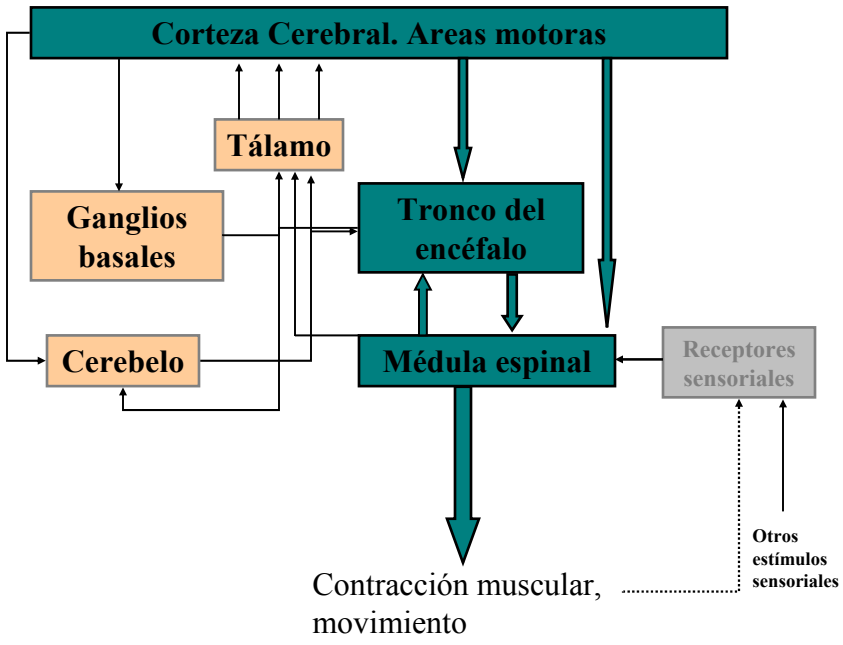
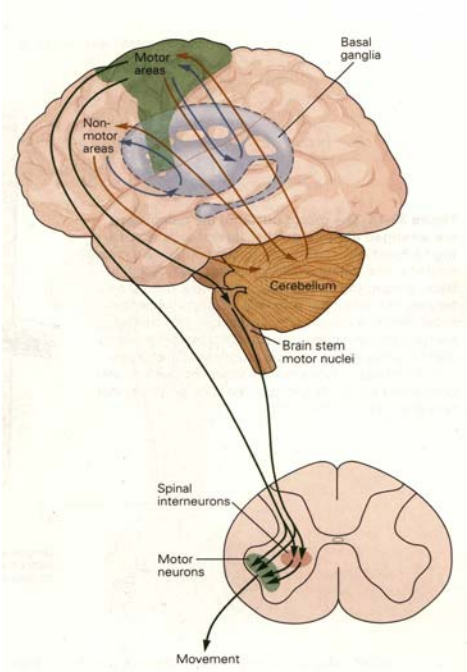
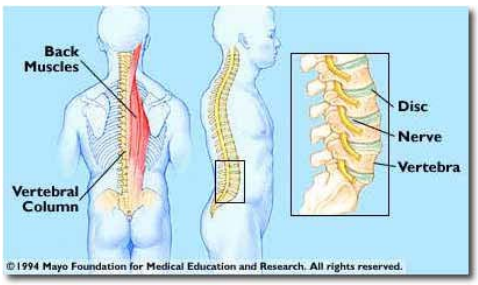
Sistema motor

Pablo Caviedes

Programa de Farmacología Molecular y Clínica




Motor areas
Basal ganglia
Non-motor areas
Cerebellum
Brain stem motor nuclei
Spinal interneurons
Motor neurons
Movement


Back Muscles
Vertebral Column
Disc
Nerve
Vertebra
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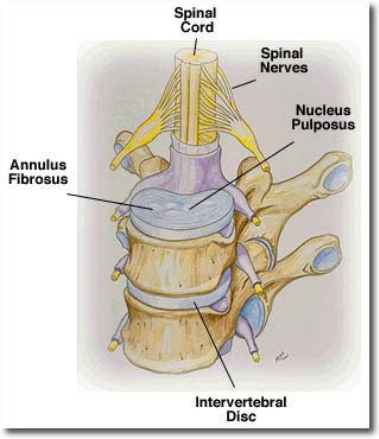
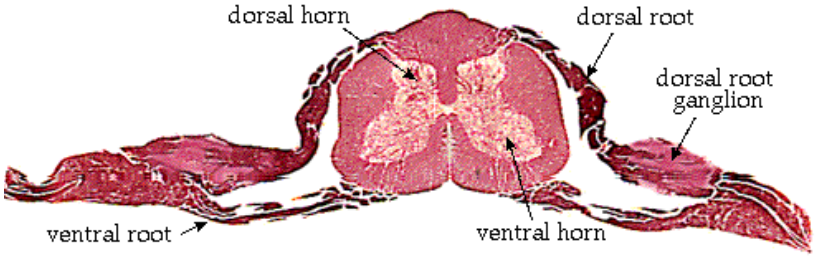
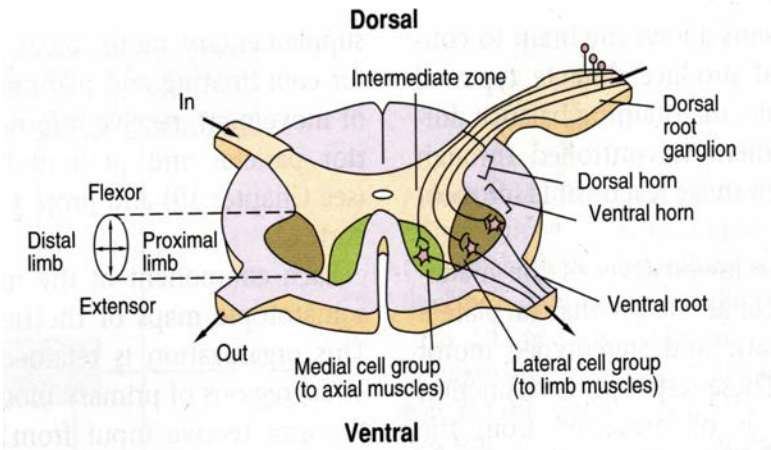

Spinal Cord
Spinal Nerves
Nucleus Pulposus
Annulus Fibrosus
Intervertebral Disc

Médula espinal



Médula espinal



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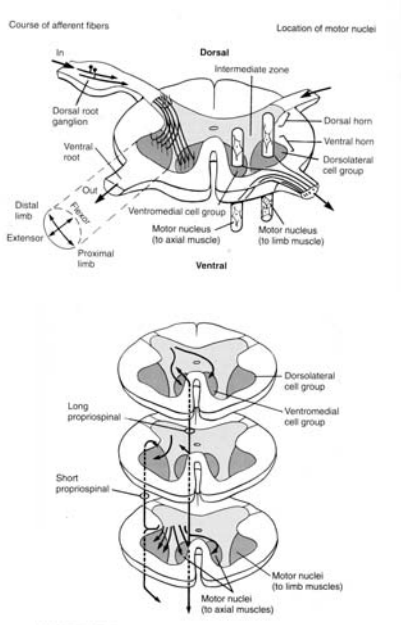

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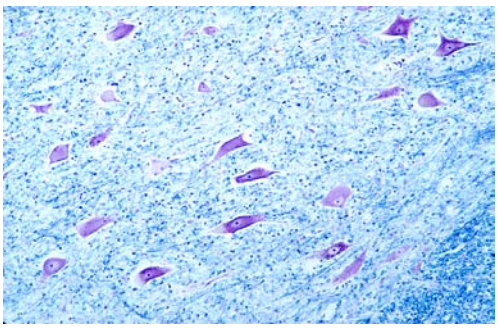

