NERVNO TKIVO

3

Textus nervosus

Citologija i tkiva

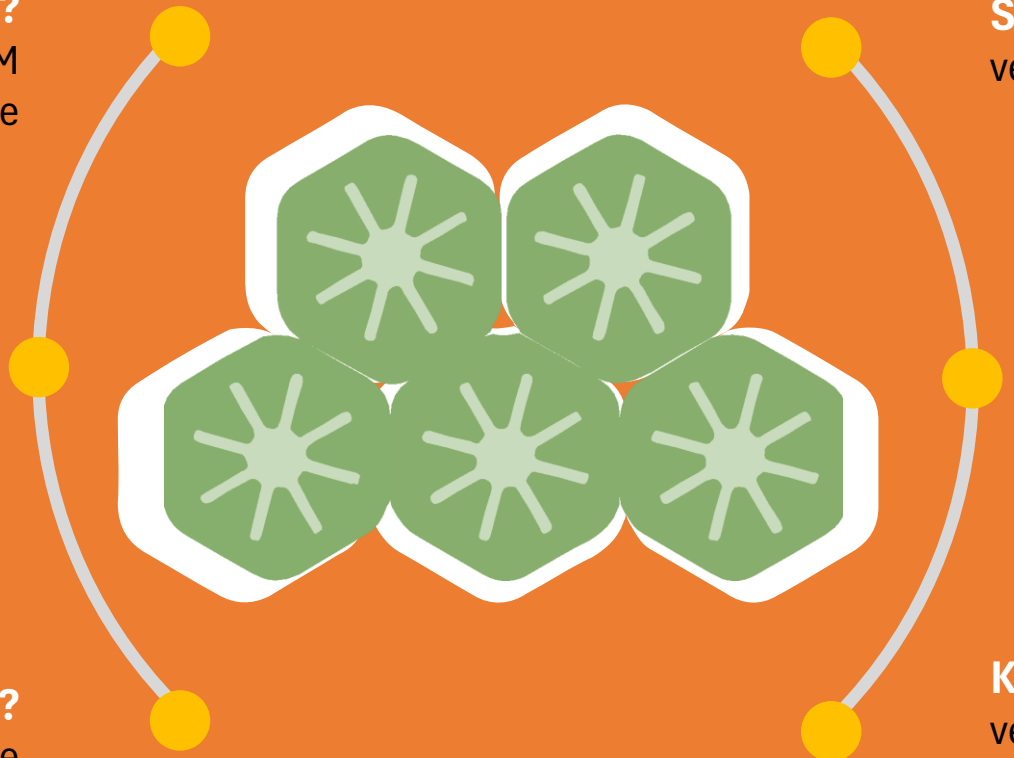
Mijat BOŽOVIĆ

OSVRT

Šta su tkiva?
ćelije na različite načine udružene sa ECM formirajući kooperativne sisteme

Koje su osnovne vrste tkiva?
epitelno, vezivno, nervno i mišićno

Kakve ćelije?
identične ili različite u morfološkom i funkcionalnom smislu

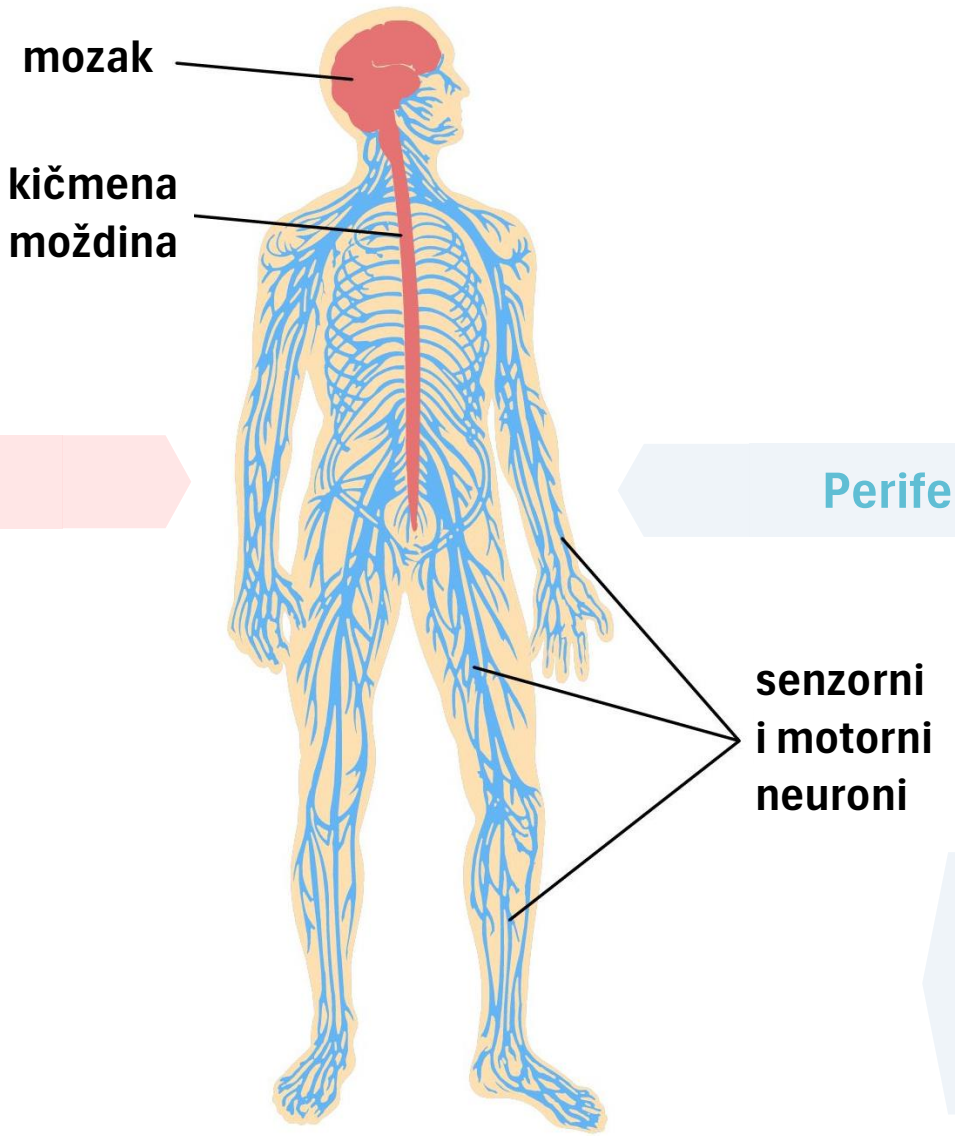


Šta izgrađuju tkiva?
veće funkcionalne cjeline – organe

Kakvo je epitelno tkivo?
gusto zbijene ćelije sa minimalnom količinom ECM

Kakvo je vezivno tkivo?
velika količina ECM koja dominira nad ćelijskom komponentom

Organizacija nervnog sistema



Centralni nervni sistem (CNS)

mozak i kičmena moždina
integrativni kontrolni centar

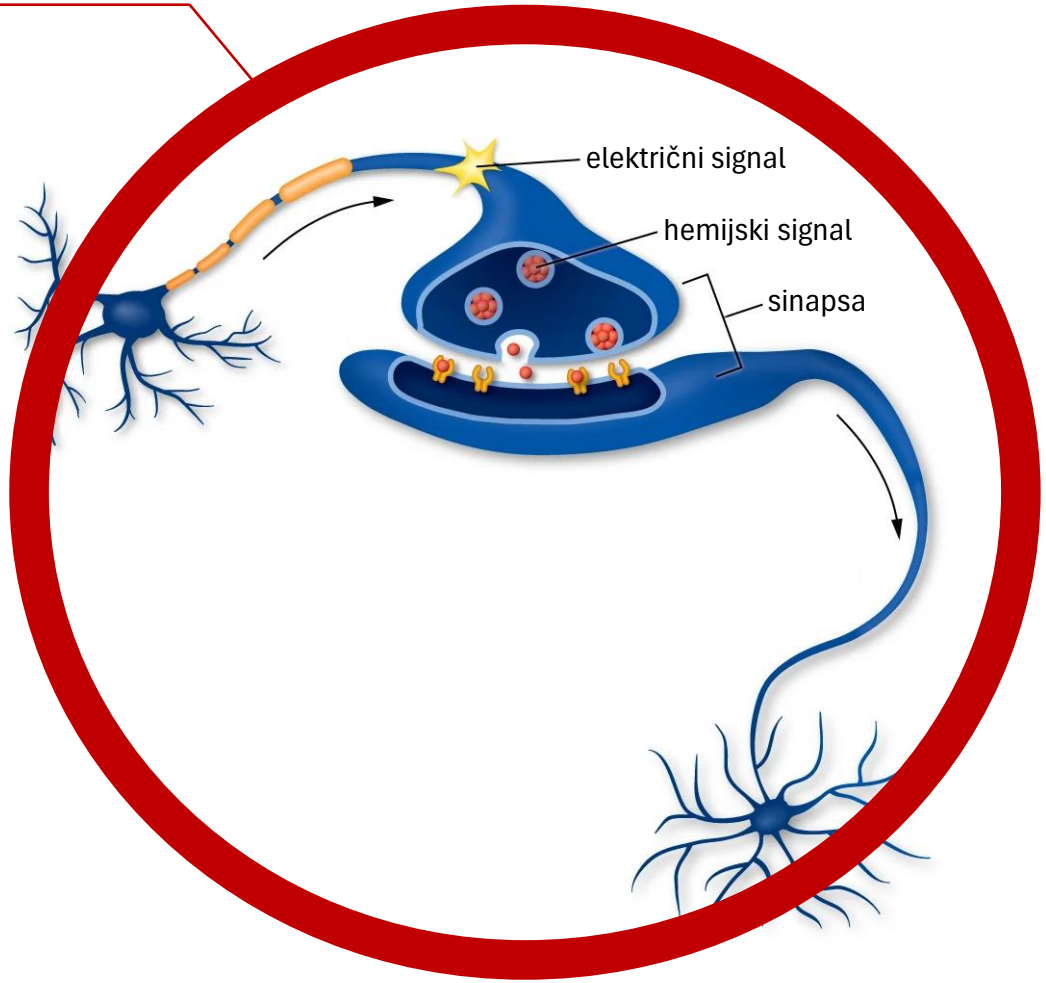
Periferni nervni sistem (PNS)

kranijalni i spinalni nervi
komunikacija između CNS i ostatka tijela

Funkcionisanje nervnog tkiva

sinapse

komunikativne veze između nervih ćelija; njima se neuroni integrišu u jedinstvenu funkcionalnu mrežu



Osnovna svojstva neurona:

nadražljivost

iritabilnost, ekscitabilnost:
svojstvo nervne ćelije da reaguje na mehaničke, termičke, hemijske i svjetlosne stimuluse

