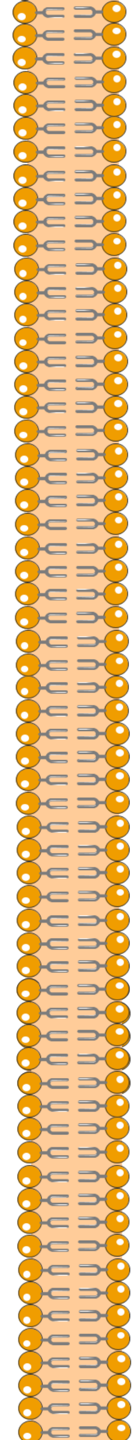
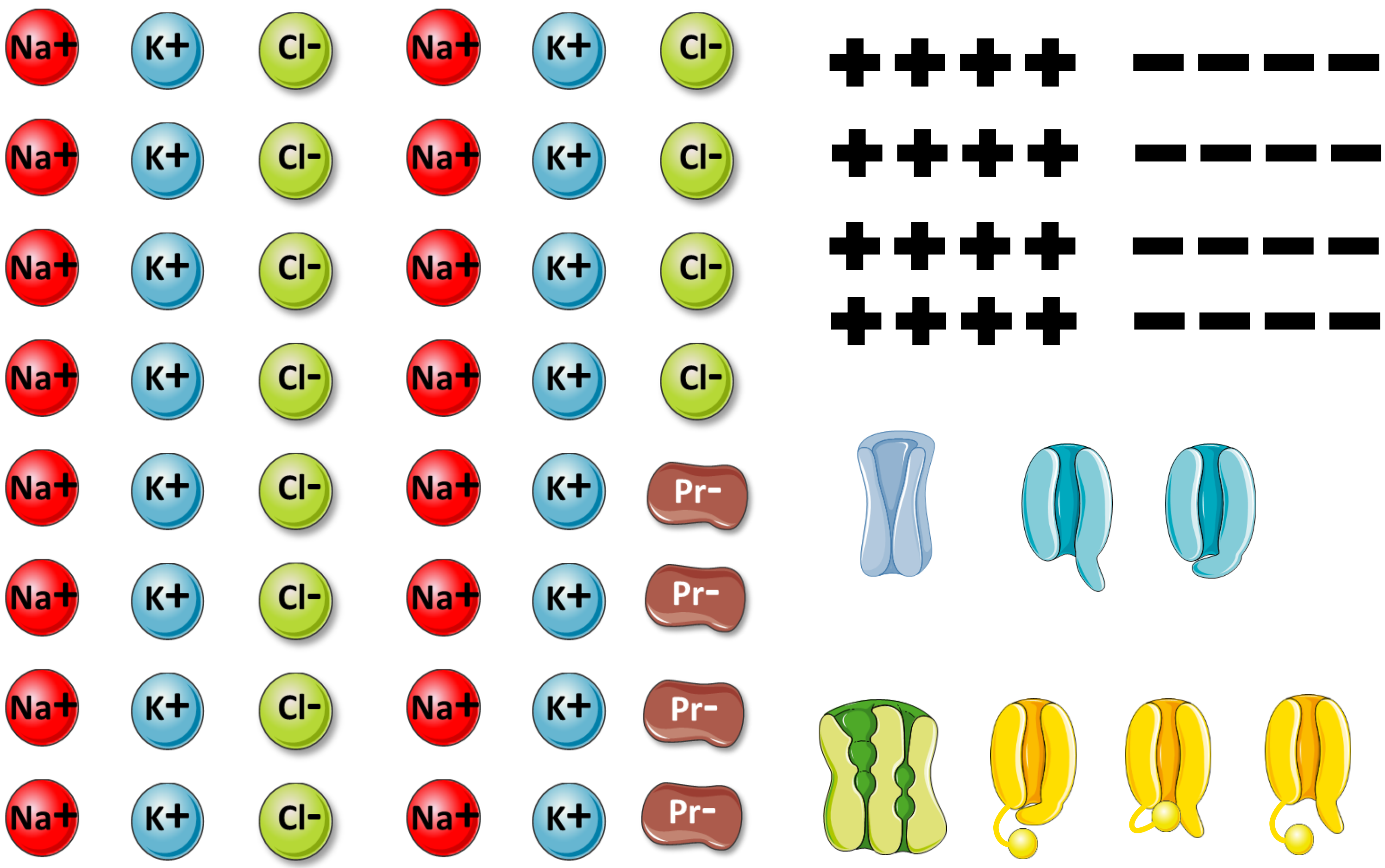
INT



