

Basal Nuclei Review

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Basal Nuclei Overview

The basal nuclei (ganglia) consists of several groups of cell bodies that modify/adjust motor activity.

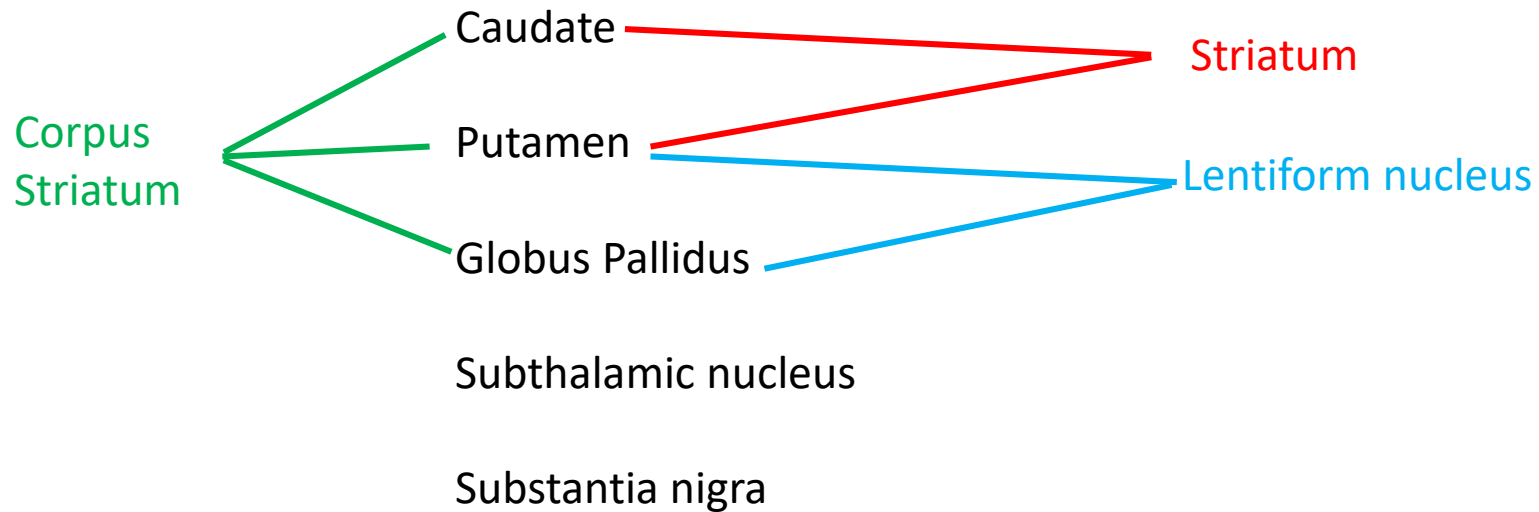
The basal nuclei function via disinhibition.

The output center for the basal nuclei is the globus pallidus which projects to the thalamus.