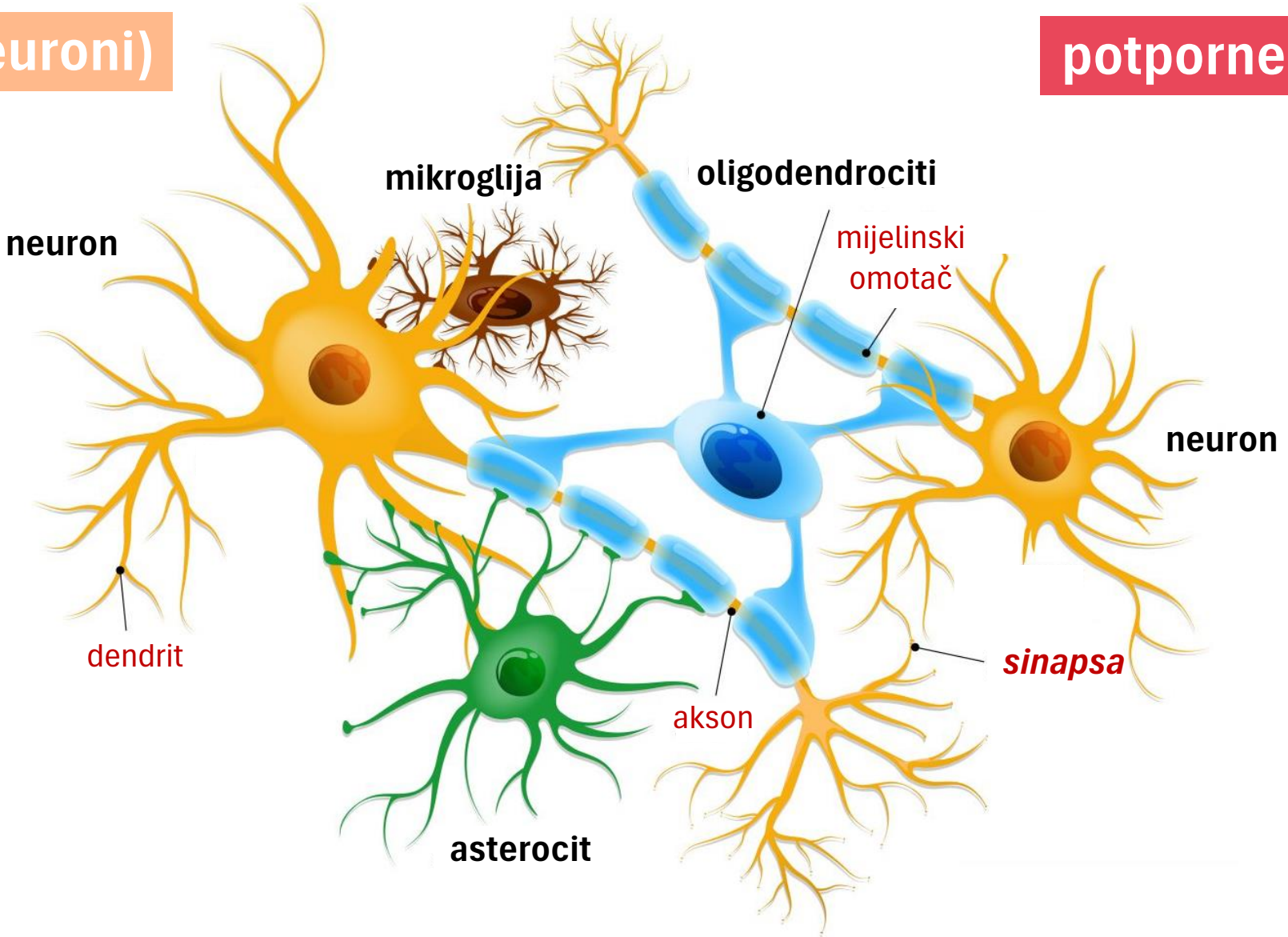
sprovodljivost

konduktivnost:
sposobnost neurona da primljeni nadražaj u vidu električnog signala prenese i proslijedi drugim ćelijama

2 vrste ćelija

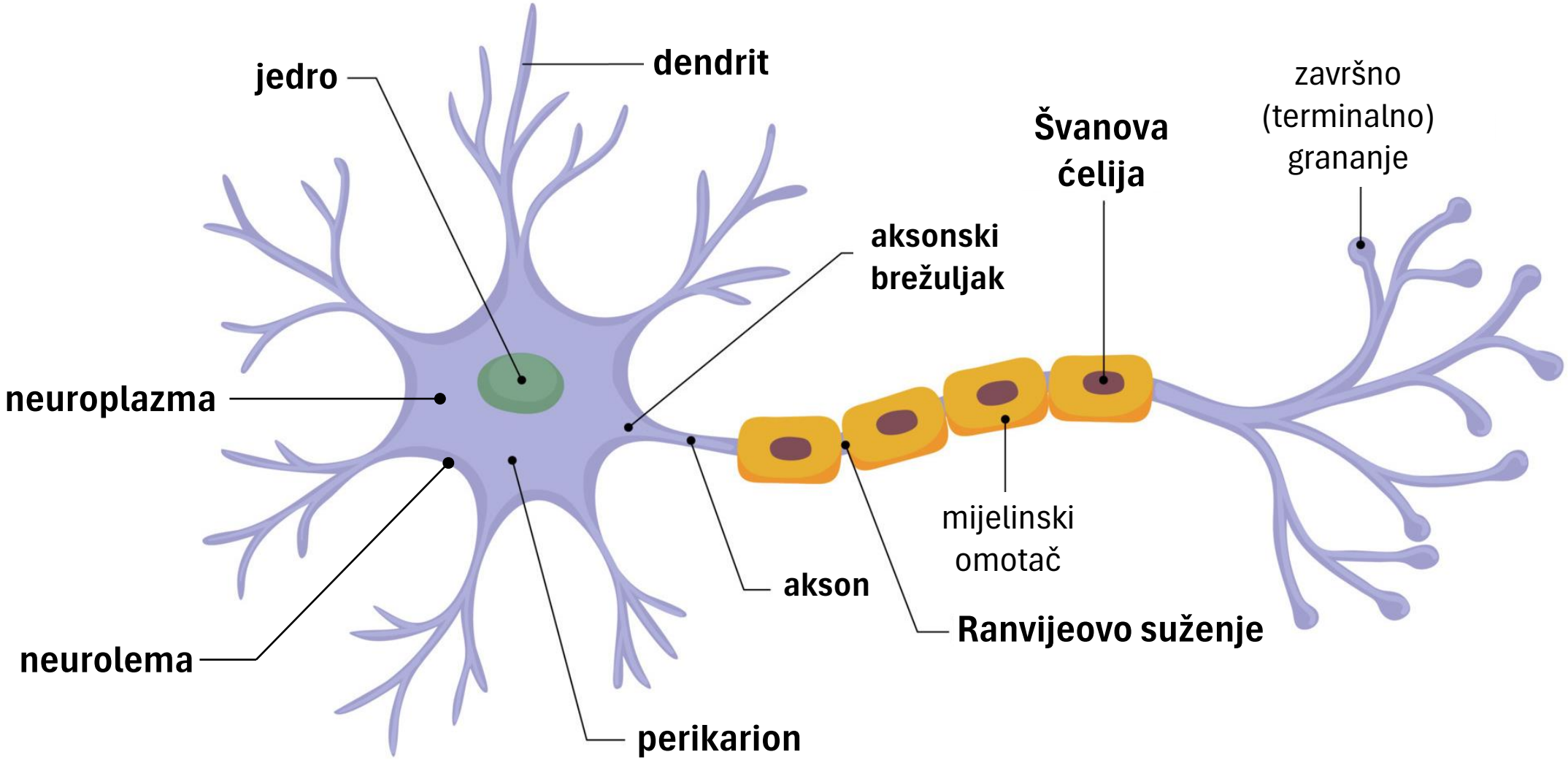
nervne ćelije (neuroni)

potporne ćelije (glije)

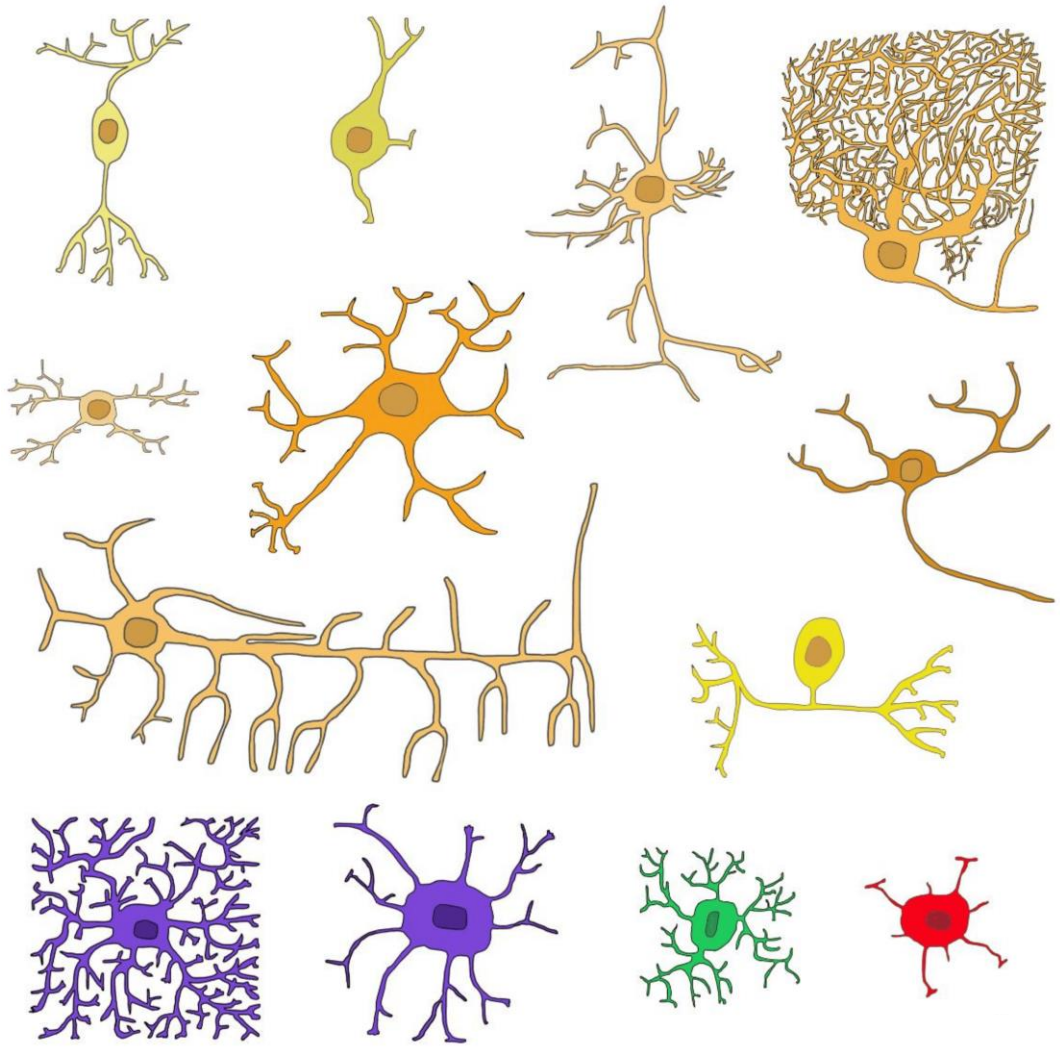


Nervna ćelija

Struktura neurona



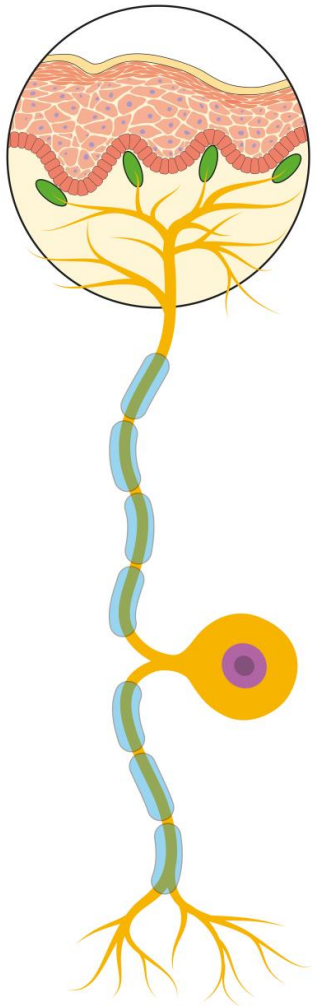
Klasifikacija neurona



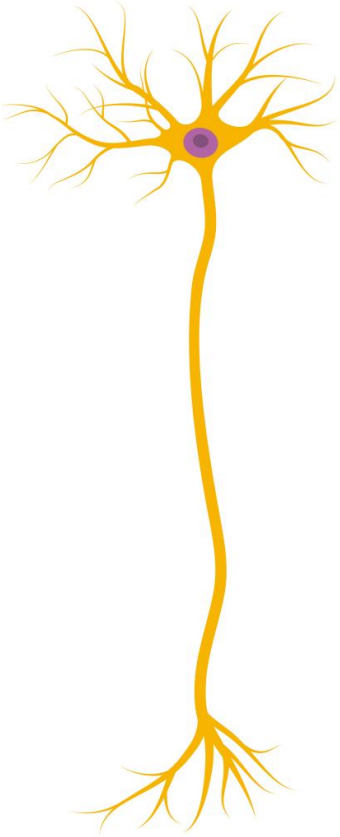
prema:

