

Stratégies de Réparation de la Moelle Épinière

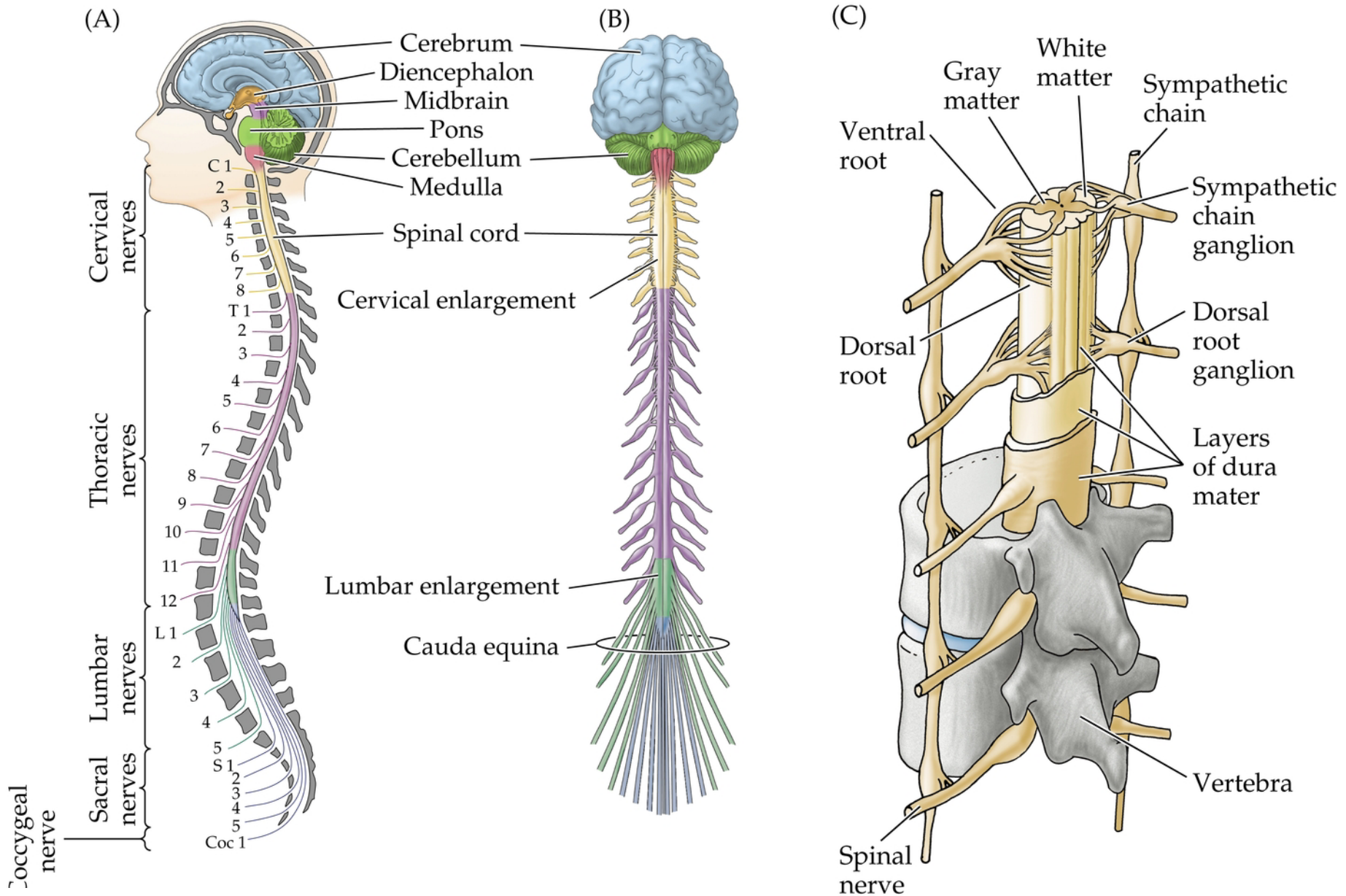
Abdeljabbar El Manira

Nobel Institute for Neurophysiology

Department of Neuroscience

Karolinska Institute

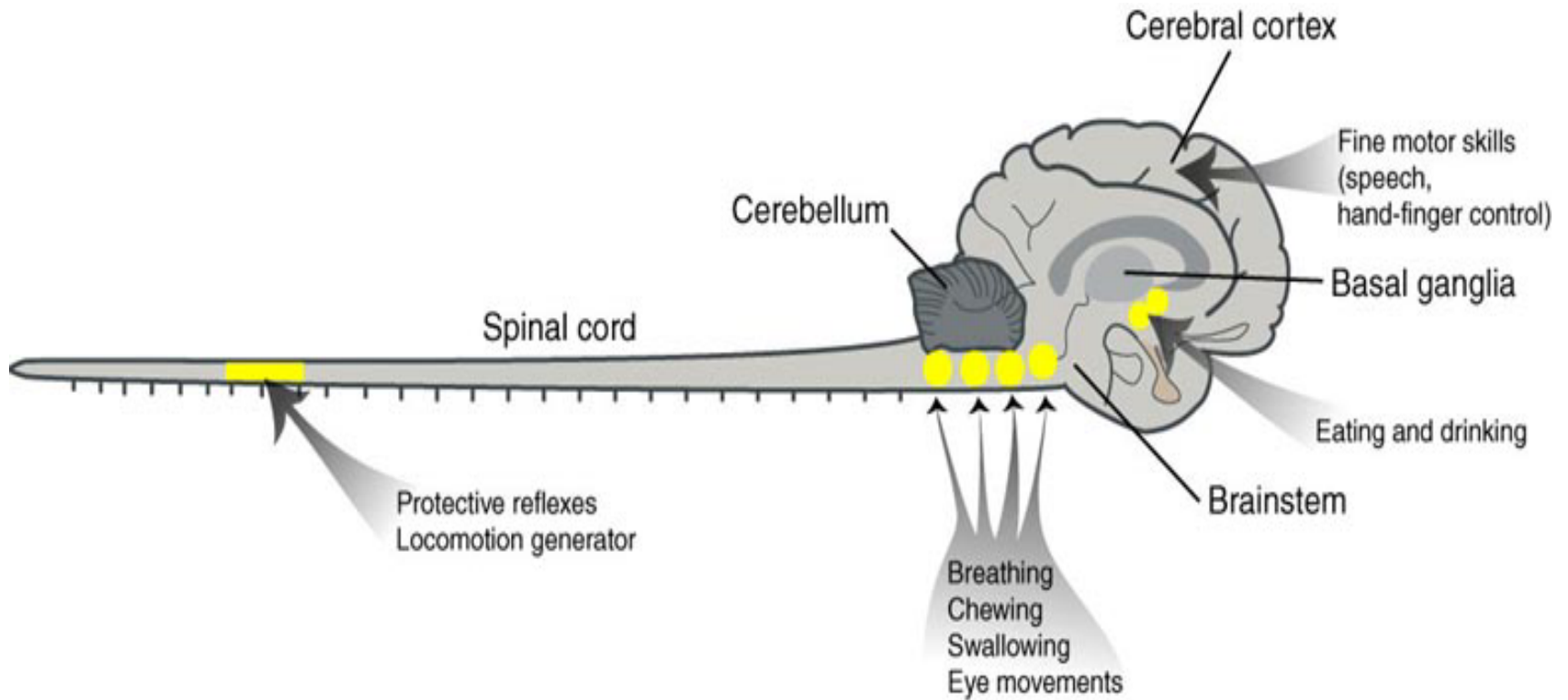
1er Colloque Marocain
Neuroscience & Handicap
10/12/2004-11/12/2004



Personnes avec lésion de la moelle épinière aux USA

- 10 000 à 12 000 cas par an.
- 250 000 de personnes au total.
- Le coût de la prise en charge de ces personnes est estimé à \$4 milliards.
- 38,5%: accidents; 24,5: violence; le reste: sport, accidents de travail, chutes...
- 55% des victimes sont âgés de 16 à 30 ans.
- 80% des cas sont de sexe masculin.

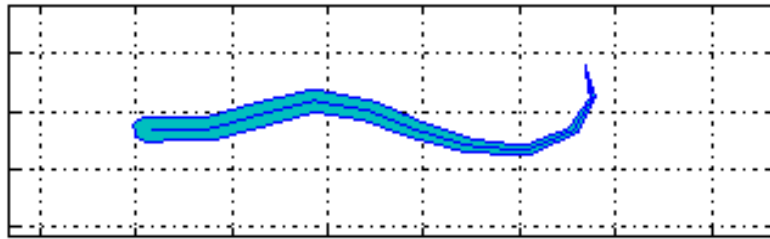
Organisation des centres moteurs



Comment le système nerveux nous permet de marcher?

