

# GLOSSARY

<sup>123</sup>I-Metaiodobenzylguanidine (123I-MIBG) *A particular type of radioactive drug that is used to visualize sympathetic nerves such as in the heart.*

3,4-Dihydroxyphenylacetaldehyde (DOPEGAL) *An intermediate metabolite of norepinephrine.*

3,4-Dihydroxyphenylacetic acid (DOPAC) *The main intra-neuronal metabolite of dopamine.*

3,4-dihydroxyphenylglycol (DHPG) *The main intra-neuronal metabolite of norepinephrine.*

3-Methoxy, 4-hydroxyphenylglycol (MHPG) *A major end-product in the metabolism of norepinephrine.*

5-Hydroxyindoleacetic acid (5-HIAA) *The main end-product in the metabolism of serotonin.*

5-hydroxytryptophan (5-HTP) *The amino acid precursor of serotonin.*

6-[<sup>18</sup>F]Fluorodopamine (<sup>18</sup>F-Dopamine) *A drug that is the catecholamine, dopamine, with a fluorine atom attached that is a radioactive isotope called a positron emitter. Positron-emitting fluorodopamine is used to visualize sites of sympathetic innervation such as in the heart.*

6-[<sup>18</sup>F]Fluorodopa (<sup>18</sup>F-DOPA) *A drug that is the catechol amino acid, DOPA, with a fluorine atom attached that is a radioactive isotope called a positron emitter. Positron-emitting fluorodopa is used to visualize sites of dopaminergic innervation in the brain.*

-A-

AAG (abbreviation for autoimmune autonomic ganglionopathy).

**Acetylcholine** *A particular chemical that functions as the messenger of the parasympathetic nervous system and the sympathetic cholinergic system. Acetylcholine is also the mediator of transmission in ganglia.*

**ABPM** (Abbreviation for ambulatory blood pressure monitoring).

**Acetate** *A small organic molecule that is a common building block in the body.*

**Acetylcholinesterase (AChE)** *The enzyme that rapidly breaks down acetylcholine.*

**Acetyl coenzyme A** *A small organic molecule that is combined with choline to form the chemical messenger acetylcholine.*

**ACH** (Abbreviation for acetylcholine)

**Adenosine triphosphate (ATP)** *The main source of chemical energy in the body.*

**ADH** (Abbreviation for antidiuretic hormone).

**Adrenal, adrenal gland** *Glands near the tops of the kidneys that produce steroids such as cortisol and catecholamines such as adrenaline.*

**Adrenalectomized** *Having the adrenal glands removed.*

**Adrenaline** *The same as epinephrine.*

**Adrenal medulla** *The “marrow,” or core, of the adrenal gland.*

**Adrenoceptors** *Specialized proteins in cell membranes of various tissues that bind to the catecholamines norepinephrine (noradrenaline) or epinephrine (adrenaline), resulting in changes in the state of activity of the cells.*

**Adrenocortical** *Referring to the adrenal cortex, the outer layer of the*

*adrenal gland.*

**Adrenomedullary hormonal system (AHS)** *The part of the autonomic nervous system where epinephrine (adrenaline) is released from the adrenal medulla.*

**AHS** *Abbreviation for adrenomedullary hormonal system, synonymous with the sympathetic adrenergic system (SAS).*

**AIDS** *Abbreviation for acquired immunodeficiency syndrome, the final stage of HIV disease.*

**<sup>131</sup>I-Albumin** *Albumin that is tagged with a trace amount of radioactive iodine (<sup>131</sup>I). Injection of <sup>131</sup>I-albumin is the basis for a test to measure the blood volume.*

**Albumin** *A prominent protein in the bloodstream.*

**Alcohol dehydrogenase** *An enzyme that breaks down alcohol.*

**Aldehyde dehydrogenase (ALDH)** *An enzyme involved in the intra-neuronal metabolism of dopamine.*

**Aldehyde/aldose reductase (AR)** *An enzyme that converts some aldehydes to glycols.*

**Aldehydes** *A particular class of chemicals containing a CHO group. Aldehydes formed within cells are very reactive.*

**ALDH** (Abbreviation for aldehyde dehydrogenase)

**Aldosterone** *The main sodium-retaining steroid produced in the adrenal gland.*

**Algorithm** *A step by step procedure for solving a problem.*

**Alizarin red** *A pigment powder that turns purple when wet, used in sweat testing.*

*Allostasis A concept according to which goal values for internal variables can change as a function of circumstances.*

*Allostatic load Cumulative wear and tear from allostasis.*

*Alpha-1 adrenoceptors A particular type of adrenoceptors that is prominent in blood vessel walls. Stimulation of alpha-1 adrenoceptors in blood vessel walls causes the vessels to tighten.*

*Alpha-2 adrenoceptor blocker A drug that blocks alpha-2 adrenoceptors.*

*Alpha-2 adrenoceptors A type of adrenoceptor that is present on particular cells in the brain, in blood vessel walls, in several organs, and on sympathetic nerve terminals.*

*Alpha-adrenoceptors One of the two types of receptors for norepinephrine (noradrenaline) and epinephrine (adrenaline).*

*Alpha-methylDOPA (Aldomet™) A drug that resembles levodopa and is an effective drug to treat high blood pressure.*

*Alzheimer's disease A common neurodegenerative disease causing dementia.*

*Amphetamines Drugs that share a particular chemical structure that causes decreased appetite, increased attention, decreased sleep, and behavioral activation.*

*Amine A chemical containing a nitrogen atom with hydrogen atoms attached.*

*Amino acid A particular type of chemical that contains an amino chemical group and a carboxylic acid chemical group and is a "building block" of proteins.*

*Amygdala A structure of the limbic system in the brain, involved with*

*emotional responses.*

*Amyloidosis Any of a variety disorders in which a type of protein called amyloid is deposited within body organs.*

*Anemia A decreased amount of red blood cells. Anemic patients look pale and feel tired.*

*Angiotensin II A particular peptide hormone that produces blood vessel constriction. Angiotensin II is a key part of the renin-angiotensin-aldosterone system.*

*Anoxia Absence of oxygen.*

*ANS (Abbreviation for *autonomic nervous system*) Antidiuretic hormone (ADH). Same as vasopressin.*

*Anti-Hu An antibody produced in the setting of some cancers.*

*Arginine vasopressin (Synonymous with vasopressin)*

*Arrector pili muscles Small muscles that cause the hair to stand up.*

*Arrhythmia Abnormal rhythm, usually referring to abnormal heart rhythm.*

*Arterial blood sampling Obtaining blood from a large blood vessel that moves blood away from the heart.*

*Arterial pressure The blood pressure in an artery.*

*Artery A large blood vessel that carries blood from the heart. Arteries (with the exception of the arteries to the lungs) carry oxygen-rich blood at high pressure.*

*Arterial baroreflex A rapid reflex that keeps arterial blood pressure within bounds.*

*Arteriole Tiny arteries that carry blood from the heart, like “twigs” of the arterial tree. The overall amount of constriction of arterioles*

*is the main determinant of the total resistance to blood flow in the body. Constriction of arterioles therefore increases the blood pressure, just like tightening the nozzle increase the pressure in a garden hose.*

*Arteriosclerosis Hardening of arteries.*

*Ascorbic acid (Synonymous with vitamin C)*

*Ashkenazi Referring to people of Eastern European Jewish ethnicity.*

*Asphyxiation Severe, sudden loss of oxygen supply due to lack of breathing, such as in suffocation.*

*Aspiration Inhalation of a foreign body into the airway.*

*Asthma A disease of the airways that involves episodes of airway spasm, producing wheezing, coughing, and shortness of breath.*

*Asystole A state of no electrical activity and therefore no pumping activity of the heart. Asystole is a cause of sudden death.*

*ATPase An enzyme that breaks down ATP releasing energy.*

*Atropine A drug that blocks muscarinic acetylcholine receptors.*

*Auerbach's plexus A nerve network in the wall of the gastrointestinal tract, part of the enteric nervous system.*