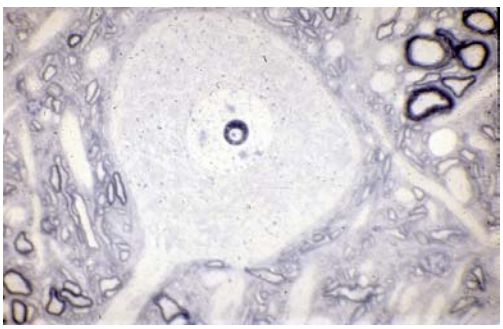

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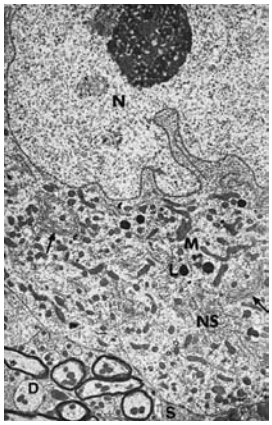
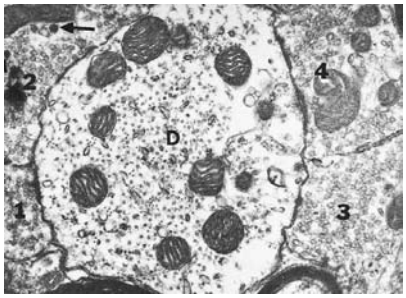
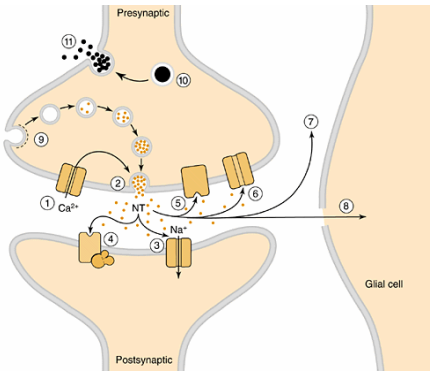
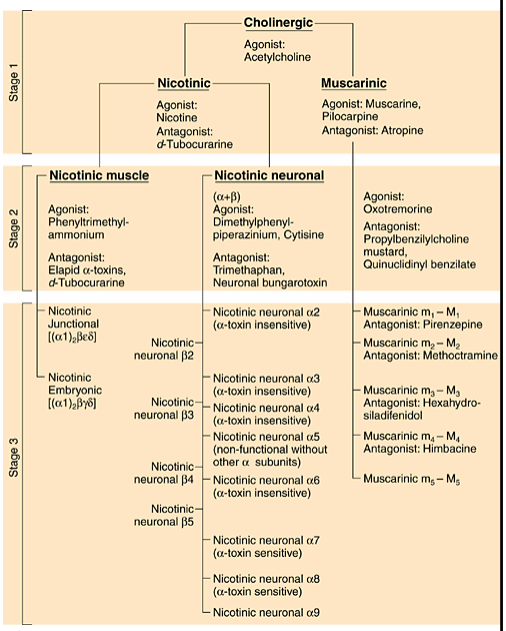


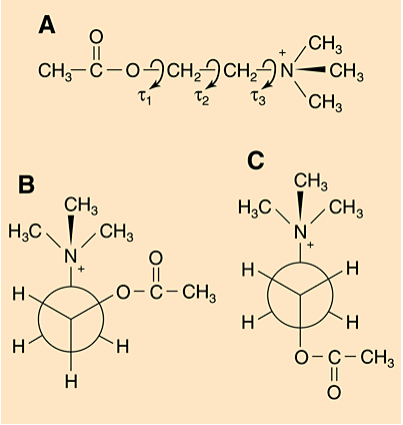


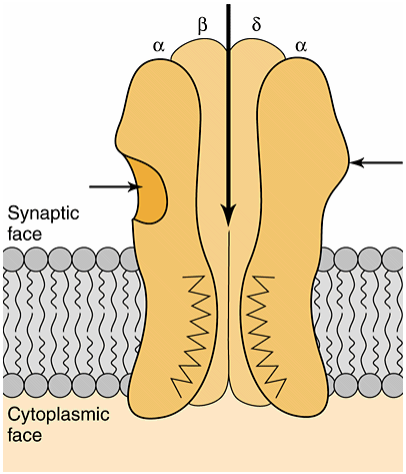
Acetilcolina: Receptores





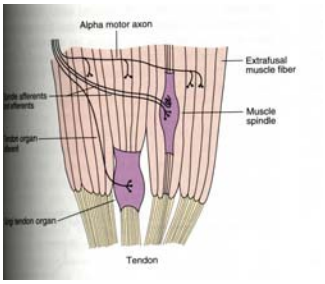
Acetilcolina:
Estructura, Receptores

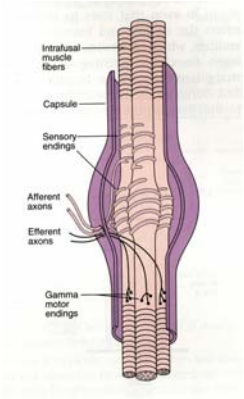


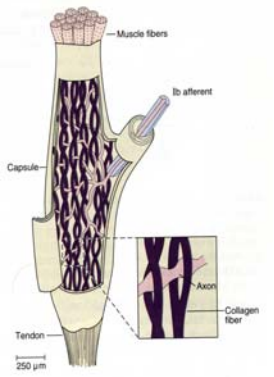


Colina + Acetil coenzima A ⇄ Acetilcolina + Coenzima A

Reflejo miotático, antimiotático: Receptores

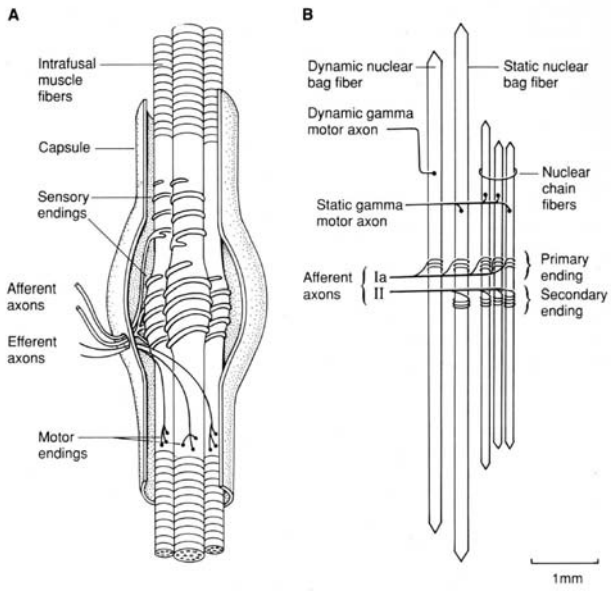




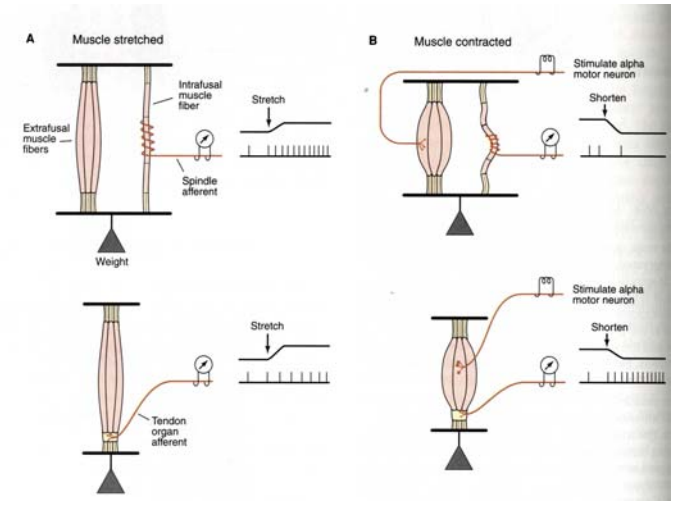


Reflejo miotático:

