

Autonomic nervous System

Regulates activity of: Smooth muscle
 Cardiac muscle
 certain glands

Autonomic- illusory (convenient)-not under direct control

Regulated by: hypothalamus

 Medulla oblongata

Divided in to two subdivisions: Sympathetic

 Parasympathetic

Sympathetic: mobilizes all the resources of body in an
 emergency

Parasympathetic: maintains the normal body functions

Complimentary to each other.

ANS

Activity expressed

- Regulation of Blood Pressure
- Regulation of Body Temperature
- Cardio-respiratory rate
- Gastro-intestinal motility
- Glandular Secretion

Sensations

- General – Hunger , Thirst , Nausea
- Special -- Smell, taste
and visceral pain

- Location of ANS in CNS:
 1. cerebral hemispheres (limbic system)
 2. Brain stem (general visceral nuclei of cranial nerves)
 3. Spinal cord (intermediate grey column)

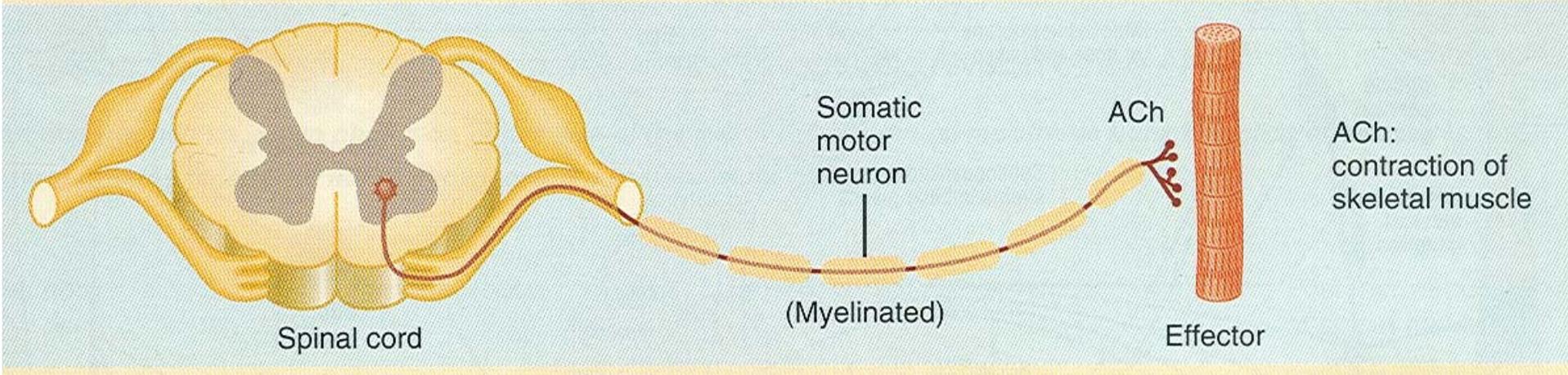
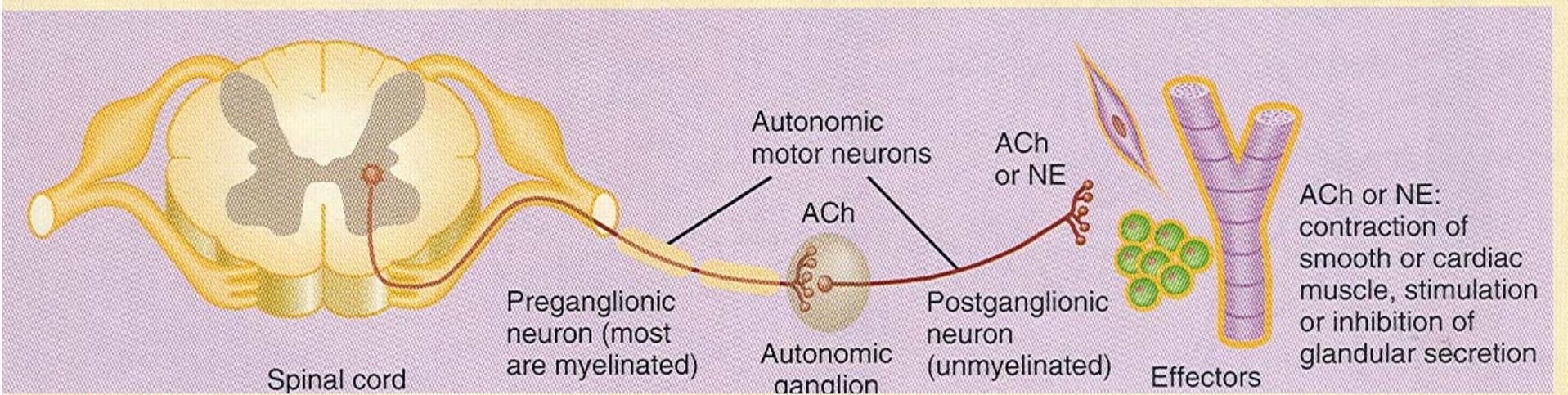
ANS Anatomy