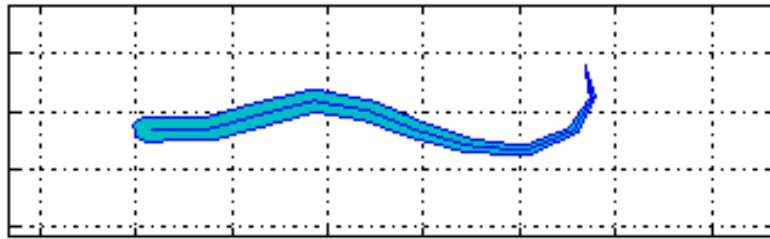
- Identification des neurones impliqués
- Interactions synaptiques – réseaux de neurones
- Propriétés membranaires
- Modulation - plasticité



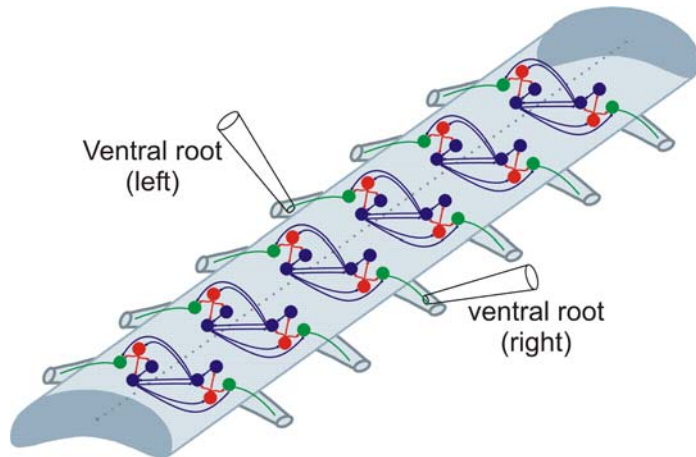


Lamprey

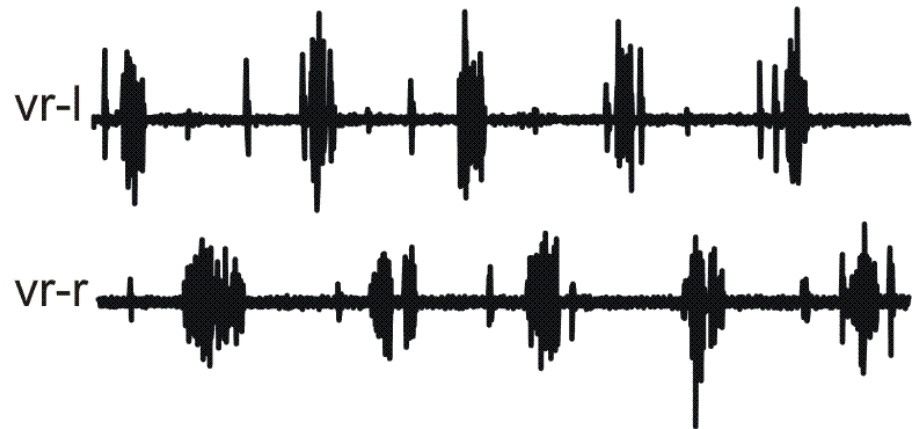




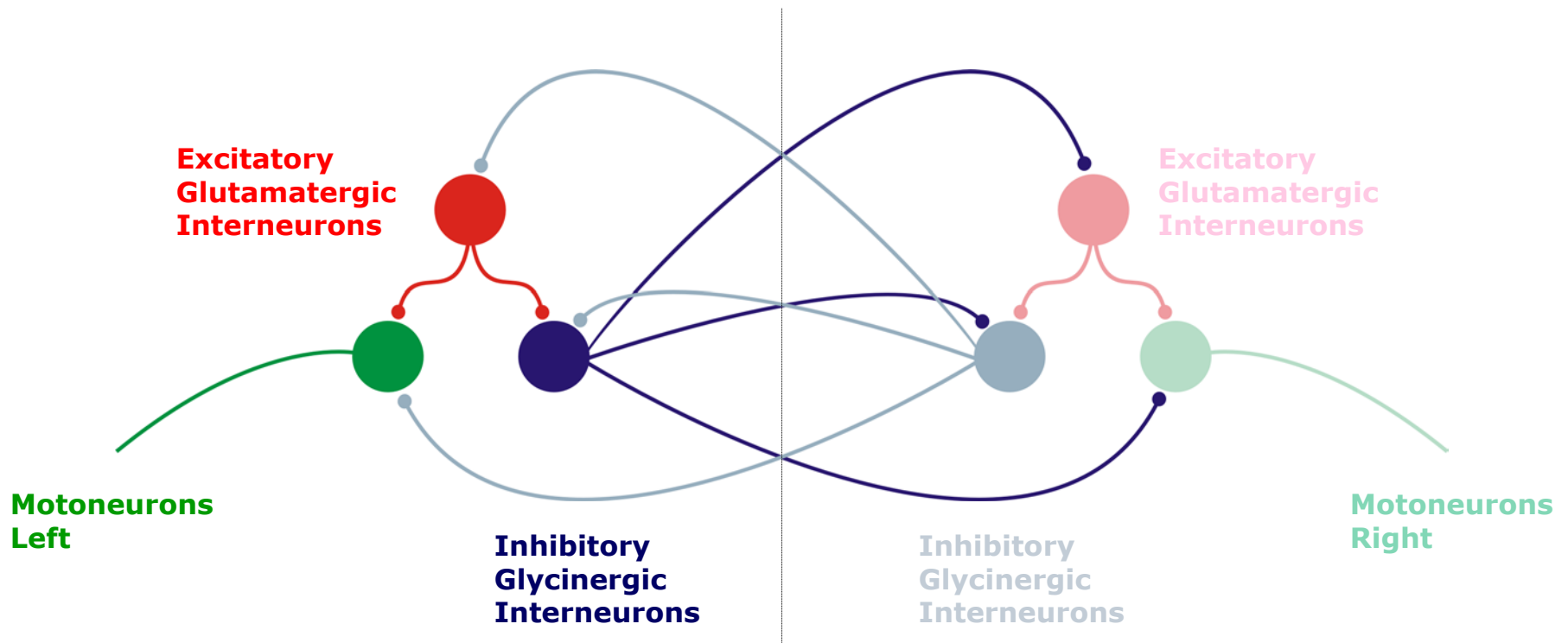
In vitro spinal cord



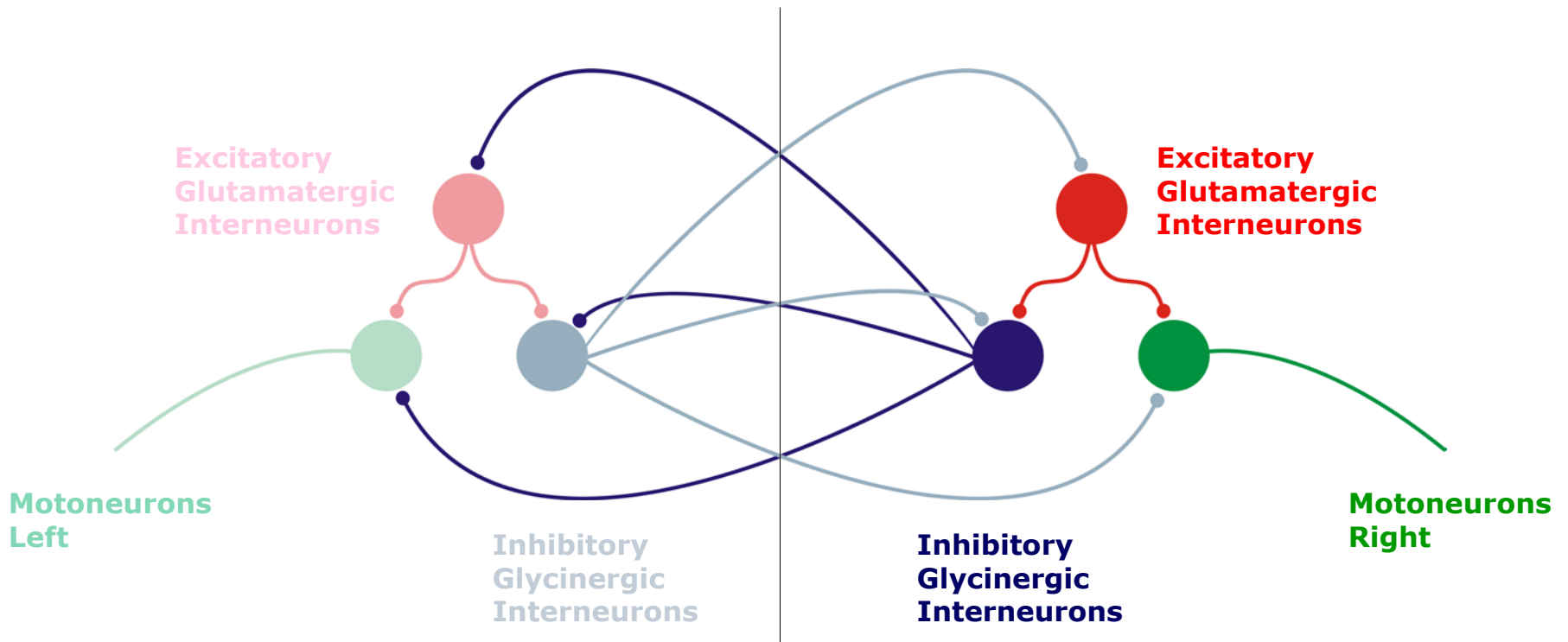
Fictive locomotion



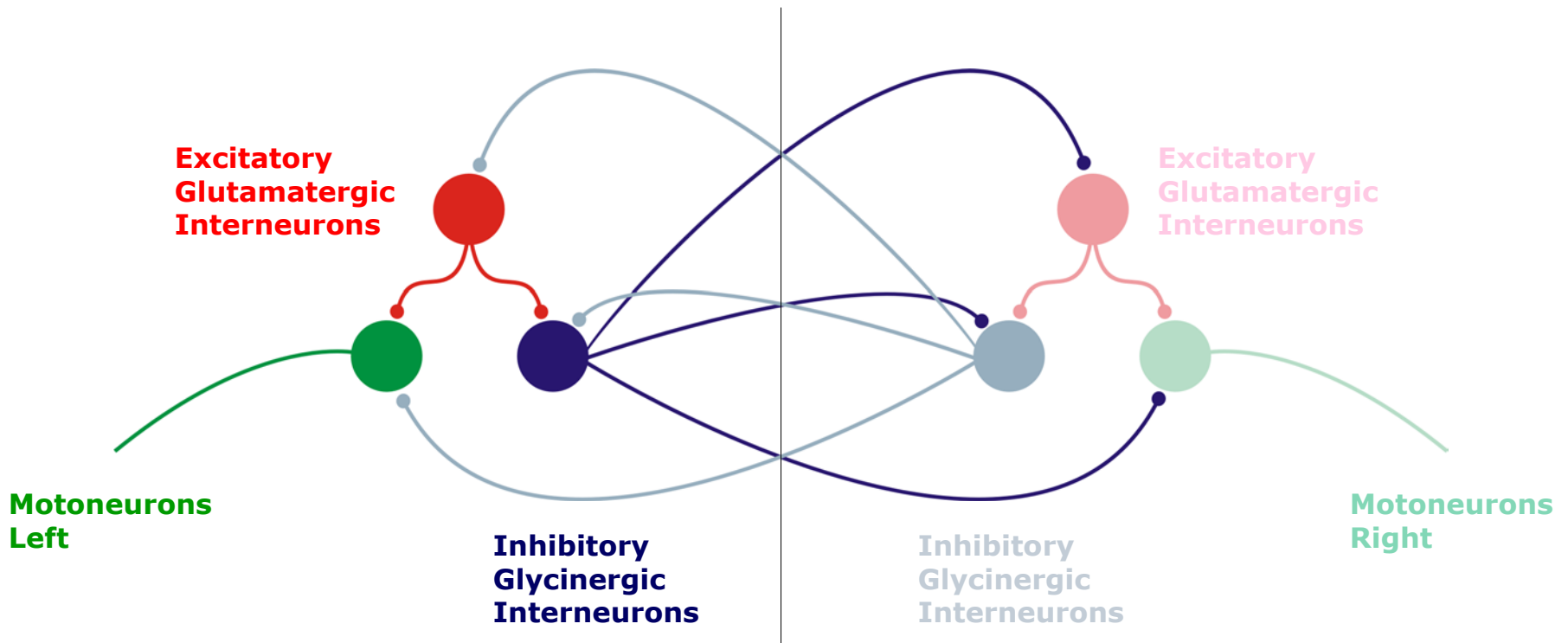
La locomotion est générée par un réseau de neurones excitateurs et inhibiteurs