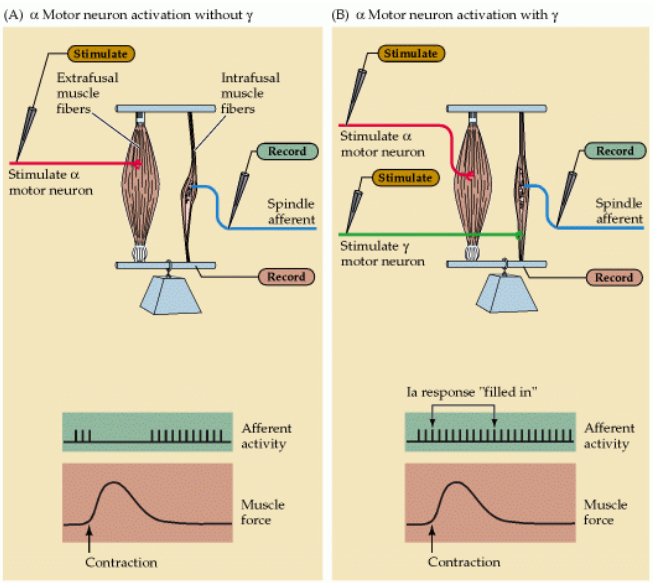
Huso neuromuscular

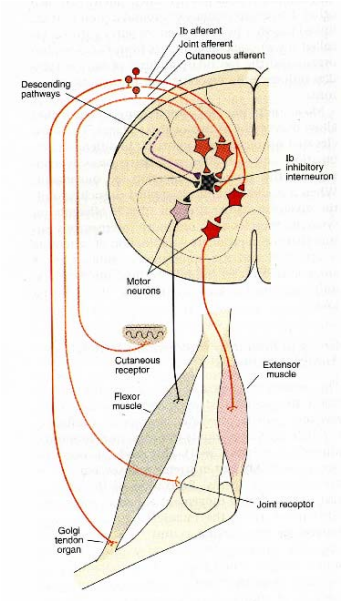


Reflejo miotático, antimiotático:
Receptores

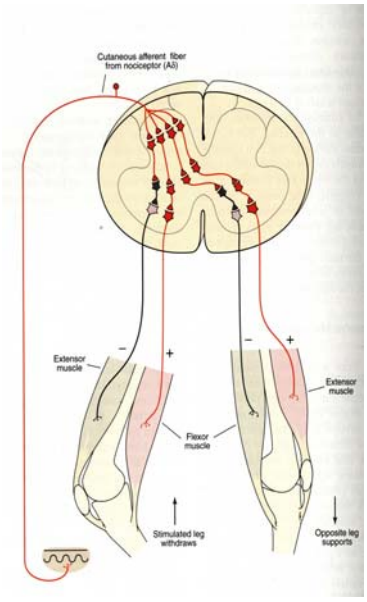


Coactivación
α-γ



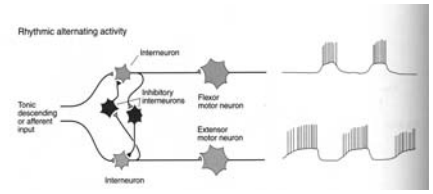


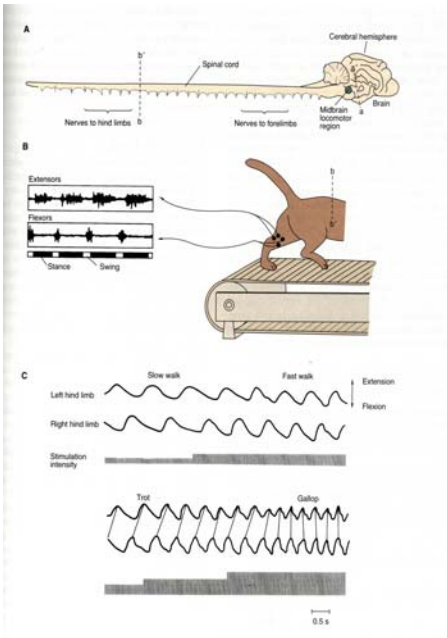
Reflejo flexor

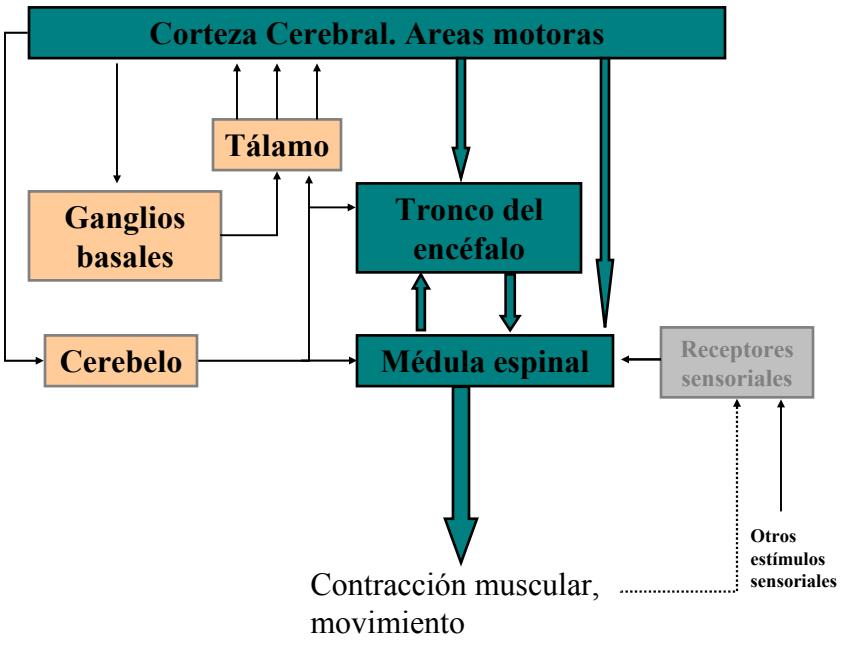


Extensión cruzada

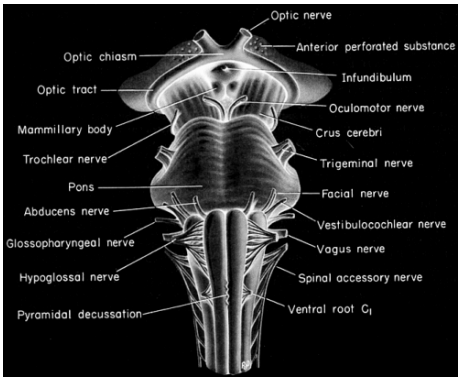
Circuitos medulares

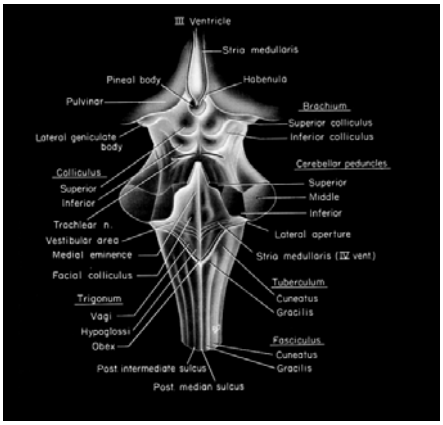






Tronco del encéfalo





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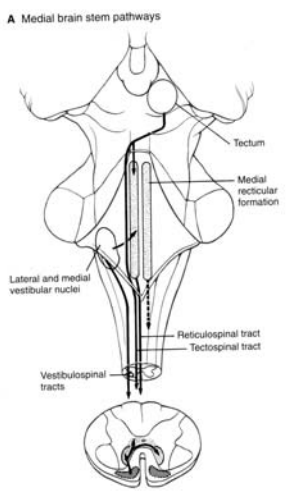
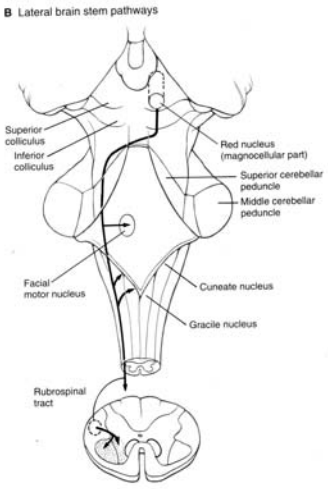