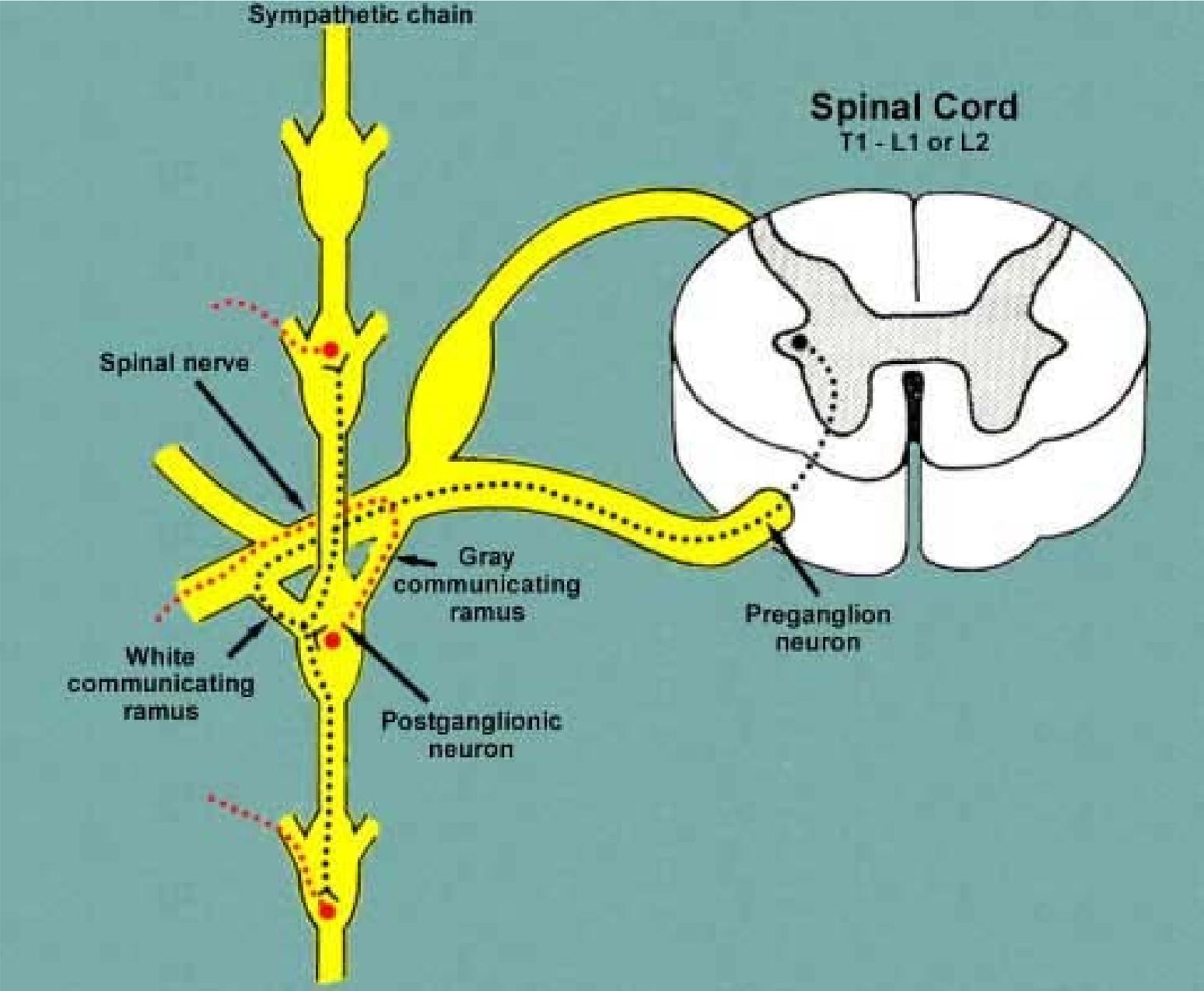
- **Pathway: Two motor neurons**

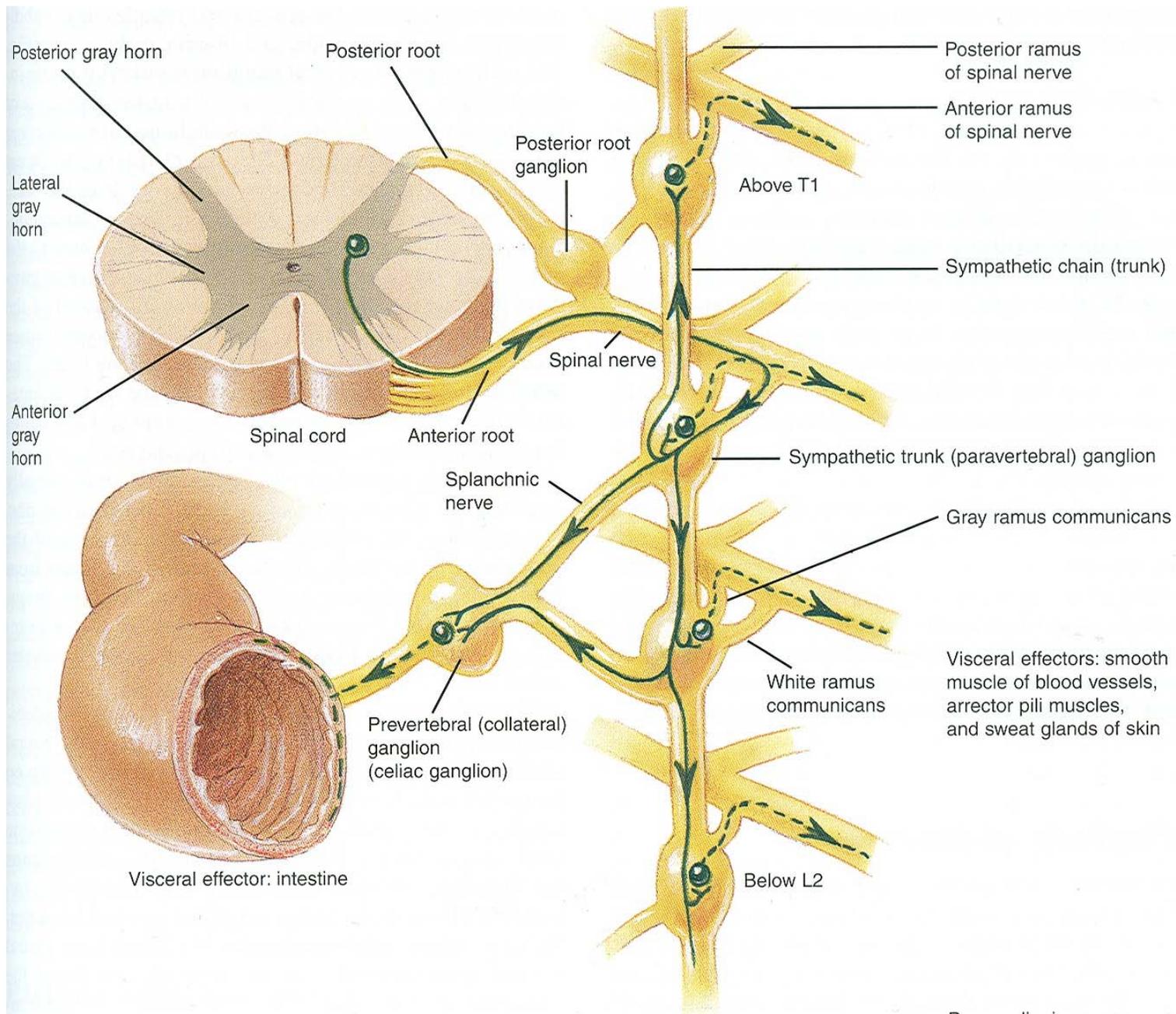
1. In CNS -->Axon-->Autonomic ganglion
2. In Autonomic ganglion-->Axon-->effector organ