EXT


Na+ K+ Cl- Na+ K+ Cl-
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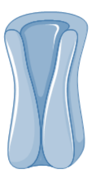
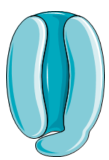
Na+ K+ Cl- Na+ K+ Pr-
Na+ K+ Cl- Na+ K+ Pr-
Na+ K+ Cl- Na+ K+ Pr-
Na+ K+ Cl- Na+ K+ Pr-

Disponer las figuras sobre la lamina de acuerdo a las siguientes consignas:

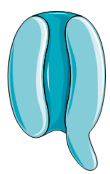
1. Colocar 6 KCl de una lado y 6 NaCl del otro. Habrá alguna redistribución espontanea? (considerando una membrana permeable a todos los iones)
2. Que ocurriría si solo fuera permeable al K^+?
3. Que ocurriría al agregar 3 proteínas? (reemplazar iones para mantener solo 12 piezas sobre la lamina)
4. Que canales y bombas estarían involucradas?
5. Recrear las etapas de un potencial de acción utilizando los iones Na^+ y K^+, canales y bombas



Leak

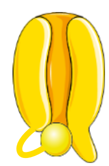


K_v cerrado

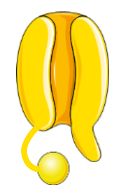


K_v

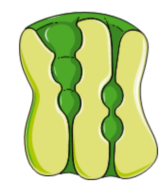
Na_v cerrado



Na_v inact

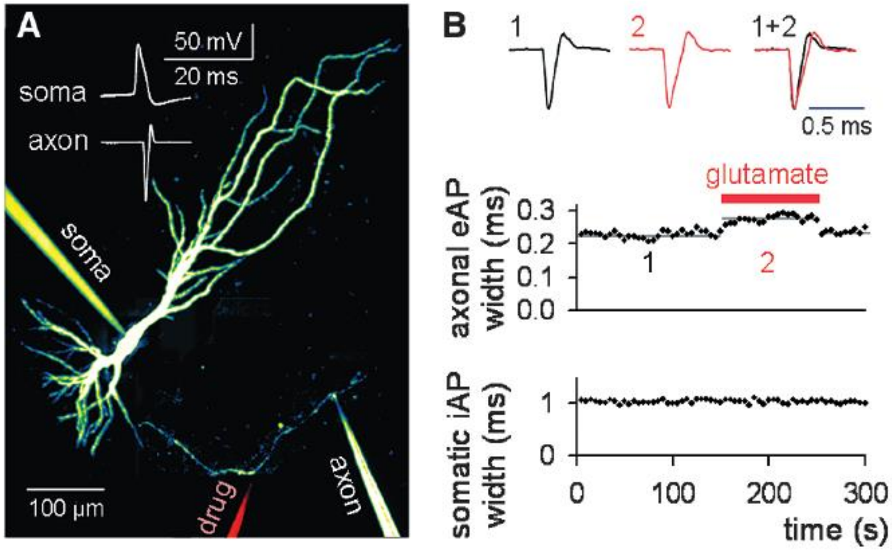


Na_v

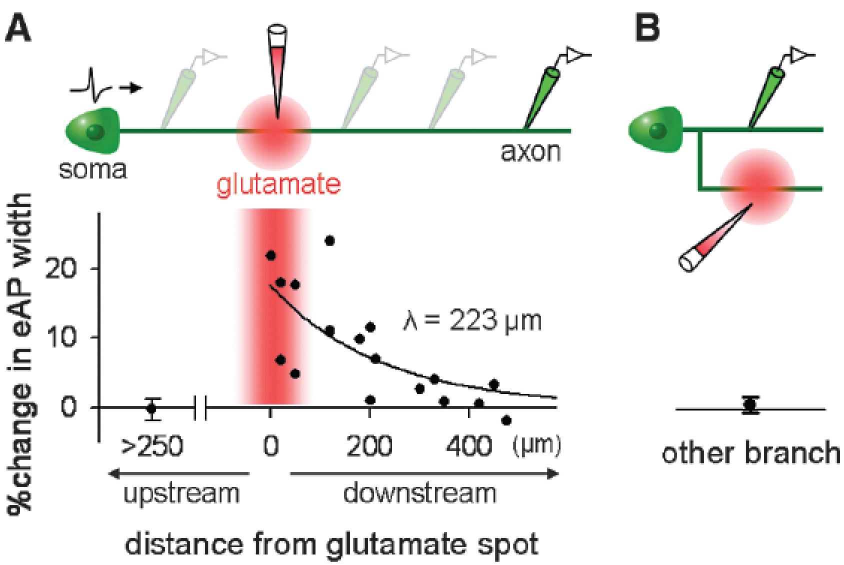


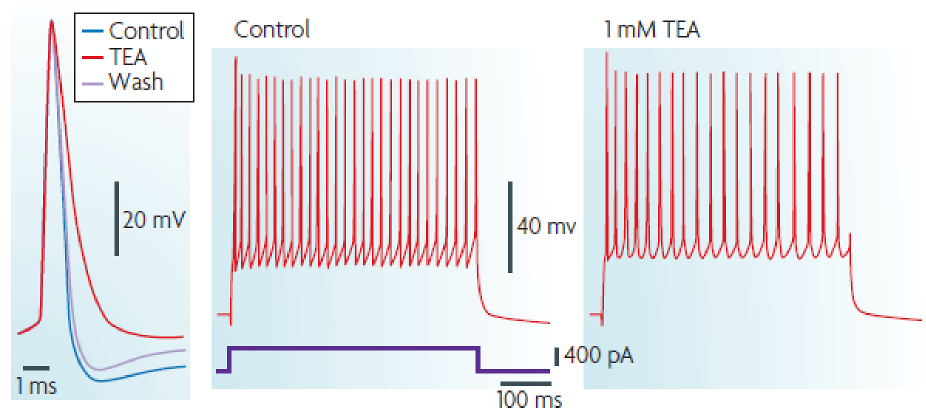
NaK-atpasa

Potencial de acción

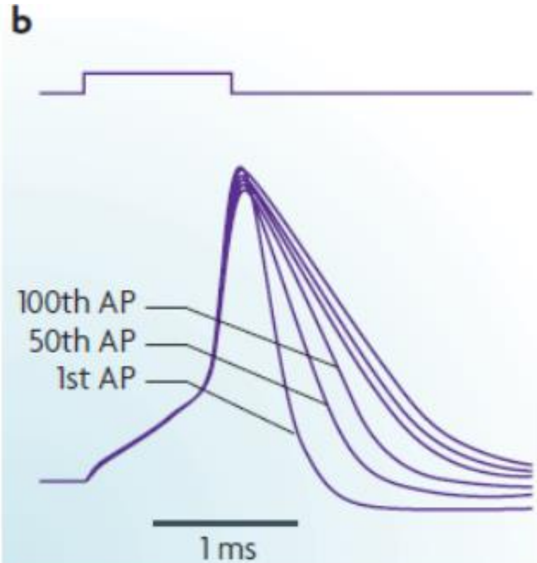


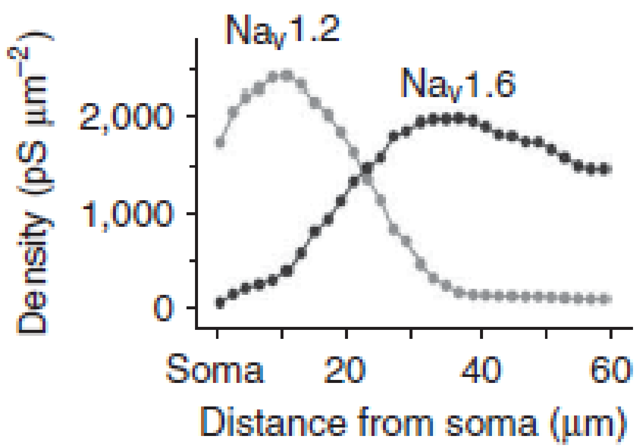
- Es modulable el potencial de acción? De que manera?
- Que factores causan ensanchamiento del PA?
- Que diferencias hay entre los diferentes Na_v? Como incide esto en el PA?
- En que dirección puede propagarse el PA?