- obliku ćelijskog tijela
- funkciji
- dužini aksona
- broju nervnih produžetaka

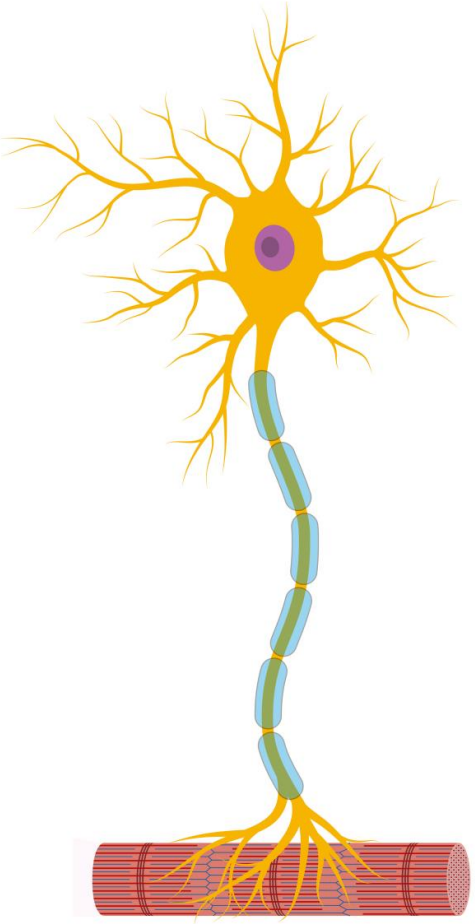
Neuroni prema funkciji:



senzorni (aferentni)

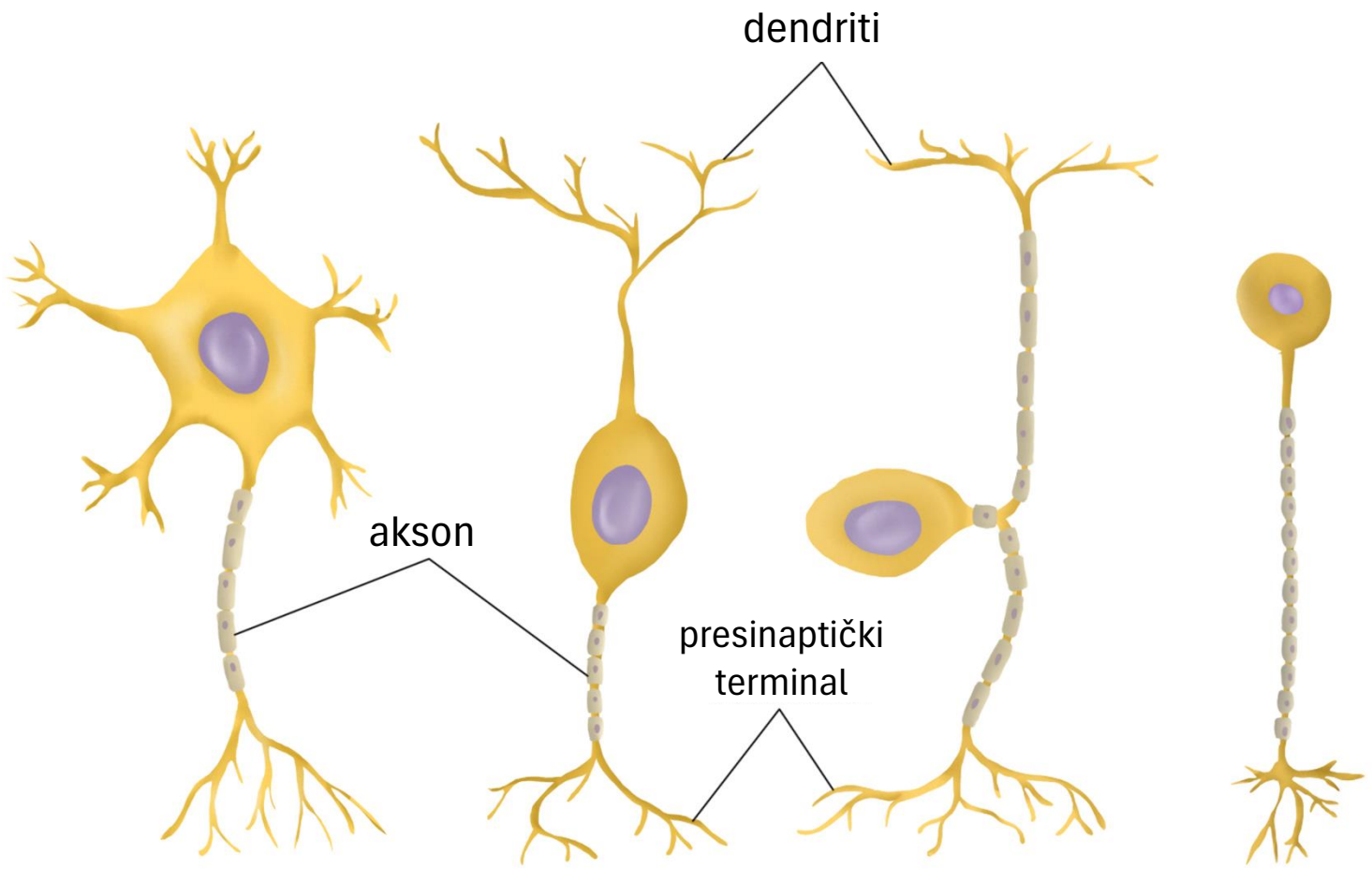


interneuroni



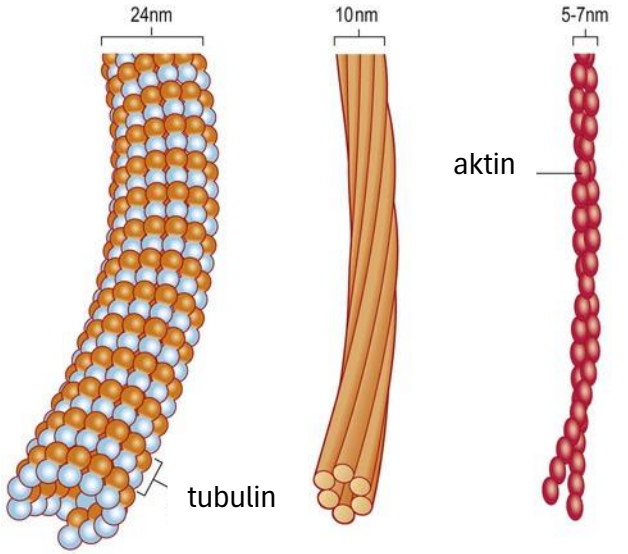
motorni (eferentni)

Neuroni prema broju produžetaka:

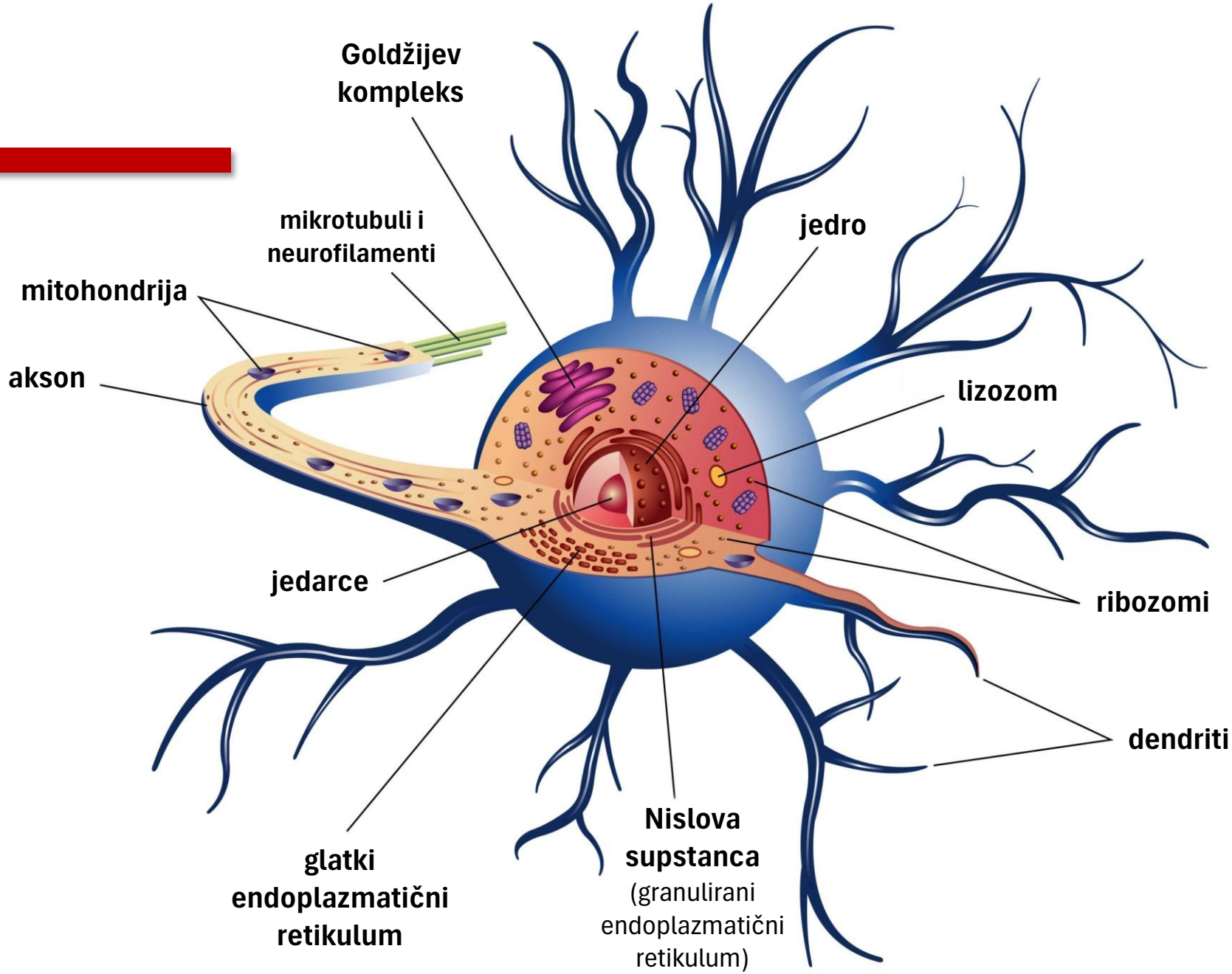


multipolarni **bipolarni** **pseudo-unipolarni** **unipolarni**

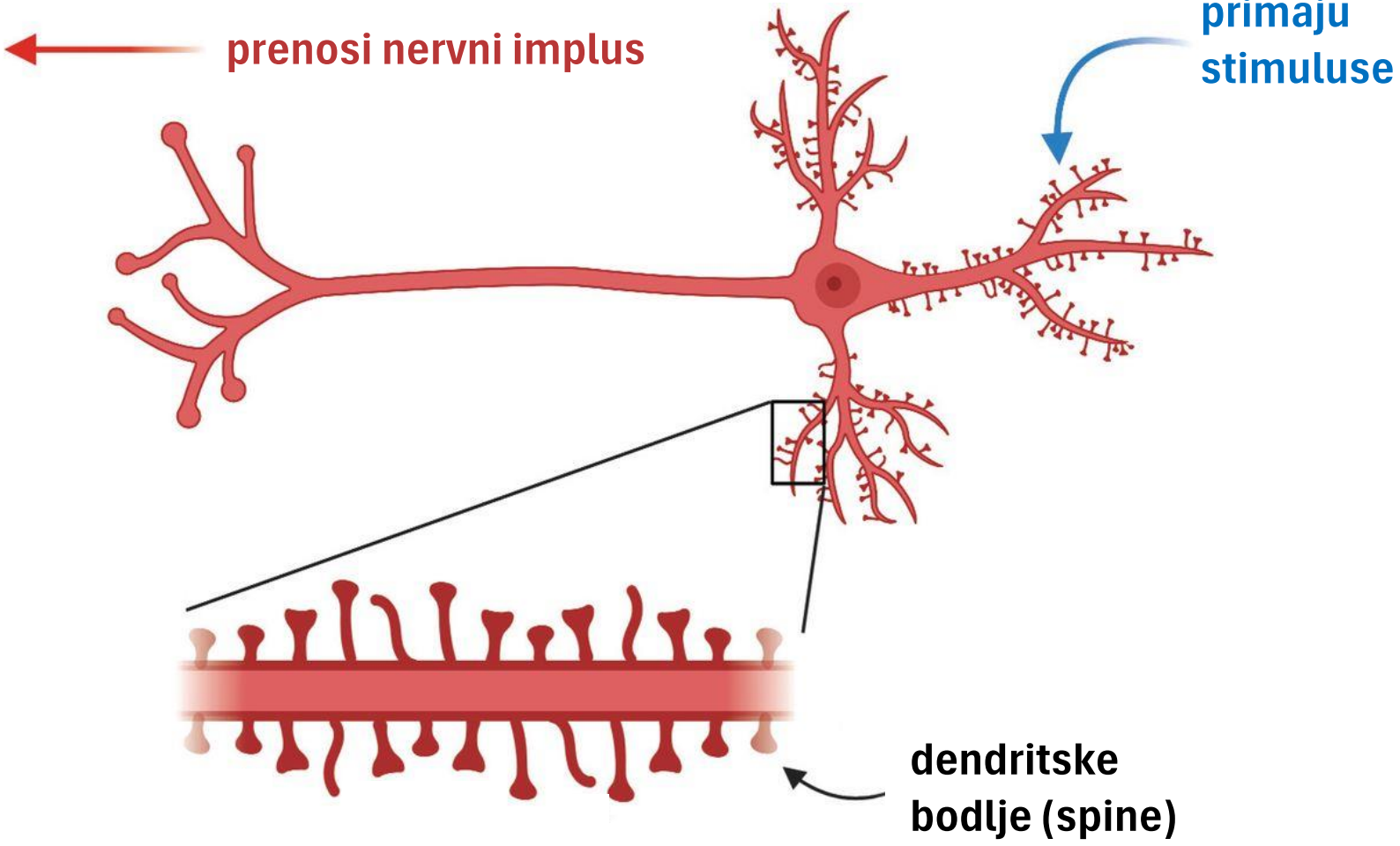
Građa neurona

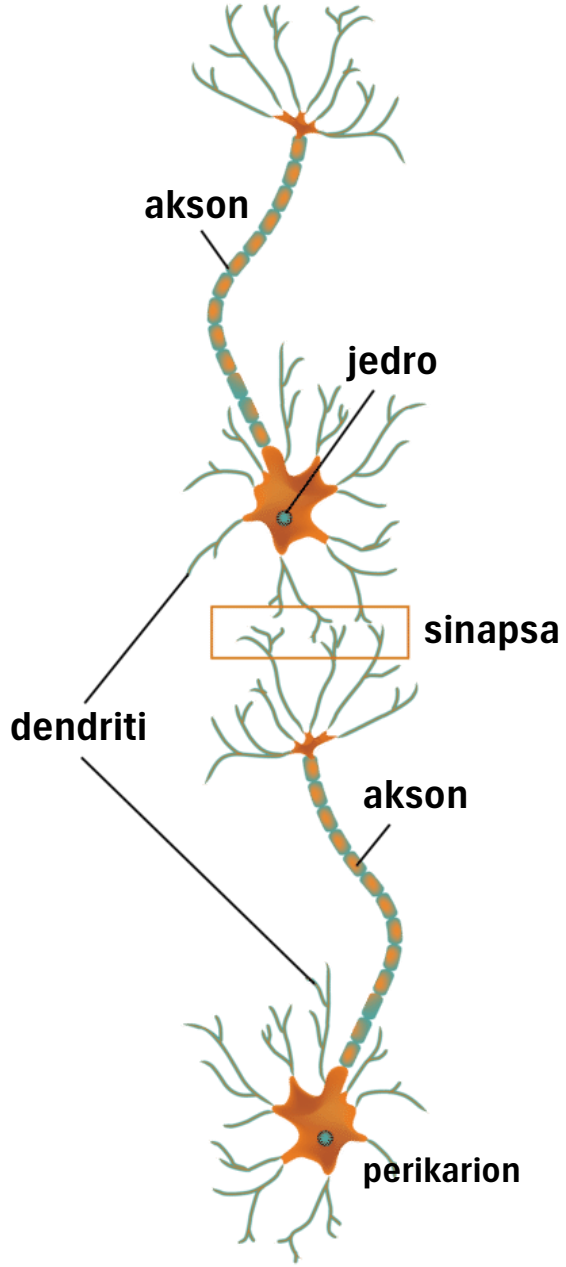


citoskelet neurona

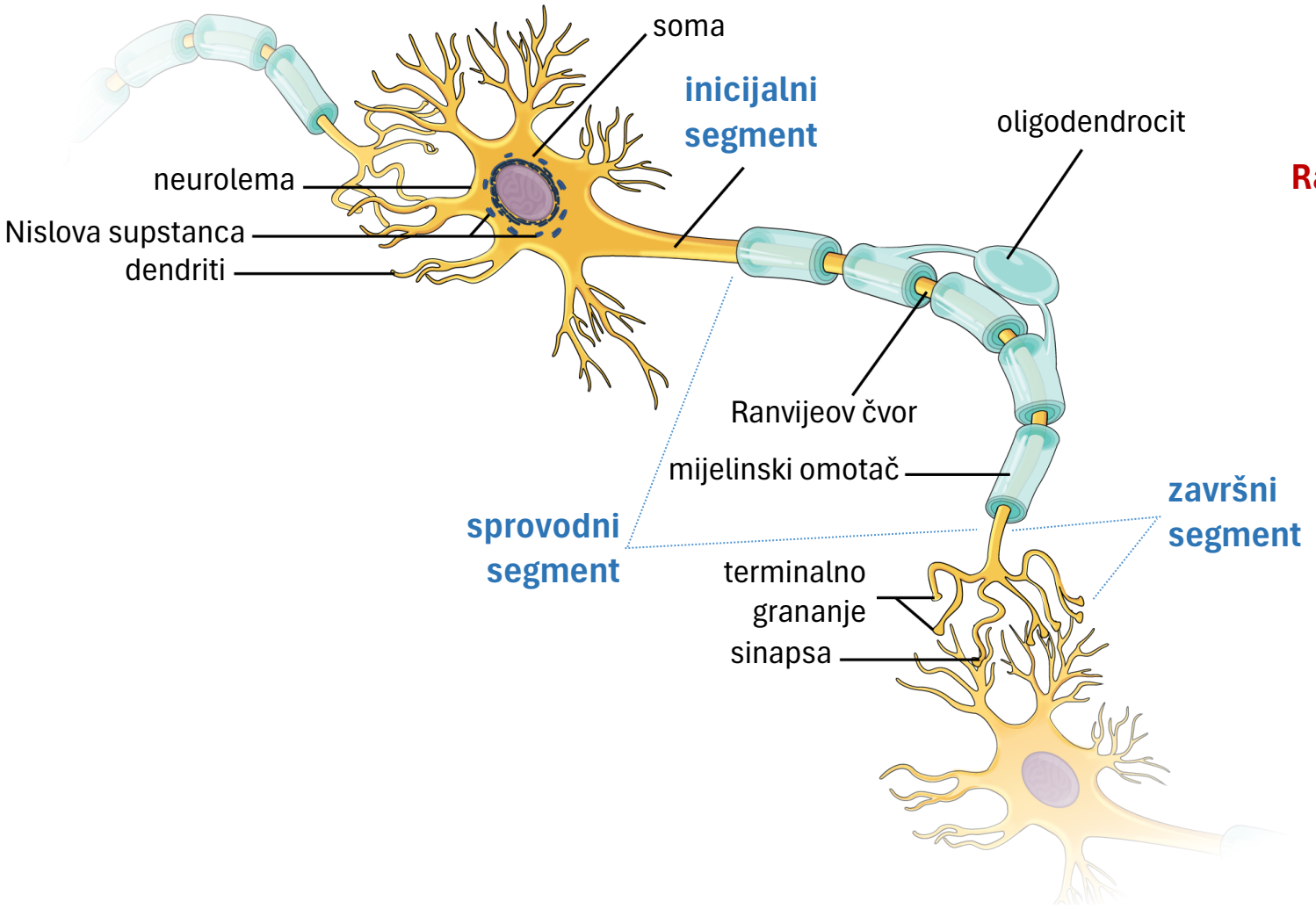


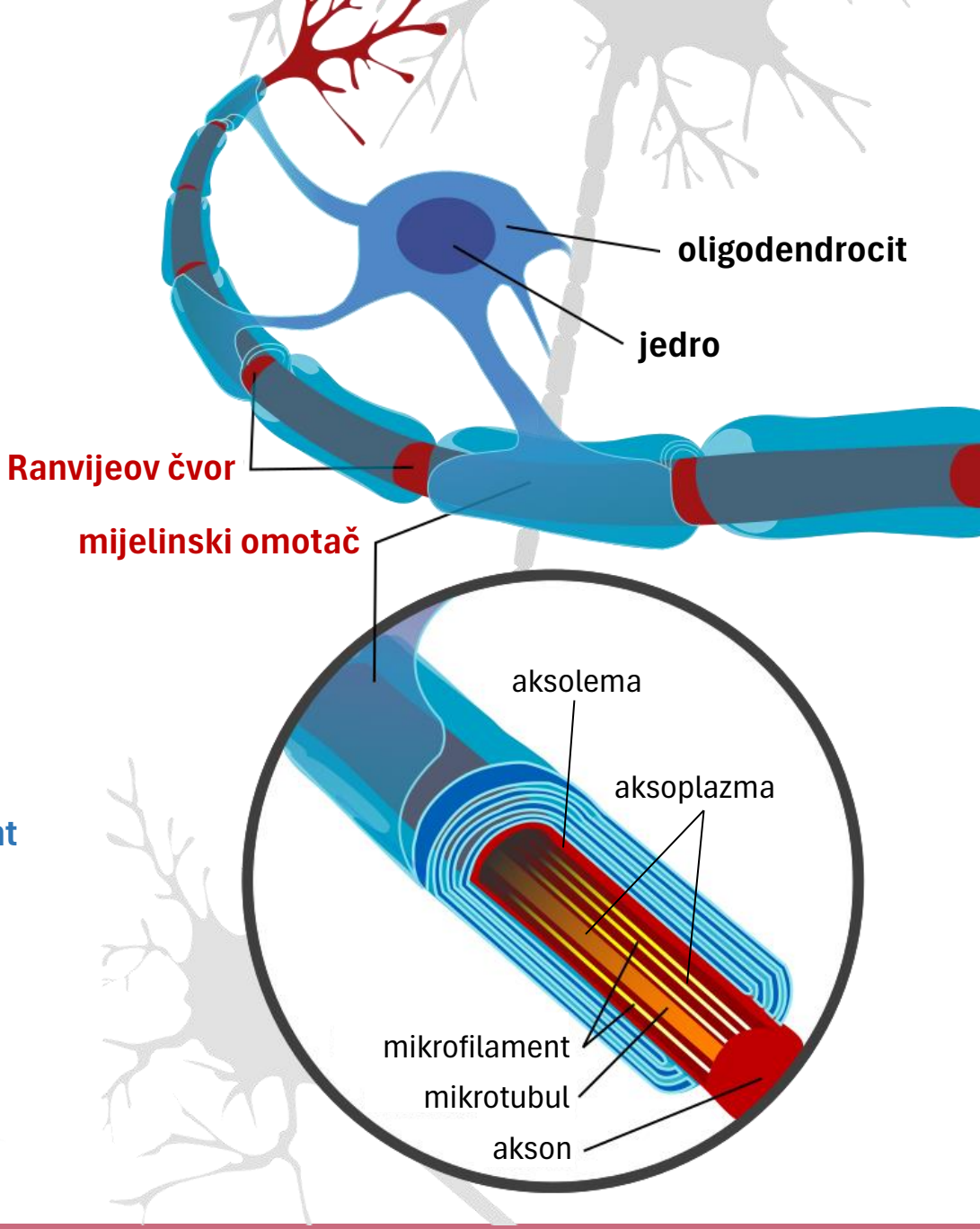
Dendriti


prenosi nervni implus
primaju
stimuluse
dendritske
bodlje (spine)