- **Anatomy:**

Preganglionic neuron--->preganglionic fibre (myelinated axon)--->out of CNS as a part of cranial/spinal nerve--->fibres separate & extend to ANS ganglion-->synapse with postganglionic neuron--->postganglionic fibre (nonmyelinated)-->effector organ



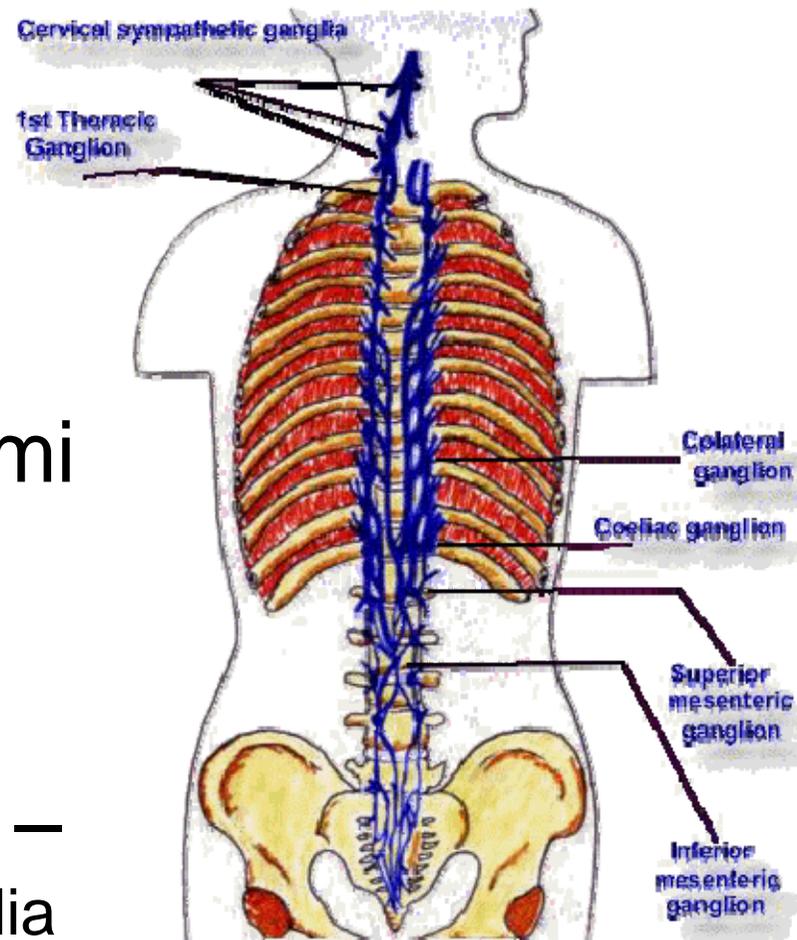




Sympathetic system

Components

- Pair of ganglionic sympathetic trunk
- Communicating rami
- Branches
- Plexuses
- Subsidiary ganglia – collateral, terminal ganglia