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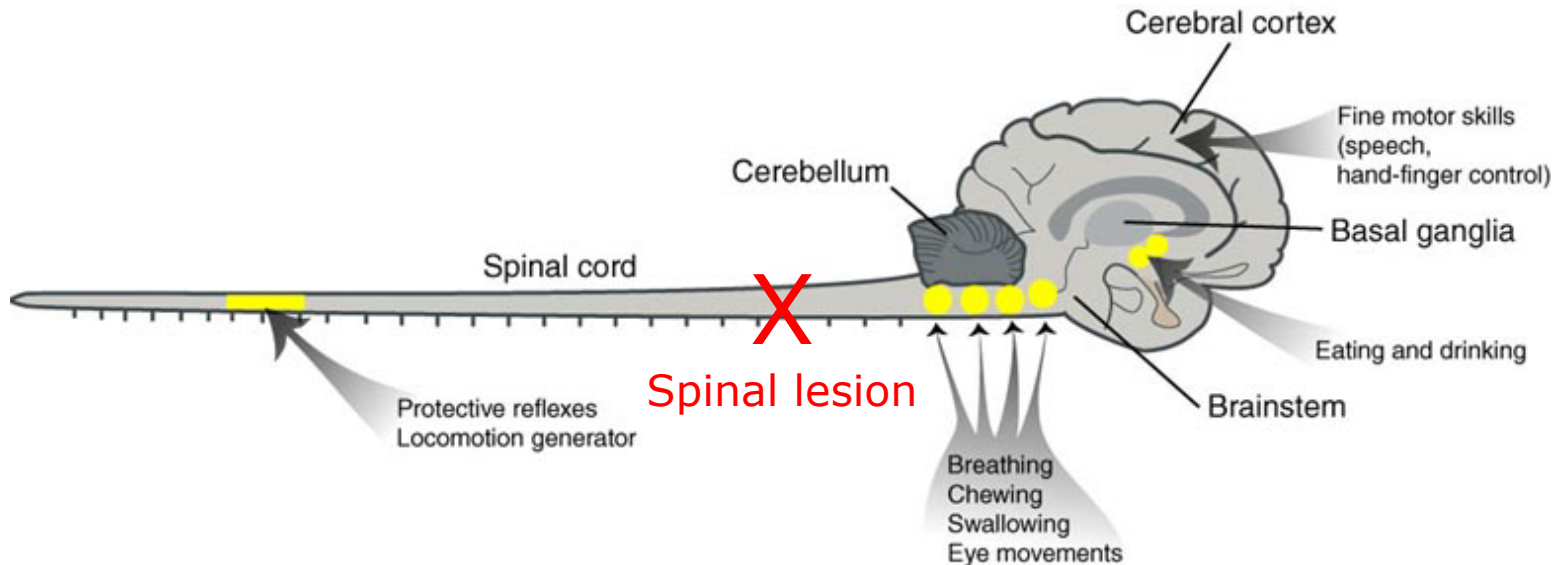


L'organisation du générateur central de locomotion est conservée chez les vertébrés





Consequences de la lésion de la moelle épinière



Hémorragies
Ischémie

Accumulation
Radicaux libres
AA excitateurs

Inflammation
Mort cellulaire

Dégénérescence
Cicatrisation

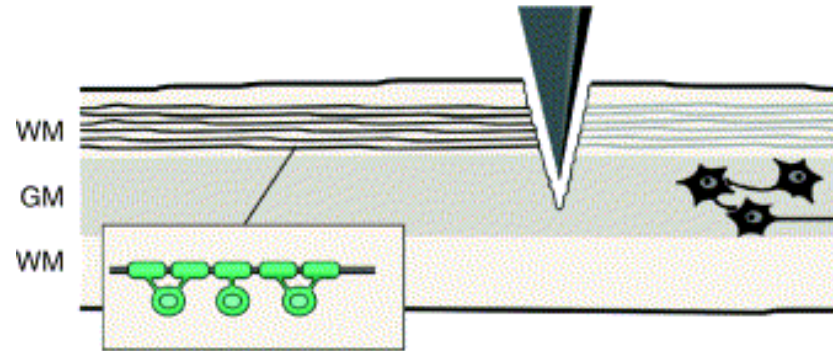
Secondes - minutes

Minutes - heures

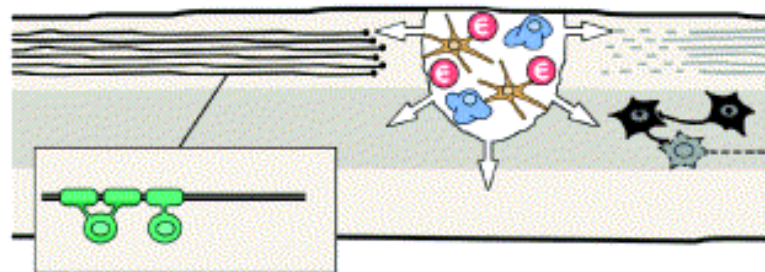
Heures - semaines

Semaines - mois

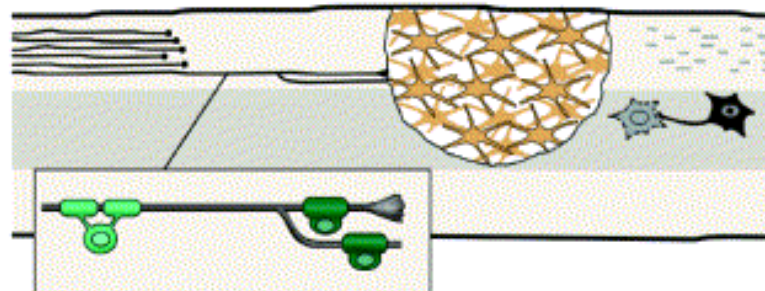
(a) Acute: from the impact to the first few days after SCI