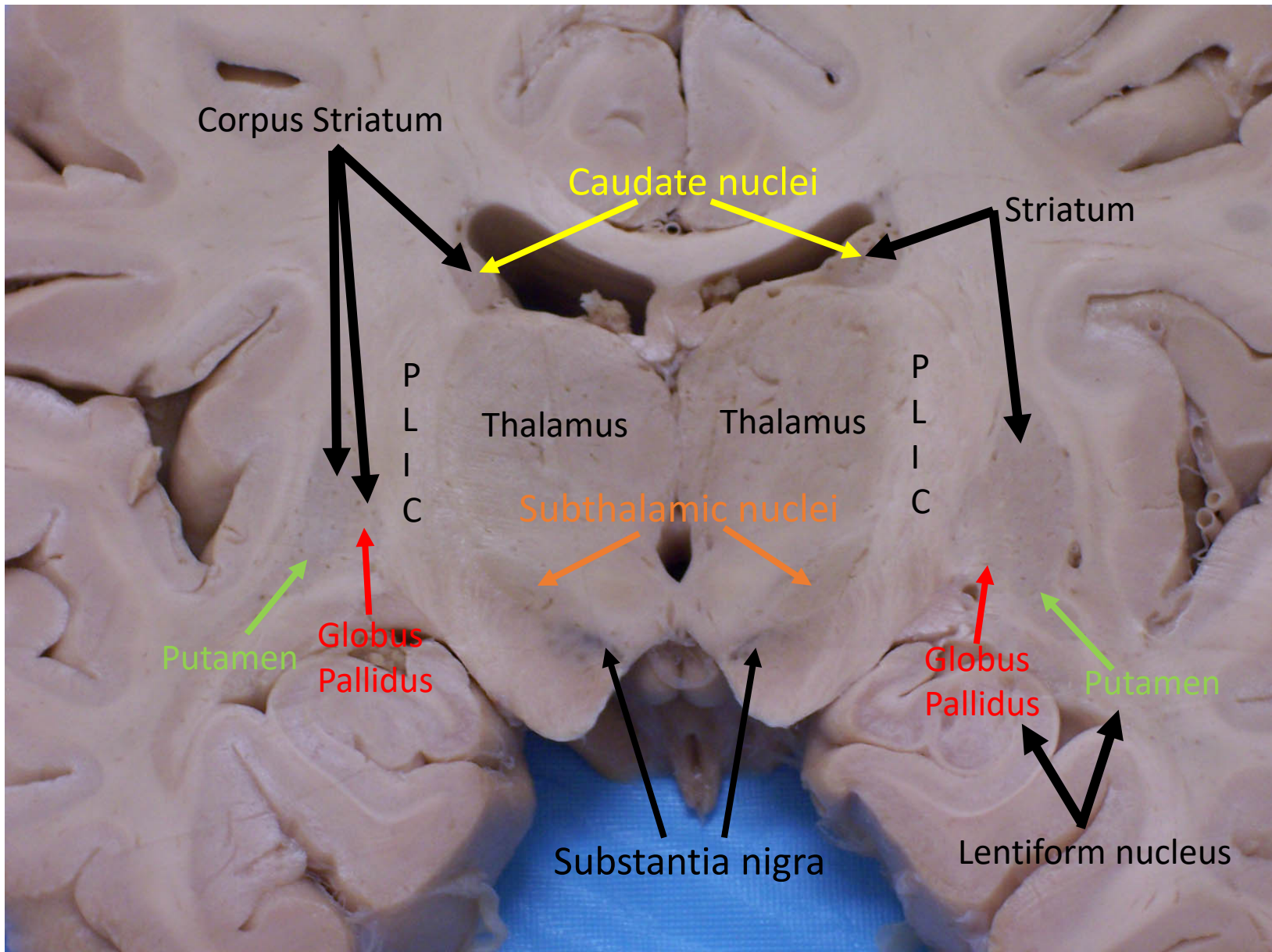
The thalamus will project to the motor cortex.

Basal Nuclei Structures

There are 5 main groups of neuronal cell bodies (nuclei) that comprise the Basal Nuclei:



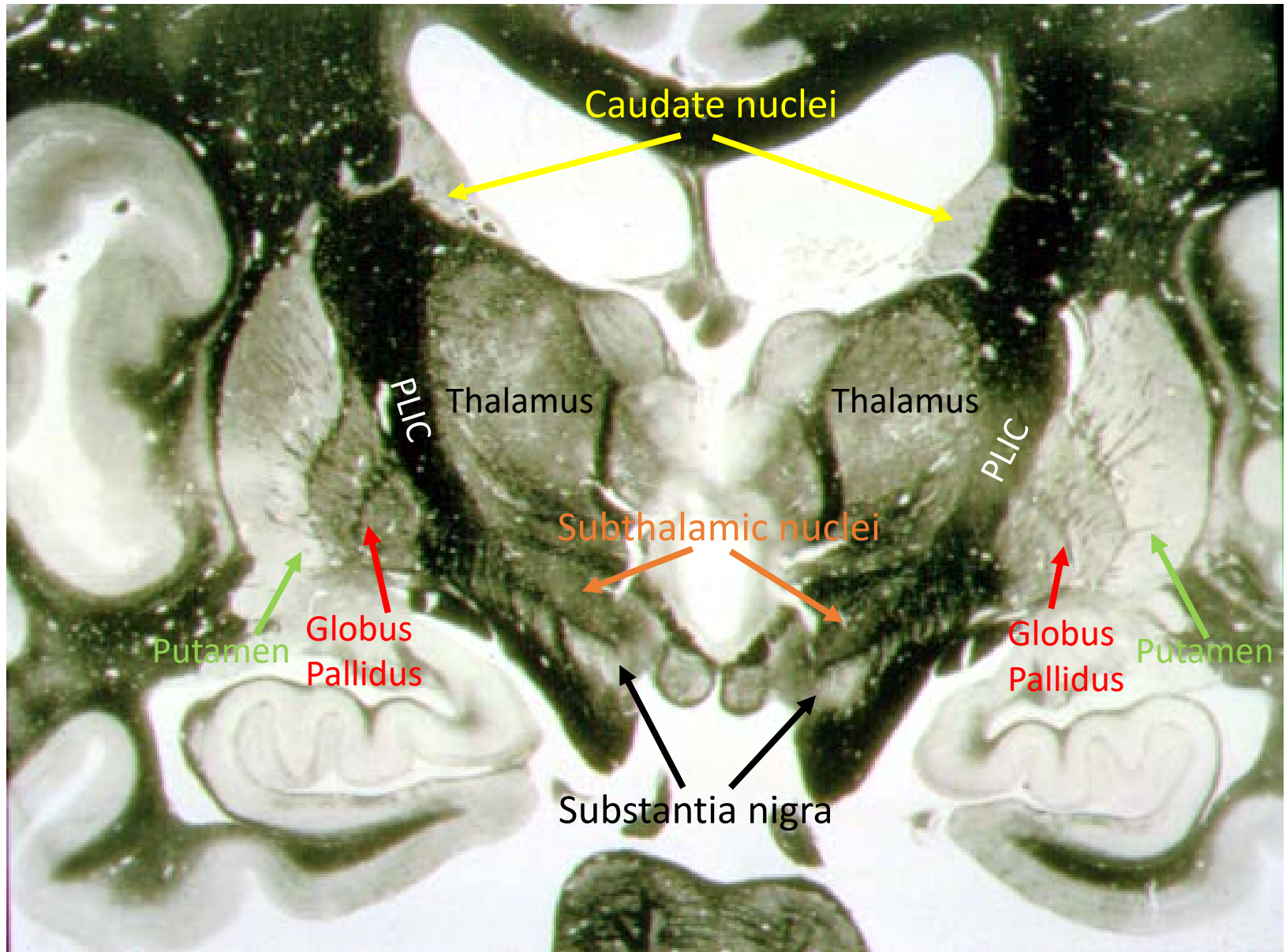
Basal Nuclei Neuroanatomy



Coronal gross brain section depicting basal nuclei

PLIC = Posterior limb internal capsule

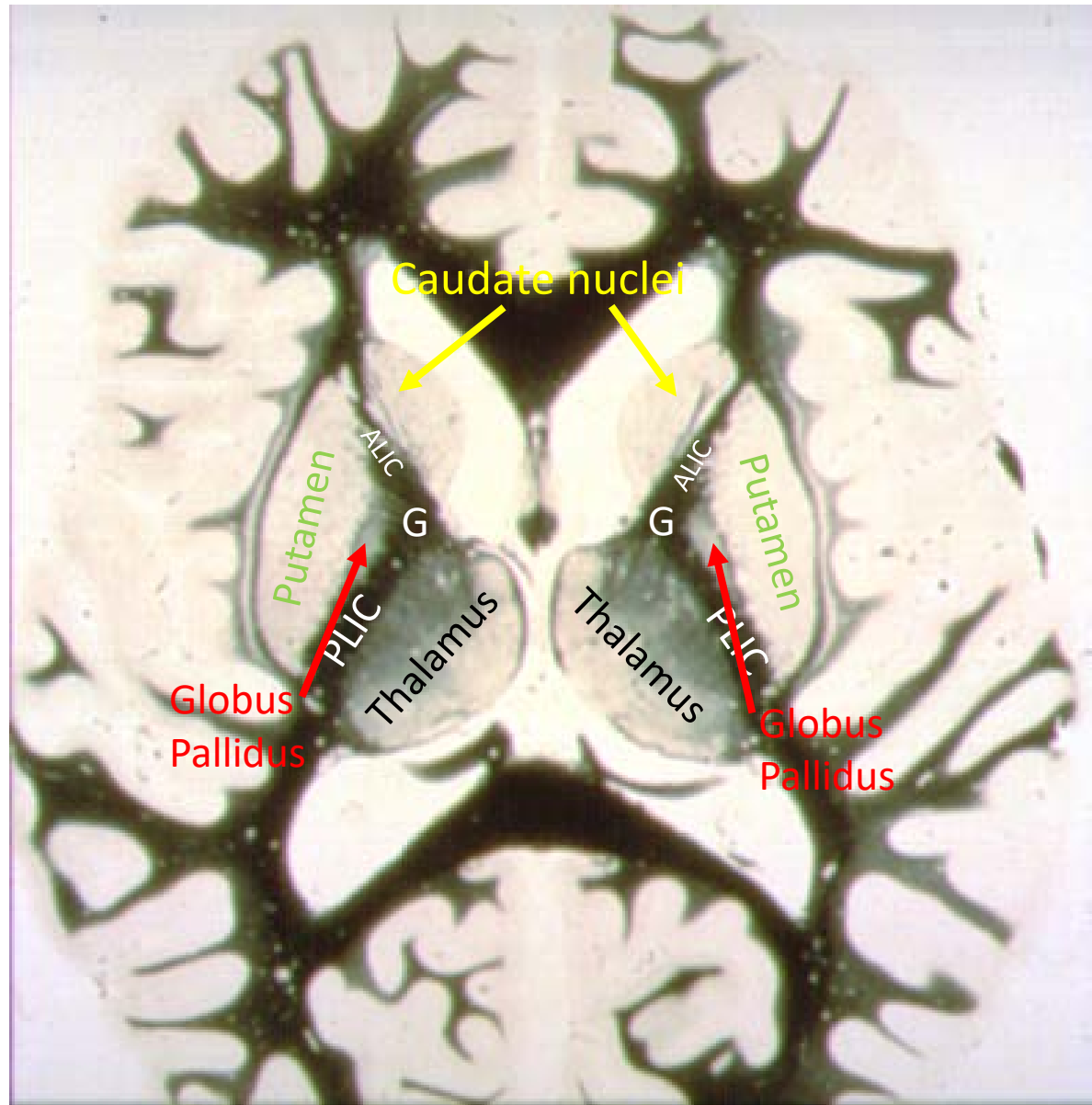
Basal Nuclei Neuroanatomy



Coronal myelin stained brain section depicting basal nuclei

PLIC = Posterior limb internal capsule

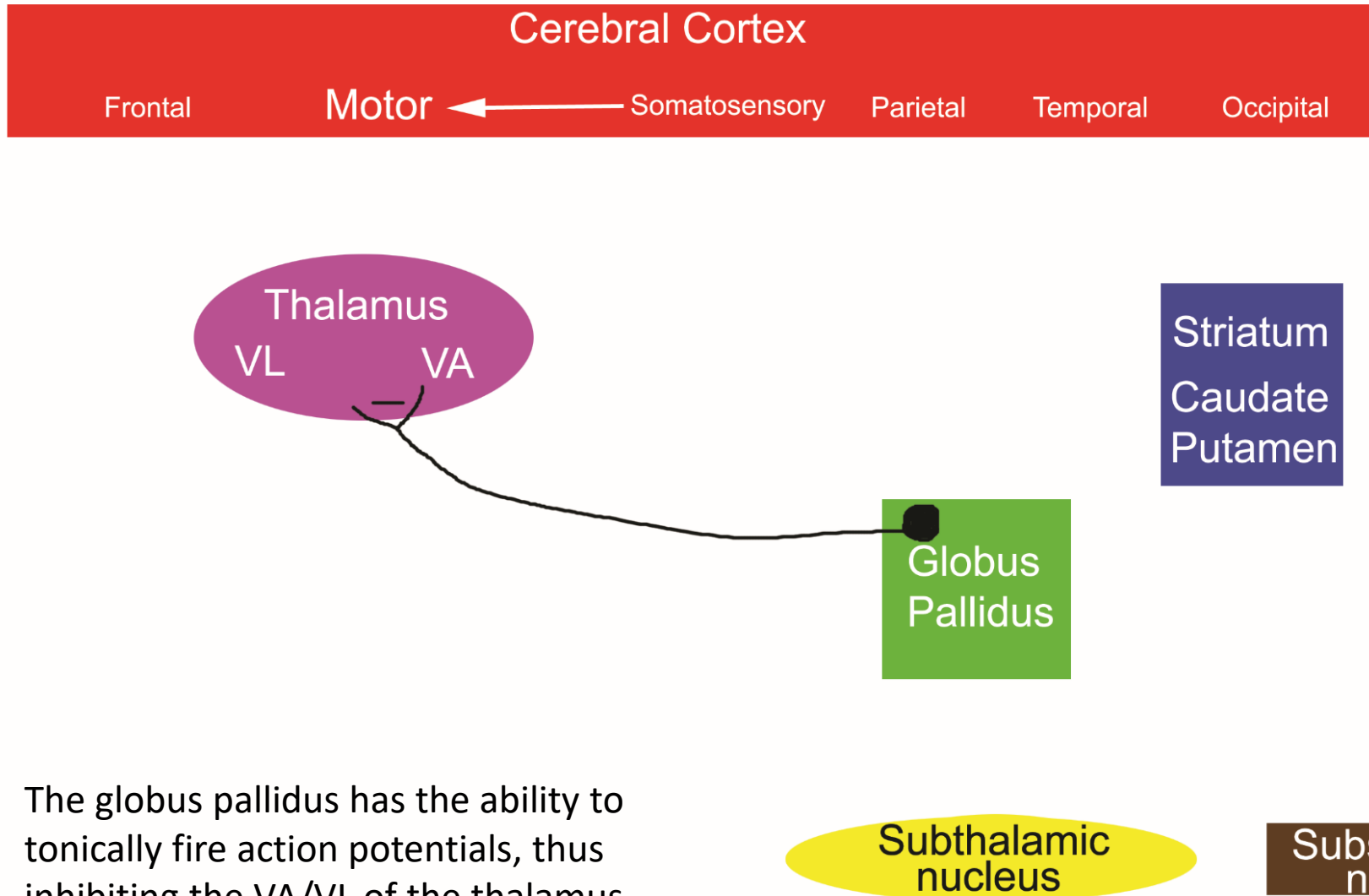
Basal Nuclei Neuroanatomy



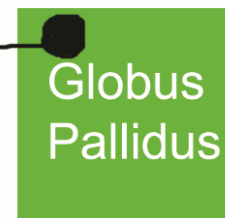
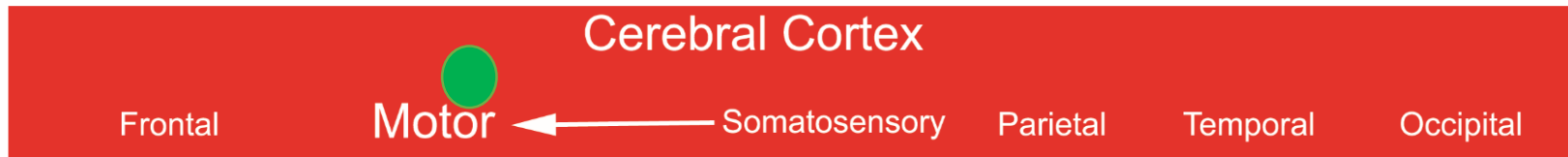
ALIC = Anterior limb
internal capsule
G = Genu of internal
capsule
PLIC = Posterior limb
internal capsule

Horizontal myelin stained brain section depicting basal nuclei

Basal Nuclei General Schematic



Basal Nuclei Direct Pathway

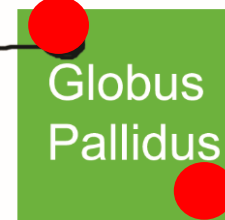