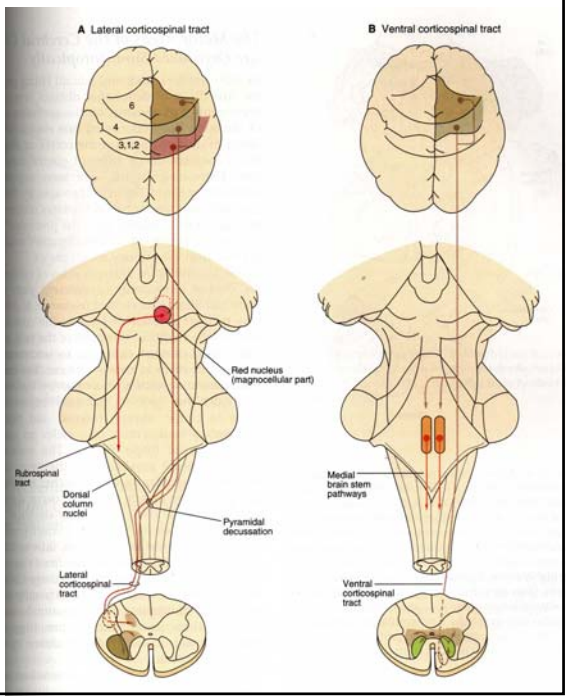
Proximal

Extensor > Flexor

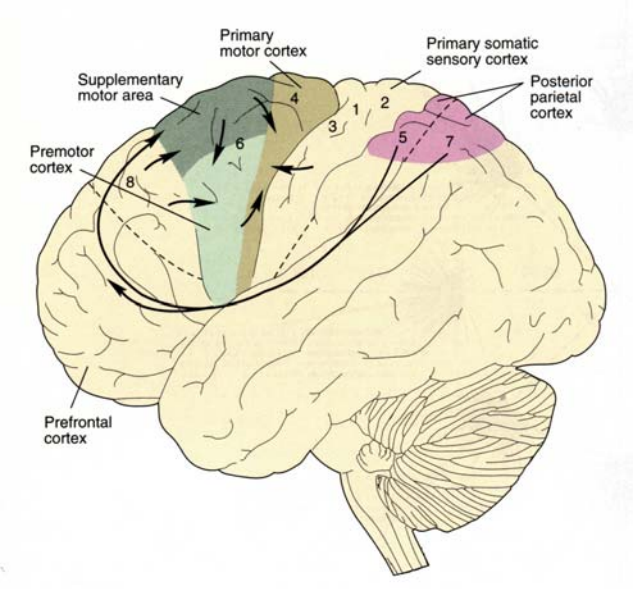
Distal

Extensor < Flexor

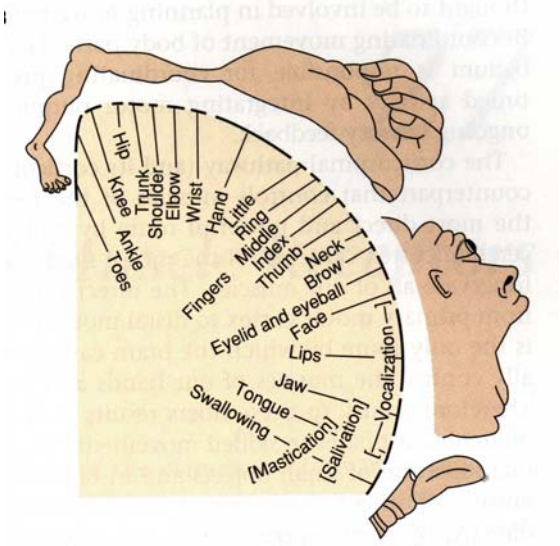
Corteza cerebral: Vía corticoespinal



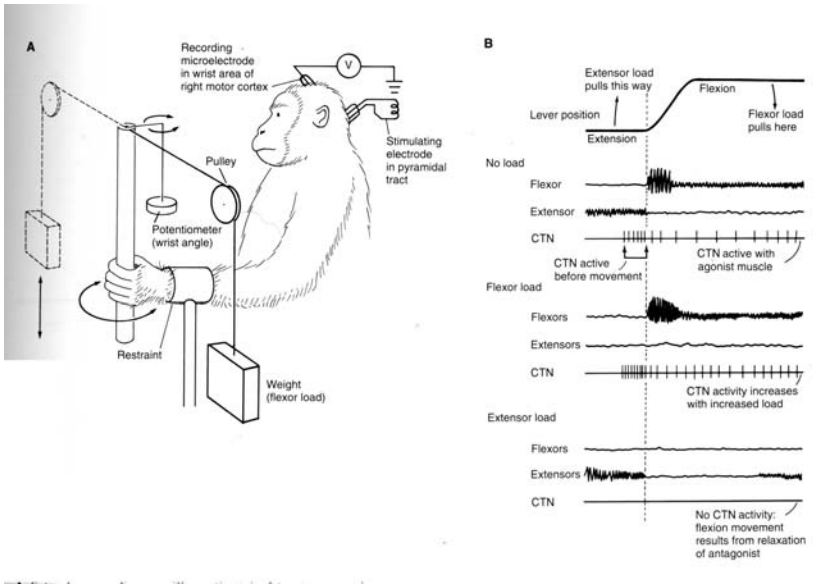
Corteza cerebral



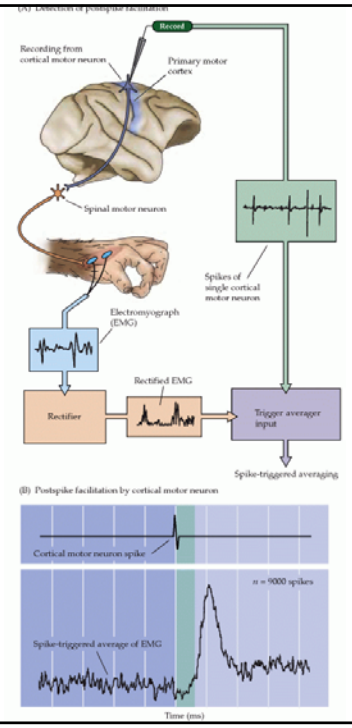
Corteza cerebral: Homúnculo



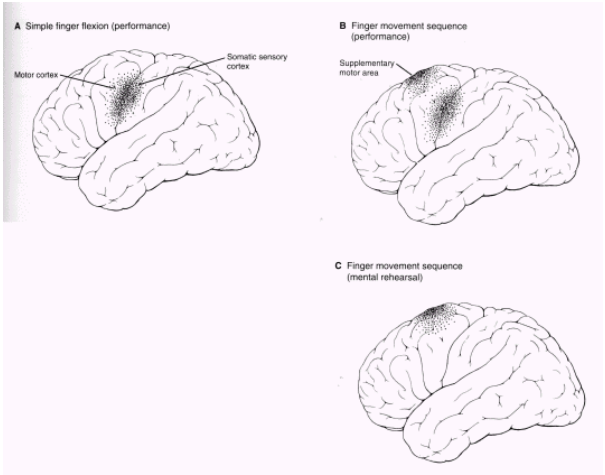
Monos entrenados (Evarts)

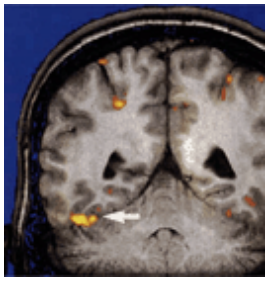


Facilitación post espiga



Estudios de flujos regionales





Neurona superior vs. Neurona inferior:

PARALISIS

Límite dado por la α motoneurona

MN Superior:

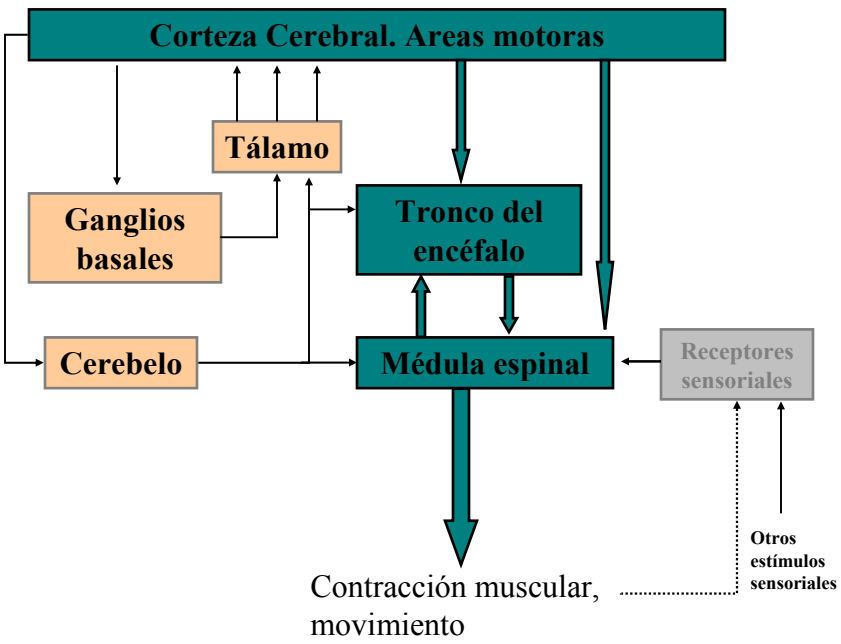
- **Exacerbación de respuesta. Espasticidad**
- **Simetría/asimetría**
- **Signos positivos (Babinski)**

Ej.: AVE cápsula interna, sección medular

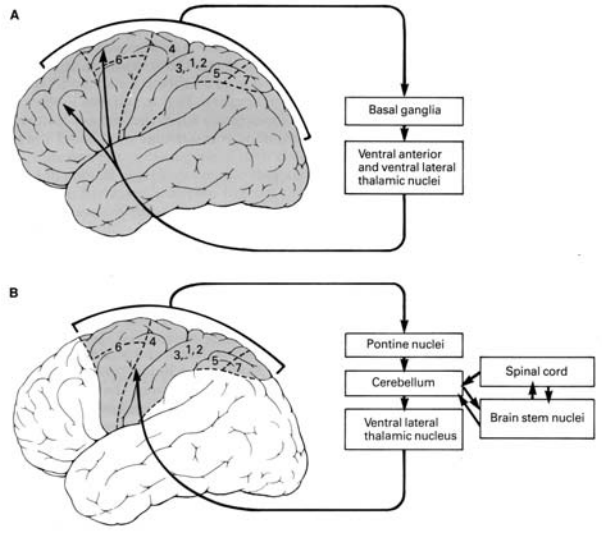
MN Inferior:

- **Flaccidez**
- **Simetría/asimetría**
- **Hiporreflexia/ arreflexia**
- **Marcada atrofia**

