minor to moderate symptoms. The common starting point for first time wear.

FIRM COMPRESSION (20-30 mmHg)
Best for legs with major symptoms and/or severe conditions. Wear when specifically directed by a doctor or health care provider.

EXTRA-FIRM COMPRESSION (30-40 mmHg)
Best for legs with severe conditions. Wear when specifically directed by a doctor or health care provider.

- Compression stockings 20-40 mmHg
 - Consider compressive sports clothing
 - Abdominal binder/compression
 - Compression tights for PoTS should be waist high for maximum benefit.
- https://www.potsuk.org/compression_clothing




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POTS Exercises: Starting Out

If you are very deconditioned, start easy:

- Lying down exercises encourage blood return
 - Squeeze pillow between legs
 - Squeeze pillow between palms
 - Ankle alphabets
 - Leg lifts
 - Core exercises (lying down)
 - Muscle stretching (careful to protect hypermobile joints)
- Recumbent (horizontal) cardio exercises
 - Pool exercise, recumbent bike, rowing
- Strength training..
 - <http://www.dysautonomiainternational.org/page.php?ID=43>

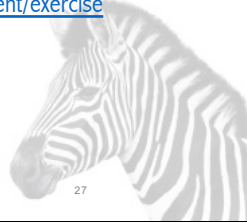


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POTS Exercise: Progression

- Depends on your starting point...
- Progress exercises gradually
 - Start horizontal, progress to vertical
 - Start with lower extremity exercise, add upper
 - May need to start with compression garments
- Focus on LE resistance, then gentle aerobic exercise
- Exercise guides:
 - The Levine Protocol: <http://standinguptopots.org/treatment/exercise>
 - <https://heartofthevalley.us/docs/levin-protocol-example/> ..
 - POTS-specific exercise videos available at: <http://www.dysautonomiainternational.org/index.php>



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Gastrointestinal Issues in POTS

- Nausea and/or vomiting
- GERD/indigestion
- Abdominal pain & bloating
- Early satiety (feeling full)
- Rapid or delayed gastric emptying
- Constipation or diarrhea
- Increased POTS symptoms after eating..

HSD 106: Gut Issues in HSD, MCAS & POTS



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DUMPING SYNDROME

Occurs 15-30 Minutes After Eating

- Epigastric Fullness
- Weakness
- Dizziness, vertigo
- Diaphoresis
- Tachycardia
- Abdominal Cramping
- Self-Limiting

No Fluids With Meals
No High Carbs i.e., Bread, Potatoes

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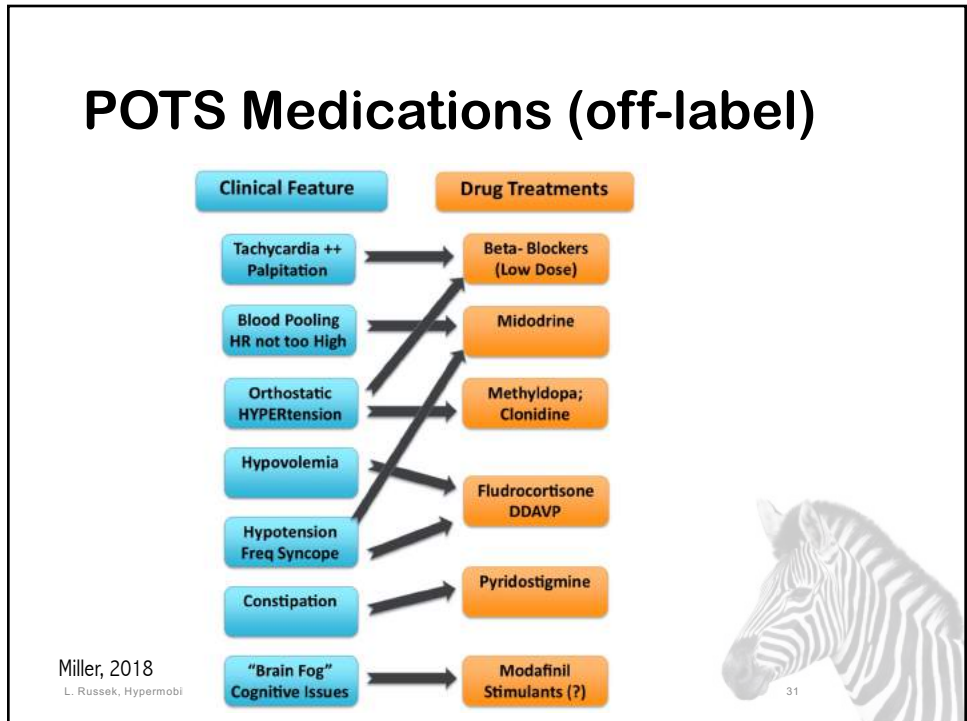
Gastroparesis/Constipation