*Autocrine/paracrine A type of arrangement where a chemical messenger acts on the same or nearby cells from the site of its release.*

*Autoimmune Referring to an abnormal immune response against substances or tissues in the body.*

*Autoimmune autonomic ganglionopathy (AAG) A rare form of autonomic failure associated with high levels of antibody to the neuronal nicotinic receptor, resulting in impaired transmission of*

*autonomic nerve impulses in ganglia.*

**Autoimmune autonomic neuropathy** *A form of autonomic failure associated with an “attack” of the immune system on a part of the autonomic nervous system.*

**Autonomic** *Referring to the autonomic nervous system.*

**Autonomic function testing** *Testing of one or more functions of the autonomic nervous system.*

**Autonomic myasthenia** *Nickname for a form a chronic autonomic failure associated with an antibody to the acetylcholine receptor responsible for transmission of nerve impulses in ganglia.*

**Autonomic nerve supply** *The amount of autonomic nerve fibers and terminals in a tissue or organ.*

**Autonomic nervous system (ANS)** *The body’s “automatic” nervous system, responsible for many automatic, usually unconscious processes that keep the body going.*

**Autotoxicity** *Referring to harmful effects of a chemical to the cells in which it is produced.*

**AVP** (Abbreviation for arginine vasopressin).

**Axon reflex** *A type of reflex where stimulation of nerves going towards the brain leads directly to a change in nerve activity towards a nearby site.*

-B-

**Baroreceptor reflex** *The same as baroreflex.*

**Baroreceptors** *Stretch or distortion receptors in the walls of large blood vessels such as the carotid artery and in the heart muscle.*

**Baroreflex** *A rapid reflex where an increase in blood pressure sensed by the brain leads to relaxation of blood vessels and a decrease in heart rate. The baroreflex keeps blood pressure stable.*

**Baroreflex failure** *An unusual disorder in which the baroreceptor reflex fails, resulting in variable blood pressure and orthostatic intolerance.*

**Barostat** *The “thermostat” for blood pressure regulation. The barostat is located in the lower brainstem.*

**Basal ganglia** *Structures in the brain that are below the cortex and above the brainstem.*

**Basic** *Having an alkaline pH.*

**Benign prostatic hypertrophy (BPH)** *Long-term enlargement of the prostate gland that does not result from a cancer.*

**Benzodiazepine** *A type of drug with a particular chemical structure that causes sedation, an anti-anxiety effect, relaxation of skeletal muscle, and decreased seizure activity.*

**Beta-1 adrenoceptors** *One of the three types of beta-adrenoceptors, prominent in the heart muscle.*

**Beta-2 adrenoceptors** *One of the three types of beta-adrenoceptors, prominent in blood vessel walls in skeletal muscle, in the heart muscle, and on sympathetic nerve terminals.*

**Beta-3 adrenoceptors** *One of the three types of beta-adrenoceptors, prominent in fatty tissue.*

**Beta-Adrenoceptor blocker** *A type of drug that blocks one or more types of beta-adrenoceptors.*

**Beta-Adrenoceptors** *One of the two types of receptors for the*

- norepinephrine (noradrenaline) and epinephrine (adrenaline).*
- Bethanechol (Urecholine™)** *A drug that stimulates some receptors for acetylcholine, mimicking some of the effects of stimulating the parasympathetic nervous system.*
- Bicuspid aortic valve** *A congenital abnormality in which the aortic valve has two rather than the normal three leaflets.*
- Biomarker** *An objective measure of a biological or disease process.*
- Blood glucose** *The concentration of the important metabolic fuel, glucose (dextrose), in the blood.*
- Blood pressure** *The pressure in arteries. Systolic blood pressure is the maximum pressure while the heart is beating, and diastolic blood pressure is the minimum pressure between heartbeats.*
- Blood volume** *The total volume of blood in the body. Most of the blood volume is in veins.*
- Blood-brain barrier** *A physical and chemical barrier that keeps compounds in the bloodstream from entering the substance of the brain.*
- Botulinum toxin** *A toxic chemical released from a particular bacterium. Botulinum toxin blocks release of acetylcholine.*
- BPH (Abbreviation for benign prostatic hypertrophy)**
- Bradykinesia** *Slow movement, especially slow initiation of movement.*
- Brain fog** *Decreased ability to concentrate, remember, or carry out executive functions.*
- Brainstem** *The lower part of the brain, located just above the spinal cord. The brainstem includes the hypothalamus, midbrain, pons, and, just at the top of the spinal cord, the medulla oblongata.*

Beighton score *A scoring system for rating joint hyperextensibility.*

Bromocriptine *A drug that blocks a class of dopamine receptors.*

Bronchioles *Small airway tubes in the lungs.*

-C-

Cachexic *Having the appearance of wasting, as in end-stage cancer.*

Caffeic acid *A particular chemical found in coffee beans that is not caffeine.*

Caffeine *A chemical found in high concentrations in coffee beans.*

Carbidopa *A drug that inhibits the conversion of L-DOPA (levodopa) to dopamine. Because carbidopa does not enter the brain from the bloodstream, carbidopa blocks the conversion of L-DOPA to dopamine outside the brain.*

Cardiac output *The amount of blood pumped by the heart in one minute.*

Cardiovascular *Referring to the heart and blood vessels.*

Carotid arteries *The main arteries in the neck. In the upper neck, the common carotid artery splits into the external and internal carotid arteries.*

Carotid sinus *A region at the split of the common carotid artery into the internal and external carotid arteries. In humans, the carotid sinus contains abundant distortion receptors called baroreceptors.*

Carotid sinus stimulation *A method to control high blood pressure using a device that stimulates the carotid sinus.*

Catechol-O-methyltransferase (COMT) *A major enzyme metabolizing*

*catechols in non-neuronal cells.*

**Catecholaldehyde hypothesis** *A concept in which aldehyde metabolites of catecholamines cause or contribute to neuronal death, such as in Parkinson's disease.*

**Catecholamine autotoxicity** *A concept in which spontaneous or enzyme-catalyzed oxidation of cytoplasmic catecholamines causes or contributes to neuronal death, such as in Parkinson's disease.*

**Catechols** *Chemicals with a structure that includes two adjacent hydroxyl groups on a benzene ring. The catecholamines norepinephrine (noradrenaline), epinephrine (adrenaline), and dopamine are catechols, as are the non-catecholamines levodopa and carbidopa in Sinemet™.*

**Catecholamine** *A member of an important chemical family that includes adrenaline.*

**Catecholamines** *Norepinephrine (noradrenaline) epinephrine (adrenaline), and dopamine.*

**Catechols** *Chemicals that have a particular structure in them called catechol. Dopamine, norepinephrine, adrenaline, and dopamine are catechols.*

**Caudate** *A brain structure that is part of the striatum, in the basal ganglia.*

**Cell membrane norepinephrine transporter (NET)** *The transporter responsible for "recycling" of norepinephrine back into sympathetic nerves.*

**Cellcept (Mycophenolic acid)** *A drug that inhibits the immune system.*

Central nervous system *The brain and spinal cord.*

Central Sympathetic Hyperactivity *A condition where there is an increase in the rate of sympathetic nerve traffic in the body as a whole.*

Cerebellar *Referring to the cerebellum.*

Cerebellar atrophy *A decrease in size of the cerebellum, a part of the brain.*

Cerebellum *A part of the brain, located above and behind the brainstem, that plays important roles in coordination of movement and the sense of orientation in space.*

Cerebrospinal fluid (CSF) *The clear fluid that bathes the brain and spinal cord.*

Cheese effect *Side effects such as paroxysmal hypertension from eating tyramine-containing foodstuffs in the setting of monoamine oxidase inhibition.*

Chiari malformation *An anatomic abnormality where part of the brainstem falls below the hole between the brain and spinal cord.*

Choline *A small organic molecule that is used in the body to produce acetylcholine.*

Choline acetyltransferase (ChAT) *An enzyme that converts choline to acetylcholine.*

Chorea *A type of quick abnormal movement of the hands or feet.*

Chromosome *Organized structures of DNA in cells. Humans have 23 pairs of chromosomes, including 2 sex chromosomes (X and Y in males, 2 X chromosomes in women).*