(b) Secondary: within minutes to weeks after SCI



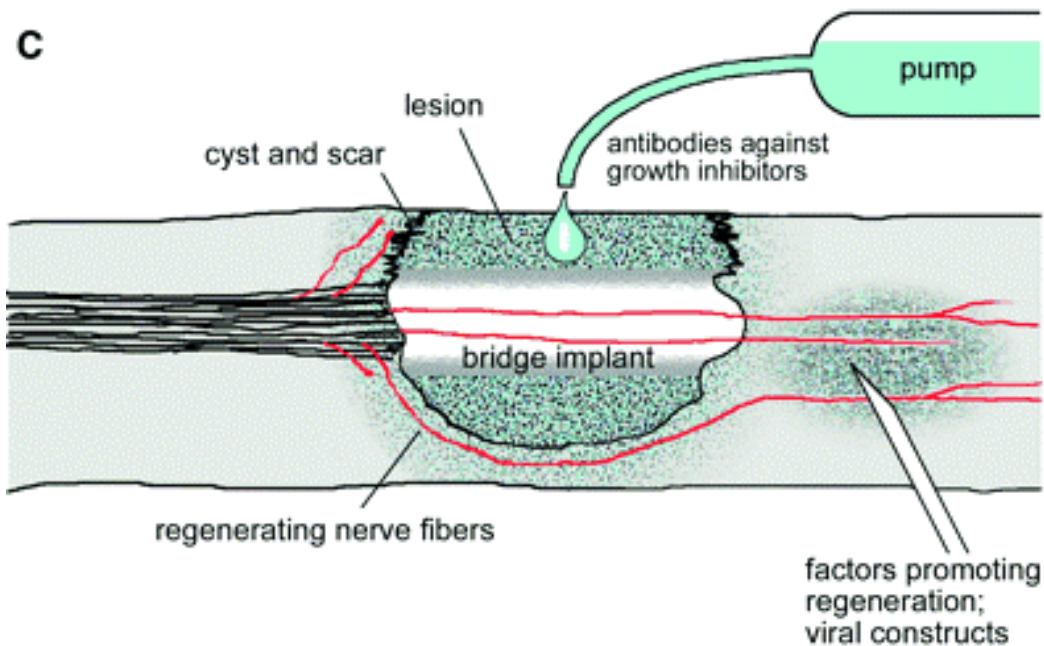
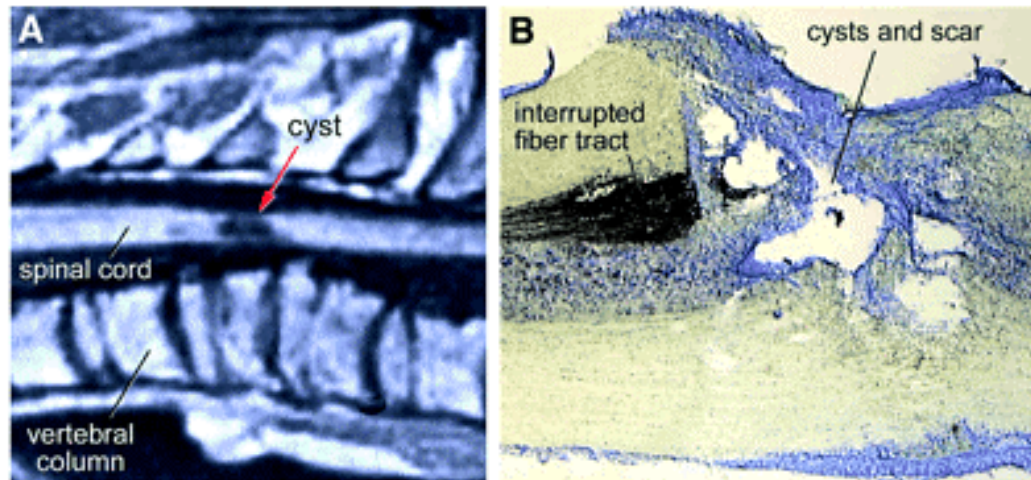
(c) Chronic: within days to years after SCI



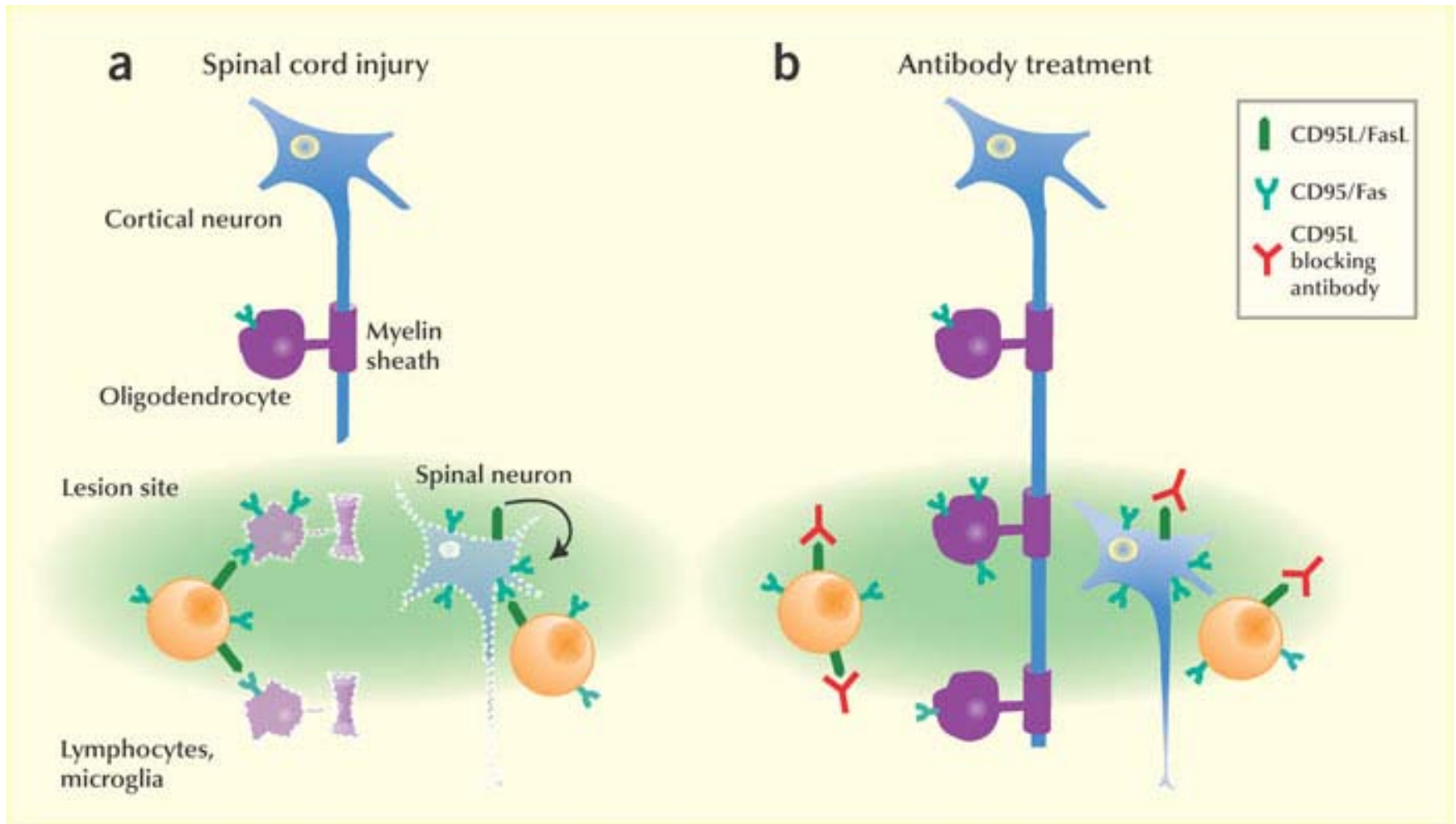
Comment rétablir les fonctions motrices?

- Régénération des fibres sectionnées.
- Protection – restreindre l'étendue de la lésion.
- Programmes de rééducation.

Régénération des circuits endommagés



Inhibition de la mort cellulaire au niveau du site de la lésion



uninjured

***untreated
one week after
SCI***

α CD95L | α TNF
-treated
one week after
SCI

Programmes de rééducation chez le chat...



Programmes de rééducation chez le chat...



Programmes de rééducation chez l'Homme...



Programmes de rééducation chez l'Homme...



Programmes de rééducation chez l'Homme...



Programmes de rééducation chez l'Homme...

