An Herbalist's View
The Nervous System

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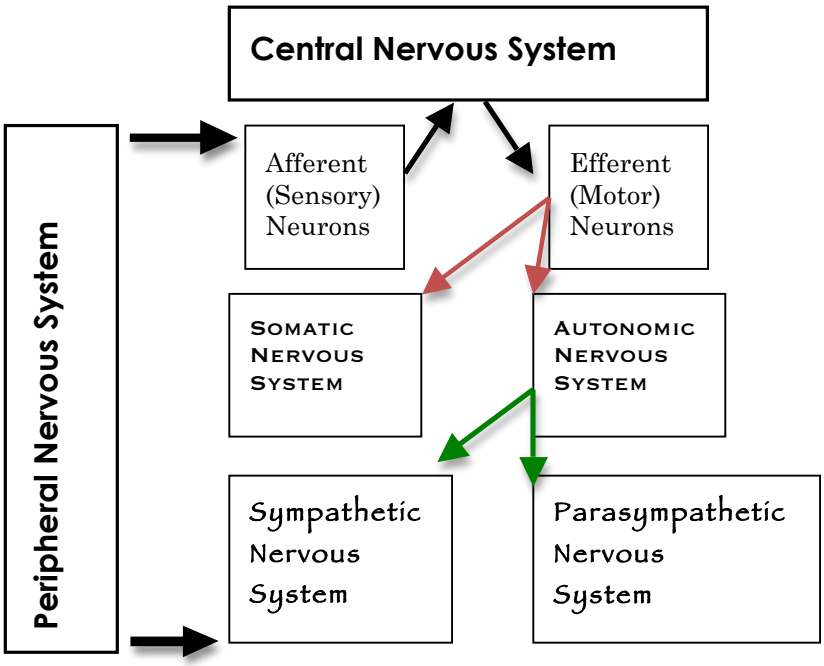
Major Divisions of the Nervous System

- **Central nervous system** (CNS)–brain and spinal cord. Receives information, processes and coordinates responses. Contains interneurons which carry nerve impulses within the CNS.
- **Peripheral nervous system** (PNS)–cranial nerves and spinal nerves. All the nerves outside of the CNS.
- **Afferent (sensory) neurons**-input, transmits nerve impulses to CNS.
- **Efferent (motor) neurons**–response, transmits nerve impulses away from CNS.
- **Somatic nervous system** (SNS)–innervates skeletal (voluntary) muscle.
- **Autonomic nervous system** (ANS)–innervates smooth and cardiac (involuntary) muscle and glands. The ANS functions 'automatically' (without thinking about it) as well as alongside conscious control. It affects most organs such as heart and respiratory rate, digestion, sexual arousal and perspiration.
- **Sympathetic nervous system**–a division of the ANS involved with stress responses, 'Fight or flight'.
- **Parasympathetic nervous system**–a division of the ANS involved with maintaining energy, balancing the sympathetic nervous system, 'Rest and digest'.



Neuron Physiology

- Action potential
- Axonal transport
- Depolarization
- Innervation
- Nerve impulse
- Polarization
- Propagation (conduction)
- Resting membrane potential
- Summation
- Threshold

Neuron Anatomy

- Cell body
- Nucleus
- Dendrite
- Axon
- Axon collaterals
- Axon hillock
- Axon terminal
- Terminal knob
- Presynaptic membrane
- Synaptic cleft
- Postsynaptic membrane
- Schwann cell
- Myelin sheath
- Node of Ranvier
- Synaptic vesicle
- Receptor
- Neurotransmitter
- Sodium-potassium pump
- Chemical-gated channel
- Voltage-gated channel

Principal Types of Cells

1. **Neurons**–carry nerve impulses
2. **Neuroglial (glia) cells**–support neurons. There are many more times the amount of glial cells than neurons.

Types of Neuroglia

Central Nervous System

1. **Astrocytes**–support and maintain neurons, they attach to blood vessels
2. **Oligodendrocyte**–support neurons and produce a myelin sheath around their axons
3. **Microglia**–CNS macrophages
4. **Ependymal cells**–line ventricles of CNS

Peripheral Nervous System

1. **Satellite cells**–support neurons in ganglia of PNS
2. **Schwann cells**–wrap themselves as a myelin sheath around axons and help with rapidity of nerve impulse and regeneration of injured axons

Other Terminology

Adrenergic
Agonist
Antagonist
Anticholinergic
Brain
Cerebrospinal fluid
Cholinergic
Dermatomes
Enzyme
Ganglia
Muscarinic receptor
Neurohormone
Neuromodulator
Neuropeptide
Neuropharmacology
Neuropsychopharmacology
Nicotinic receptor
Nociceptors
Reuptake
Secondary messenger
Tolerance
Vagus nerve

Major Neurotransmitters

Small-Molecule Rapidly Acting Transmitters

Class I

- **Acetylcholine** – widely used; generally excitatory but occasionally inhibitory as with the vagus nerve and the heart

Class II: The amines

- **Catecholamines** – derived from tyrosine
- **Dopamine** – generally inhibitory
- **Norepinephrine** (noradrenaline) (NE) – widely used; excitatory and inhibitory
- **Epinephrine** (adrenaline) (E)
- **Serotonin** – 5 hydroxytryptamine (5-HT) – derived from tryptophan; found in the brain (as a neurotransmitter) and spinal cord. Affects mood, pain, sleep and sensory perception
- **Histamine** – derived from histidine; acts as a neurotransmitter in the brain

Class III: Amino acids

- **Gamma-Aminobutyric Acid** (GABA) – found primarily in the brain and spinal cord; primary inhibitory neurotransmitter in the brain
- **Glycine** – found primarily in the spinal cord where it is the major inhibitory neurotransmitter
- **Glutamate** – primary excitatory neurotransmitter in the brain
- **Aspartate** – excitatory neurotransmitter in the brain

Class IV

- **Nitric oxide** (NO) – a neurotransmitter and neuromodulator in the brain. A gas.