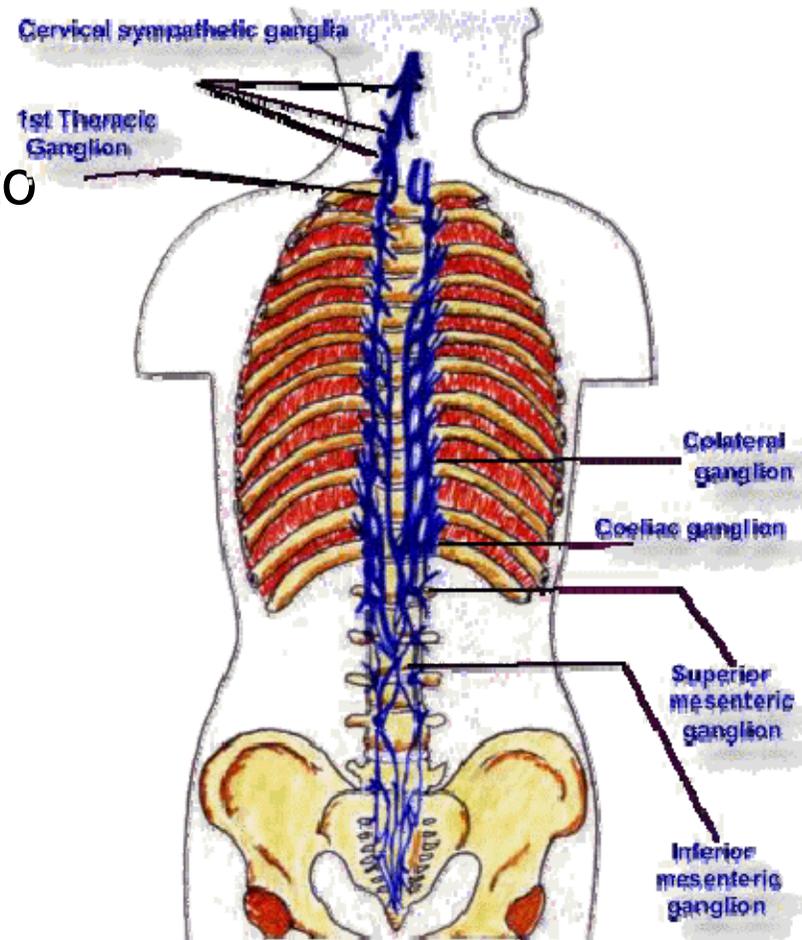


Sympathetic trunk (lateral ganglia)

- Paravertebral in position
- Extend from base of skull to coccygeal
- Both trunk unite to form – ganglion impar

Total Ganglia

- Cervical-3
- Thoracic-11
- Lumbar-4
- Sacral-4



Subsidiary ganglia

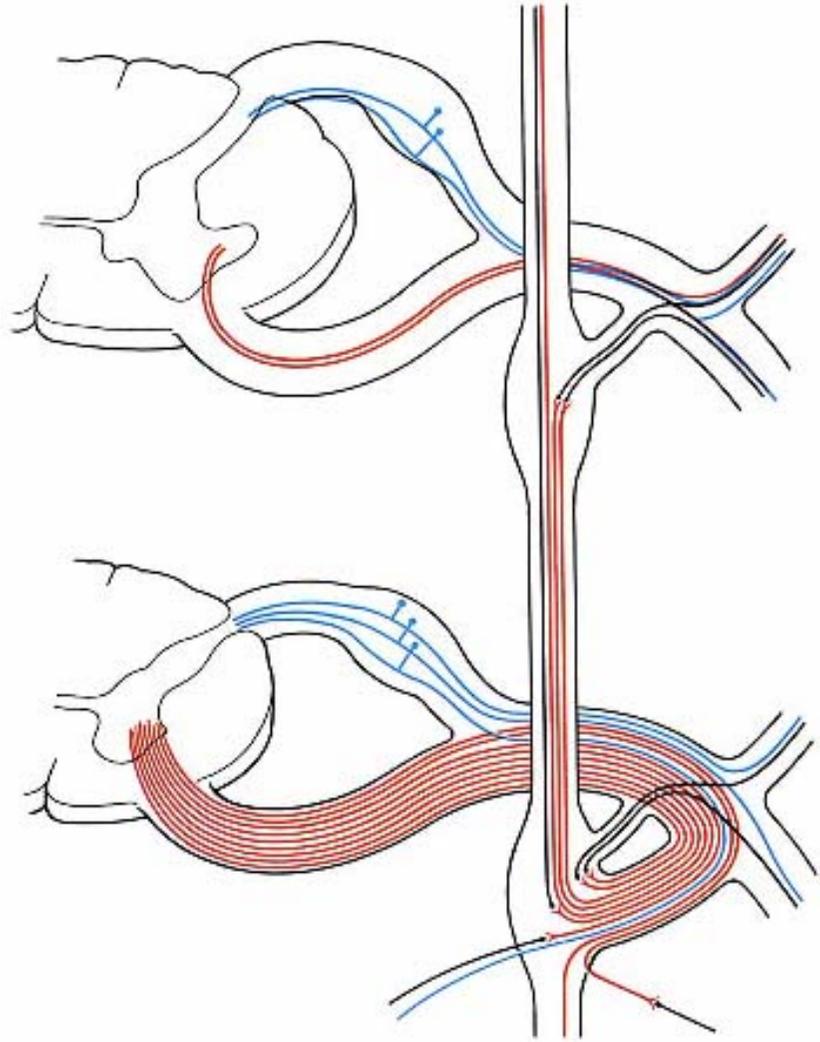
Collateral ganglia

- Coeliac
- Superior mesenteric
- Inferior mesenteric
- Aortico-renal
- Neurons of sup. hypogastric plexus