Chronic autonomic failure *Long-term failure of the autonomic*

*nervous system.*

**Chronic fatigue syndrome** *A condition where the patient has a sense of persistent fatigue for more than six months, without an identified cause.*

**Chronic orthostatic intolerance** *Long-term inability to tolerate standing up.*

**Ciliary ganglion** *A parasympathetic ganglion at the back of the eye socket.*

**Clearance** *The volume of fluid cleared of a substance in one minute.*

**Clonidine** *A drug that stimulates alpha-2 adrenoceptors in the brain, in blood vessel walls, and on sympathetic nerve terminals. Clonidine decreases release of norepinephrine from sympathetic nerves and decreases blood pressure.*

**Clonidine suppression test** *A test based on effects of clonidine administration on blood pressure and plasma levels of chemicals such as norepinephrine (noradrenaline).*

**Coat hanger phenomenon** *Pain in the back of the neck and shoulders during standing. This can be a symptom of chronic orthostatic intolerance.*

**Common faint** *The same as neurocardiogenic syncope, autonomically mediated syncope, and reflex syncope.*

**Compensatory activation** *A situation where failure of one effector system compensatorily activates another effector system, allowing a degree of control of a monitored variable.*

**Complex 1 (NADH:ubiquinone oxidoreductase)** *The first enzyme in the mitochondrial respiratory chain.*

Composite Autonomic Severity Scale (CASS) *A scale to rate the severity of autonomic failure.*

Composite Autonomic Symptom Score 31 (COMPASS 31) *An autonomic symptom scale that contains a total of 31 questions in 6 domains, yielding an overall autonomic symptom score from 0 to 100.*

Conductance *A measure of how easily electricity flows along a particular path.*

Congenital *Present from birth.*

Constipation *Infrequent and difficult bowel movements.*

Contraction band necrosis *A particular pathologic appearance of dead heart muscle that can result from high levels of adrenaline.*

Conversion reaction *Neurological symptoms such as numbness, blindness, or paralysis without an identified organic cause.*

Core temperature *The temperature at the core of your body, such as the temperature of the arterial blood.*

Coronary arteries *The arteries that deliver blood to the heart muscle.*

Coronary artery disease *A disease where the coronary arteries become narrowed or blocked by fatty deposits and thickening of the walls.*

Coronary ischemia *Lack of adequate blood flow to heart muscle via the coronary arteries.*

Corpus striatum (synonymous with striatum) *The caudate and putamen in the basal ganglia of the brain.*

Cranial nerves *The twelve nerves that come through holes in the skull from the brainstem and go to many organs, from the eyes to the gastrointestinal tract.*

Cyclic adenosine monophosphate (cAMP) *A key chemical “second messenger” inside cells.*

Cytoplasm *The gel-like solution that fills cells.*

-D-

d-Amphetamine *The dextro- mirror image form of amphetamine.*

DAT (Abbreviation for the cell membrane dopamine transporter)

DAT scan *A type of scan of the brain that is used to detect loss of dopamine terminals in the striatum, as in Parkinson disease.*

Desmopressin (DDAVP) *A synthetic form of vasopressin, the anti-diuretic hormone.*

DBH (Abbreviation for *dopamine*-beta-hydroxylase)

Dehydration *Abnormal lack of water in the body.*

Delayed orthostatic hypotension *A fall in blood pressure after prolonged standing.*

Dementia with Lewy bodies (DLB, synonymous with Lewy body dementia, LBD) *A form of dementia in which the brain contains abundant Lewy bodies.*

Denervation supersensitivity *Increased sensitivity of a process as a result of loss of delivery of a chemical messenger to its receptors that normally mediate the process.*

Detrusor *A smooth muscle in the wall of the urinary bladder that causes the urinary bladder to contract.*

Dextro-amphetamine (Same as d-amphetamine)

DHPG (Abbreviation for 3,4-dihydroxyphenylglycol)

Diabetes *A disease state with excessive volume of urination and*

*excessive water intake. Diabetes mellitus results from lack of insulin effects in the body. Diabetes insipidus results from lack of antidiuretic hormone (vasopressin) in the body.*

Diabetic autonomic neuropathy (DAN) *Dysautonomia in the setting of diabetes mellitus.*

Diagnosis *A decision about the cause of a specific case of disease.*

Dihydrocaffeic acid *A particular chemical that is a breakdown product of caffeic acid.*

Dihydropteridine reductase (DHPR) deficiency *A rare, atypical form of phenylketonuria (PKU).*

Distress *A form of stress that is consciously experienced, where the individual senses an inability to cope, attempts to avoid or escape the situation, elicits instinctively communicated signs, and activates the adrenal gland.*

DNA *A long molecule, in the shape of a double helix, that contains genetic instructions.*

DOPA decarboxylase (DDC, LAAAD) *The enzyme responsible for conversion of L-DOPA to dopamine in the body.*

DOPAC (Abbreviation for 3,4-dihydroxyphenylacetic acid)

DOPAL (Abbreviation for 3,4-dihydroxyphenylacetaldehyde)

DOPET (Abbreviation for 3,4-dihydroxyphenylethanol)

Dopamine *One of the body's three catecholamines.*

Dopamine sulfate *A particular metabolite of dopamine.*

Dopamine-beta-hydroxylase (DBH) *The enzyme responsible for conversion of dopamine to norepinephrine in the body.*

Dysautonomia *A condition in which a change in the function of one or*

*more components of the autonomic nervous system adversely affects health.*

Dyspnea *Shortness of breath.*

-E-

Eaton-Lambert syndrome *A rare autoimmune condition in which there is decreased acetylcholine release at neuromuscular junctions, resulting in weakness.*

Edinger-Westphal nucleus *A cluster of nerve cells in the midbrain from which parasympathetic nerves travel to the eye.*

Effector *An entity that influences the level of a monitored variable. The sympathetic noradrenergic system is an example of an effector for controlling the blood pressure.*

Effector sharing *A situation in which two homeostats use the same effector.*

Ehlers-Danlos syndrome *A type of inherited disease of structural tissue that involves the protein, collagen. Some signs of Ehlers-Danlos syndrome are stretchy skin and overly flexible joints.*

Enkephalins *A class of compounds made in the body that bind to opiate receptors.*

Enteric nervous system (ENS) *A component of the autonomic nervous system found in the walls of the gastrointestinal tract.*

Enzyme *A type of protein that accelerates a biochemical process.*

Ephedrine *A particular drug that acts in the body as a sympathomimetic amine.*

Epinephrine (adrenaline) *The main hormone released from the adrenal*

*medulla. Epinephrine is one of the body's three catecholamines.*

EPI (Abbreviation for epinephrine)

Erectile impotence *Impotence from failure to have or sustain erection of the penis.*

Ergotamine *A particular drug that constricts blood vessels.*

Erythromelalgia *A condition in which the patients complain of burning pain in the skin.*

Erythropoietin *A hormone that stimulates the bone marrow to produce red blood cells.*

Exocytosis *Release of the contents of vesicles into the extracellular fluid, after fusion and poration of the vesicles with the cell membrane.*

Extracellular fluid (ECF) *The fluid outside cells of the body. The ECF is composed of the interstitial fluid and the blood plasma.*

Extravasation *Leakage of fluid from blood vessels into the surrounding tissues.*

-F-

Fainting *Relatively rapid loss of consciousness that is not caused by heart disease.*

False-positive test *A positive test result when the patient does not actually have the disease.*

Familial Dysautonomia (FD) *A rare inherited disease that features abnormalities in sensation and in functions of the autonomic nervous system.*

FBF (Abbreviation for forearm blood flow)

FD (Abbreviation for Familial Dysautonomia)

F-DOPA *Fluorinated DOPA. 18F-DOPA is used to image the striatum in the brain by PET scanning.*

Fenfluramine *A particular drug that acts in parts of the nervous system where serotonin is the chemical messenger.*

Fibromyalgia *A condition that involves widespread, chronic pain and tenderness of muscle or connective tissues.*