Effects on the firing of fast-spiking neocortical interneurons of 1 mM tetraethylammonium (TEA), which, in these neurons, appears to be selective for Kv3 channels.





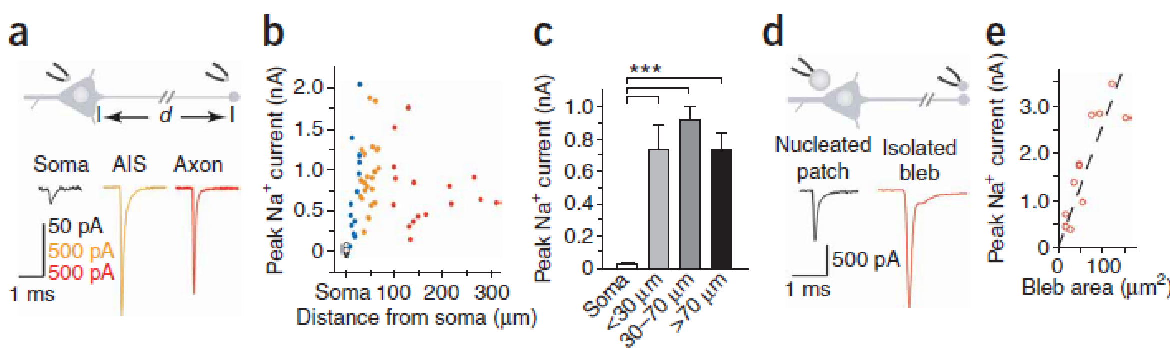


Figure 2 Estimates of Na^+ channel density at the soma and the axon with regular and giant outside-out patch recording. (**a**) Top, schematic diagram of the outside-out recording from patches excised from the soma and axon blebs. Bottom, examples of peak Na^+ current evoked by step depolarizations (30 ms) from a holding potential of −100 to +20 mV in outside-out patches obtained from the soma (black), AIS (orange, distance (d) = 39 µm) and axon (red, d = 265 µm). (**b**) Plot of peak Na^+ current in somatic and axonal outside-out patches with varying distances from the soma, indicating a peak distribution of Na^+ currents at the distal AIS. (**c**) Average amplitude (± s.e.m.) of the peak Na^+ current obtained from the soma and different compartments of the axon. Error bars represent s.e.m. *** indicates $P < 0.001$. (**d**) Top, schematic diagram of the giant outside-out patch recordings: nucleated patch and isolated bleb recording. Bottom, examples of peak Na^+ current in nucleated patch (black) and isolated bleb (red, >50 µm). (**e**) Plot of peak Na^+ current as a function of bleb surface area. The dashed line represents the linear regression fit.

Canales ionicos

- Como clasificaría los canales iónicos? Cuantos tipos existen?
- Que estructura poseen los canales voltaje-dependientes? Es conservativa?
- Que mecanismos evolutivos explican la diversidad de canales voltaje-dependientes existentes en la actualidad?
- Que consecuencias acarrea la mutaciones en estos canales?