- Education about gastroparesis in EDS/HSD
- Aerobic exercise
- Deep breathing
- “Belly-button presses”
- Trigger point management through self-care or manual therapy?
- Abdominal propulsive massage?
Harrington & Haskvitz, *Phys Ther.* 2006;86:1511-19)
- Visceral mobilization (additional training needed)..


Figure.
Path of propulsive abdominal bowel massage taught to patient.

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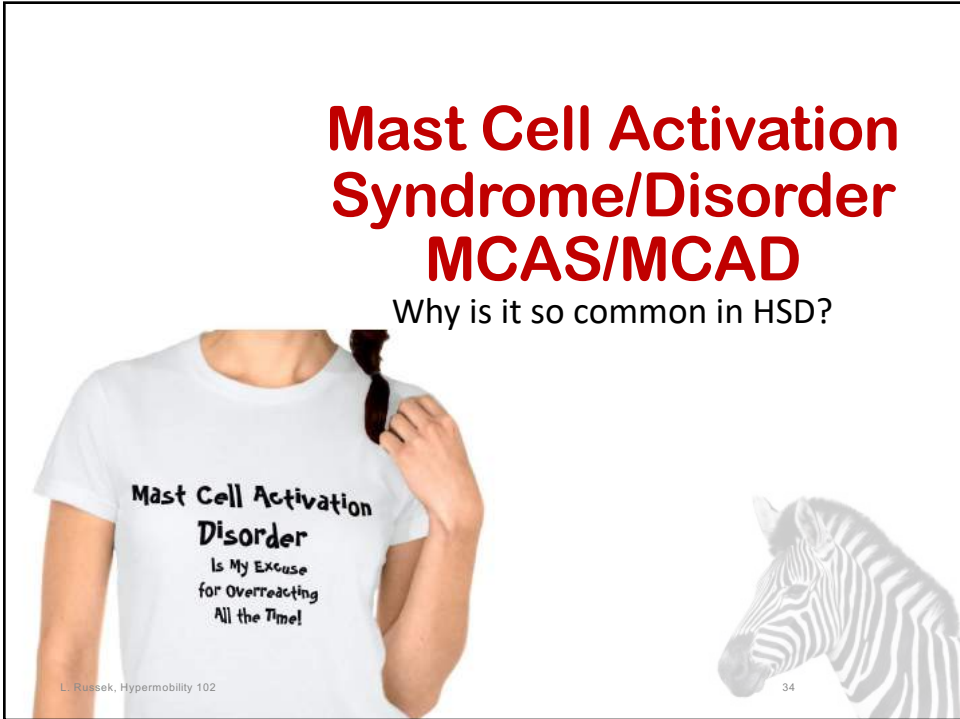
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- ## POTS Medications (off-label)
- Vasoconstrictors
 - Midodrine
 - Octreotide
 - Droxidopa
 - Phenylephrine (Sudafed PE)
 - Blood volume expansion
 - Fludrocortisone
 - Desmopressin
 - Erythropoietin (EPO)
 - Intravenous Saline
 - Slowing heart rate
 - Beta blockers (propranolol, bisoprolol, metoprolol)
 - Ivabradine
 - Antidepressants (SSRI or SNRI)
 - Bupropion, Paroxetine, Sertraline increase blood pressure
 - Avoid vasodilator & sympathomimetic meds..
- www.potsuk.org
www.dysautonomiainternational.org
<http://standinguptopots.org/treatment/medicine>
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What is a MAST CELL?