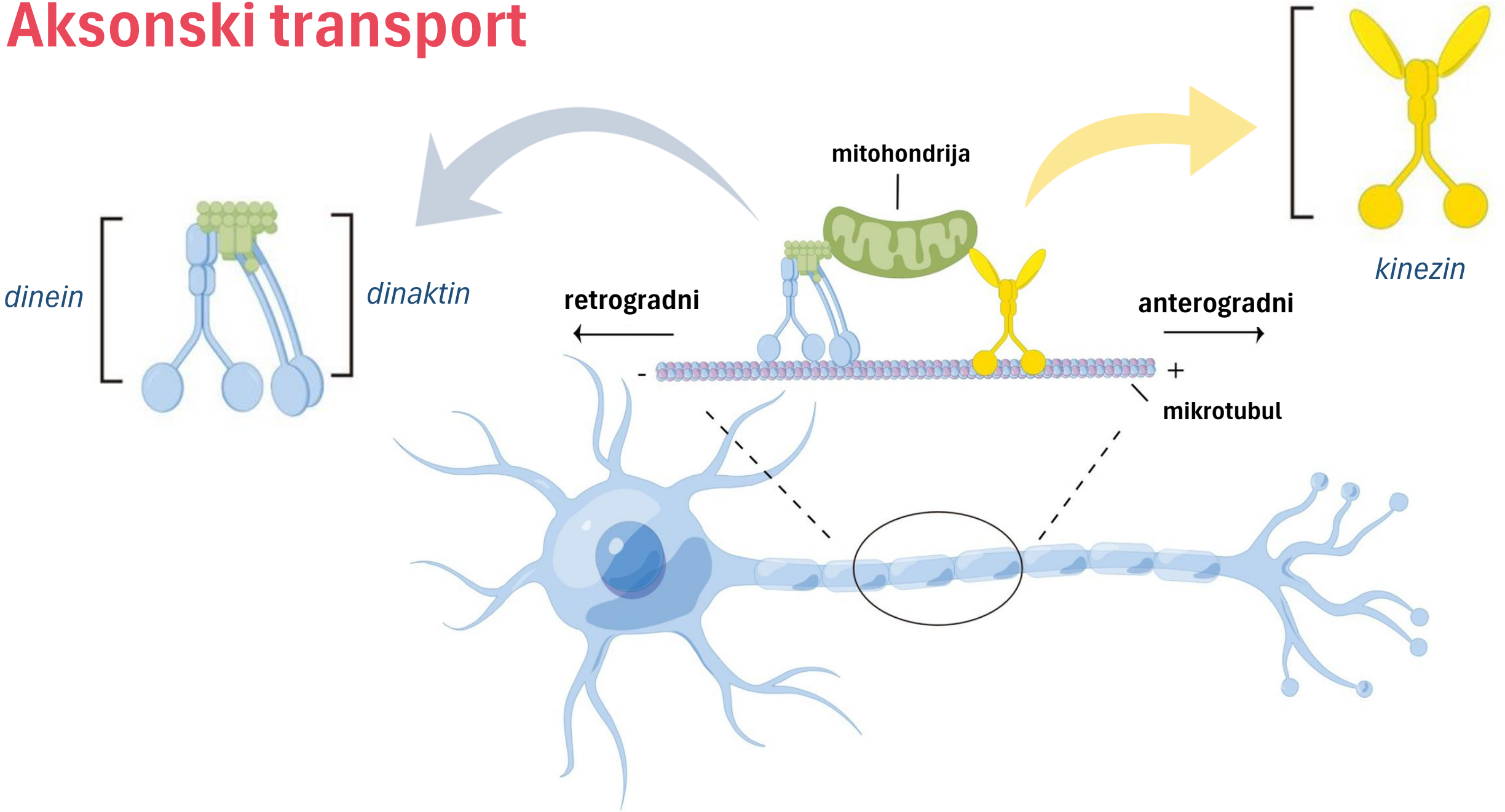

akson
jedro
sinapsa
dendriti
akson
perikarion

Akson/neurit

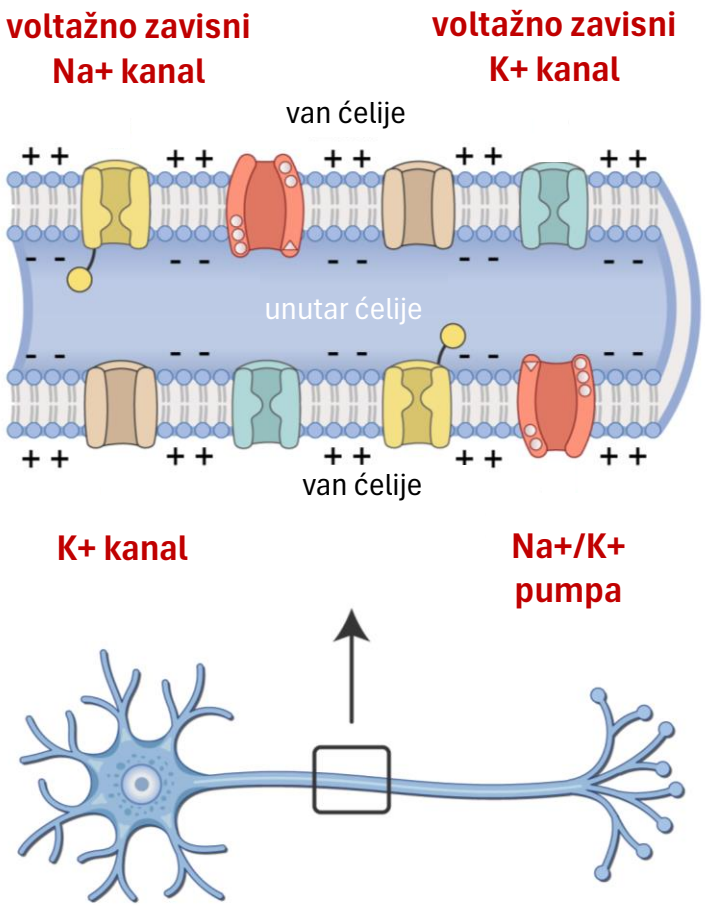


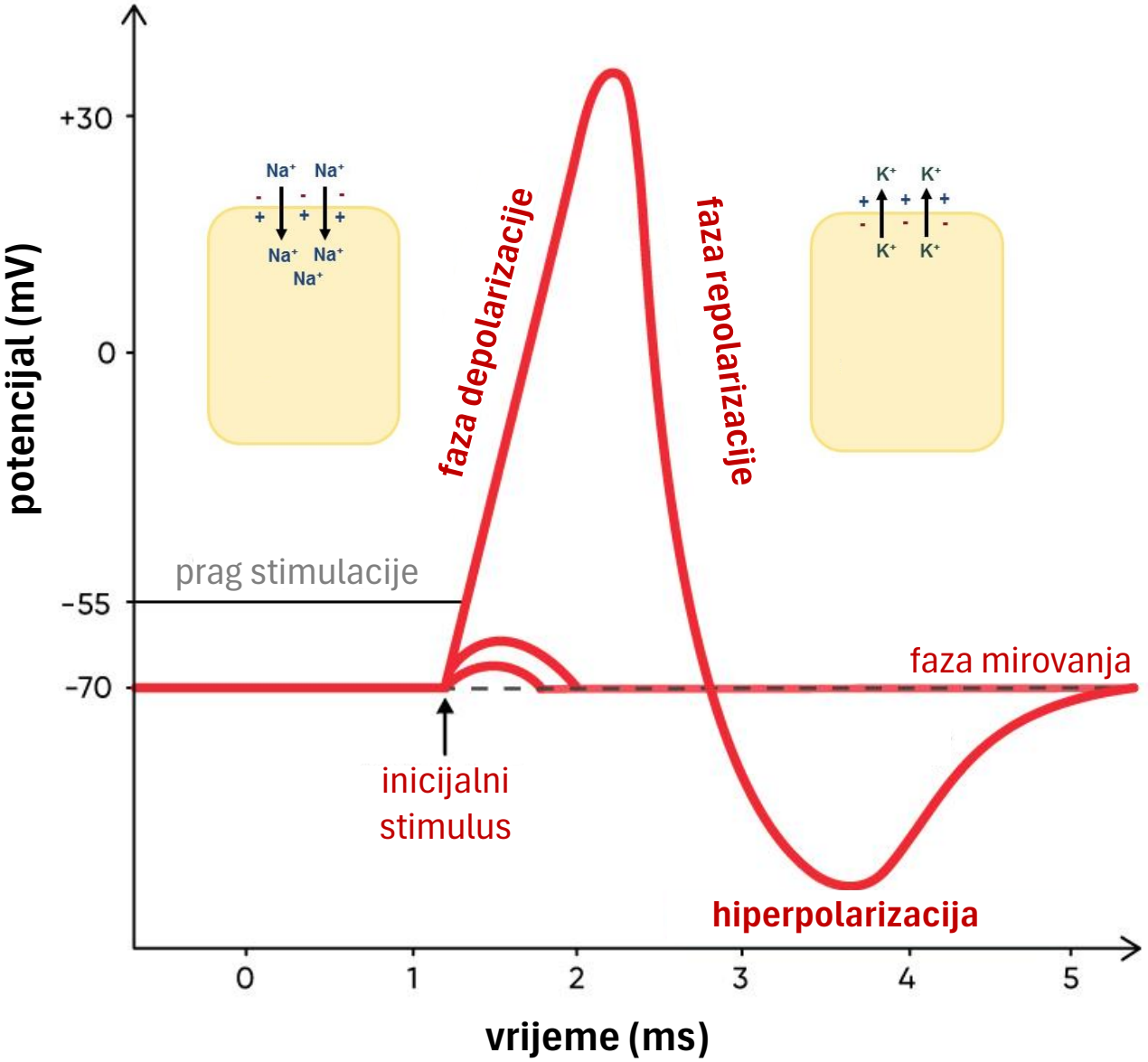


Aksonski transport



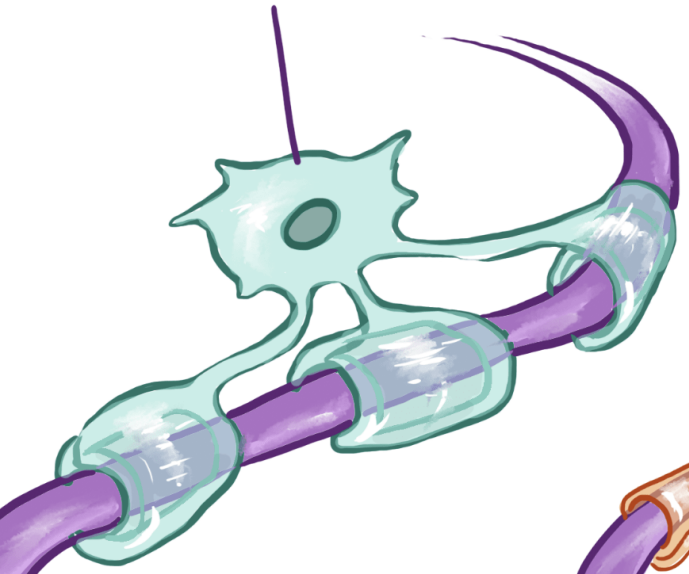
Akcioni potencijal



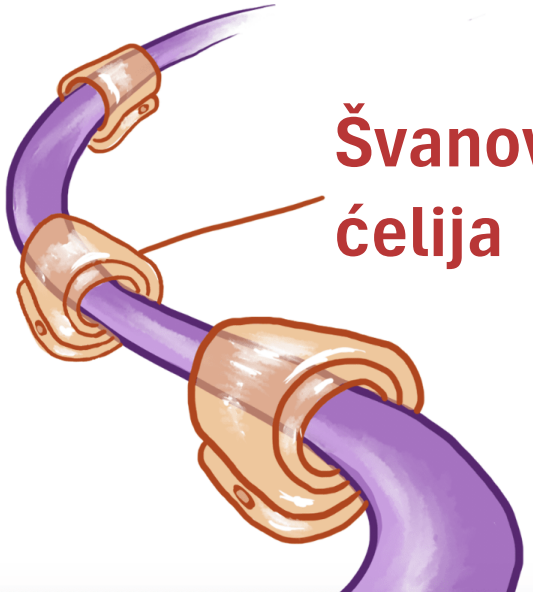