First messenger *A hormone or other chemical messenger that acts on receptors on target cells. Second messengers within the target cells mediate the changes in cell functions.*

Flipping the clinic *A term referring to empowerment and responsibility of people in their medical care.*

Florinef™ (Brand name for fludrocortisone)

Fludrocortisone (Florinef™) *A type of artificial salt-retaining steroid drug.*

Fluorodopamine *A drug that is the catecholamine, dopamine, with a fluorine atom attached. The fluorine atom can be a type of radioactive isotope called a positron emitter. Positron-emitting fluorodopamine is used to visualize sympathetic nerves such as in the heart.*

Forearm blood flow (FBF) *The rate of inflow of blood into the forearm, usually expressed in terms of blood delivery per 100 cc of tissue volume per minute.*

Forearm vascular resistance (FVR) *The extent of resistance to blood flow in the forearm blood vessels.*

FVR (Abbreviation for forearm vascular resistance)

-G-

**G protein** *A particular type of protein (guanine nucleotide-binding protein) that mediates the effects of receptor occupation.*

**Galvanic skin response (GSR)** *A physiological change in the ability of the skin to conduct electricity, due to a change in the amount of sweat.*

**Ganglia** *Plural of ganglion.*

**Ganglion** *A clump of cells where autonomic nerve impulses are relayed between the spinal cord and target organs such as the heart.*

**Ganglion blocker** *A type of drug that inhibits the transmission of nerve impulses in ganglia.*

**Gastroparesis** *Poor stomach motility, so that it does not pass food properly.*

**Gene** *A segment of DNA that directs development and behavior in an organism. If the genetic material were an encyclopedia, the genes would be sentences.*

**Glands** *Organs that release into the bloodstream.*

**Glial cytoplasmic inclusions (GCIs)** *Inclusion bodies in the cytoplasm of glial cells.*

**Glomerulus** *A microscopic tuft of arterioles that filters the plasma in the kidneys.*

**Glossopharyngeal nerve** *The ninth cranial nerve.*

**Glucagon** *A hormone that plays a major role in regulation of glucose*

*levels.*

**Glucocorticoid** *A type of steroid made in the adrenal cortex that increases glucose levels.*

**Glucose** *One of the body's main fuels. The same as dextrose.*

**Growth hormone** *A hormone released by the pituitary gland that promotes growth.*

**GSR (Abbreviation for galvanic skin response)** *A rapid increase in electrical conduction in the skin as a result of an increase in production of sweat.*

**GTP cyclohydrolase (GTPCH)** *An enzyme in the biosynthesis of tetrahydrobiopterin.*

**Guillain-Barré syndrome** *A condition involving autoimmune attack on neurons of the peripheral nervous system.*

**Gustatory** *Referring to tasting something.*

**-H-**

**Heart block** *An impediment to conduction of impulses in the electrical conduction pathways of the heart.*

**Heart failure** *A condition where the heart fails to pump an amount of blood for the tissues of the body.*

**Hematocrit** *The percent of the total blood volume that is the volume of the red blood cells.*

**Hemorrhage** *Rapid blood loss from the circulation.*

**Hereditary sensory and autonomic neuropathy type III (HSAN III)**  
*(Synonymous with familial dysautonomia)*

**Heterozygous** *A situation in which a genetic mutation is found*

*on one chromosome but not the other.*

**Hirschsprung's disease** *A disease of newborns in which there is failure to pass meconium or stool due to a loss of enteric ganglion neurons.*

**HIV disease** *A disease caused by the human immunodeficiency virus. The final stage of HIV disease is AIDS (acquired immunodeficiency syndrome), in which there is progressive failure of the immune system, setting the stage for certain life-threatening infections and cancers.*

**Homeostasis** *A condition in which levels of monitored variables of the body are stable.*

**Homeostat** *A general term for a comparator that functions like a thermostat. Information reaching the brain about the status of a monitored variable is compared with settings in the brain, and when there is a sensed discrepancy between what is sensed and what is set, this leads to altered activities of effectors that reduce the discrepancy. Homeostats are metaphors, as there are no actual physiological comparators in the body.*

**Homovanillic acid (HVA)** *The main end-product of dopamine metabolism.*

**Homozygous** *A situation in which the same genetic mutation is found on both chromosomes*

**Hormone** *A chemical released into the bloodstream that acts at remote sites in the body.*

**Horner's syndrome** *A syndrome of lid lag (ptosis), constricted pupil (miosis), and decreased sweating (anhidrosis) due to disruption*

*of sympathetic nerve traffic.*

HR (Abbreviation for heart rate)

HSAN (Abbreviation for hereditary sensory and autonomic neuropathy.

Huntington's disease *An inherited, progressive neurodegenerative disease of adults that involves involuntary limb movements and dementia.*

Hyperadrenergic Orthostatic intolerance *A condition where an inability to tolerate standing up is combined with signs or symptoms of excessive levels of catecholamines such as epinephrine (adrenaline).*

Hyperdynamic Circulation Syndrome *A condition where the rate and force of the heartbeat are abnormally increased.*

Hyperglycemia *A condition in which there is a high blood glucose level.*

Hyperhidrosis *A condition involving excessive sweating.*

Hypernoradrenergic Hypertension *Long-term high blood pressure associated with increased release of norepinephrine from sympathetic nerve terminals.*

Hypertension *A condition where the blood pressure is persistently increased.*

Hypertrophied *An increase in the volume of an organ or tissue, due to enlargement of the component cells.*

Hypoglycemia *A condition where there is an abnormally low blood glucose level.*

Hypothalamus *A region of the brain in above the brainstem that is part of the limbic system.*

Hypothermia *A condition where there is an abnormally low body temperature.*

-I-

IBS (Abbreviation for irritable bowel syndrome)

IkappaB kinase-associated protein (IKAP) *The protein product encoded by the gene, IKBKAP. FD patients have decreased levels of this protein in nervous system tissue.*

IKBKAP *A particular gene, mutation of which causes familial dysautonomia.*

Impotence *Inability to have erection of the penis or ejaculation of semen.*

Ileus *Distension of the bowel due to lack of propulsive movement of contents.*

Inappropriate Sinus Tachycardia *Excessive fast heart rate because of excessively fast firing of the heart's pacemaker in the sinus node.*

Incontinence *Sudden involuntary urination or bowel movement.*

Inderal™ (Brand name of propranolol)

Indirectly acting sympathomimetic amine *A type of drug that produces effects similar to those of stimulating sympathetic nerves.*

Innervation *Nerve supply.*

Insulin *An important hormone released from the pancreas that helps to control the blood glucose level.*

Intravenous saline *Physiological salt-in-water solution that is given by vein.*

Ionotropic *Referring to movement of ions across the cell membrane.*

Iontophoresis *A way using electricity to deliver a drug to the skin surface.*

Isoproterenol (Isuprel™)

Isoproterenol Infusion Test *A test where isoproterenol is given by vein, to see if this affects the ability to tolerate tilting or to measure the body's responses to stimulation of beta-adrenoceptors.*

Isuprel™ (Brand name of isoproterenol)

-J-

Juxtaglomerular apparatus *A specialized structure near glomeruli of the kidneys that is involved with regulating renal blood flow and the rate of glomerular filtration.*

-K-

Kinky hair disease *The same as Menkes disease.*

-L-

LAAAD (Abbreviation for L-aromatic-amino-acid decarboxylase)

L-aromatic-amino-acid decarboxylase (LAAAD) *The enzyme that converts levodopa to dopamine in the body.*

L-dihydroxyphenylalanine (Levodopa, L-DOPA)

L-Dihydroxyphenylserine (L-DOPS) *A particular amino acid that is converted to norepinephrine by the action of L-aromatic-amino-acid decarboxylase.*

L-DOPA (Abbreviation for L-dihydroxyphenylalanine, the same as

levodopa)

L-DOPS (Abbreviation for L-dihydroxyphenylserine, brand name Northera™)

Lambert-Eaton myasthenic syndrome (Same as Eaton-Lambert syndrome)