Disinhibition

Activation of the **direct** pathway
results in:
increased motor cortex activity
and **increased movement**



Basal Nuclei Indirect Pathway



Activation of the **indirect** pathway results in:
decreased motor cortex activity
and **decreased movement**

Lesions to the basal nuclei pathways

Lesions in the direct and indirect pathways will result in movement disorders.

These lesions can cause:

Hypokinetic disturbances

Hyperkinetic disturbances

Types of Hypokinetic disturbances:

1. Akinesia – impairment of initiation of movement
2. Bradykinesia – reduction in the velocity and amplitude of movement

Types of Hyperkinetic disturbances:

1. Ballismus – uncontrolled flinging of the upper or lower extremity
2. Choreiform movements – irregular, brisk, dance-like movements of the limbs
3. Athetoid movements – writhing of distal portions of the extremity, slow writhing movements, more common in upper extremity and hands and face

Basal Nuclei Clinical Correlates

Parkinson disease

Considered a hypokinetic disorder

Caused by loss of **dopaminergic** neurons in the **substantia nigra**

Huntington disease

A genetic disorder that causes hyperkinetic disturbances

Neuronal cell death occurs in the **caudate and putamen (striatum)**

Hemiballism

Occurs on 1 side of the body

Hyperkinetic movement which involves the flinging or flailing of the upper or lower extremity

A lesion to the **subthalamic nucleus** causes **contralateral hemiballism**