Understanding Your Child’s Brain

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Objectives:

❖ To review location and structure of Basal ganglia
❖ To understand the function and connectivity
❖ To review the role of chemicals that play a role for Basal ganglia functions
The Location of the Basal Ganglia in the Human Brain

basal ganglia (pink)

Basal ganglia
Thalamus
Amygdala
Basal ganglia anatomy
- Caudate
- Globus pallidus
- Putamen
- Subthalamic nucleus
- Substantia nigra
Functions of basal ganglia

• General motor control
  • Voluntary motor activities
  • Maintains posture
  • Control of muscle tone

• Planning and programming movements

• Cognitive functions

• Emotional functions and behavior
Basal ganglia and motor functions

✓ The initiation and planning of movements
✓ Adjusting speed and magnitude of movement
✓ Implementation of learned motor activity
✓ Implementation of simultaneous movement
✓ Adjustment of muscle tone
✓ Truncal stability
Basal ganglia circuits
Basal ganglia functions

- Control
  - Goal-directed motor activity
- Regulate
  - Cognitive and motivational behavior
- Inhibitory control
- Habit formation

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Neurotransmitters

- Brain chemicals that communicate information through our brain to body
- They relay signals between the nerve cells

Brain send messages to the organ systems
- Heart - to beat
- Lungs to breath
- Stomach to digest
- Regulates mood, sleep
- Concentration and weight
Types of neurotransmitters

**Excitatory**
- Glutamate
- Aspartate
- Nitric oxide

**Inhibitory**
- Glycine
- GABA
- Serotonin
- Dopamine

**Both**
- Acetylcholine
- Nor Epinephrine
How does the neurotransmitter work?

- Neurons create and store neurotransmitters
- Creation of electrical activity stimulates the neurons
- This electrical charge leads the neurotransmitter release
- Neurotransmitters released into the synapse of the axon
- The neurotransmitters bind to special receptors on the target cell
- After bindings the receptor, a specific response will occur
Neurotransmitters and psychiatric symptoms
Neurotransmitters and neurological symptoms

- Dystonia
- Chorea
- Tics?
- Rigidity
- Dyskinesia
- Sleep disorders

Dopamin

Seratonin

Acetylcoline
Autoimmunity against dopamine receptors in neuropsychiatric and movement disorders: a review of Sydenham chorea and beyond

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Pathogenic Mechanisms In Sydenham Chorea and PANDAS

Group A Streptococcal Infections
Pharyngitis/Skin and Soft Tissue Infections

Molecular Mimicry
Between Streptococcus and Brain

Activated B Cells

Cross-reactive Antibodies (Ab)
Anti-Streptococcal/Neuronal Antibodies
Antistreptococcal Group A carbohydrate

Anti-SLA/CNAb Antibodies
larger dopamine receptors
Neurons (from figure 1)

Neuron

CuM Kinase

Tyrosine Hydroxylase

Dopamine

Substantia nigra

STN

Basal Ganglia

SYNAPSES

Neurotransmission

MODEL OF AUTOANTIBODY EFFECTS IN THE BRAIN

SC Antineuronal Autoantibody

Binding of high-affinity cross-reactive antineuronal Abs to lysoganglioside and dopamine receptors may cause alterations in dopamine neurotransmissions.