Lesion *A damaging abnormality in a tissue.*

Levodopa *The same as L-DOPA and L-dihydroxyphenylalanine.*

Lewy body *A type of inclusion body in the cytoplasm of neurons. Lewy bodies contain abundant precipitated alpha-synuclein.*

Lewy body dementia (LBD; synonymous with dementia with Lewy bodies)

Lewy body diseases *A group of diseases characterized by Lewy bodies. The autonomic synucleinopathies Parkinson's disease with orthostatic hypotension and pure autonomic failure are examples.*

Limbic system *A group of brain structures above the level of the brainstem and below the level of the cerebral cortex.*

Locus ceruleus (LC) *A cluster of nerve cells in the pons of the brainstem. The LC is the main source of norepinephrine in the brain.*

Low pressure baroreceptors *Distortion receptors in the walls of the atria of the heart and great veins.*

Lumbar puncture *A procedure where a needle is inserted into the lower back, such as to sample cerebrospinal fluid.*

-M-

- Ma huang* Chinese name for an herbal remedy that is ephedrine
- Macula densa* An area of specialized cells in the juxtaglomerular apparatus that are sensitive to sodium chloride.
- MAO (Abbreviation for monoamine oxidase)
- MAO-A and MAO-B (Abbreviations for monoamine oxidase-A and monoamine oxidase-B)
- MAP (Abbreviation for mean arterial pressure)
- Mean arterial pressure (MAP) *The average blood pressure in the arteries.*
- Meconium *The earliest stool of a newborn.*
- Meissner's plexus *A network of neurons in the submucosal layer of the wall of the small intestine.*
- Melanin *A black pigment formed from oxidation of tyrosine or catechols.*
- Menkes disease *A rare inherited disease of copper metabolism that causes death in early childhood.*
- Mesolimbic *Referring to a nervous pathway from the midbrain to the limbic system.*
- Metabotropic receptor *A type of membrane receptor that acts through a second messenger. The muscarinic cholinergic receptor is an example of a metabotropic receptor.*
- Metanephrine (MN) *The O-methylated metabolite of epinephrine.*
- Methylphenidate (Ritalin™) *A particular drug in the family of amphetamines.*
- MIBG (Abbreviation for metaiodobenzylguanidine)
- Midodrine (Proamatine™) *A particular drug that can be taken as a*

*pill and constricts blood vessels by way of stimulation of alpha-adrenoceptors, used commonly in the treatment of orthostatic hypotension and orthostatic intolerance.*

*Milieu Intérieur Claude Bernard's concept of the fluid environment of nearly constant composition bathes and nourishes the cells of the body.*

*Military anti-shock trousers (MAST) suit A type of inflatable trousers that decreases pooling of blood in the legs.*

*Mineralocorticoid A type of steroid that causes the body to retain sodium.*

*mmHg Abbreviation for millimeters of mercury, a measure of pressure.*

*Monitored variable A biological activity that can be sensed and the level of which can be controlled by effectors. Blood pressure, core temperature, and serum glucose levels are examples of monitored variables.*

*Monoamine A type of biochemical that contains a component called an amine group. Serotonin and adrenaline are monoamines.*

*Monoamine oxidase An enzyme localized to the outer mitochondrial membrane that metabolizes catecholamines and related chemicals.*

*Moxonidine A particular drug that decreases blood pressure by decreasing sympathetic nerve traffic.*

*MSA (Abbreviation for multiple system atrophy)*

*MSNA (Abbreviation for muscle sympathetic nerve activity)*

*Multiple system atrophy (MSA) A progressive disease of the brain that includes failure of the autonomic nervous system.*

**Muscarine** *A chemical found in some mushrooms that stimulates muscarinic cholinergic receptors.*

**Muscarinic** *One of the two types of acetylcholine receptors. The other is nicotinic.*

**Muscle sympathetic nerve activity (MSNA)** *Pulse-synchronous traffic in sympathetic post-ganglionic fibers in peripheral nerves.*

**Mutation** *A rare genetic change, like a “typo” in the genetic encyclopedia.*

**Myelin** *A fatty, electrically insulating material found in sheaths surrounding nerve fibers.*

**Myelinated** *Having a myelin sheath.*

**Myocardium** *Muscle tissue of the heart.*

**Myocytolysis** *A microscopic pathologic finding in the heart that can reflect death of heart muscle cells due to exposure to catecholamines.*

-N-

**NAD<sup>+</sup>** (Abbreviation for the oxidized form of nicotinamide adenine dinucleotide) *A type of co-enzyme required for some enzymes to function. NAD<sup>+</sup> is an oxidizing agent that accepts electrons.*

**nAChR** (Abbreviation for nicotinic acetylcholine receptor)

**NE** (Abbreviation for *norepinephrine*)

**Negative feedback loop** *A type of control system in which alteration in the input about a monitored variable leads to an opposing alteration in the output via an effector. If the overall feedback of the system is negative, then the level of the monitored variable*

*will tend to be stable. A thermostatic system is an example of a negative feedback loop. When the room temperature goes down, this leads to the furnace being turned on, which brings the room temperature back up.*

**Nerve terminal** *The end of a nerve fiber, from which chemical messengers are released.*

**Nerve traffic** *Electrical signals conducted within a nerve.*

**NET** (Abbreviation for cell membrane norepinephrine transporter)

**NET deficiency** *A rare cause of orthostatic intolerance resulting from decreased activity of the cell membrane norepinephrine transporter.*

**Neurally mediated hypotension (NMH)** *A sudden fall in blood pressure during provocative tilt table testing.*

**Neurally mediated syncope** *A condition that includes sudden loss of consciousness from a change in the function of the autonomic nervous system.*

**Neurasthenia** (Same as neurocirculatory asthenia).

**Neurocardiogenic syncope** (Same as Neurally Mediated Syncope).

**Neurochemical** *A chemical released from nervous tissue.*

**Neurocirculatory asthenia** *A condition closely related to chronic fatigue syndrome that features exercise intolerance without identified cause, described mainly in medical literature from the former Soviet Union.*

**Neurodegeneration** *Progressive loss of structure or function of neurons.*

**Neuroimaging tests** *Tests based on visualizing the nervous system.*

- Neuronal nicotinic receptor (nAChR) *The form of acetylcholine receptor that mediates ganglionic neurotransmission.*
- Neuropathic POTS *A form of postural tachycardia syndrome (POTS) thought to result from local or patchy loss of sympathetic nerves.*
- Neuropharmacologic *A type of drug effect that acts on nervous tissue or mimics chemicals released in nervous tissue.*
- Neurotransmitter *A chemical released from nerve fibers or terminals that produces effects on other cells nearby.*
- Nicotine *A chemical in tobacco that stimulates a particular type of receptor for the chemical messenger acetylcholine.*
- Nicotinic receptor *One of the two types of receptors for the chemical messenger acetylcholine. The other is muscarinic.*
- Nitroglycerine *A particular drug that relaxes walls of veins in the body.*
- Non-selective beta-adrenoceptor blockers *A type of drug that blocks all types of beta-adrenoceptors.*
- Noradrenergic *Referring to norepinephrine.*
- Norepinephrine (noradrenaline) *The main chemical messenger of the sympathetic nervous system that is responsible for much of regulation of the cardiovascular system by the brain.*  
*Norepinephrine is one of the body's three catecholamines.*
- Normal saline *A dilute solution of sodium chloride (table salt) that has the same concentration as in the serum.*
- Normetanephrine (NMN) *The O-methylated metabolite of norepinephrine.*
- NTS (Abbreviation for nucleus of the solitary tract)

Nucleus of the solitary tract (NTS) *The brainstem site of the initial synapse in the arterial baroreflex.*

Nucleus accumbens *A region at the bottom of the brain in front of the pre-optic area of the hypothalamus. The nucleus accumbens and the [olfactory tubercle](#) together form the [ventral striatum](#), part of the [basal ganglia](#).*

-O-

Oculogyric crisis *A reaction to certain drugs or medical conditions in which there is prolonged, involuntary upward deviation of the eyes.*