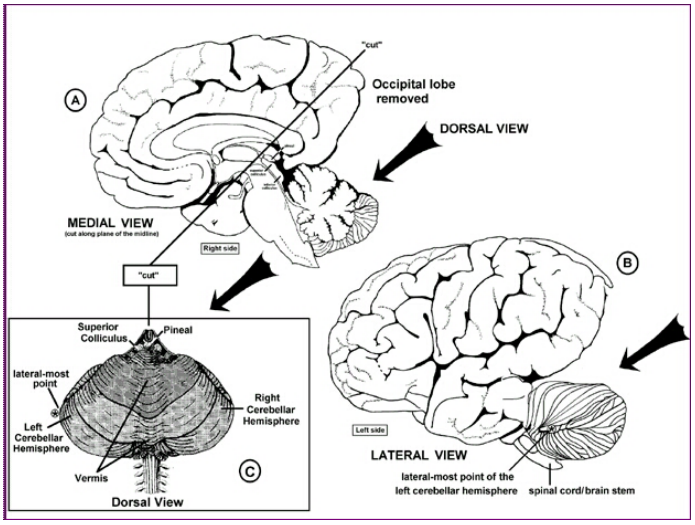
Ej.: Poliomielitis



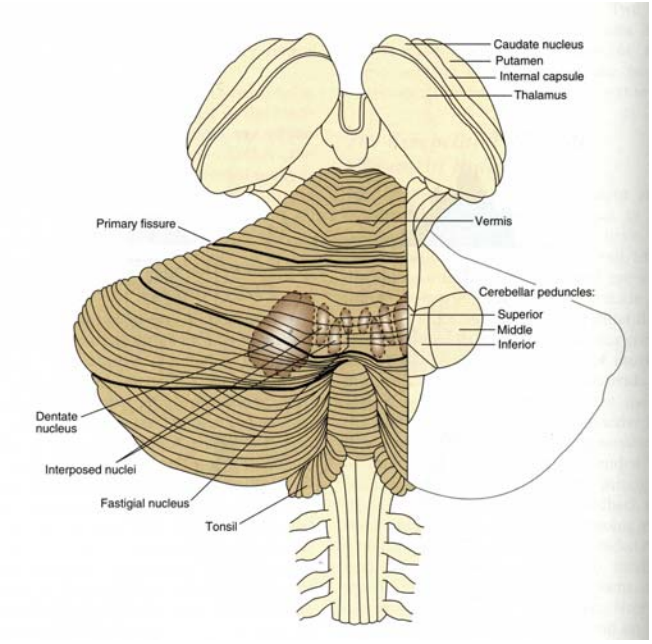
Ganglio basales - Cerebelo



ANATOMIA



ANATOMIA



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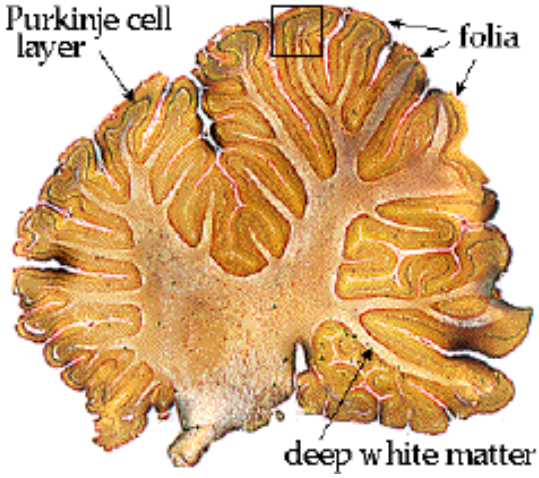
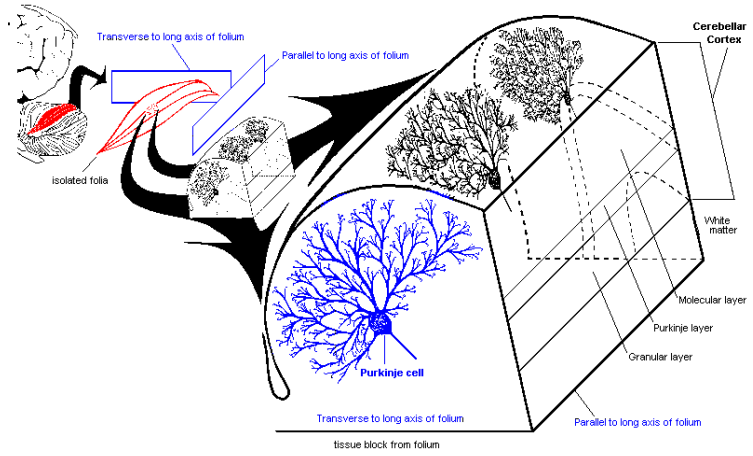


CORTEZA



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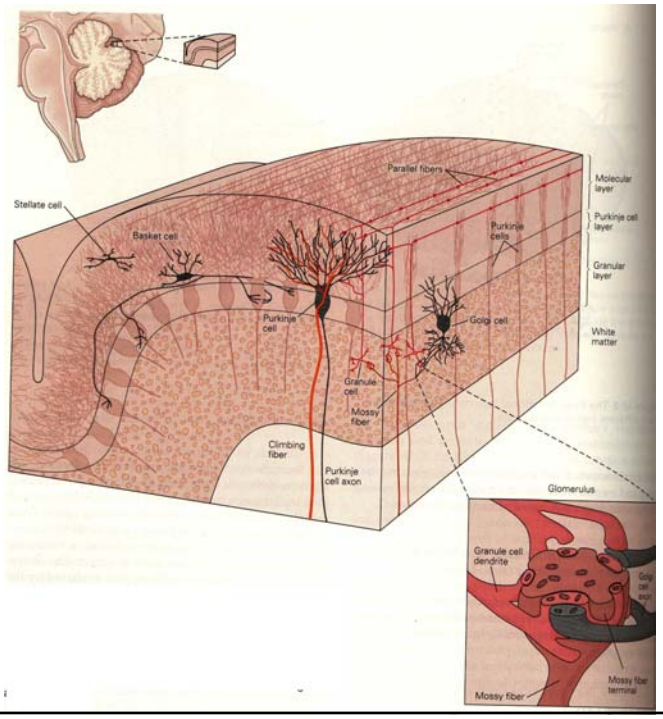

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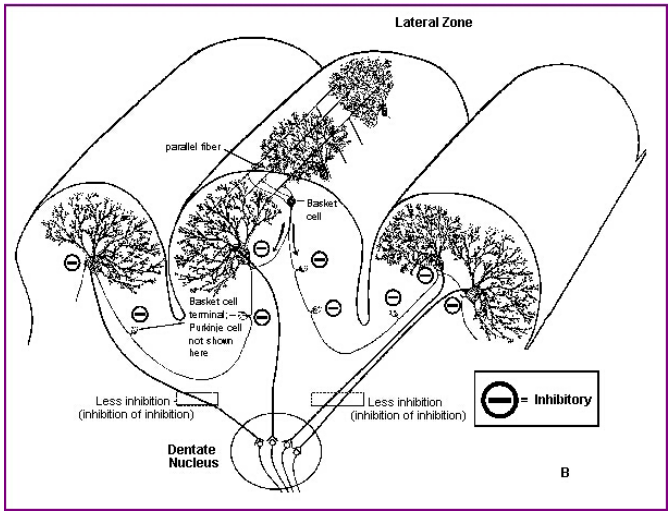

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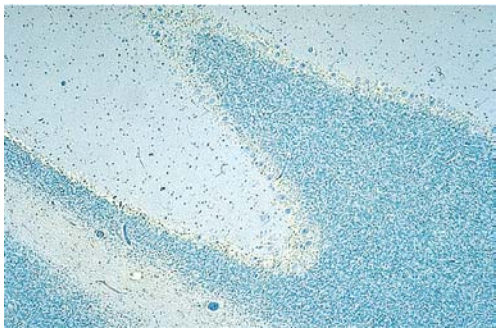
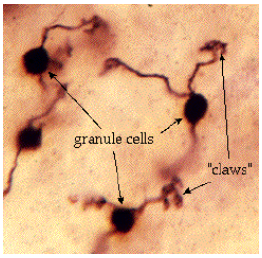
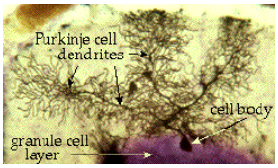