Mast cells are a part of the immune system.

- 1 Mast cells are well-known for releasing histamine during allergic reactions, such as in pollen or insect sting allergies.
- 2 They're found in most tissues throughout the body, especially those that interact with the outside environment including the lungs gastrointestinal tract and skin.
- 3 They play an important role in anaphylaxis!
- 4 Mast cells play a role in inflammation, help defend against pathogens and are involved in wound healing and tissue repair
- 5 They can detect and respond to foreign substances.
- 6 When a mast cell is activated by a trigger, these granules release many mediators (chemicals that mediate reactions leading to symptoms) Histamine is one of the most common example of the many mediators that can be released during degranulation.

MAST CELL DISEASE
Happens when these cells aren't behaving normally.

TickedOffMastCells.Org

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Some common SYMPTOMS of MAST CELL DISEASE

that are caused by mast cell mediator release

Patients may have a few or many symptoms

- NEUROLOGICAL**: headache, brain fog, cognitive dysfunction, anxiety, depression
- CUTANEOUS (SKIN)**: flushing of the face/neck/chest, hives, skin rashes, itching with or without rash
- EAR/NOSE/THROAT/RESPIRATORY**: nasal itching and congestion, throat itching and swelling, wheezing, shortness of breath
- CARDIOVASCULAR**: light-headedness, syncope (fainting), rapid heart rate, chest pain, low blood pressure, high blood pressure at the start of a reaction, blood pressure instability
- GASTROINTESTINAL**: diarrhea, nausea, vomiting, abdominal pain, bloating, gastroesophageal reflux disease (GERD)
- SKELTAL**: bone/muscle pain, osteopenia, osteoporosis
- GYNECOLOGICAL**: uterine cramps, bleeding
- URINARY**: bladder irritability, frequent voiding
- SYSTEMIC AND/OR ORGAN SPECIFIC**: anaphylaxis, angioedema (swelling)

Prevalence estimated at 17% - Molderings, 2013

Symptoms can be **SUDDEN and UNPREDICTABLE** in onset

AND MORE...
LEARN MORE AT tmsforacure.org

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MCAS: Skin Problems



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<https://tmsforacure.org/visual-guide-skin-lesions/>

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MCAS: Diagnostic Criteria

- It is really difficult to formally diagnose
- A. Diagnostic criteria:
 - A. Typical symptoms of severe, recurrent (episodic) systemic MCA, involving ≥ 2 organ systems
 - B. Involvement of MC documented by biochemical studies (increased serum tryptase is preferred marker)
 - C. Response of symptoms to therapy with MC-stabilizing agents or drugs blocking mediator release (Valent, 2019)

Prevalence is hotly contested..



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MCAS Common Triggers

MAST CELL DISEASE COMMON TRIGGERS
 These generalized triggers are common, but each patient has their own specific sensitivities.
not just a picnic in the park
 Reactions are often **disabling and dangerous.**

Stress Physical, emotional and environmental stress are all major triggers, as is fatigue. Unpredictable symptoms can make living with mast cell disease very challenging!

Medication Get a headache? Careful! Certain medications can be triggering.

Specific Foods Especially histamine containing or releasing foods

Alcohol Opiates & NSAIDs

Odors

Insect Stings & Bites

Exercise Even modest exercise can be triggering for some.

Temperatures HOT or COLD

And more! Patients can react to a wide range of triggers!