Terminal ganglia

- Chromaffin cells of suprarenal glands

Sympathetic System



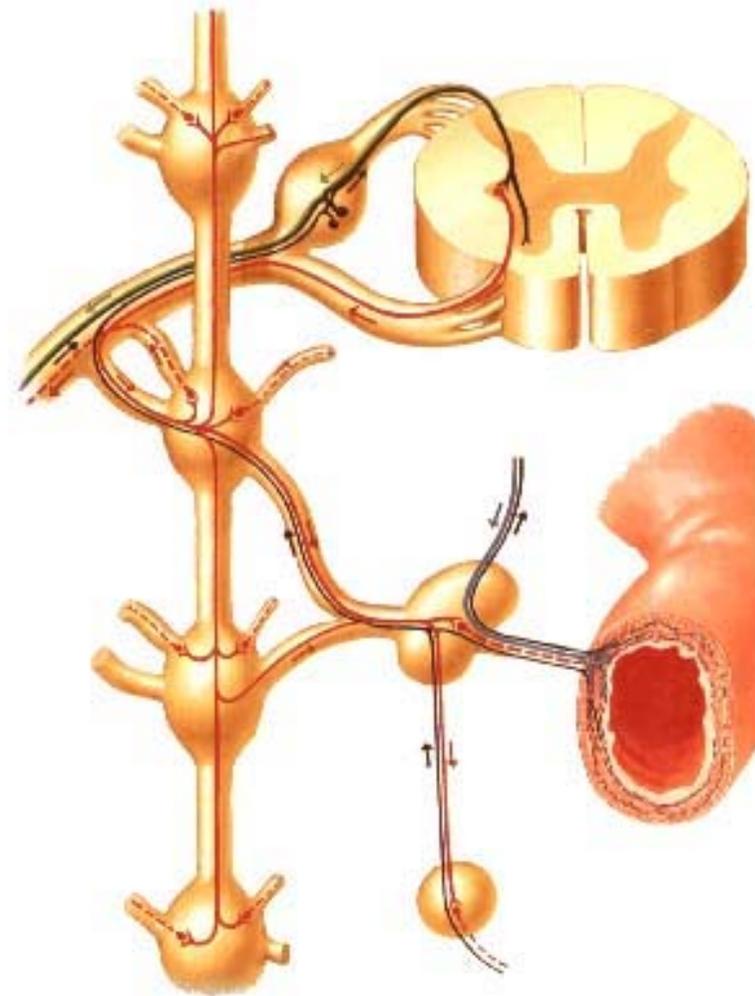
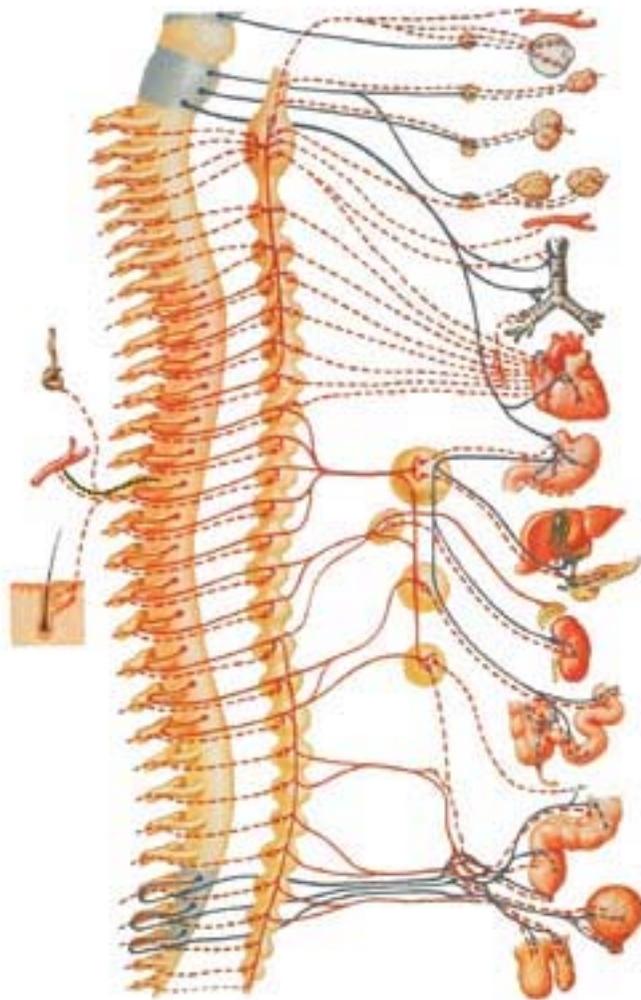
Called Thoracolumbar outflow
Arises from T1 – L2-3 Segment