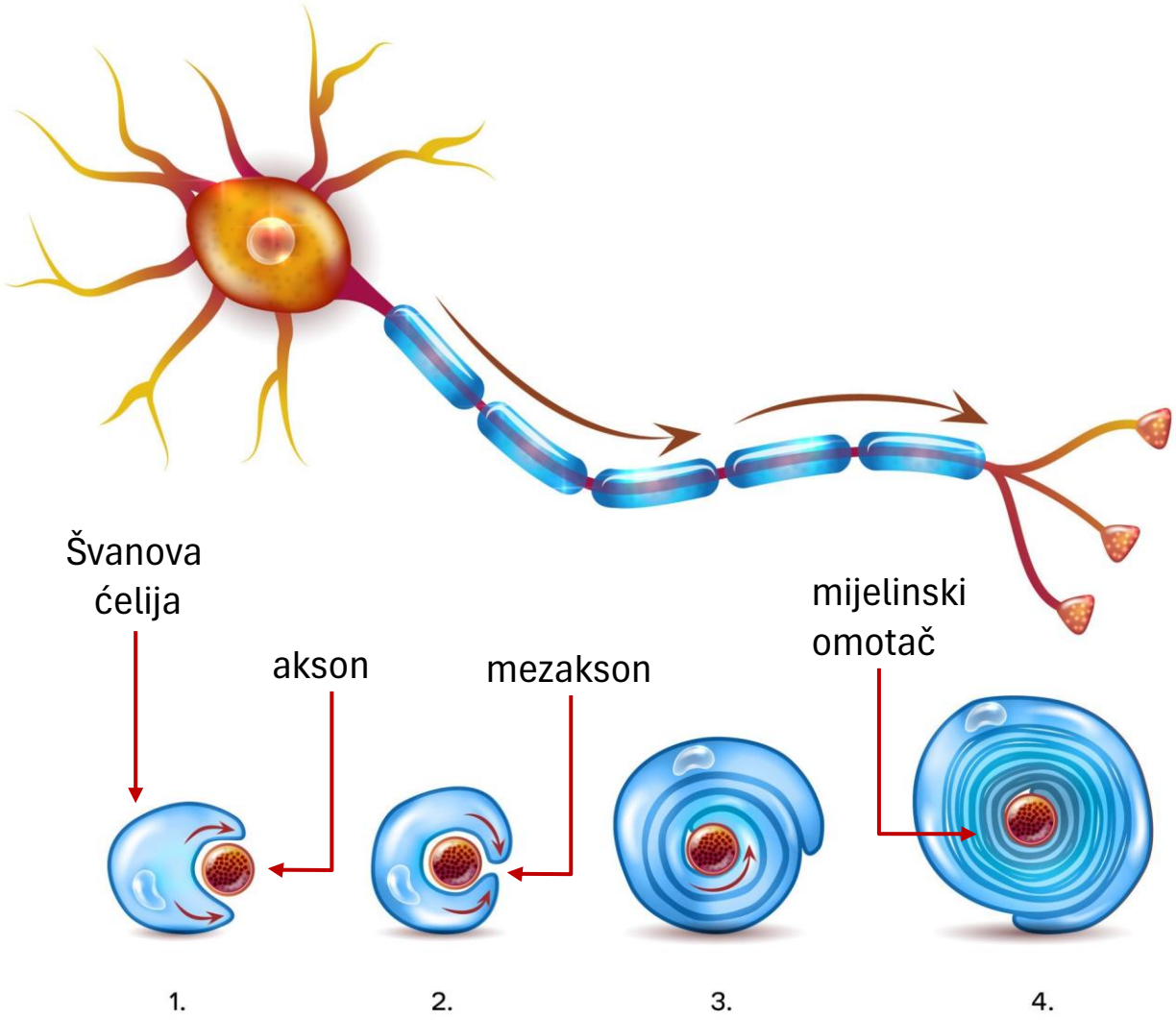
Mijelinski omotač

oligodendrocit

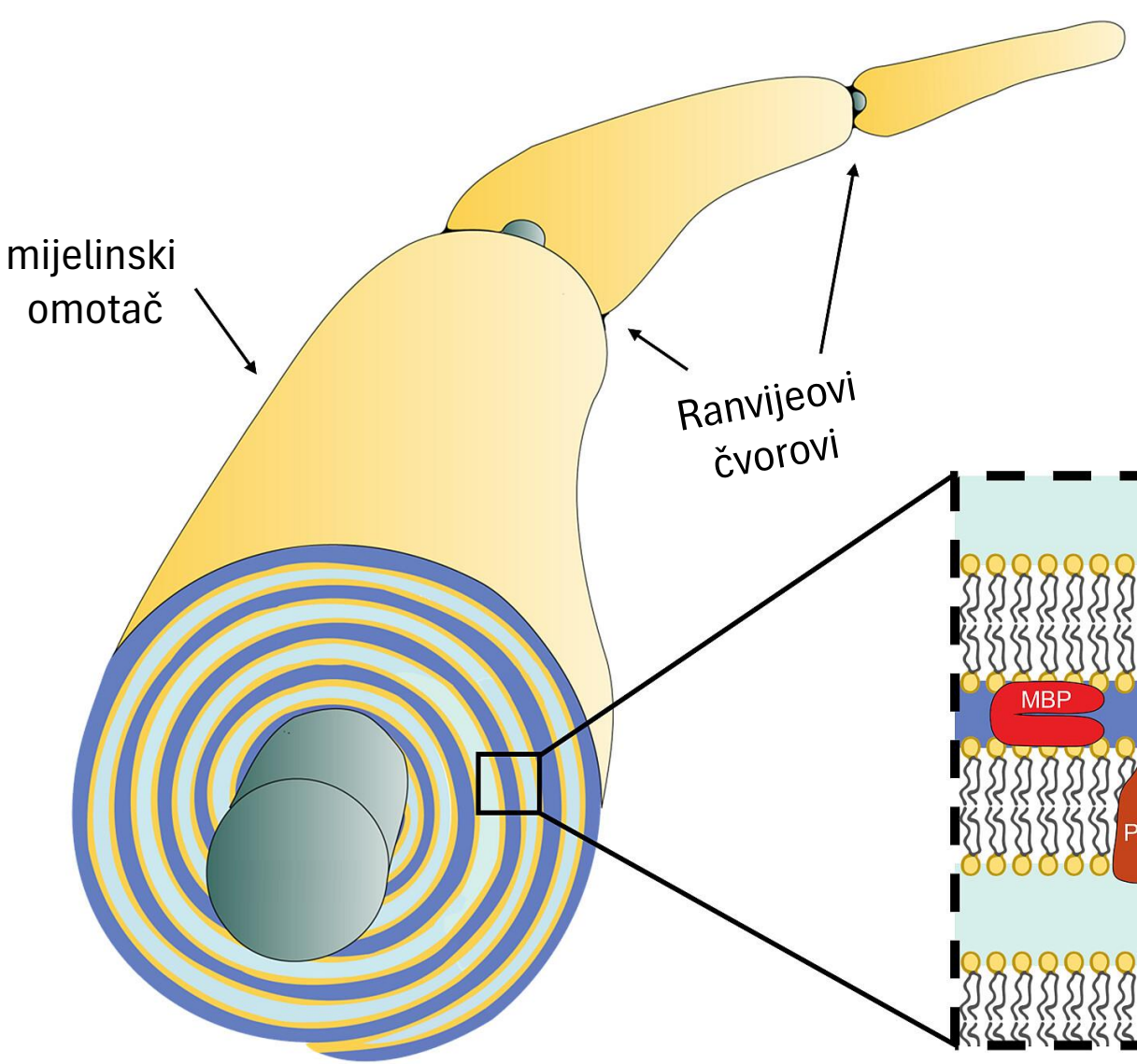


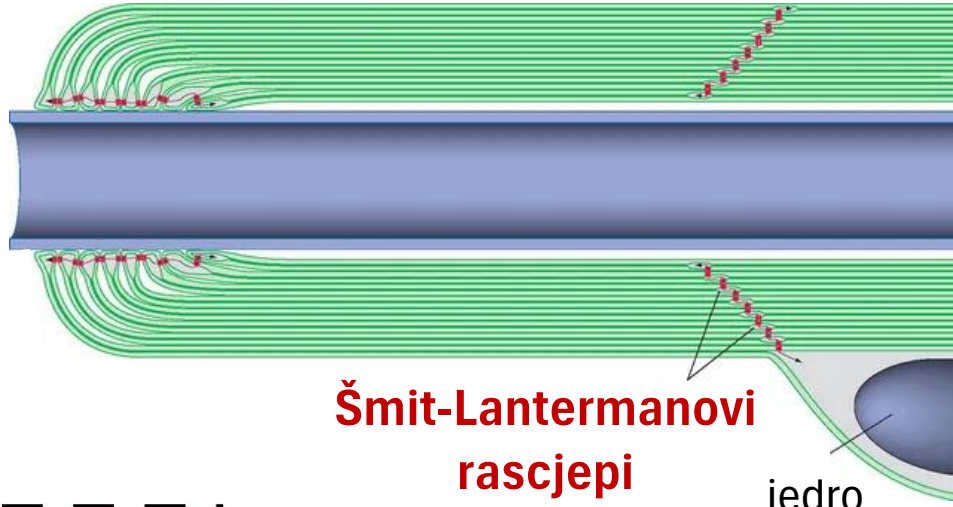
Švanova ćelija

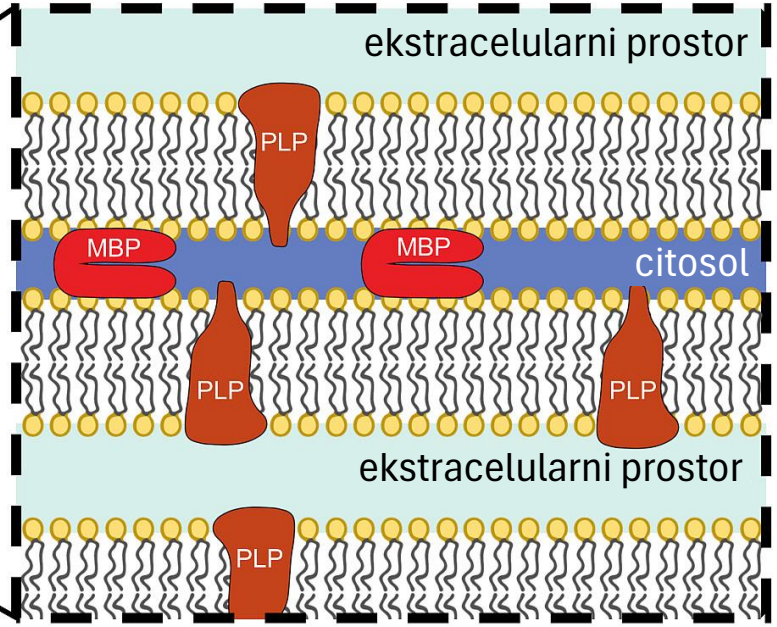




Ultrastruktura mijelinskog omotača





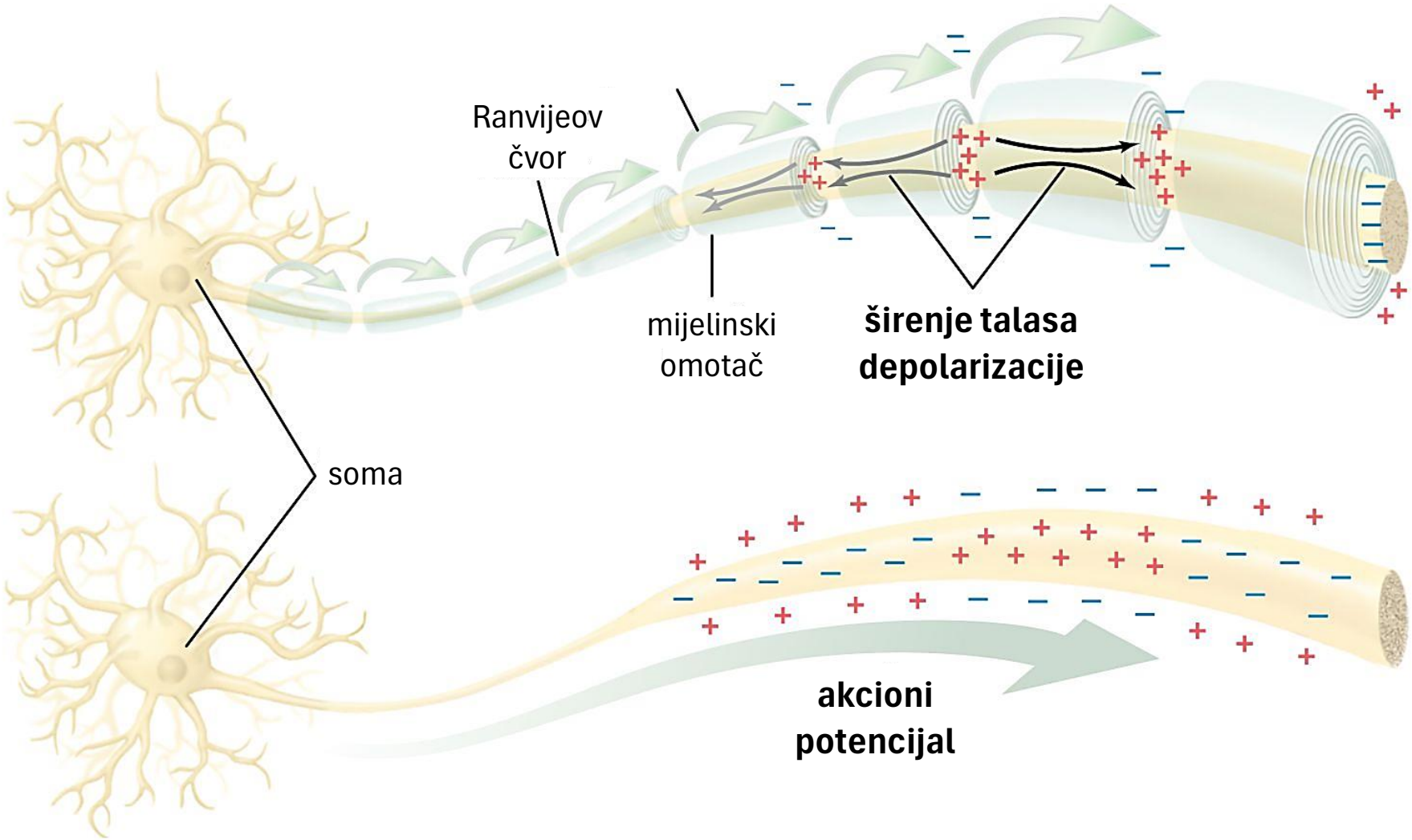


tamne linije

interperiodne (svijetle) linije