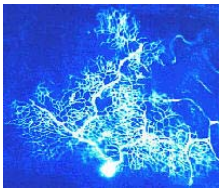
Cels. Cesta, Purkinje

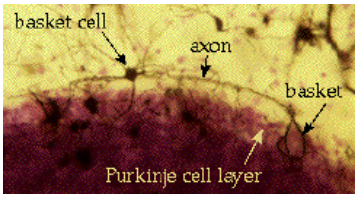
Capa granular



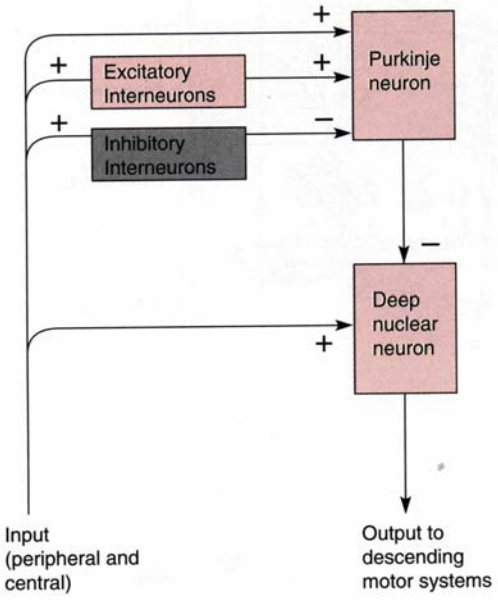
Capa Purkinje







CIRCUITO BASICO



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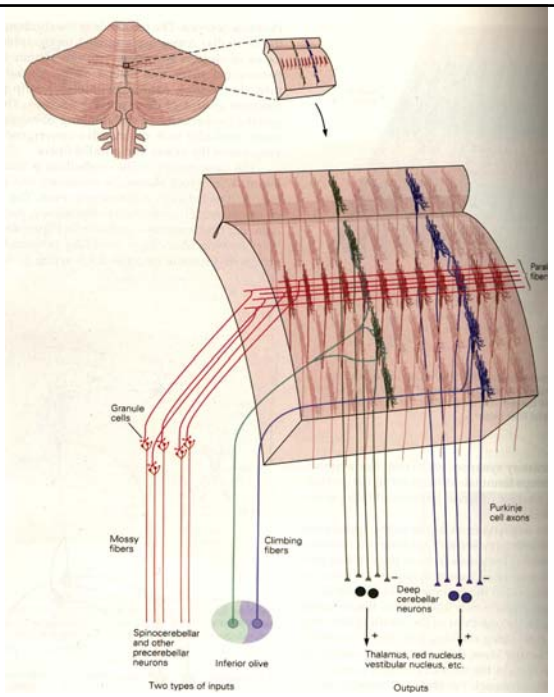
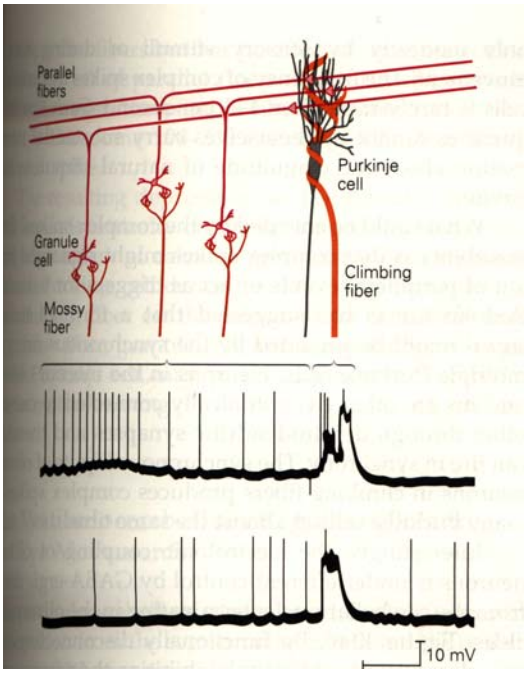
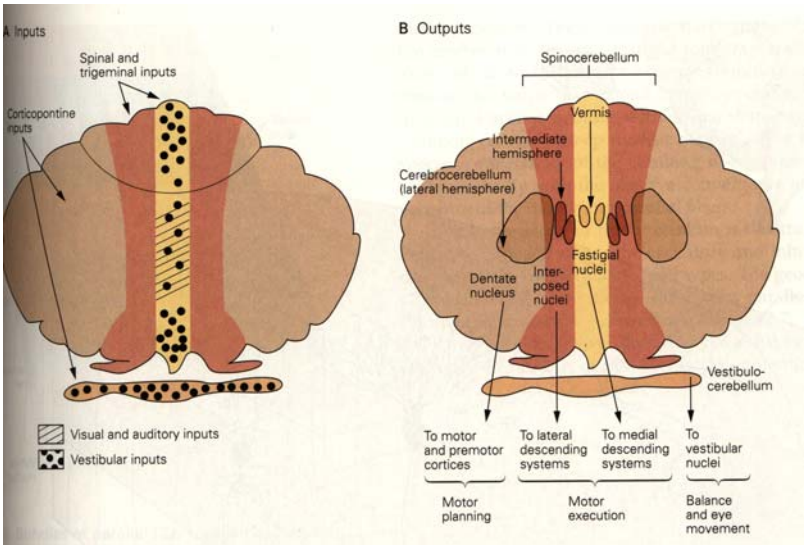