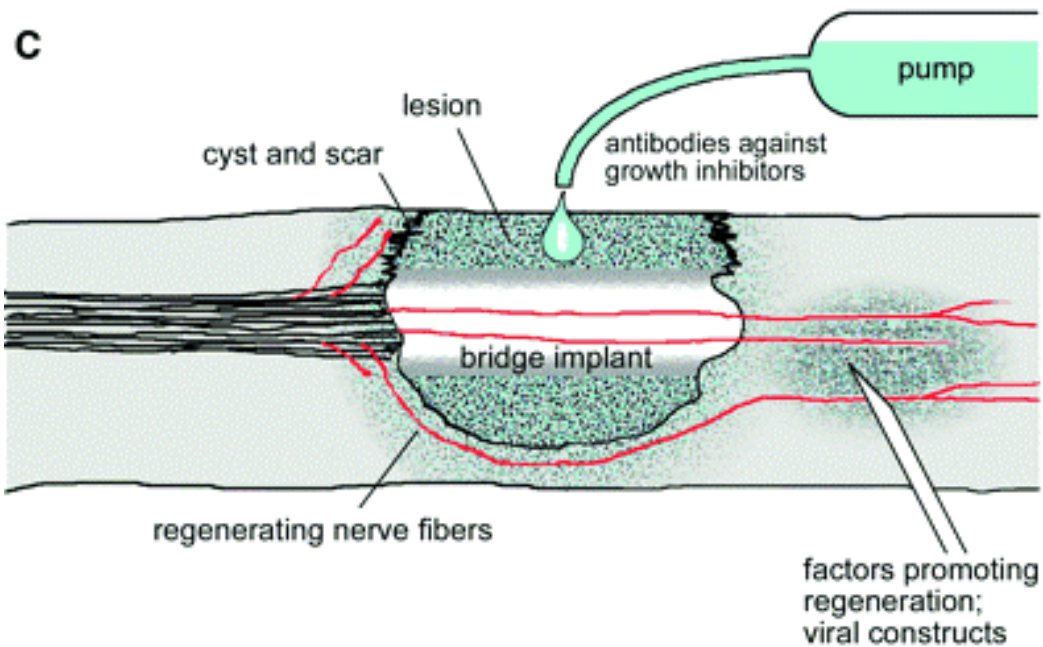
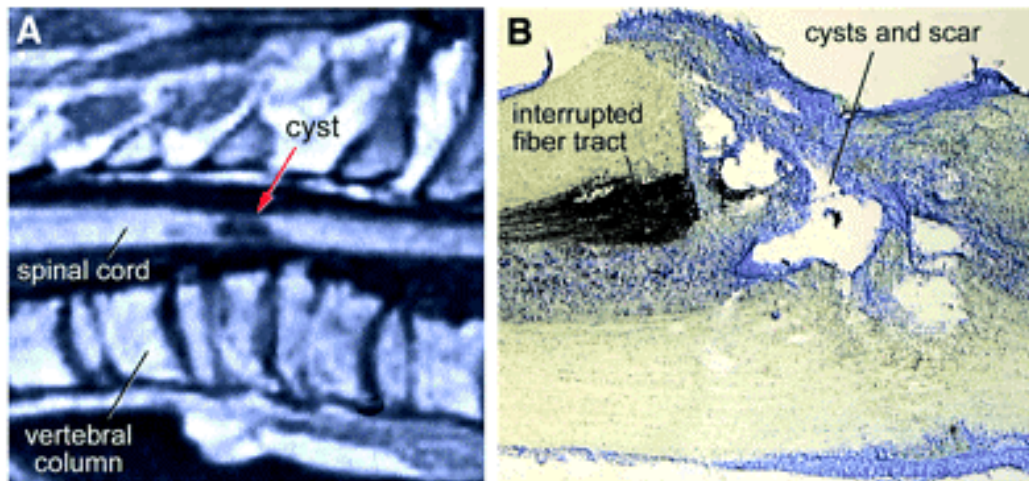




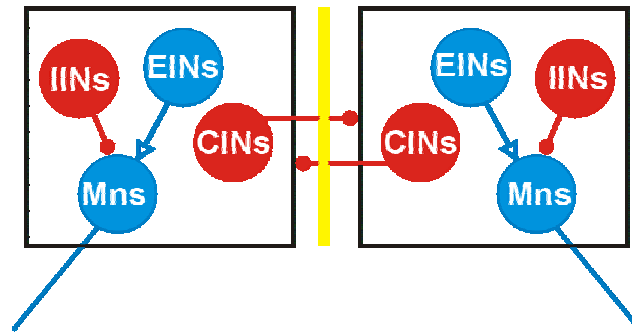
*"Once we choose hope,
everything is possible."*

Christopher Reeve

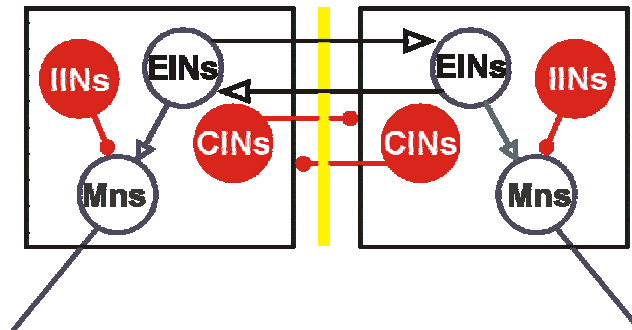




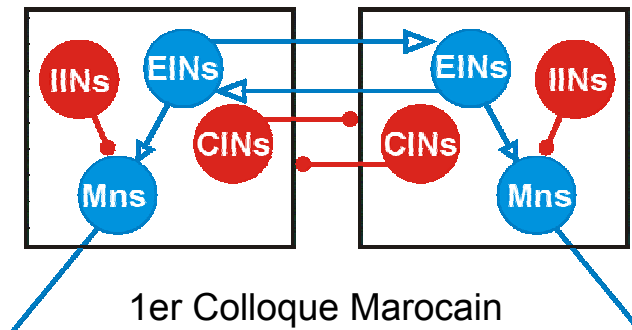
Wild type

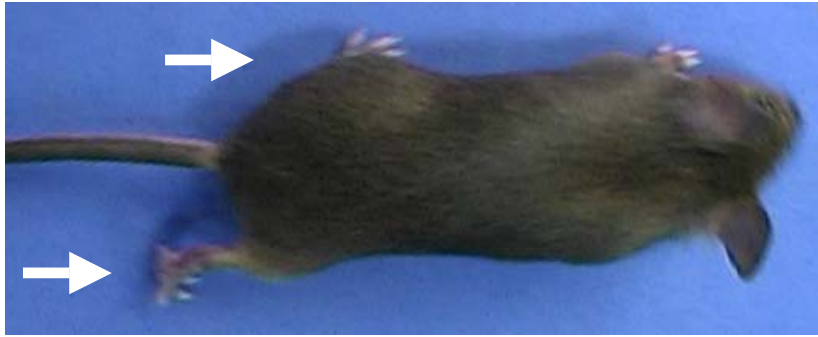


Eph4A KO



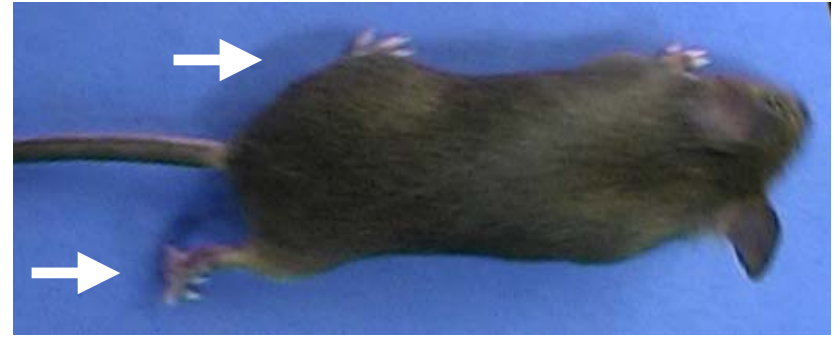
Ephrine 3 KO





Mouse with *lox* sites flanking the **EphA4** gene

X



Mouse expressing CRE recombinase in **VGLUT2**-positive cells

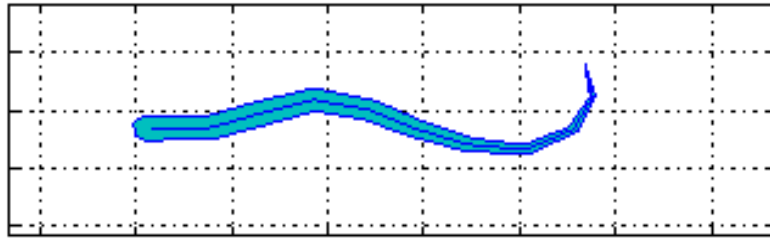


Deletion of **EphA4** in **VGLUT2**- positive cells

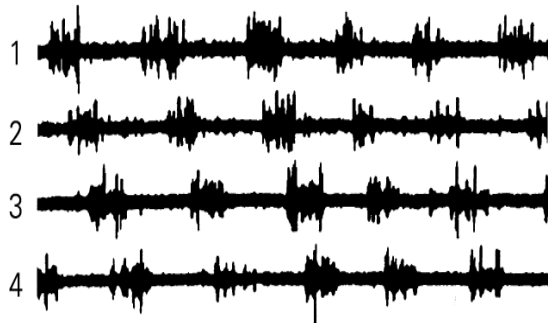
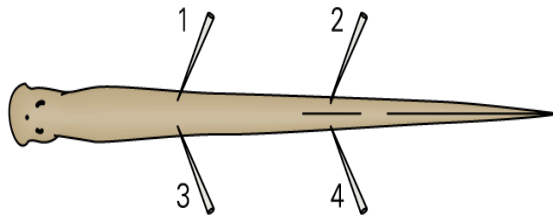
To understand the network requires:

- 1) Identification of component neurons
- 2) Network structure
- 3) Cellular properties
- 4) Modulation

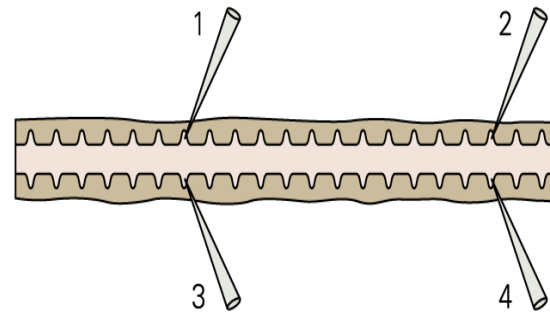
Requires multidisciplinary approach...

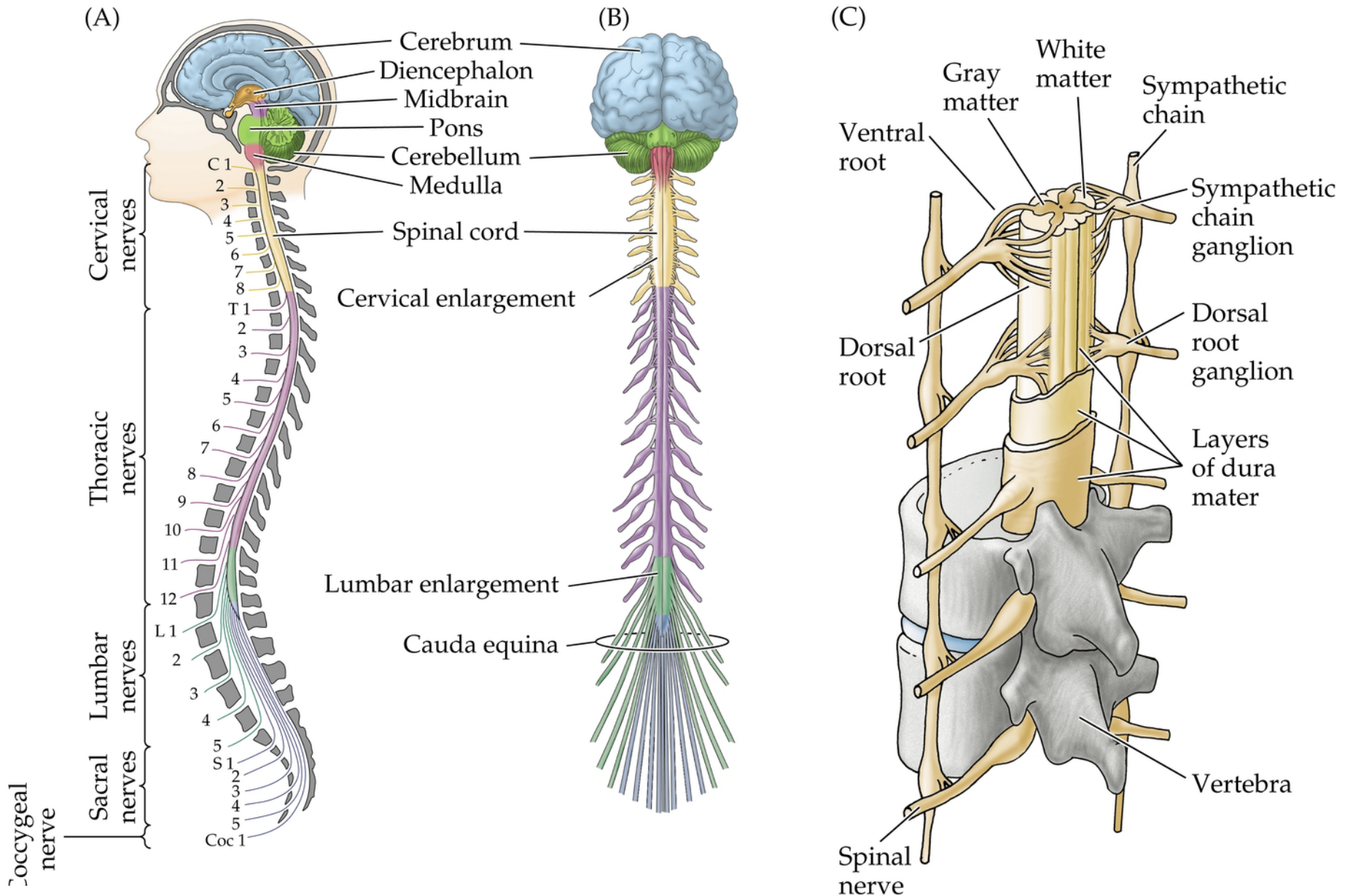


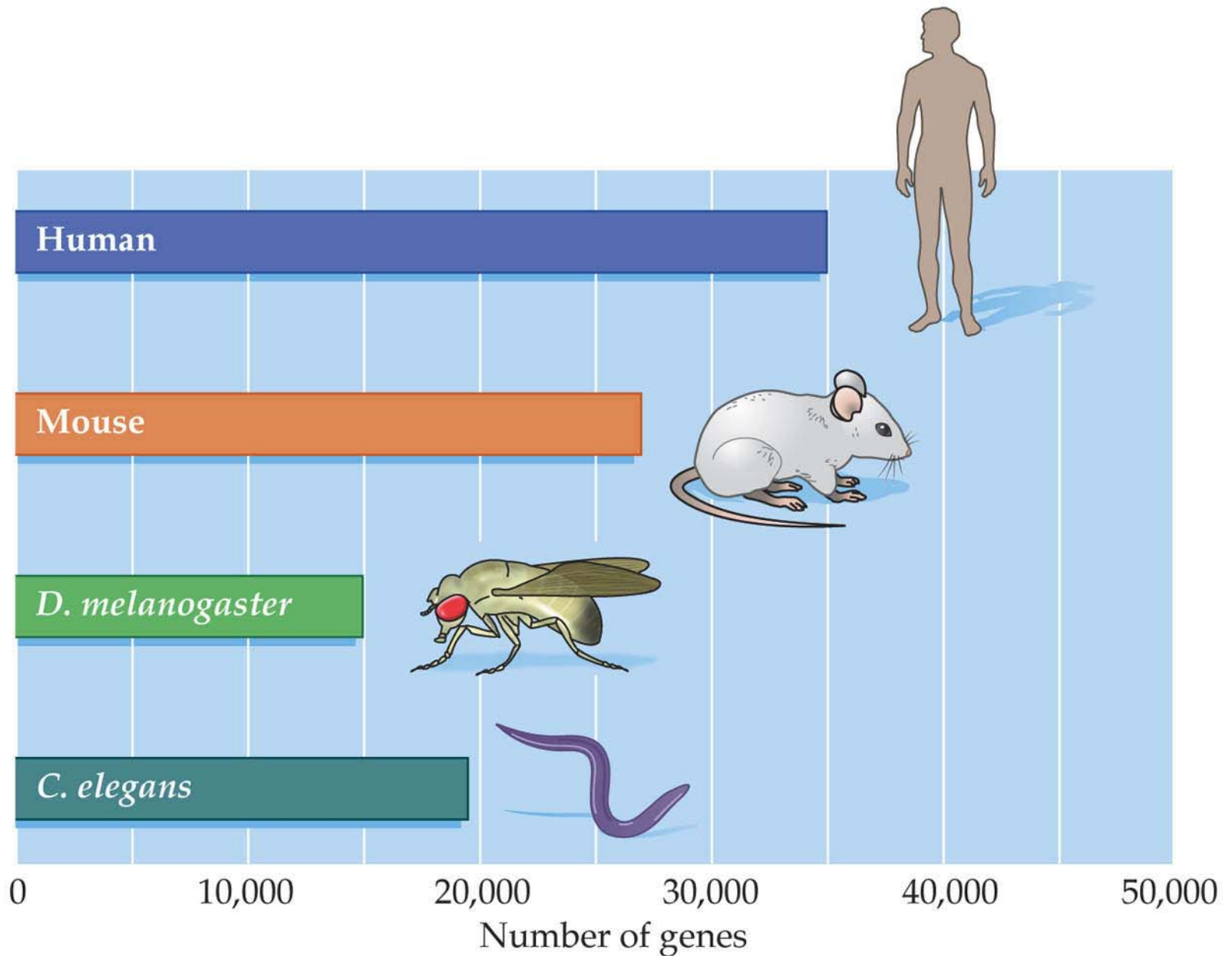
Rhythm in intact animal

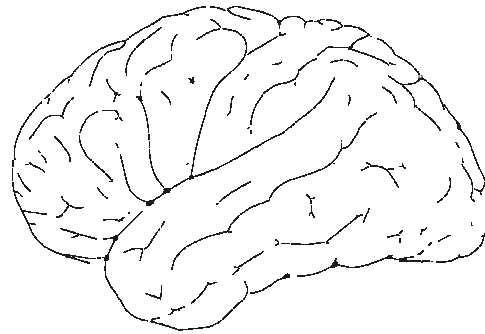


Rhythm in isolated cord

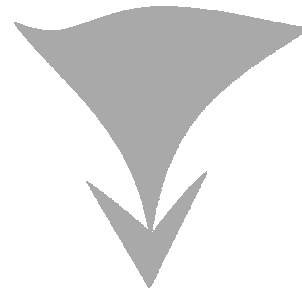




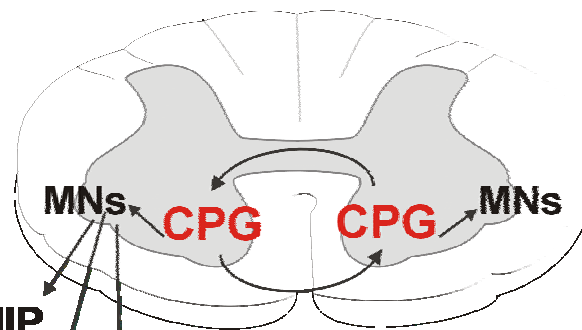




BRAIN



**DESCENDING
DRIVE**



**SPINAL
CORD**

HIP
KNEE