PLP: proteolipidni protein
MBP: mijelinski bazni protein

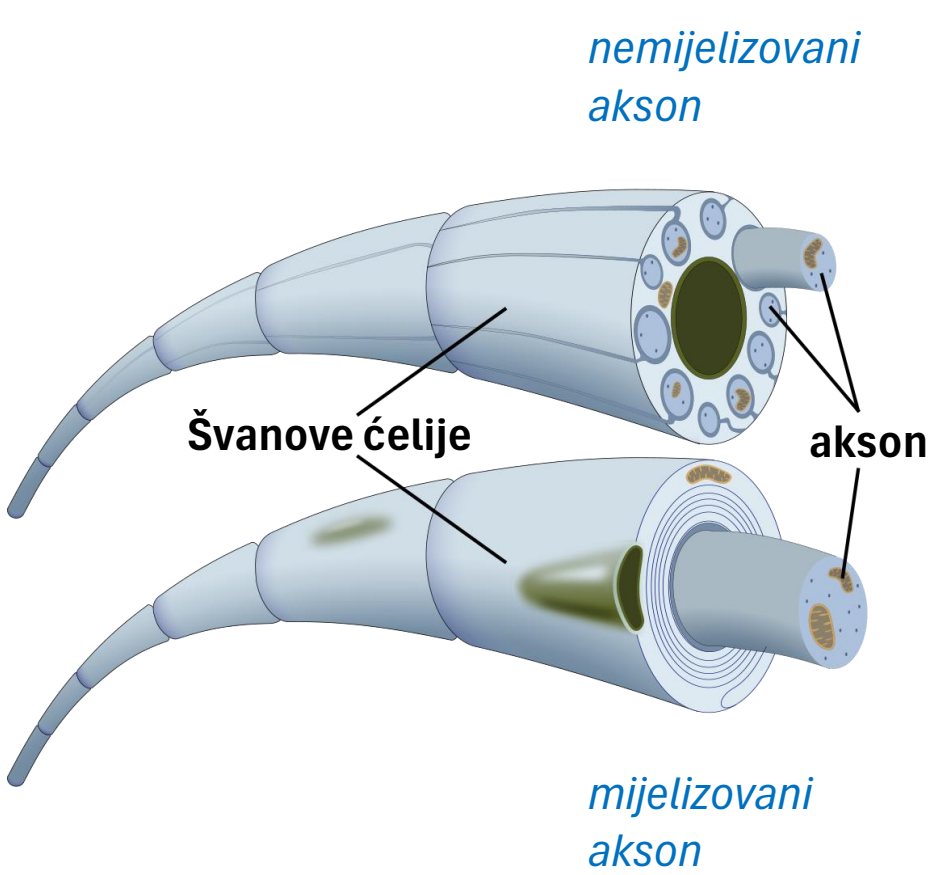
Saltatorna konducija

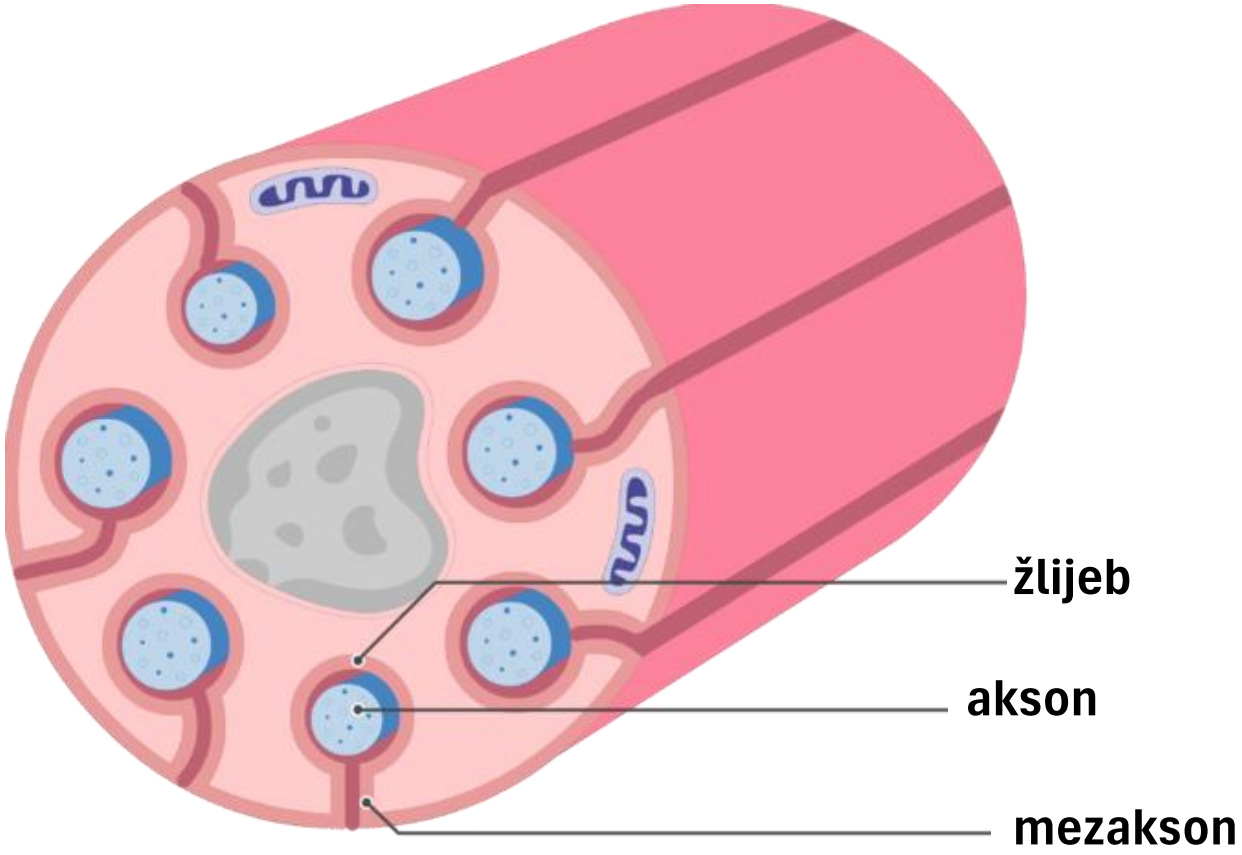


mijelinizovani akson

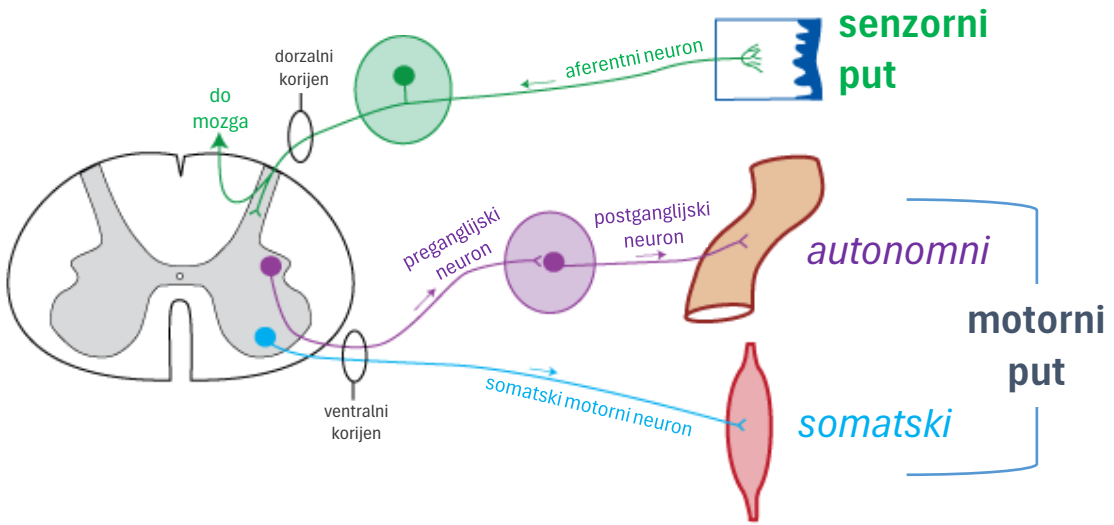
nemijelinizovani akson

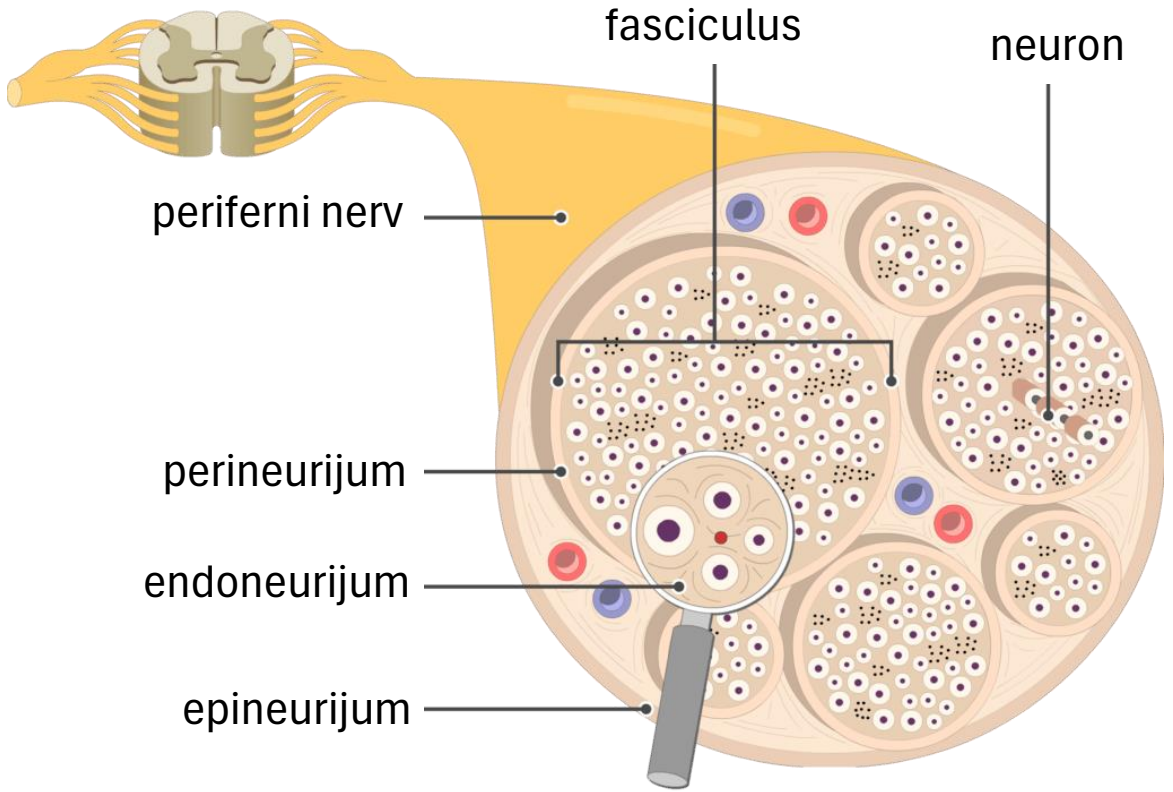
Nemijelinizovana vlakna