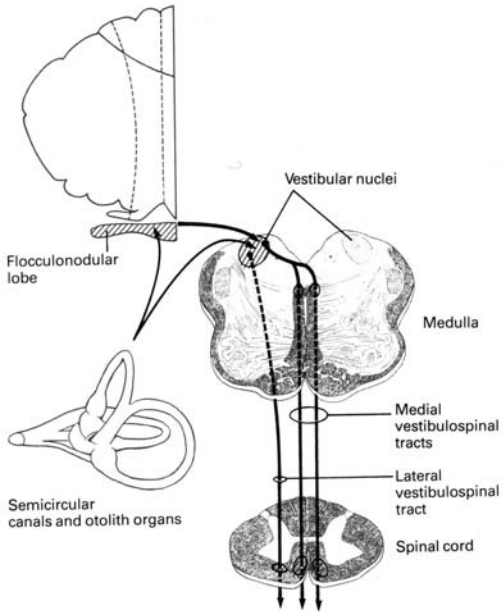
RESPUESTAS NEURONALES



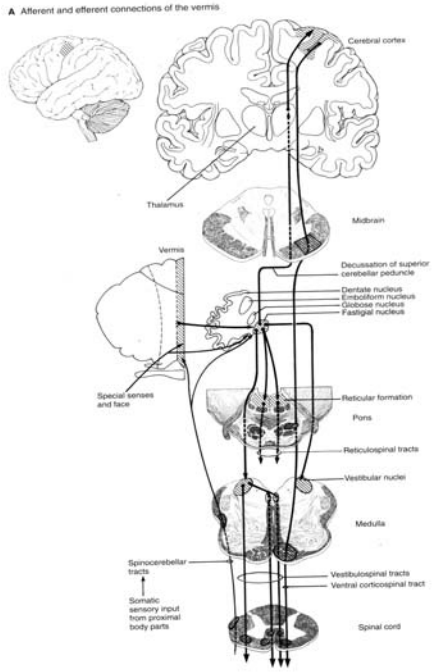
ANATOMIA - FUNCIÓN



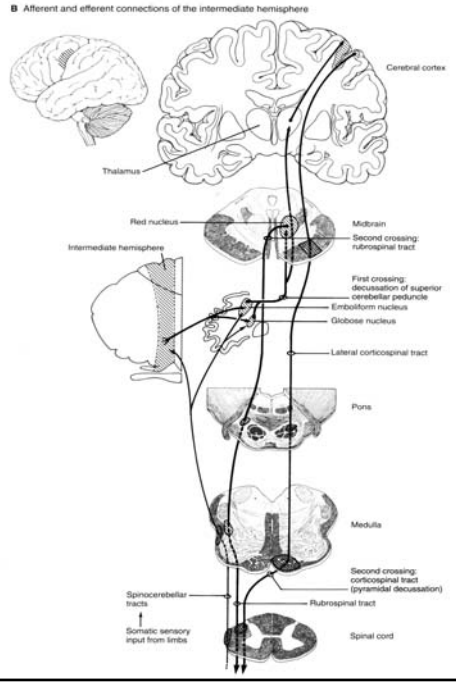
VESTIBULO CEREBELO



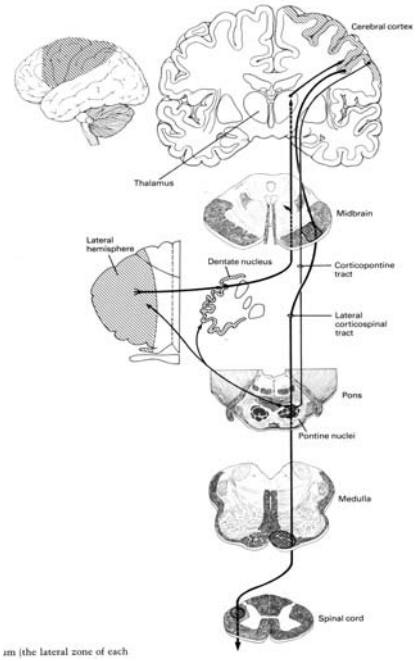
ESPINO CEREBELO MEDIAL



ESPINO CEREBELO LATERAL

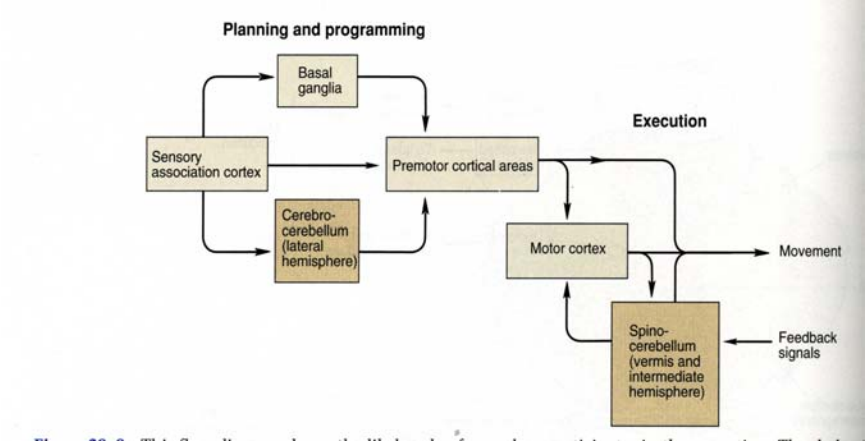


CEREBRO CEREBELO

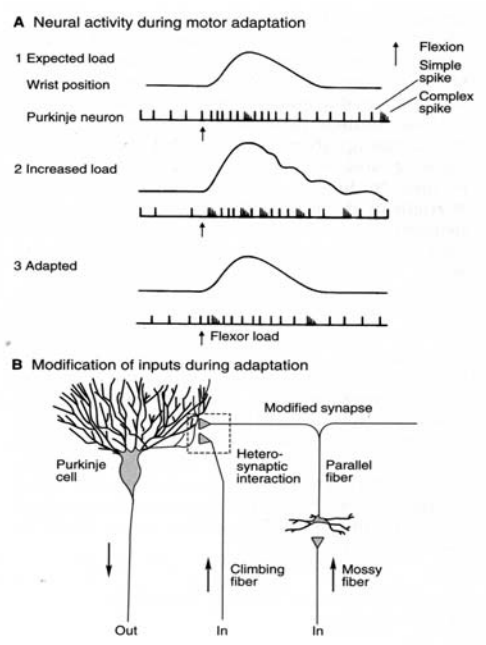


am (the lateral zone of each

ESQUEMA FUNCION



APRENDIZAJE MOTOR



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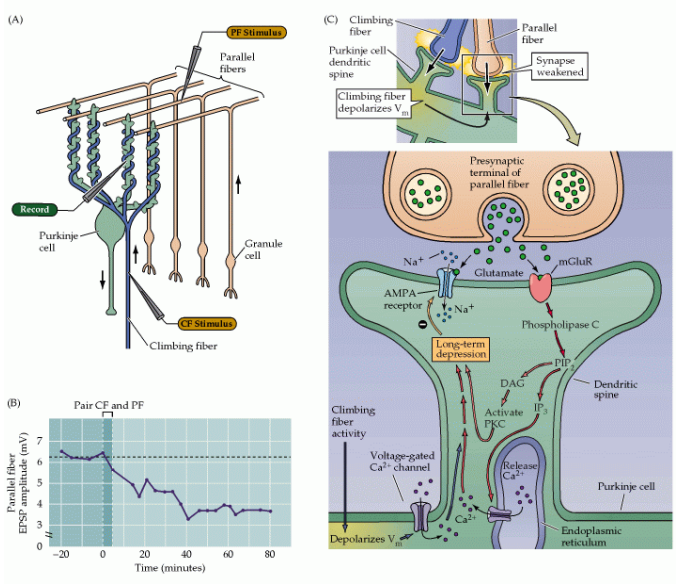
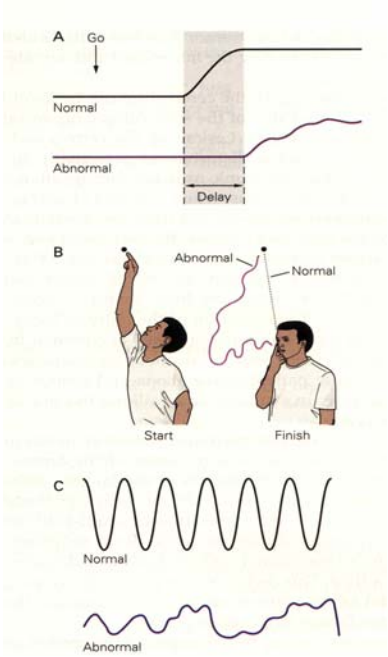
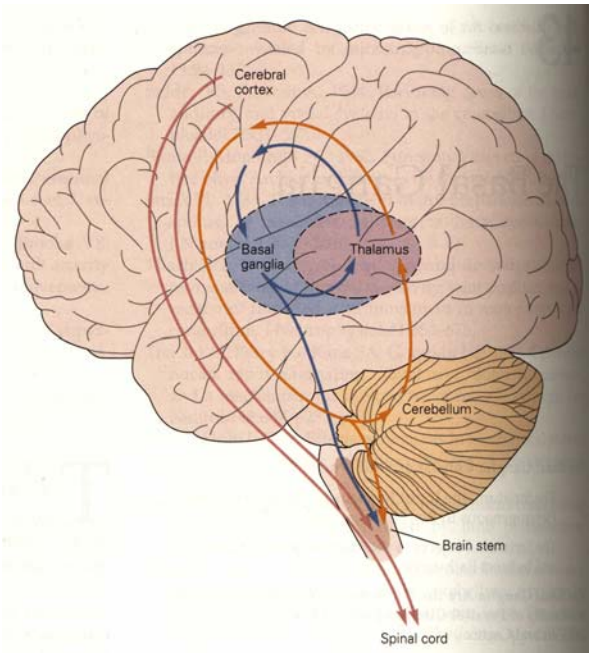


DEFICIT

- Retardo en inicio de movimientos
- Ataxia, temblor de intención
- Disdiadocosinesia
- Hipotonía, sin déficit motor.
- Sin deterioro intelectual



Ganglios basales



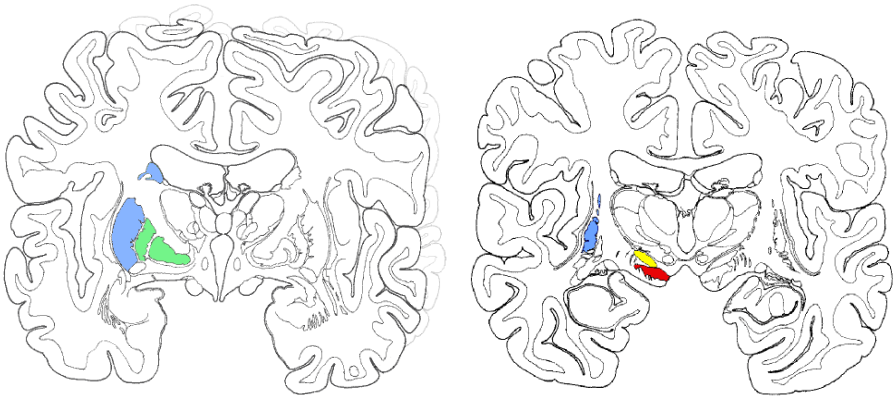
Ganglios basales

- Caudado
- Putámen

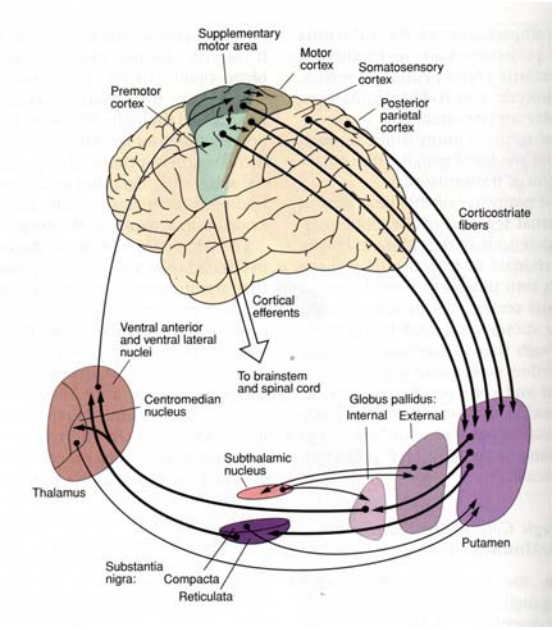
} Cuerpo estriado

- Globus pallidus
- Núcleo subtalámico
- Sustantia nigra:
  - Pars reticulata
  - Pars compacta