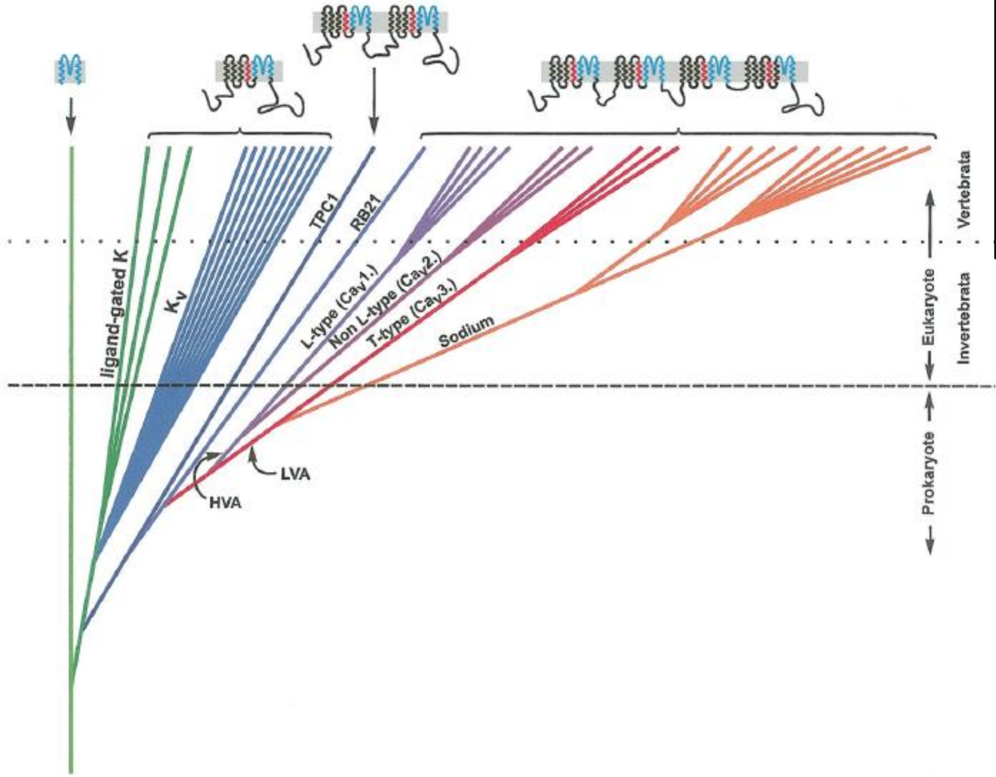
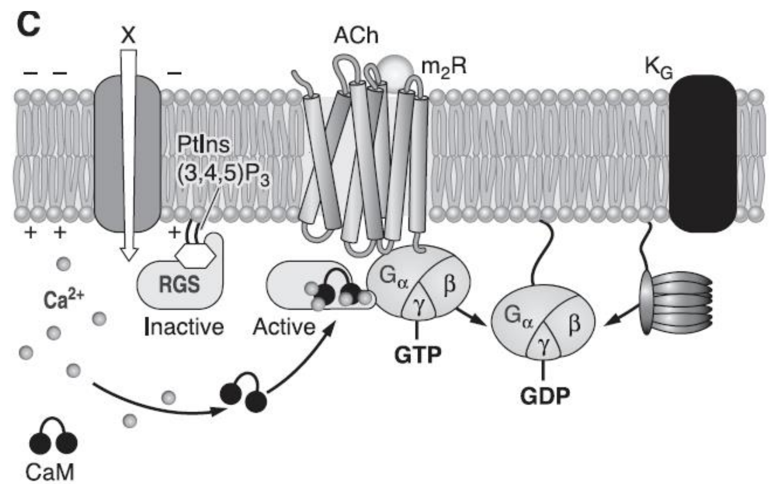


Fig. 2. A hypothetical phylogeny of voltage-gated ion channels. The model predicts that voltage-gated ion channels evolved over time (*Y*-axis not to scale) from a prokaryote 2-TM channel. Following the addition of four more domains, an early, ligand-gated, 6-TM protein gave rise to the voltage-gated K^+ family (Kv) and extant ligand-gated K^+ channels, and then, following two rounds of gene duplication, formed a four-domain 6-TM channel. Early four-domain channels were likely non-selective, but some are assumed to have developed calcium selectivity, giving rise to LVA and HVA calcium channels. Sodium channels are thought to have evolved from LVA channels.



Schematic representation of K_G modulation resulting from Ca_2/CaM facilitation of the action of RGS proteins. In a hyperpolarized state, the action of RGS is inhibited by PtdIns(3,4,5)P_3. Once the intracellular Ca_2 concentration is elevated, e.g., upon depolarization, Ca_2/CaM binds to RGS proteins and reverses the inhibitory effect of PtdIns(3,4,5)P_3, which results in the negative regulation of the G protein cycle.