Optic nerve *The second cranial nerve, which transmits visual from the retina of the eye to the brain.*

Organic compound *A chemical containing carbon atoms that are bound to other atoms of other elements, especially hydrogen, nitrogen, or oxygen.*

Orthostasis *Standing up.*

Orthostatic hypotension *A fall in blood pressure when a person stands up. This has been defined by a fall in systolic blood pressure of 20 mm Hg or more or a fall in diastolic blood pressure of 10 mm or more when the person stands up.*

Orthostatic intolerance *An inability to tolerate standing up, due to a sensation of lightheadedness or dizziness.*

Orthostatic tachycardia *An excessive increase in pulse rate when a person stands up.*

Osmolality *A measure of the amount of particles dissolved in a fluid.*

Osmostat *The homeostat that keeps serum osmolality within bounds.*

-P-

Pacemaker *A device that produces electrical impulses in the heart.*

PAF (Abbreviation for *Pure autonomic failure*)

Palpitations *A symptom where the patient notes a forceful, rapid heartbeat or a sensation of the heart “flip-flopping” in the chest.*

Pancreas *An organ in the abdomen that secretes hormones such as insulin and digestive enzymes.*

Pandysautonomia *Failure of all components of the autonomic nervous system, such as in autoimmune autonomic ganglionopathy.*

Panic disorder *A condition that features a rapid buildup of fear or anxiety that the patient cannot control.*

Paraneoplastic *A consequence of cancer that is not due to the local presence of cancer cells.*

Parasympathetic nerve traffic *The rate of traffic in parasympathetic nerves.*

Parasympathetic nervous system (PNS) *One of the two branches of the autonomic nervous system, responsible for many “vegetative” functions such as gastrointestinal movements after a meal.*

Parasympathetic neurocirculatory failure *Failure to regulate the heart rate appropriately, such as during normal breathing or in response to the Valsalva maneuver.*

PARK1 *A form of familial Parkinson’s disease due to A53T mutation*

*of the gene encoding alpha-synuclein.*

**PARK4** *A form of familial Parkinson's disease due to triplication of the gene encoding alpha-synuclein.*

**Parkinson disease (PD)**, also called **Parkinson's disease** *A disease that involves slow movements, a form of limb rigidity called "cogwheel rigidity," and a "pill-roll" tremor that decreases with intentional movement. Other features of Parkinson disease include a mask-like facial expression, stopped posture, difficulty initiating or stopping movements, and small handwriting. The movement disorder in PD results from loss of dopamine-containing nerve terminals in a particular brain pathway called the nigrostriatal system. PD also involves abnormalities of the autonomic nervous system, including orthostatic hypotension.*

**Parkinson disease with orthostatic hypotension (PD+OH)** *Parkinson disease with a fall in blood pressure when the patient stands up.*

**Parkinsonian** *Having one or more features of Parkinson disease.*

**Parkinsonian form of MSA** *A form of multiple system atrophy that includes one or more features of Parkinson disease.*

**Partial dysautonomia (Same as Neuropathic POTS)** **PD** *Abbreviation for Parkinson disease.*

**Pathogenic** *Capable of causing disease.*

**Pentolinium** *A particular type of drug that blocks chemical transmission in ganglia.*

**Peptide** *A short chain of amino acids.*

**Peristalsis** *Gastrointestinal movements such as after a meal that move digested material.*

PET scanning (Abbreviation for positron emission tomographic scanning)

PGP 9.5 (Abbreviation for protein gene product 9.5, also known as ubiquitin C-terminal hydrolase 1, or UCHL-1) *A protein expressed by nerves that is used to visualize nerve fibers in tissue samples.*

pH *The negative log of the hydrogen ion concentration in an aqueous solution.*

Phen-Fen *Two drugs, phentermine and fenfluramine, prescribed together to decrease appetite and promote weight loss.*

Phentermine *A particular drug that acts in the body as a sympathomimetic amine.*

Phenylalanine *A particular amino acid*

Phenylalanine hydroxylase *The enzyme that converts phenylalanine to tyrosine. Phenylketonuria patients typically have low phenylalanine hydroxylase activity.*

Phenylephrine (Brand name Neo-Synephrine™) *A particular drug that constricts blood vessels by stimulating alpha-1 adrenoceptors.*

Phenylketonuria (PKU) *A disease of children that results from lack of activity of a particular enzyme, phenylalanine hydroxylase, resulting in a toxic buildup of phenylalanine in the body.*

Phenylpropanolamine (PPE) *A particular drug that acts in the body as a sympathomimetic amine.*

Pheo (slang for pheochromocytoma)

Pheochromocytoma *An abnormal growth that produces the*

*catecholamines norepinephrine (noradrenaline) or epinephrine (adrenaline).*

**Physiological** *Referring to a body function, as opposed to a body part.*

**Pituitary gland** *A gland located at the end of a stalk at the base of the brain that releases a variety of hormones.*

**Plasma** *The part of the blood that is left after anti-coagulated blood settles or is centrifuged (spun at a high rate in a tube).*

**Plasma epinephrine level** *The concentration of epinephrine (adrenaline) in the plasma.*

**Plasma metanephrines** *Plasma levels of the free (unconjugated) O-methylated metabolites of norepinephrine (normetanephrine) and epinephrine (metanephrine).*

**Plasma norepinephrine level** *The concentration of norepinephrine (noradrenaline) in the plasma.*

**Platelets** *Tiny particles in the blood that when activated clump together. Platelet plugs stop bleeding from punctures in blood vessel walls.*

**Pleiotropic** *A situation in which one gene affects multiple, seemingly unrelated traits.*

**PNS** *Abbreviation for parasympathetic nervous system.*

**Polymorphism** *A genetic change that is not as rare as a mutation but not so common as to be considered normal.*

**Polysomnography** *A type of sleep test in which multiple parameters are monitored.*

**Positive feedback loop** *A situation in which a change in input about a monitored variable lead to output that makes the change in input*

*even larger. For instance, if the room temperature in your house went up, and this led to the furnace being turned on, bringing the room temperature up even further, this would be a positive feedback loop. When there is a positive feedback loop, the level of the monitored variable becomes unstable.*

**Positron emission tomographic scanning (PET scanning)** *A type of nuclear medicine scan where a positron-emitting form of a drug is injected, and particular parts of the body become radioactive, with the radioactivity detected by a special type of scanner called a PET scanner.*

**Positron emitter** *A chemical that releases a special type of radioactivity called positrons.*

**Post-ganglionic nerves** *Nerves from the ganglia that deliver signals to nerve terminals in target tissues such as the heart.*

**Post-prandial hypotension** *A fall in blood pressure after eating a meal.*

**Postural tachycardia syndrome (POTS)** *A condition where the patient has a long-term inability to tolerate standing up, along with an excessive increase in pulse rate in response to standing.*

**Potassium** *An important element found in all cells of the body.*

**POTS (Abbreviation for Postural tachycardia syndrome)**

**Post-ganglionic** *A type of nerve that originates in ganglia. Sympathetic and parasympathetic nerves are examples of post-ganglionic nerves.*

**Power spectral analysis of heart rate variability** *A special type of test based on changes in the heart rate over time.*

**PPE (Abbreviation for phenylpropanolamine)**

- Prednisone *The name of a steroid drug commonly used to treat disorders involving inflammation.*
- Pre-ganglionic nerves *Nerves of the autonomic nervous system that come from cell bodies in the spinal cord and pass through the ganglia.*
- Pre-symptomatic *Before symptoms occur.*
- Presyncope *A feeling of near-fainting.* Proamatine™ (Brand name of midodrine) Procrit™ (Brand name of erythropoietin)
- Pro-drug *A drug that works by being converted in the body to an active compound. For instance, L-DOPS is a norepinephrine pro-drug.*
- Progressive Supranuclear Palsy (PSP) *A type of neurological syndrome with particular abnormalities of gaze.*
- Propranolol (Brand name Inderal™) *A drug that is the classical non-selective beta-adrenoceptor blocker.*
- Proton *A sub-atomic particle with a positive electric charge and mass of about 1 atomic mass unit.*
- Proton pump inhibitor (PPI) *A drug that inhibits secretion of acid in the stomach.*
- Provocative test *A test designed to evoke an abnormal response of the body.*
- Pseudoephedrine (Sudafed™) *A particular drug that acts in the body as a sympathomimetic amine.*
- Psilocybin *A psychedelic chemical found in some mushrooms.*
- Ptosis *Droopy eyelid.*
- Pupillometry *A test involving measuring the diameter of the pupils.*