Neuropeptides: slower acting neurotransmitters

Opiate Peptides – widely found in the brain and are inhibitory

- **Beta Endorphin**
- **Enkephalins**
- **Dynorphins**

Gut-brain Peptides – found in both brain and intestine

- **Substance P** – found widely in the body; a slowly released pain transmitter
- **Vasoactive intestinal polypeptide** (VIP) – excitatory neurotransmitter and modulator in the brain. Broad action in the GI tract as a hormone
- **Cholecystokinin** (CCK)
- **Neurotensin** (NT)
- **Insulin**

Categories of Therapeutics

Adaptogen–helps the body adapt to stress
Analeptic–increases activity of the central nervous system
Analgesic–relieves pain
Anesthetic–produces a partial or complete loss of nerve sensation
Anticholinergic–inhibits the impulses of acetylcholine
Anticonvulsant–preventing or reducing the severity of epilepsy or other seizures
Antidepressant–helps prevent or alleviate depression
Antispasmodic–relieves smooth muscle spasms
Anxiolytic–reduces anxiety or nervousness
Calmative–promotes a feeling of calm, relaxation
Hypnotic–induces sleep
Narcotic–producing sleep or stupor, or an opium derived drug
Nervine–nourishes and treats nervous system related disorders
Psychotropic–affecting psychic function, i.e. Behavior and experience
Relaxant–reduces tension, mental or physical
Restorative–general term for agents that help regain strength and health
Sedative–increases rate of activity of a body system
Skeletal muscle relaxant–relaxes skeletal muscles
Soporific–induces deep sleep
Stimulant–elicits cerebral or motor excitation

Nervous System Disorders

Affective disorders
Alzheimer's
Anxiety
Aphasia
Attentions deficit disorder (ADD)
Bipolar (manic depressive) disorder
Cognitive deficiency
Dementia
Depression
Digestive disorders
Dyslexia
Epilepsy
Headache
Insomnia
Multiple sclerosis (MS)
Myasthenia gravis
Neuralgia
Neuropathy
Pain
Panic attacks
Parkinson's disease
Post-traumatic stress disorder
Schizophrenia
Seasonal affective disorder
Shingles
Stress
Tay-Sachs disease
Tinnitus
Vertigo

Drugs and Drug Therapies

- Anticholinergics
- Antipsychotics
- Benzodiazepines
- L-Dopa
- Lithium
- Monoamine oxidase (MAO) inhibitors
- Second-generation antidepressants
- Serotonin reuptake inhibitors
- Tricyclic antidepressants
- Tropane alkaloids

Considerations

- Alcohol
- Anxiety
- Breathe
- Caffeine
- Diet
- Drug use
- Excitability
- Exercise
- Habits
- Insomnia
- Lifestyle
- Meditation
- Mood alterants
- Mood swings
- Occupation
- Relaxation
- Stress
- Work hard/play hard

Herbs

American ginseng–Panax quinquefolius
Ayahuasca–Banisteriopsis caapi
Belladonna–Atropa belladonna
Black cohosh–Actaea racemosa
Blue vervain–Verbena hastata
Bugleweed–Lycopus spp.
Calamus–Acorus calamus
California poppy–Eschscholtzia spp.
Chamomile–Matricaria recutita
Coca–Erythroxylum coca
Coffee–Coffea arabica
Cola–Cola acuminata/C. nitida
Corydalis–Corydalis aurea
Coyote weed–Thamnosma texana
Damiana–Turnera diffusa
Dicentra–Dicentra spp.
Epipactis–Epipactis helleborine
Ginger–Zingiber officinale
Gingko–Gingko biloba
Gotu kola–Centella asiatica
Guarana–Paullinia cupana
Henbane–Hyoscyamus niger
Hops–Humulus lupulus
Jamaican dogwood–Piscidia piscipula
Jimsonweed–Datura spp.
Kava kava–Piper methysticum
Khat–Catha edulis
Lavender–Lavandula spp.
Lemon balm–Melissa officinalis
Linden–Tilia europaea
Lobelia–Lobelia inflata
Marijuana–Cannabis sativa
Mistletoe–Viscum album
Monkshood–Aconitum columbianum
Motherwort–Leonurus cardiaca
Mountain laurel–Kalmia latifolia
Nux vomica–Strychnos nux-vomica
Oats–Avena sativa
Passionflower–Passiflora incarnata
Peppermint–Mentha piperita
Peyote–Lophophora williamsii
Poison hemlock–Conium maculatum
Poppy–Papaver somniferum
Pulsatilla–Anemone spp.
Rauwolfia–Rauwolfia serpentina
Rosemary–Rosmarinus spp.
Siberian ginseng–Eleutherococcus senticosus
Skullcap–Scutellaria lateriflora
St. Johnswort–Hypericum perforatum
Syrian rue–Peganum harmala
Tea–Camellia sinensis
Tobacco–Nicotiana spp.
Valerian–Valeriana officinalis
Vervain–Verbena officinalis
Wild lettuce–Lactuca spp.
Wood betony–Stachys officinalis
Yellow jessamine–Gelsemium sempervirens
Yerba mate–Ilex paraguariensis
Yohimbe–Corynanthe yohimbe