Mielinización

- La mielinización es un proceso estático o dinámico?
- Que consecuencias puede tener a nivel del desarrollo psicomotriz?
- En que organismos hay axones mielinizados?
- Como varia filogenéticamente la mielina? Que ventaja adaptativa confiere?
- Que caracteristicas posee la membrana axonal en el area de los nodulos de Ranvier?

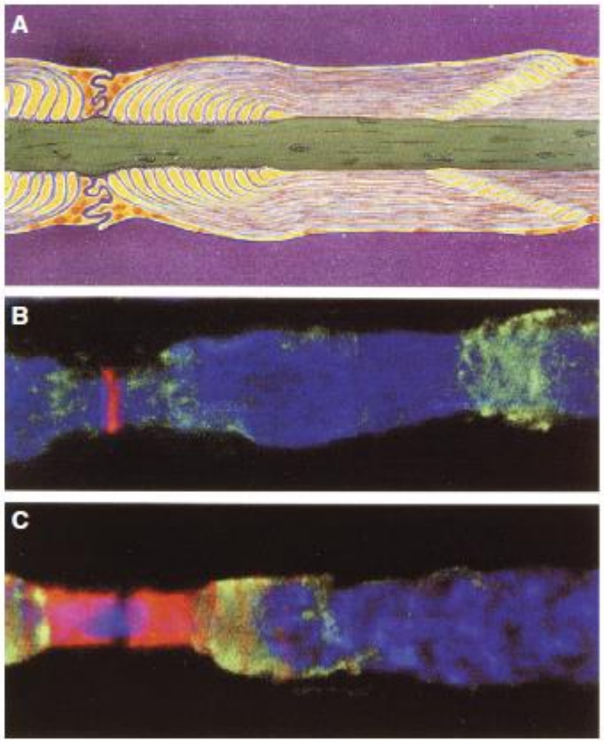


Figure 6. Molecular microdomains at the vertebrate node of Ranvier.

(A) Diagram of a longitudinal EM section showing paranodal loops terminating the myelin layers on the left, and a Schmidt-Lanterman incisure at the right. (B) Immunoreactivity for sodium channels (magenta) and myelin-associated glycoprotein (green). (C) Immunoreactivity for Caspr in the paranodal domain (magenta) and potassium channels (green). (Reproduced with permission from [39,40].)

Table 1. Conduction velocities.

Nerve fibre	Diameter (μm)	Velocity (m/s)
Unmyelinated squid	500	20
Myelinated earthworm	90	30
Myelinated shrimp	120	90–219
Myelinated rat	4.5	59

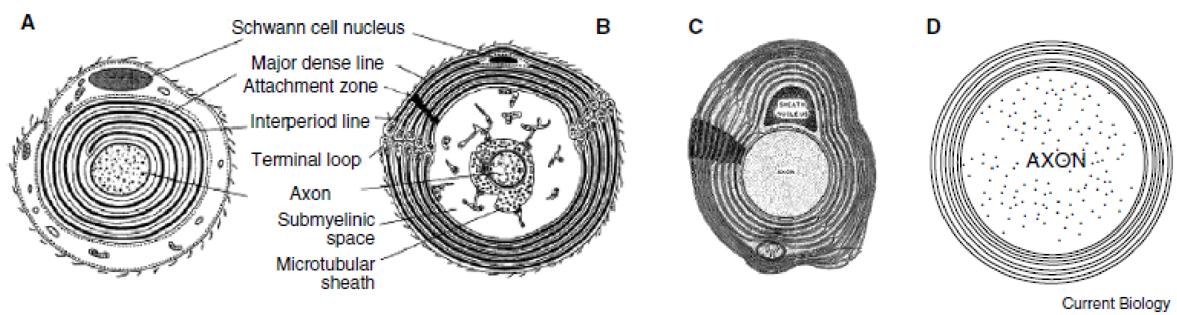
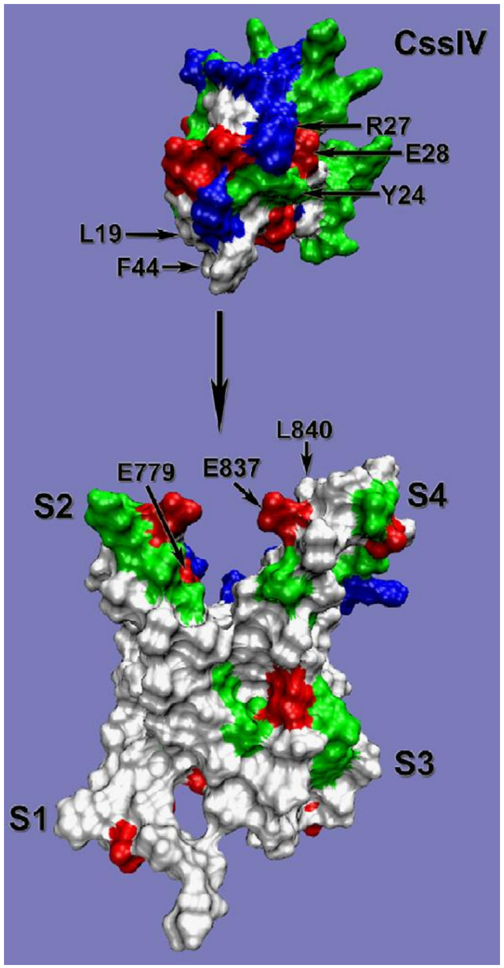