Motor Preganglionic Fibres
(White rami communicans)
Arise from lateral grey column
emerges through ventral rami and
connected to ganglia(lateral ganglia)
Of sympathetic chain or relay in
Collateral ganglia

Postganglionic fibres (**Grey rami
Commucans**) reach the organ of supply
i.e. – involuntary muscles of hairs,
blood vessels, sweat glands
Sebaceous glands

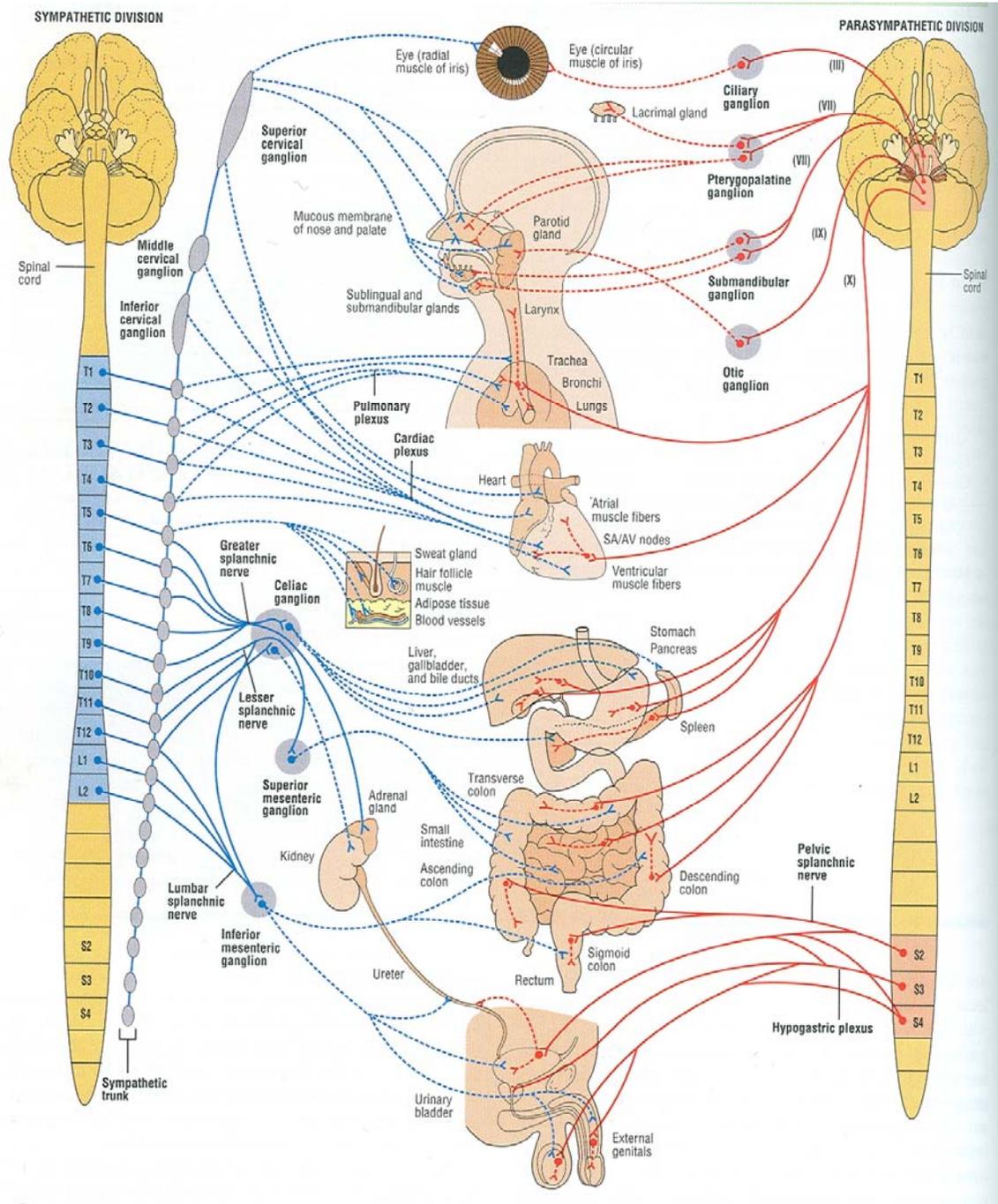
- Preganglionic fibres (white rami): Thinly myelinated; reach ganglia; terminate
 1. Synapse in corresponding ganglia
 2. Ascend or descend along symp. trunk and synapse accordingly
 3. Pass uninterrupted through symp. trunk & synapse with collateral or terminal ganglia