LEARN MORE AT tmsforacure.org

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Migraine & MCAS Triggers

HSD 108: Headaches

- Migraines & headaches reported in 63% of people with MCAS (Afrin, 2017)
- Mast cells contribute to migraines through a neuroinflammatory process
- Histamine in the CNS causes migraines

Migraines:

- Stress
- Changes in sleep schedule
- Alcohol (especially red wine)
- Diet: histamine, MSG, chocolate, cheese, dairy, artificial sweeteners, cured meats
- Strong smells
- Sunlight
- Dehydration
- Hormones
- Caffeine
- Weather changes
- (<https://americanmigrainefoundation.org/resource-library/top-10-migraine-triggers/>)

Mast Cell Activation:

- Stress
- Fatigue, changes in sleep schedule
- Alcohol (especially red wine)
- Diet: ripe cheese, dried meat or sausage, tomato, nuts, pickled foods, cured meats fish, food additives
- Strong smells
- Sunlight
- Exercise
- Medications (NSAIDs, antibiotics, opioids)
- Insect and other venoms
- Infections (viral, bacterial, fungal)
- Mechanical irritation, friction
- (<https://tmsforacure.org/symptoms/symptoms-and-triggers-of-mast-cell-activation/>)

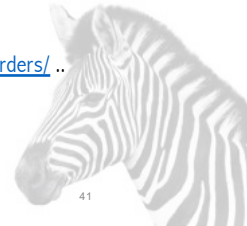
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MCAS Management

- Avoid triggers, especially foods
 - Probably histamine containing or releasing foods
- Substitute 'safe' meds for mast cell activators
 - (Molderings, 2016)
- Physiological quieting
 - Relaxation, meditation, yoga, Tai chi, etc.
- Medication (Molderings, 2016)
 - [https://tmsforacure.org/treatments-2/medications-treat-mast-cell-disorders/..](https://tmsforacure.org/treatments-2/medications-treat-mast-cell-disorders/)



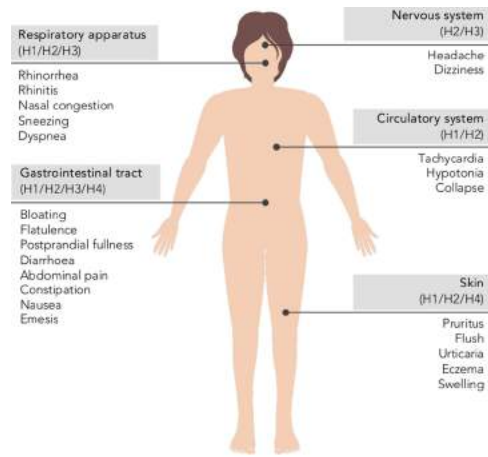
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Dietary Histamine Intolerance

HSD 106: Gut Issues in HSD, MCAS, POTS



- Histamine that crosses from the gut to blood stream causes systemic effects
- Some foods contain a lot of histamine, or cause mast cells to release histamine
- Histamine is normally metabolized in the gut by DAO (diamine oxidase)
 - Some people lack DAO
 - Some foods and medications inhibit DAO
 - There is a blood test for DAO
 - You can take DAO supplements



Comas-Basté, 2020

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HSD 106: Gut Issues in HSD, MCAS, POTS

Low Histamine Diet

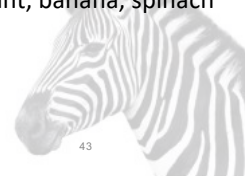
Low Histamine Foods to Eat

- Fresh meat and freshly caught fish.
- Non-citrus fruits.
- Eggs, mozzarella, ricotta.
- Gluten-free grains, such as quinoa corn and rice.
- Dairy substitutes, such as coconut milk and almond milk.
- Fresh vegetables except as noted
- Cooking oils, such as olive oil.

<https://www.healthline.com/health/low-histamine-diet>
 Good resource at:
https://www.histaminintoleranz.ch/downloads/SIGHI-Leaflet_HistamineEliminationDiet.pdf
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High Histamine Foods to Avoid

- Fermented dairy products, such as cheese (especially aged), yogurt, sour cream, buttermilk, and kefir.
- Fermented or pickled vegetables
- Vinegar, kombucha, miso, soy sauce
- Cured or fermented meats, such as sausages, salami, and fermented ham.
- Wine, beer, alcohol, and champagne
- Fermented grains: sourdough bread
- Tomatoes, eggplant, banana, spinach
- Soy milk
- Most nuts..



Low FODMAP Diet

A low FODMAP diet may help people with gastrointestinal problems like bloating, gas, or irritable bowel syndrome (IBS).