ANKLE

MUSCLES

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10/12/2004-11/12/2004

Traumatisme de la Moelle Epinière



Effets secondaires



Hemorragies
Ischemie

Accumulation
Radicaux libres
AA excitateurs

Inflamation
Mort cellulaire

Dégénérescence
Cicatrisation

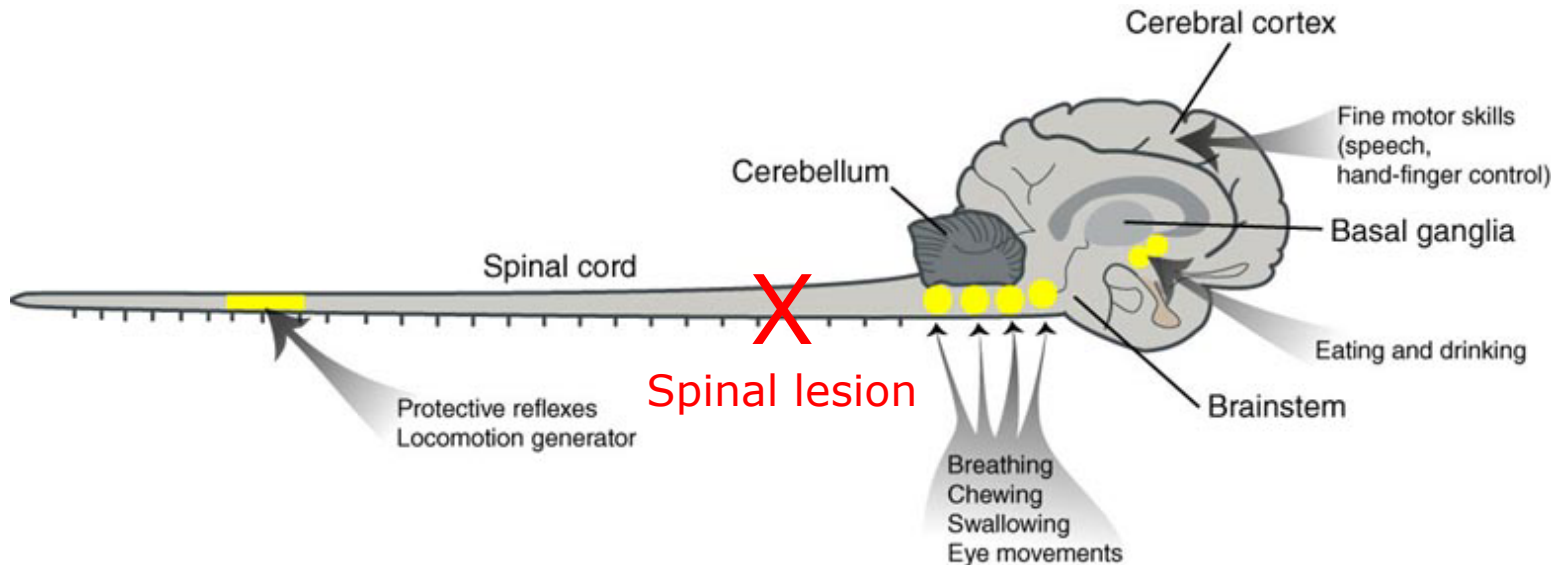
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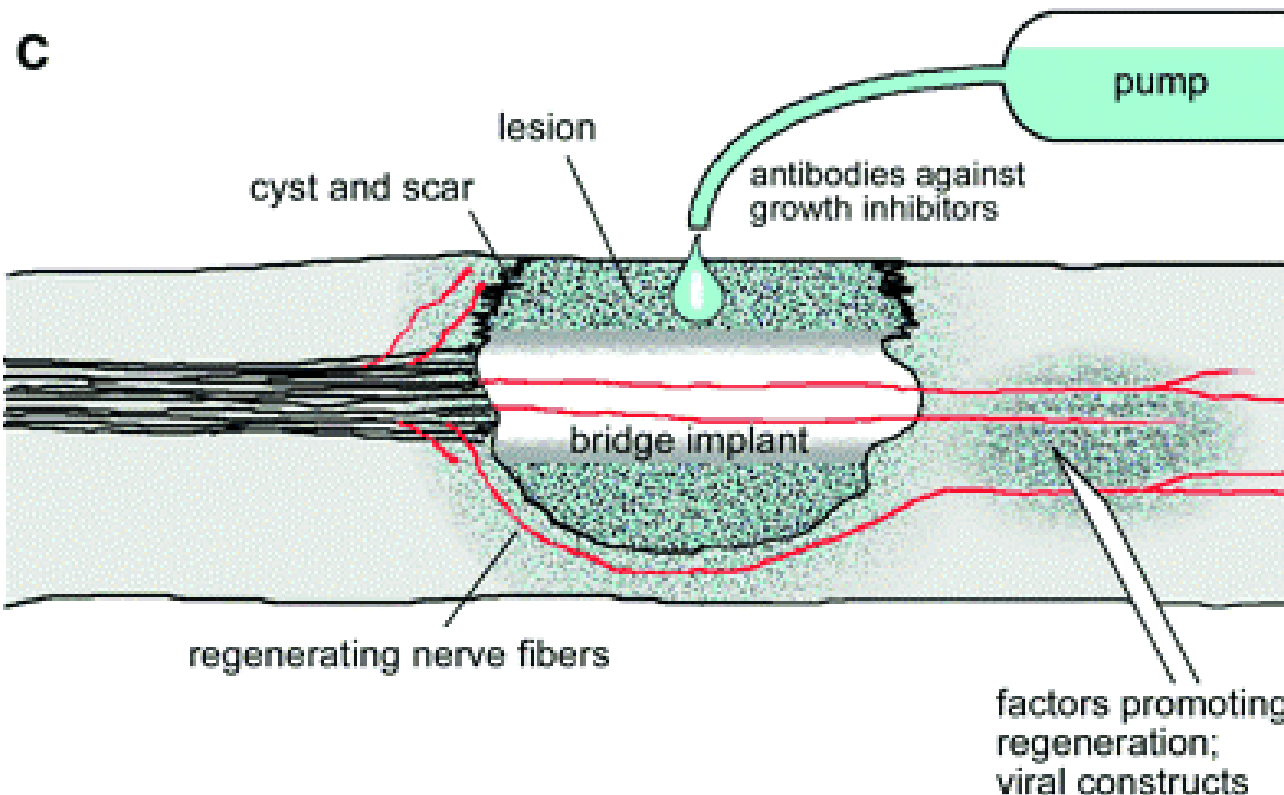
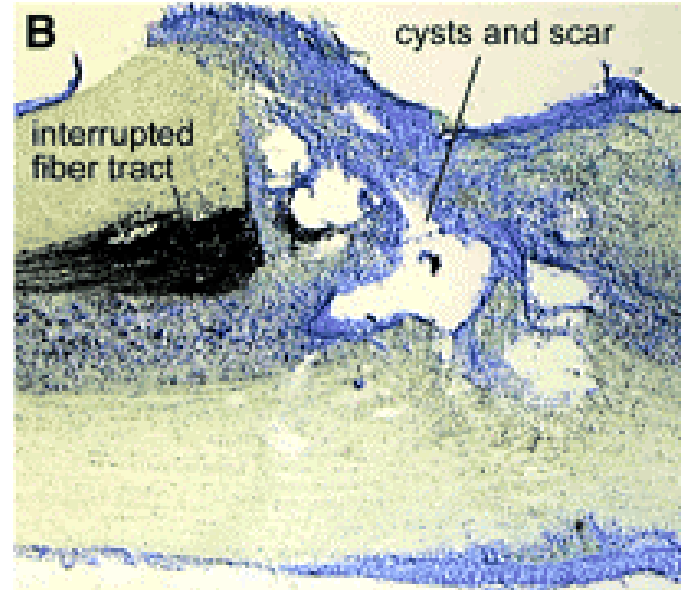
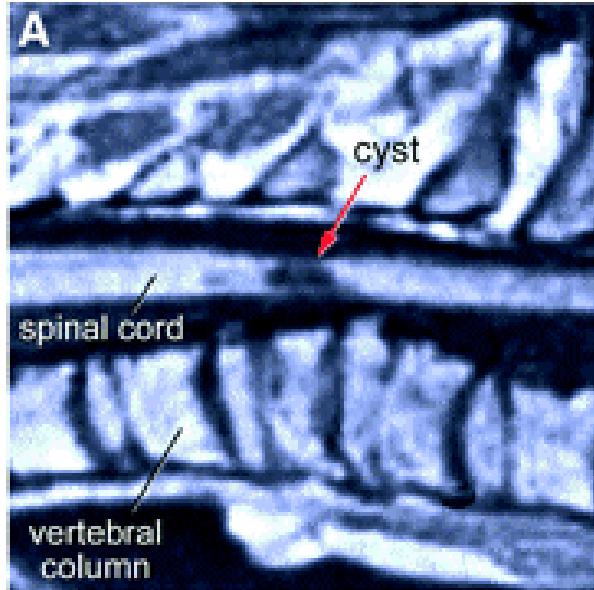
Heures - semaines

