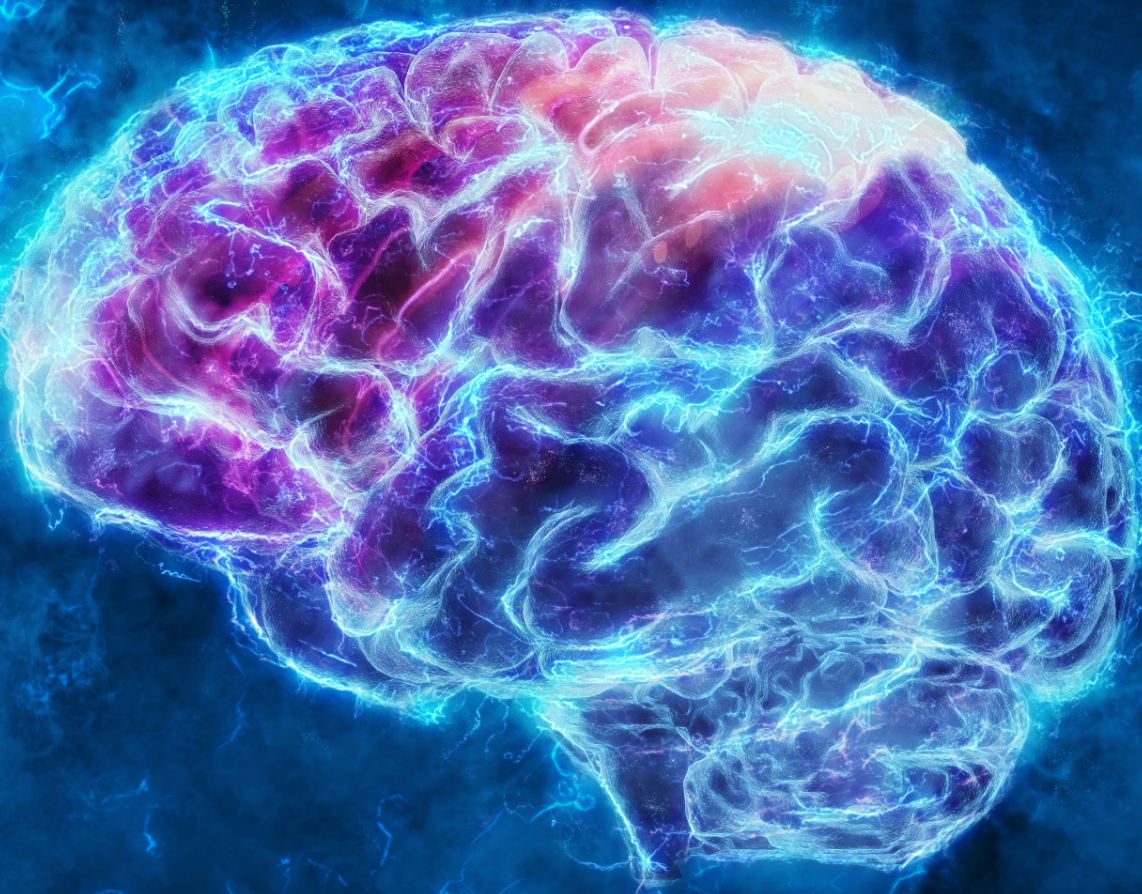


# ANS OVERVIEW

AUTONOMIC NERVOUS SYSTEM



**MORNINGSIDE**  
MEDICAL EQUIPMENT

# ANS OVERVIEW

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## GENERAL OVERVIEW OF ANS

The Autonomic Nervous System is made up of 3 systems: Sympathetic (SNS), Parasympathetic (PSNS), and Enteric (ENS). While the ENS is part of the ANS system, it's primarily involved in digestive processes.

Your sympathetic and parasympathetic systems create a balancing act. Your sympathetic nervous system activates body processes, and your parasympathetic deactivates or lowers them. That balance is key to your body's well-being and your ongoing survival. The part of your brain that runs autonomic functions is your Hypothalamus. This structure isn't part of your autonomic nervous system, but is a key part of how it works.

The ANS is the part of the nervous system that controls involuntary body functions (functions you don't consciously control) like:

- HEART RATE
- BLOOD PRESSURE
- BREATHING
- DIGESTION
- BODY AND SKIN TEMPERATURE
- HORMONAL FUNCTION
- BLADDER FUNCTION
- SEXUAL FUNCTION
- and many other functions



## SNS-SYMPATHETIC NERVOUS SYSTEM - 'FIGHT OR FLIGHT'

SNS enables the body to handle stressors via the “fight-or-flight” response. This reaction primarily regulates blood vessels. The SNS is constantly active, even in non-stressful situations. SNS regulates immunity through the innervation of immune organs such as the spleen, thymus, and lymph nodes, which influence may up- or down-regulate inflammation.

## PSNS-PARASYMPATHETIC NERVOUS SYSTEM 'REST & DIGEST'

An easy acronym to remember how and where the PSNS works is **SLUDD**. This stands for:

- **S**alivation: As part of its rest-and-digest function, the PSNS stimulates production of saliva, which contains enzymes to help your food digest.
- **L**acrimation: Lacrimation is a fancy word for making tears. Tears keep your eyes lubricated, preserving their delicate tissues.
- **U**rination: The PSNS contracts the bladder, which squeezes it so urine can come out.
- **D**igestion: The PSNS stimulates the release of saliva to promote digestion. It also enacts peristalsis, or the movement of the stomach and intestines, to digest food as well as release bile for the body to digest fats.
- **D**efecation: The PSNS constricts the sphincters in the intestine and moves digested food material down the digestive tract so a person can have a bowel movement.