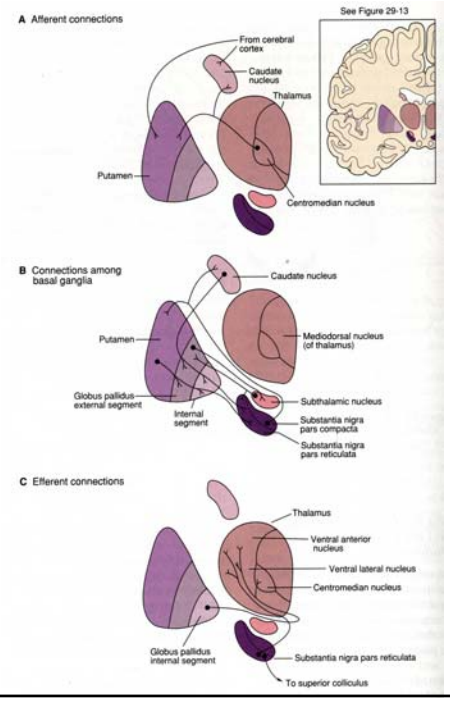
Ganglios basales



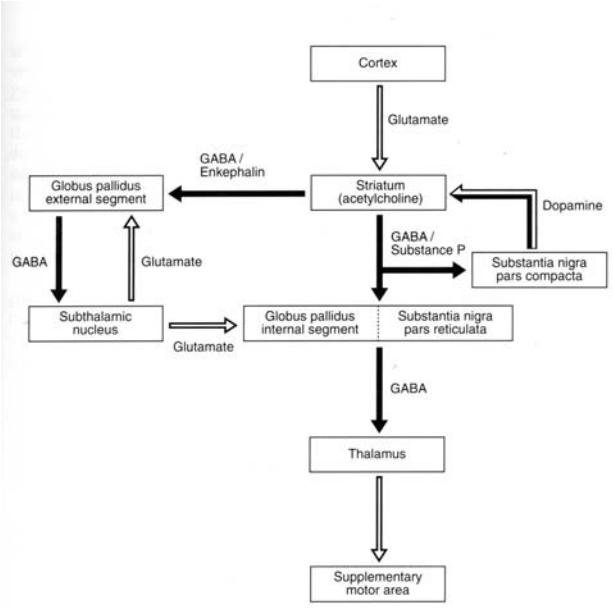
Ganglios basales



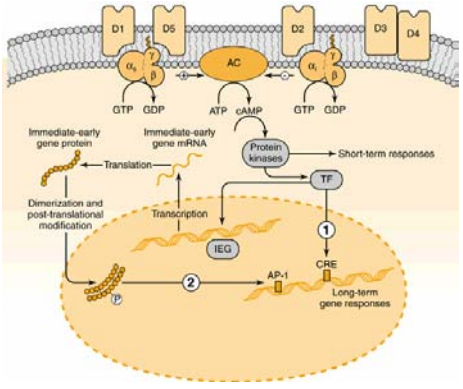
Ganglios basales



Ganglios basales: circuito básico



Ganglios basales: Receptores Dopamina



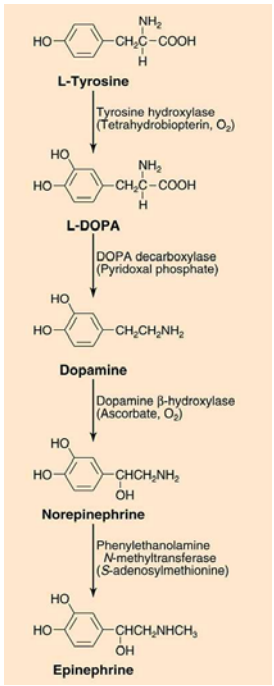
PROPIEDADES DE RECEPTORES DE DOPAMINA CLONADOS

	D1	D5	D2S/D2L	D3	D4
Aminoácidos (hum)	446	477	415/444	400	387
Cromosoma	5	4	11	3	11
Vías efectoras	↑cAMP	↑cAMP	↓cAMP ↑canal K+ ↓canal Ca^{2+}	↓cAMP	↓cAMP ↑canal K+
Distribución mRNA	Caudado putámen, nucleus accumbens, Tub. olfatorio	Hipocampo, hipotálamo	Caudado putámen, nucleus accumbens, Tub. olfatorio	Tub. olfatorio	Corteza frontal hipotálamo bulbo, tronco nucleus accumbens

CONCENTRACION DE DOPAMINA ESTRIATAL EN PARKINSON, PARKINSONISMO

Patología	% Control normal Caudado	Putámen
Parkinson	31	22
	10	4
	18	2
Parkinsonismo postencefalitis	6	6
	1.5	0.6
Sindromes Parkinsonianos		
Degeneración Nigroestriatal	<0.4	<0.4
Steele-Richardson-Olszewski	20	27
Hallervorden-Spatz	1.4	0.9
Atrofia olivopontocerebelosa	0.3	0.01
SIDA	43	—
Huntington	86 (NS)	99 (NS)
Alzheimer	61 (NS)	50 (NS)

Parkinson: Base neuroquímica



CAMBIOS NEUROBIOQUIMICOS EN LA VIA DOPAMINERGICAS NIGROSTRIATAL EN PARKINSON

	Región	% control normal
Dopamina, metabolitos		
Dopamina	Substantia nigra	17
	Caudado	10
	Putámen	4
DOPAC	Substantia nigra	2
	Putámen	10
HVA	Substantia nigra	48
	Putámen	29
Enzimas		
Tirosina hidroxilasa	Substantia nigra	46
	Caudado	60
	Putámen	16
Decarboxilasa aminoácidos aromáticos	Caudado	9
	Putámen	4
Catecol-O-metil transferasa	Substantia nigra	82
	Caudado	70
	Putámen	78
Monoamino oxidasa-B	Substantia nigra	125
DAT	Caudado	32
	Putámen	16

Parkinson. Clínica

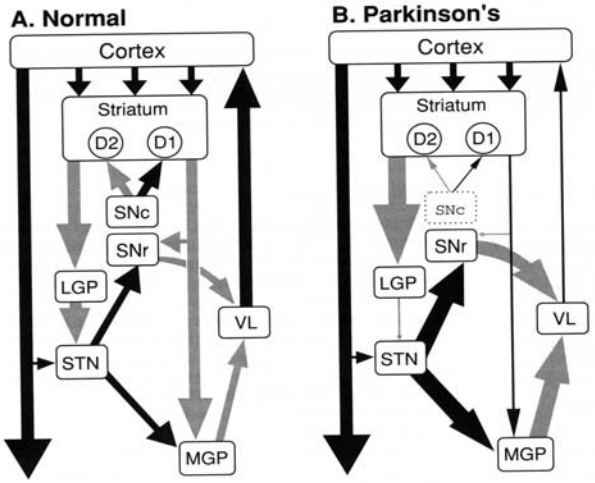
Fase "Off"

Fase "On"

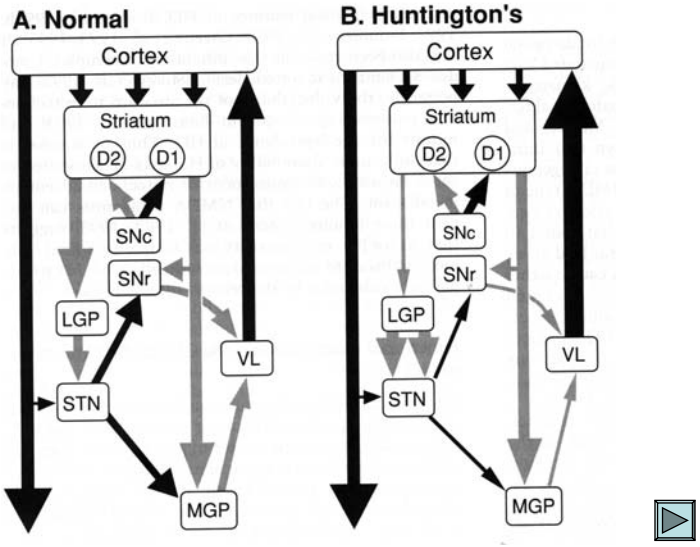
Diskinesia

Inestabilidad postural

Parkinson. Fisiopatología



Huntington. Fisiopatología



Normal

Parkinson's

Pre-Transplant

Post-Transplant