Figure 4. Schematics of myelin wraps in the different myelinated taxa.

(A) Vertebrate; (B) penaeid shrimp; (C) palaemonid shrimp; (D) copepod. (Panels reproduced with permissions from: (A,B), [20]; (C), [22].)

PA y toxinas

- Que organismos poseen toxinas capaces de interferir con el mecanismo del potencial de acción (PA)?
- De que maneras afectan las toxinas a los PA?
- Como actúa la TTX? Que mecanismos de resistencia se desarrollaron?
- Que utilidad tienen las toxinas para el progreso científico en el área de la Fisiología?



Modelo estructural del docking de la toxina de escorpión CssIV en los dominios V-sensores de Na_v 1.2

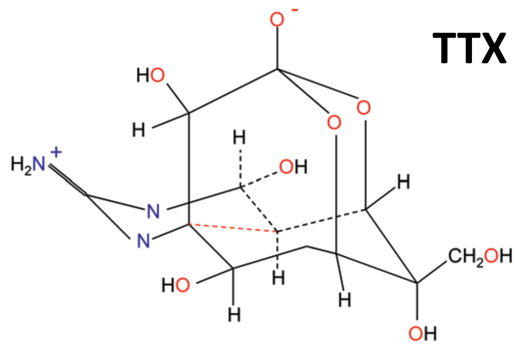


Table 1. Comparative lethality of tetrodotoxin in various animals (Kao, 1966).

	Minimum lethal dose (µg TTX/kg body weight)
Plaice (Paralichthys olivaceus)	0.5
Dragonfly	1.3
Carp	2.0
Pigeon	2.7
Rat	2.7
Sparrow	4.0
Guinea pig	4.5
Frog	5
Hen	6
Rabbit	8
Mouse	8
Dog	9
Cat	10
Turtle	46
Eel	80
Toad (Bufo)	200
Snake (non-poisonous, species not given)	450

Table 2. Resistibility of TTX- and non-TTX-bearing organisms (Noguchi et al, 2004).

Species		MLD[a] (MU/20 g)
TTX bearing organisms		
Xanthid crab	*Atergatis floridus*	1000
Tropical goby	*Yongeichthys criniger*	>300
Japanese newt	*Cynops pyrrhogaster*	>2000
Pufferfish		
Toxic	*Takifugu niphobles*	700-750
	T. pardalis	500-550
	T. rubripes (culture)	300-500
Generally non-toxic or rarely toxic	*Lagocephalus wheeleri*	15-18
	L. gloveri	19-20
	Liosaccus cutaneous	13-15
Non-toxic	*Ostracion immaculatum*	0.9-1.3
TTX-free vertebrates		
Teleosts	*Oplegnathus punctatus*	0.8-0.9
	O. fasciatus	0.8-1.8
	Girella punctata	0.3-0.5
Land mammal		
Mouse	*Mus musculus*	1

[a]Minimum lethal dose of TTX (MU/20g body mass) that killed 100% of the test animals by intraperitoneal injection.