\*This is also why doctors may also call the parasympathetic system the “feed and breed” system.

\*\*According to the American Heart Association, a person's resting heart rate can be one indicator of how well a person's PSNS, specifically the vagus nerve, is working (when unmedicated).

### \*\*\*PSNS and The VAGUS NERVE

The vagus nerve, CN X, makes up about 75% of the PSNS, which is responsible for the “rest and digest” processes. The vagus nerve promotes cardiac relaxation and decreases contractility in the atria (and less so in the ventricles). Due to the expansive nature of the vagus nerve, it has been described as an ideal “early warning system” for foreign invaders as well as for monitoring the body's recovery. Up to 80% of vagal fibers are sensory and innervate nearly all major organs.

## ENS-ENTERIC NERVOUS SYSTEM - 'THE GUT'S BRAIN'

The enteric nervous system (ENS) is the largest and most complex subdivision of the peripheral nervous system. The ENS regulates the major enteric processes such as immune response, detecting nutrients, motility, microvascular circulation, intestinal barrier function, and epithelial secretion of fluids, ions, and bioactive peptides. In short, the enteric nervous system has a complex role in the small intestine, interacting with all cell types to modulate motility, secretion, pain perception, and inflammation

\*Diabetes and Enteric degeneration

Diabetes can result in loss of enteric neurons as well as neuronal dysfunction and subsequent gastrointestinal complications. This condition is associated with the development of autonomic neuropathy.

## KEY DISORDERS

### **Common signs or symptoms suggesting dysautonomia, or disorders of the ANS:**

The symptoms of autonomic nervous system conditions depend on the location of the damage. With conditions like Type 2 diabetes, the damage can happen in many places throughout your body.

### **The most likely symptoms of autonomic nervous system damage include:**

- Heart rhythm problems (including arrhythmias)
- Dizziness or passing out when standing up
- Trouble swallowing (dysphagia)
- Trouble digesting food (including gastroparesis)
- Constipation
- Incontinence (bladder or bowel)
- Sexual dysfunction
- Sweating too much (hyperhidrosis) or not sweating enough (anhidrosis)
- Problems tolerating hot temperatures

**Autonomic Neuropathy can be present in nearly any system. Orthostatic Hypotension is the most common Dysautonomia condition, but there are numerous others:**

- Cardiovascular
  - Fixed heart rate
  - Postural hypotension
  - Resting tachycardia
- Gastrointestinal
- Dysphagia
  - Gastroparesis; nausea, vomiting, abdominal fullness
  - Constipation
- Genitourinary
  - Bladder atony
- Pupillary
  - Absent/delayed light reflexes
  - Decreased pupil size
- Sexual
  - Erectile dysfunction
  - Retrograde ejaculation
- Sudomotor
  - Anhidrosis
  - Gustatory sweating
- Vasomotor
  - Cold extremities (due to loss of vasomotor responses)
  - Edema (due to loss of vasomotor tone and increased vascular permeability)

## **Dysautonomia**

Dysautonomia refers to an autonomic nervous system (ANS) that doesn't function as it should, and typically involves a group of symptoms. When the ANS doesn't work the way it should, it can cause heart and blood pressure problems, breathing trouble, loss of bladder control and many other problems.

## **Metabolic Syndrome**

Metabolic syndrome is a collection of conditions that often occur together and increase your risk of diabetes, stroke and heart disease. The main components of metabolic syndrome include obesity, high blood pressure, high blood triglycerides, low levels of HDL cholesterol and insulin resistance.

Metabolic Syndrome can also be defined as a cluster of biochemical and physiological abnormalities associated with the development of cardiovascular disease and type 2 diabetes.

"the new research may suggest treatments to combat metabolic syndrome, such as anti-inflammatory drugs"

## **Autonomic Metabolic Syndrome**

What is autonomic metabolic syndrome? Subjects with metabolic syndrome have autonomic nervous system dysfunction characterized by predominance of the sympathetic nervous system in many organs, i.e. heart, kidneys, vasculature, adipose tissue, and muscles.

## **Common disorders of or related to the Enteric Nervous System (ENS)**

- Hirschsprung Disease
- Irritable Bowel Syndrome (IBS)
- Irritable Bowel Disease (IBD)
  - Crohn's Disease
  - Ulcerative Colitis (UC)
- Functional Dyspepsia (FD)
- Hypoganglionosis

## COMMON TREATMENTS

Treating the Parasympathetic Nervous System Pharmacologically

**There are three ways to manipulate the PSNS:**

1. Administering a muscarinic agonist (increases PNS activity)
2. Administering a muscarinic antagonist (decreases PNS activity)
3. Administering a cholinesterase inhibitor, which results in an increase of ACh in the synaptic cleft (increases PNS activity)

**Common muscarinic agonists include:**

1. Muscarine (the prototype, but not a clinically used drug), Pilocarpine, Methacholine, Bethanechol

**Common muscarinic antagonists, which are also called anticholinergics, antimuscarinics, and vagolytics, include:**

1. Atropine (the prototype and widely used clinically)
2. Others: Benztropine, Glycopyrrrolate, Ipratropium (inhaled only), Tolteridine, Oxybutynin, Hyoscine, Scopolamine

**Common cholinesterase inhibitors include:**

1. Neostigmine, Physostigmine, Edrophonium, Echothiophate (eye drops only)



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