Pupillomotor *Referring to constriction or dilation of the pupils.*

Pure autonomic failure (PAF) *A form of long-term failure of the autonomic nervous system where there is no clear evidence for degeneration of the brain.*

Putamen *A brain structure that is part of the striatum, in the basal ganglia.*

Pyridostigmine (Mestinon™) *A drug that works by blocking the enzyme that breaks down acetylcholine.*

-Q-

QSART (Abbreviation for Quantitative Sudomotor Axon Reflex Test)

Quantitative Sudomotor Axon Reflex Test (QSART) *A type of test of autonomic nervous system function based on the ability of drugs to evoke sweating.*

Quaternary ammonium ion *A particular chemical arrangement in which an nitrogen atom is bonded to 4 organic groups and is therefore positively charged regardless of the pH of the solution.*

-R-

Radiofrequency ablation *Destruction of a tissue by applying radiofrequency energy, which burns the tissue.*

RAS (Abbreviation for renin-angiotensin-aldosterone system)

Rasagiline *A drug that inhibits monoamine oxidase-B.*

Receptors *Special proteins in the walls of cells that bind chemical messengers such as hormones.*

Reflex *An involuntary, rapid response to a stimulus, mediated by a*

*reflex arc.*

Reflex syncope (Synonymous with neurocardiogenic syncope, vasovagal syncope, autonomically mediated syncope, and fainting)

REM sleep (Abbreviation for rapid eye movement sleep) *A stage of sleep involving active dreaming, in which the eyes move rapidly.*

REM Behavior Disorder (RBD) *A condition in which the limbs fail to stay relaxed during REM sleep. The patient acts out his or her dreams.*

Renal nerve ablation *A technique to treat hypertension by destroying sympathetic nerves of the kidneys.*

Renin *A enzyme of the renin-angiotensin-aldosterone system that converts angiotensinogen to angiotensin I.*

Renin-Angiotensin-Aldosterone system *A system that plays an important role in maintaining the correct amount of blood volume and sodium in the body.*

Reserpine *A drug that blocks the vesicular monoamine transporter and thereby depletes stores of monoamines such as catecholamines and serotonin.*

Respiratory sinus arrhythmia *The normal changes in pulse rate that occur with breathing.*

Riley-Day syndrome (synonymous with familial dysautonomia (FD))

Ritalin™ (Brand name of methylphenidate) *A particular drug that resembles amphetamine.*

Rituximab *An anti-autoimmune drug that destroys antibody-producing B cells.*

Ryanodine receptor *A member of a class of receptors that act as intracellular calcium channels.*

-S-

S-adenosyl methionine (SAME) *A molecule that is a source of methyl groups in some biochemical reactions.*

Sacral nerve *A spinal nerve coming from the lower-most portion of the spinal cord.*

Saline *A solution of salt in water.*

Salivation *Formation of spit.*

Salivary glands *Glands in the head that produce saliva.*

SAS (Abbreviation for sympathetic adrenergic system)

SCS (Abbreviation for sympathetic cholinergic system)

Scientific integrative medicine *A conceptual framework for linking systems biology with integrative physiology in order to understand disease mechanisms. Concepts of scientific integrative medicine include (i) negative feedback regulation, maintaining stability of the body's monitored variables; (ii) homeostats, which compare information about monitored variables with algorithms for responding; (iii) multiple effectors, enabling compensatory activation of alternative effectors and primitive specificity of stress response patterns; (iv) effector sharing, accounting for interactions among homeostats; (v) stress, applying a definition as a state rather than as an environmental stimulus or stereotyped response; (vi) distress, using a noncircular definition that does not presume pathology;*

*(vii) allostasis, corresponding to adaptive plasticity of feedback-regulated systems; and (viii) allostatic load, explaining chronic degenerative diseases in terms of effects of cumulative wear and tear.*

**Second messengers** *Molecules that relay signals received at receptors on the cell surface to target molecules in the cytoplasm or nucleus.*

**Secretomotor** *Referring to secretion from a gland, such as salivation, tear production, and sweating.*

**Selective Serotonin Reuptake Inhibitor (SSRI)** *A type of drug that inhibits neuronal uptake of serotonin.*

**Selegiline** *A drug that inhibits monoamine oxidase-B.*

**Sepiapterin reductase** *An enzyme in the synthetic cascade leading to tetrahydrobiopterin.*

**Serotonin** *A chemical messenger in a family called monoamines. Catecholamines such as adrenaline are also monoamines.*

**Shy-Drager syndrome (multiple system atrophy with sympathetic neurocirculatory failure)** *A form of nervous system disease where different pathways of the brain degenerate and the patient has a fall in blood pressure during standing, because of failure of the sympathetic nervous system.*

**Sign** *Something a doctor can observe or measure that provides objective evidence of a disease.*

**Sinemet™** *Brand name of levodopa combined with carbidopa*

**Sinus node** *The pacemaker area of the heart that normally generates the electrical impulses resulting in a coordinated heartbeat.*

**Sinus node ablation** *Destruction of the sinus node in the heart, usually as a treatment for excessively rapid heart rate.*

**Sjogren's syndrome** *An autoimmune condition characterized by dry mouth and dry eyes.*

**Skin sympathetic test (SST)** *A type of test of the sympathetic nervous system based on the ability of various drugs or environmental manipulations to increase secretion of sweat.*

**Sodium** *An important chemical element found in all body fluids.*

**Somatic nervous system** *The somatic nervous system is the main way the body deals with the "outside world," by way of its main target organ, skeletal muscle.*

**Smooth muscle cells** *The type of muscle cells in the heart and in blood vessel walls.*

**SNS** *Abbreviation for sympathetic noradrenergic system.*

**Somatostatin (Octreotide™)** *A type of drug that when injected can raise the blood pressure in patients with autonomic failure.*

**Sphincter** *A circular smooth muscle that normally maintains constriction of a body passage.*

**Spillover** *The estimated rate of entry of an endogenous compound into the bloodstream. Cardiac norepinephrine spillover is the rate of entry of norepinephrine into the venous drainage of the heart.*

**SSRI (Abbreviation for selective serotonin reuptake inhibitor)** *SSRIs block one of the main ways of inactivating and recycling the chemical messenger, serotonin. This increases delivery of serotonin to its receptors in the brain. SSRIs are used to treat*

*depression, anxiety, and other psychiatric or emotional problems.*

SST (Abbreviation for skin sympathetic test)

Stereoisomer *A mirror image structure of a chemical.*

Strain gauge *A testing device that sensitively measures stretch.*

Stress *A condition in which the brain senses a challenge to physical or mental stability that leads to altered activities of body systems to meet that challenge*

Striatonigral degeneration *A form of nervous system disease where the patient seems to have Parkinson disease but does not respond well to treatment with levodopa.*

Striatum (Same as corpus striatum) *A structure in the basal ganglia of the brain that includes the caudate and putamen.*

Stridor *A harsh inspiratory crowing noise, caused by obstruction or dysregulation of the vocal cords.*

Stroke volume *The amount of blood pumped by the heart in one heartbeat.*

Substantia nigra *A black pigmented region of the midbrain that is the major source of dopamine in the brain.*

Sudafed™ (Brand name of pseudoephedrine)

Sympathectomy *Surgical removal or destruction of ganglia, which results in absence of traffic in sympathetic nerves.*

Sympathetic adrenergic system *A part of the sympathetic nervous system for which adrenaline is the main chemical messenger. Synonymous with adrenomedullary hormonal system.*

Sympathetic cholinergic system (SCS) *A part of the sympathetic nervous system for which acetylcholine is the chemical*