Avoid		Enjoy		
<p>Excess Fructose</p> <ul style="list-style-type: none"> • Fruit: apple, mango, nashi, pear, canned fruit (in natural juice, watermelon). • Sweeteners: fructose, high fructose corn syrup, corn syrup, honey • Concentrated fructose: concentrated fruit, large servings of fruit, dried fruit, fruit juice. <p>Lactose</p> <ul style="list-style-type: none"> • Milk: milk from cows, goats, or sheeps • Custard, ice cream • Yogurt • Cheese: soft, unfermented cheeses like cottage, cream, mozzarella, ricotta 	<p>Fructans</p> <ul style="list-style-type: none"> • Asparagus • Beetroot • Broccoli • Brussels sprouts • Cabbage • Eggplant • Fennel • Garlic • Leek • Onion (all) • Shallots <p>Cereals: wheat and rye in large amounts (e.g. bread, crackers, cookies, couscous, pasta)</p> <p>Fruit: custard apple, persimmon, watermelon</p> <p>Misc: chicory, dandelion, inulin</p> <p>Galactans</p> <ul style="list-style-type: none"> • Legumes: Beans, baked beans, chickpeas, kidney beans, lentils 	<p>Polyols</p> <ul style="list-style-type: none"> • Apple • Apricot • Avocado • Blackberry • Cherry • Lichee • Nashi • Nectarine • Peach • Pear • Plum • Prune • Watermelon <p>Vegetables: Green bell pepper, mushrooms, sweet corn</p> <p>Sweeteners: sorbitol (K20), mannitol (K21), sorbitol (963), malitol (966), xylitol (967)</p>	<p>Fruit</p> <ul style="list-style-type: none"> • Banana • Blueberry • Boysenberry • Cantaloupe • Cranberry • Dates • Grape • Grapefruit • Honeydew melon • Kiwi • Lemon • Lime • Mandarin • Orange • Passionfruit • Pawpaw • Raspberry • Rhubarb • Rockmelon • Star anise • Strawberry • Tangelo <p>Misc</p> <ul style="list-style-type: none"> • Sweeteners - sucrose, glucose, artificial sweeteners not ending in "ol", and sugar in small quantities • Honey substitutes - small quantities of golden syrup, maple syrup, molasses, and treacle 	<p>Vegetables</p> <ul style="list-style-type: none"> • Alfalfa • Artichoke • Bamboo shoots • Bean shoots • Beet • Bok choy • Carrot • Celery • Choke • Choy sum • Endive • Ginger • Green beans • Lettices • Olives • Parsnip • Potato • Pumpkin • Red bell pepper • Silver beek • Spinach • Summer squash (yellow) • Swede • Sweet potato • Turnip • Tomato • Zucchini <p>Starch</p> <ul style="list-style-type: none"> • Gluten free bread or cereal products • 100% spelt bread • Rice • Oats • Polenta • Other arrowroot, millet, psyllium, quinoa, sorghum, tapioca <p>Dairy</p> <ul style="list-style-type: none"> • Milk: lactose-free milk, oat milk, rice milk, soy milk (check for additives) • Cheeses - hard cheeses, brie, and camembert • Yogurt (lactose free) • Ice cream substitutes: gelato, sorbet • Butter substitutes (e.g. olive oil)



MCAS Medications

Talk to your
doctor

- **H1 antihistamines:** help with itching, abdominal pain, flushing, headaches, brain fog
- **H2 antihistamines:** help with gastrointestinal symptoms and overall mast cell stability
- **Mast cell stabilizers:** help with stomach and intestinal symptoms and brain fog
- **Leukotriene inhibitors:** help with respiratory symptoms and overall mast cell stability (all mast cell activation symptoms)
- **Aspirin therapy** (*under direct supervision of a physician*): if tolerated and if prostaglandins are elevated, helps with flushing, brain fog and bone pain

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Summary

- POTS/Dysautonomia and MCAS are common in people with hypermobility/hEDS
- POTS and MCAS are often overlooked by MDs
- Understanding these conditions can help you avoid aggravating factors and do more to care for yourself
- Improvements are often slow but can be dramatic!.