- Postganglionic fibres:
Nonmyelinated
From symp. Ganglia to:
 1. Pass back to corresponding spinal nerve via grey rami
 2. Pass via medial branches to supply deeply placed viscera
 3. Some ascend/descend and join grey rami/medial branches



Sympathetic nerves are adrenergic in nature

Functionally – Vasomotor(vasoconstrictor), Sudomotor (Secretomotor to sweat glands and Pilomotor (Contract arrector pili muscle)



Parasympathetic System

- Craniosacral outflow
- 3,7,9,10 cranial nerves and S2,3,4 segment
- Fibres emerge as part of cranial nerves or as part of anterior root of spinal nerve
- Preganglionic fibres are long and terminate in terminal ganglia and synapse with postganglionic neurons.
- Cranial outflow: **Oculomotor**- ciliary ganglion
- **Facial** – pterygopalatine & submandibular ganglion
- **Glossopharyngeal**- otic ganglion
- **Vagus** – in walls of target organ (80% of total parasympathetic outflow)
- **sacral component- synapse in terminal ganglia in the walls of viscera (pelvic splanchnic nerves)**
- Postganglionic fibres short.
- Ganglia mostly on the viscera

Sympathetic

- **Definite anatomical entity**
- **Preganglionic neuron lies in 12 thoracic & 3 lumbar segments of SC (thoracolumbar outflow)**
- **Preganglionic fibre short**
- **Sympathetic ganglia prevertebral ganglia**
- **Single preganglionic fibre synapse with 20 postgang. Neurons (divergence)**
- **Postgang. Fibres innervate several visceral effectors**
- **Widespread diffuse response**
- **Is nerve of emergency; works during stress (fight or flight)**

Parasympathetic

- **Accompanies cranial & spinal nerves**
- **In the nuclei of four cranial nerves- 3,7,9,10 & 2-4 sacral segments of SC (craniosacral outflow)**
- **Long**
- **Terminal (intramural) ganglia**
- **Single fibre synapse with 4-5 postgang. nerves**
- **Postgang. fibres supply single visceral effectors**
- **Localised & accurate response**
- **Nerve of tranquility; essential for life**

Sympathetic

- Actions:
- Conveys visceral pain sensations
- Cutaneous bld. vs constricted, coronary and skeletal vs. dilated
- Heart rate accelerated
- Blood pressure raised
- Pupils dilated
- Peristalsis decreased and sphincters closed
- Catabolic in function
- Works for today

Parasympathetic

- Conveys general visceral sensations e.g. hunger, thirst, nausea, sexual sensations
- Sensations for visceral reflexes e.g. cardiac reflex
- Conserves body resources
- Heart rate slowed
- Blood pressure lowered
- Pupils constricted
- Peristalsis, digestion & absorption increased
- Bladder & rectum evacuated
- Anabolic in function
- Works for tomorrow