*messenger. This part is especially important for regulation of sweating.*

**Sympathetic innervation** *The supply of nerve fibers and terminals in a tissue or organ.*

**Sympathetic nerve terminals** *Endings of sympathetic nerves, from which the chemical messenger, norepinephrine (noradrenaline) is released.*

**Sympathetic nerve traffic** *Nerve impulses in sympathetic nerve fibers.*

**Sympathetic nerves** *Nerves of the sympathetic nervous system.*

**Sympathetic nervous system** *One of the branches of the autonomic nervous system, responsible for many “automatic” functions such as constriction of blood vessels when a person stands up.*

**Sympathetic neurocirculatory failure** *Failure of regulation of the heart and blood vessels by the sympathetic nervous system.*

**Sympathetic noradrenergic system (SNS)** *A part of the sympathetic nervous system for which norepinephrine is the chemical messenger. This part is especially important for regulation of the heart and blood vessels.*

**Sympathetic neuroimaging** *Visualization of the sympathetic nerves in the body.*

**Sympathetic vasoconstrictor tone** *The status of constriction of blood vessels as a result of traffic in sympathetic nerves.*

**Sympathoadrenal imbalance (SAI)** *A situation in which plasma epinephrine levels increase to a greater extent than do plasma norepinephrine levels. SAI is a typical finding before or at the time of fainting.*

Sympathoadrenal system (also called the sympathetic adrenergic system, sympathico-adrenal system, or sympathoadrenomedullary system) *A name for the sympathetic nervous system and adrenomedullary hormonal system acting as a unit.*

Sympathomimetic amine *A type of drug that acts in the body like stimulation of the sympathetic nervous system.*

Sympathotonic orthostatic intolerance *Inability to tolerate standing up that is associated with excessive activity of the sympathetic nervous system.*

Symptom *A complaint about something abnormal a person notices that provides subjective evidence of a disease.*

Syncope *Sudden loss of consciousness due to decreased flow of blood to the brain.*

Syndrome *A set of symptoms that occur together.*

Synuclein *A particular dissolved protein found especially in nervous tissue.*

Synucleinopathies *A family of diseases characterized by deposition of the protein, alpha-synuclein, in the cytoplasm of affected cells. Parkinson's disease is an example of a synucleinopathy.*

Systolic blood pressure *The peak blood pressure while the heart is pumping out blood.*

-T-

Tachycardia *Excessively fast heart rate.*

Takotsubo cardiopathy *A form of stress-related acute heart failure that is most common in post-menopausal women and probably due to*

*high catecholamine levels.*

Temperomandibular joint disorder (TMJ) *A condition involving pain and decreased movement of the jaw joint.*

Tetrabenazine (TBZ) *A drug that blocks the type 2 vesicular monoamine transporter.*

Tetrahydrobiopterin (BH4) *A key co-factor for some enzymes, such as tyrosine hydroxylase.*

TH (Abbreviation for tyrosine hydroxylase)

Thermoregulatory sweat test (TST) *A test based on the ability of the patient to produce sweat in response to an increase in environmental temperature.*

Thyroid *Paired glands in the neck that produce the hormone, thyroxine.*

Tilt table testing *A test where the patient is tilted on a platform, to assess the ability of the patient to tolerate and respond appropriately to standing up.*

Tissue *A group of cells within an organ that carry out specific functions.*

TMJ (Abbreviation for temperomandibular joint)

Tomographic scan *A type of scan where the body is visualized in slices.*

Total peripheral resistance *The total amount of resistance to blood flow.*

Tremor *Involuntary shaking.*

Tricyclic *A particular chemical structure of a drug. Tricyclics include some commonly used anti-depressants.*

Trigeminal nerve *The fifth cranial nerve, supplying the face and mouth.*

Trimethaphan (Arfonad™) *A particular type of drug that blocks chemical transmission in ganglia.*

Trimethaphan infusion test *A test where trimethaphan is given by vein, to assess the effects on blood pressure.*

Trophic *Causing a growth effect.*

Tropic *Causing a change in, or affecting.*

TST (Abbreviation for thermoregulatory sweat test)

Tyramine (TYR) *A sympathomimetic amine found in foodstuffs such as hard cheese and red wine.*

Tyrosinase *An enzyme involved in the production of melanin from tyrosine.*

Tyrosine hydroxylase (TH) *An important enzyme required for production of the catecholamines dopamine, norepinephrine (noradrenaline), and epinephrine (adrenaline) in the body.*

-U-

Neuropathy *An abnormality of one or more peripheral nerves.*

Nigrostriatal system *A dopaminergic network involving the substantia nigra of the midbrain and the striatum in the basal ganglia.*

Non-dipping *Absence of the normal nocturnal decrease in blood pressure.*

Non-myelinated *Lacking a myelin sheath.*

Uptake-1 *Uptake of norepinephrine and related chemicals by way of the cell membrane norepinephrine transporter, such as uptake*

*into sympathetic nerves.*

**Uptake-2** *Uptake of norepinephrine and related chemicals by way of a transporter on non-neuronal cells such as myocardial cells.*

**-V-**

**Vagal parasympathetic outflow** *Traffic in the vagus nerve, a main nerve of the parasympathetic nervous system.*

**Vagus nerve** *The tenth cranial nerve. The vagus is the main nerve of the parasympathetic nervous system.*

**Valsalva maneuver** *A type of maneuver where the person blows against a resistance or strains as if trying to have a bowel movement, resulting in an increase in pressure in the chest and a decrease in the ejection of blood by the heart.*

**Vanillylmandelic acid (VMA)** *A major end-product of norepinephrine metabolism.*

**Vascular resistance** *Resistance to blood flow.*

**Vasoactive intestinal peptide (VIP)** *A small protein produced in the gut, brain, and other organs and used to identify sympathetic cholinergic neurons.*

**Vasoconstriction** *Tightening of blood vessel walls.*

**Vasodepressor syncope** (Same as Autonomically Mediated Syncope, Reflex Syncope, Neurocardiogenic syncope, and Neurally Mediated Syncope).

**Vasomotor** *Referring to constriction of blood vessels.*

**Vasopressin** (the same as antidiuretic hormone) *A hormone released from the pituitary gland at the base of the brain that stimulates*

*retention of water by the kidneys and increases blood pressure by constricting blood vessels.*

**Vein** *A type of blood vessel that carries blood toward the heart.*

**Venlafaxine (Effexor™)** *A drug that acts as a combined serotonin and norepinephrine reuptake inhibitor.*

**Ventricles** *The main pumping chambers of the heart. The right ventricle contains blood pumped by the heart to the lungs. The left ventricle contains blood pumped by the heart to the rest of the body. The left ventricular myocardium is the main pumping muscle of the heart.*

**Ventricular arrhythmia** *An abnormal rhythm of the heart ventricles.*

**Ventriculogram** *A radiologic procedure in which a radio-opaque dye is injected to reveal the ventricular cavity in the heart.*

**Venous return** *Return of blood to the heart by the veins.*

**Vesicle** *A bubble-like structure inside nerves that stores chemical messengers such as norepinephrine.*

**Vesicular acetylcholine transporter (VAChT)** *A particular type of protein in the walls of storage vesicles that transports acetylcholine into the vesicles.*

**Vesicular monoamine transporter (VMAT)** *A particular type of protein in the walls of storage vesicles that transports chemicals such as norepinephrine into the vesicles.*

**Vitamin** *An organic compound that an organism requires in limited amounts and is obtained through the diet.*

**VMAT** (Abbreviation for the vesicular monoamine transporter)

**Volustat** *The metaphorical homeostat keeping blood volume within*

*bounds.*

-X-

X-Chromosome *One of the two sex-determining chromosomes.*

-Y-

Yohimbe bark *A naturally occurring form of yohimbine that is available as an over-the-counter herbal remedy.*

Yohimbine *A drug that blocks alpha-2 adrenoceptors in the brain, in blood vessel walls, and on sympathetic nerve terminals.*

Yohimbine challenge test *A test where yohimbine is administered and*