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Web Resources

•POTS:

- www.potsuk.org
- <http://www.dysautonomiainternational.org>
 - POTS video: <http://www.dysautonomiainternational.org/page.php?ID=30>
 - School accommodations: <http://www.dysautonomiainternational.org/page.php?ID=107>
 - Extensive patient guide POTS: <http://www.dysautonomiainternational.org/pdf/Rowe01summary.pdf>

•MCAS: <https://www.tmsforcure.org>

- <https://www.mastzellaktivierung.info/en/introduction.html>
- Booklet for health care providers: <https://tmsforcure.org/special-edition-for-health-care-professionals/>

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Web Resources

•EDS-specific

- www.ehlers-danlos.com
- www.hypermobility.org
- <https://webpace.clarkson.edu/~lrussek/hsd.html>
- Potsdam Fibro/EDS Support Group: <https://webpace.clarkson.edu/~lrussek/pfsg.html>

- Disjointed | Navigating the Diagnosis and Management of hypermobile Ehlers-Danlos Syndrome and Hypermobility Spectrum Disorders (book). Diana Jovin, ed.

- Excellent fatigue self-management resources at: <https://www.newcastle-hospitals.nhs.uk/services/chronic-fatigue/>

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Questions?



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MCAS OTC Medications

Some First Generation H1 Antihistamines

Brand Name	Generic Name
Atarax®	Hydroxyzine hydrochloride
Benadryl®	Diphenhydramine
Chlortrimeton®	Chlorpheniramine
Doxepin®, Sinequan®	Doxepin hydrochloride
Tavist®	Clemastine

Some Second Generation H1 Antihistamines (may tend to cause less drowsiness)

Brand Name	Generic Name
Allegra®	Fexofenadine
Claritin®	Loratidine
Clarinex®	Desloratidine
Xyzal®	Levocetirizine
Zyrtec®	Cetirizine

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Table 3. Some H2 Antihistamines

More MCAS Medications

Some H2 Antihistamines

Brand Name	Generic Name
Axid®	Nizatidine
Pepcid®	Famotidine
Tagament®	Cimetidine
Zantac®	Ranitidine

Some Leukotriene Inhibitors

Brand Name	Generic Name
Singulair®	Montelukast
Accolate®	Zafirlukast
Zyflo®/Zyflo CR®	Zileuton

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And More MCAS Medications

Mast Cell Stabilizers

Brand Name	Generic Name
Gastrocrom®	Oral cromolyn sodium
Zaditor®/Zaditen® (in Europe)*	Ketotifen
Algonot, Neuroprotect, etc.	Food supplements containing bioflavonoids such as quercetin and luteolin
Bayer aspirin; Aspirin; ASA	Aspirin, under the direct supervision of a physician!

Proton Pump Inhibitors to Help with GERD

Brand Name	Generic Name
Aciphex®	Rabeprazole
Dexilant®	Dexlansoprazole
Nexium®	Esomeprazole
Prevacid®	Lansoprazole
Prilosec®	Omeprazole
Protonix®	Pantoprazole

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Medications That Inhibit DAO

Table 2. Active ingredients with an experimentally demonstrated inhibitory effect on the DAO enzyme [23,28,80,81].

Active Ingredient	Indication
Chloroquine	Antimalarial
Clavulanic acid	Antibiotic
Colistimethate	Antibiotic
Cefuroxime	Antibiotic
Verapamil	Antihypertensive
Clonidine	Antihypertensive
Dihydralazine	Antihypertensive
Pentamidine	Antiprotozoal
Isoniazid	Antituberculous
Metamizole	Analgesic
Diclofenac	Analgesic and anti-inflammatory
Acetylcysteine	Mucoactive
Amitriptyline	Antidepressant
Metoclopramide	Antiemetic
Suxamethonium	Muscle relaxant
Cimetidine	Antihistamine (H2 antagonist)
Prometazina	Antihistamine (H1 antagonist)
Ascorbic acid	Vitamin C
Thiamine	Vitamin B1

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