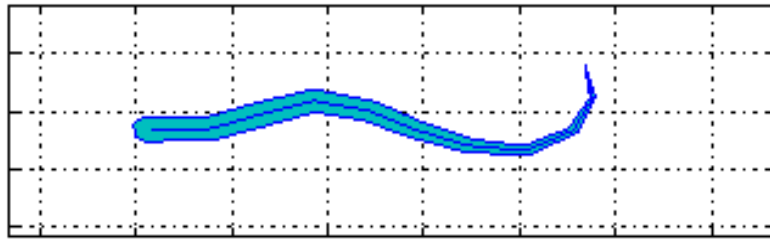
Semaines - mois

Organisation des centres moteurs

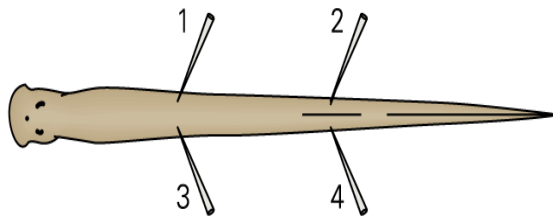


- Protection – limitation de l'étendu de la lésion.
- Régénération des fibres sectionnées.
- Substitution des neurotransmetteurs.
- Programmes de réhabilitation.

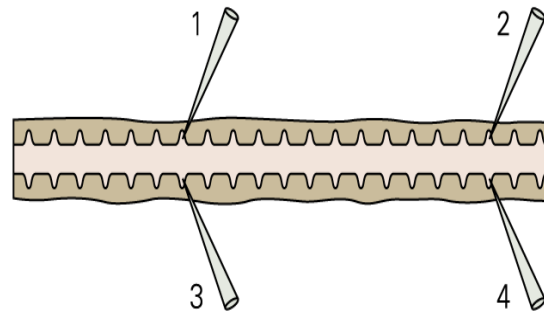




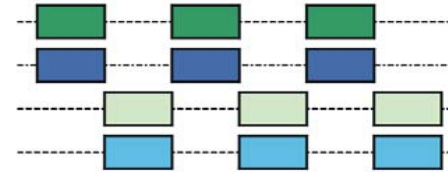
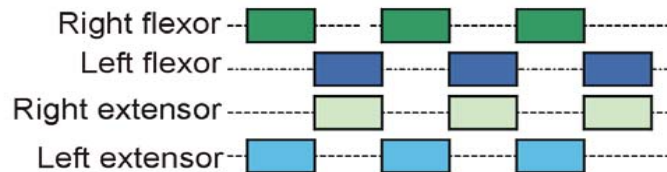
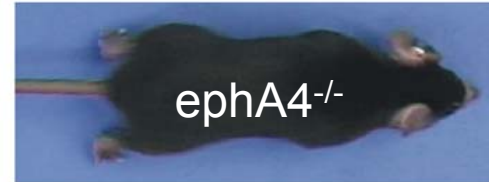
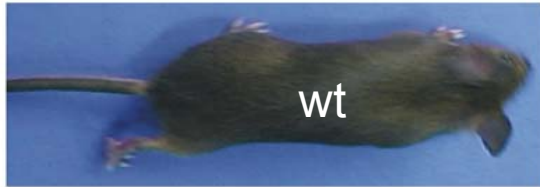
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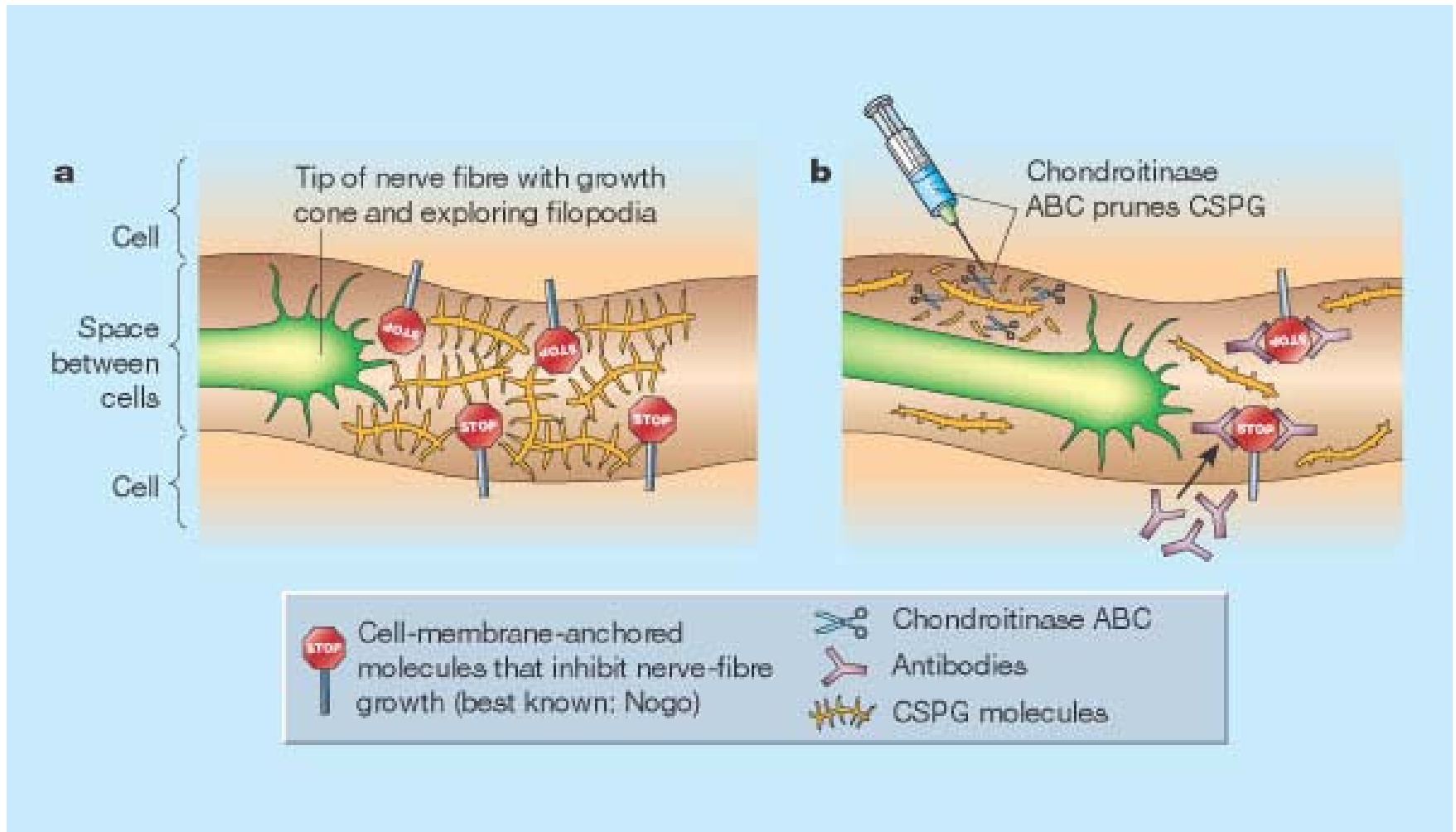
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Neutralisation des protéines inhibant la régénération des fibres nerveuses



Plasticité à court- et à long-termes