Nervna vlakna i vezivnotkivni omotači

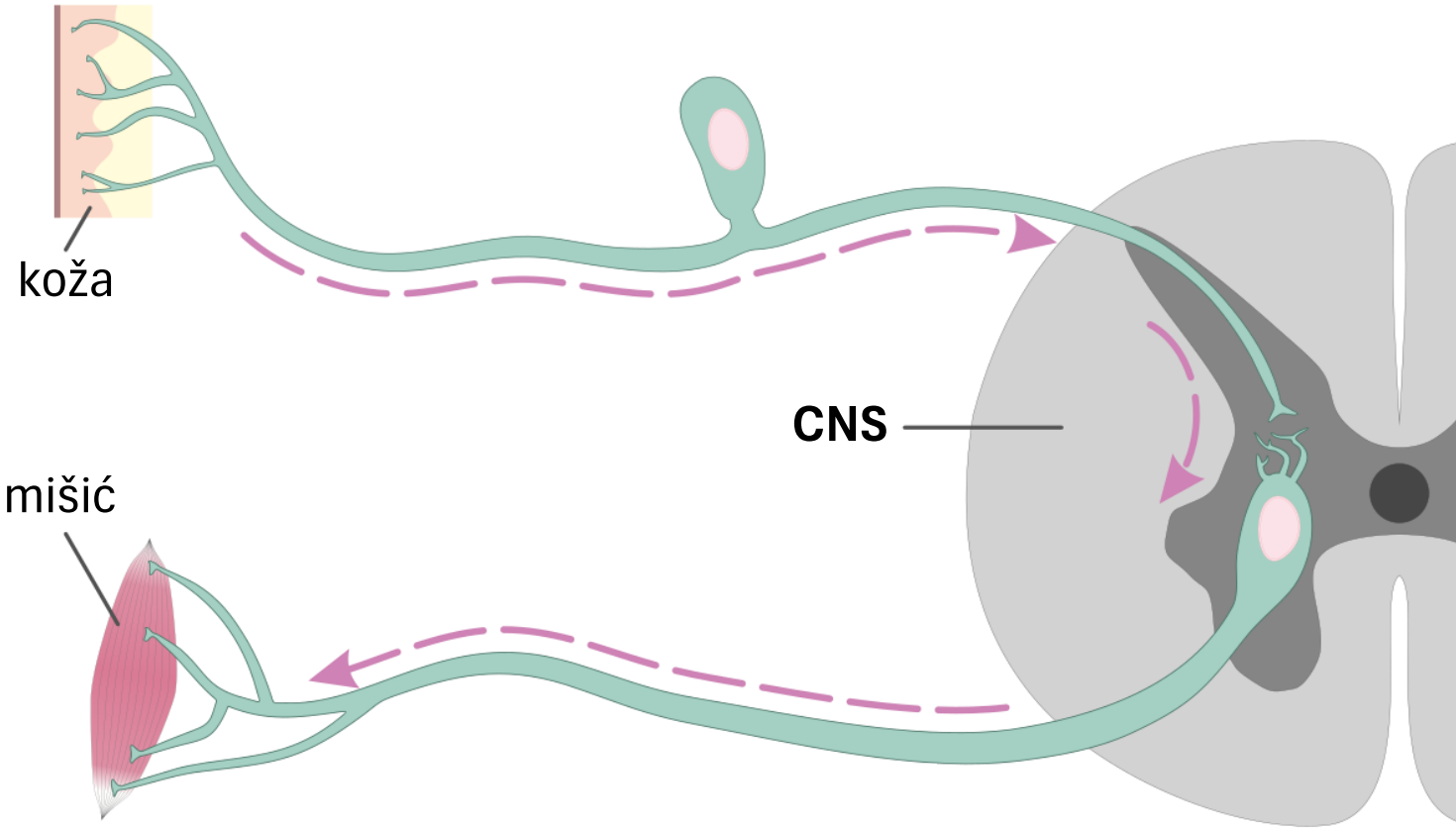




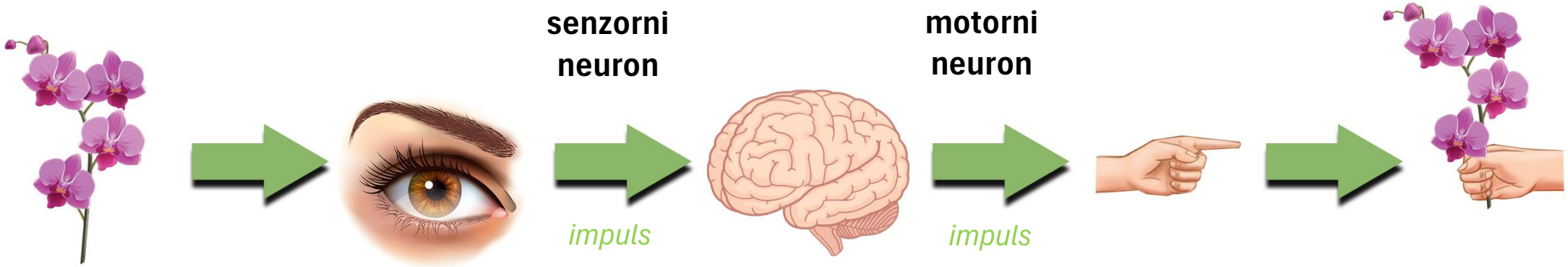
Nervni završeci

aferentni nervni završeci
primaju nadražaje iz svoje okoline

eferentni nervni završeci
predaju nadražaj efektornim ćelijama

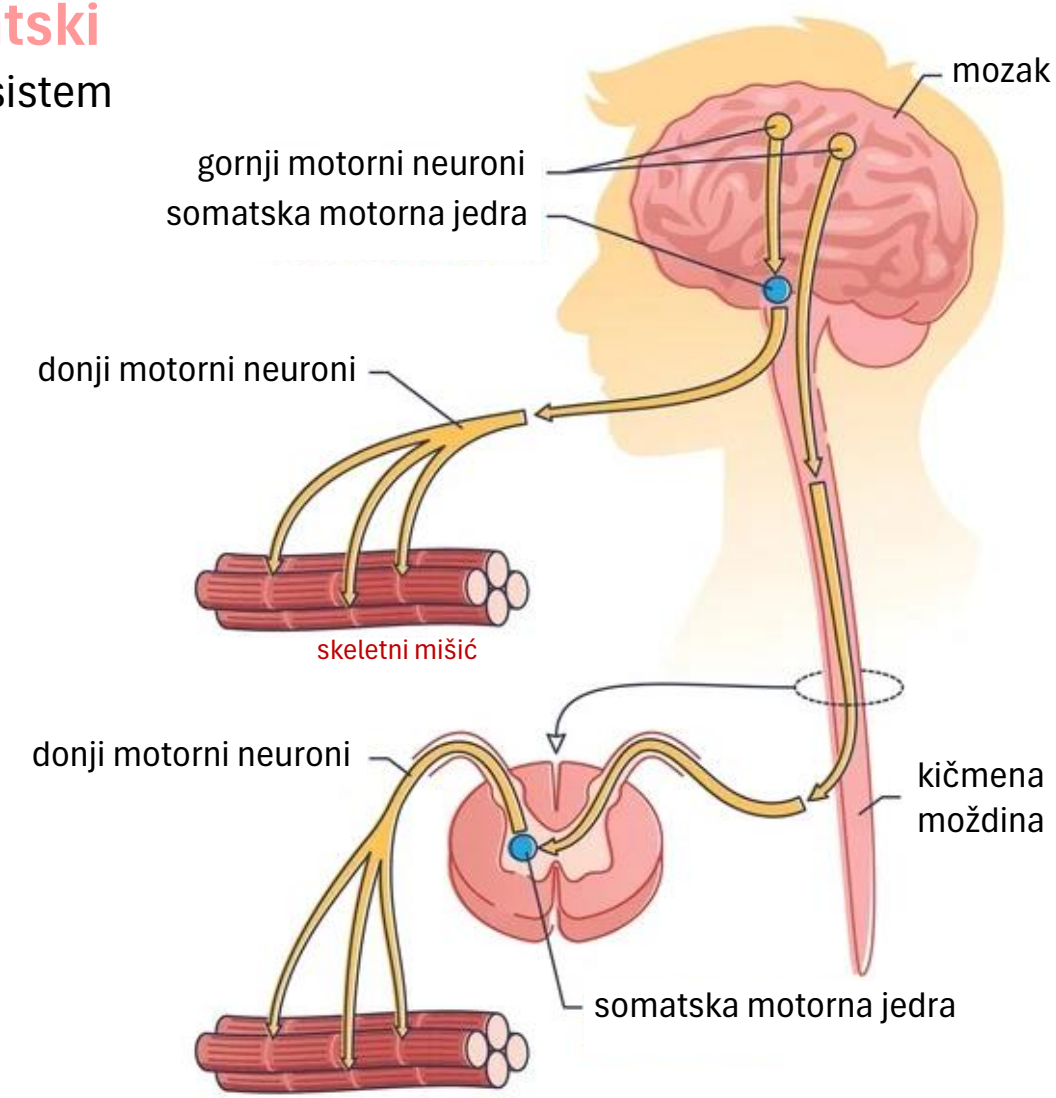


Put nervnog impulsa

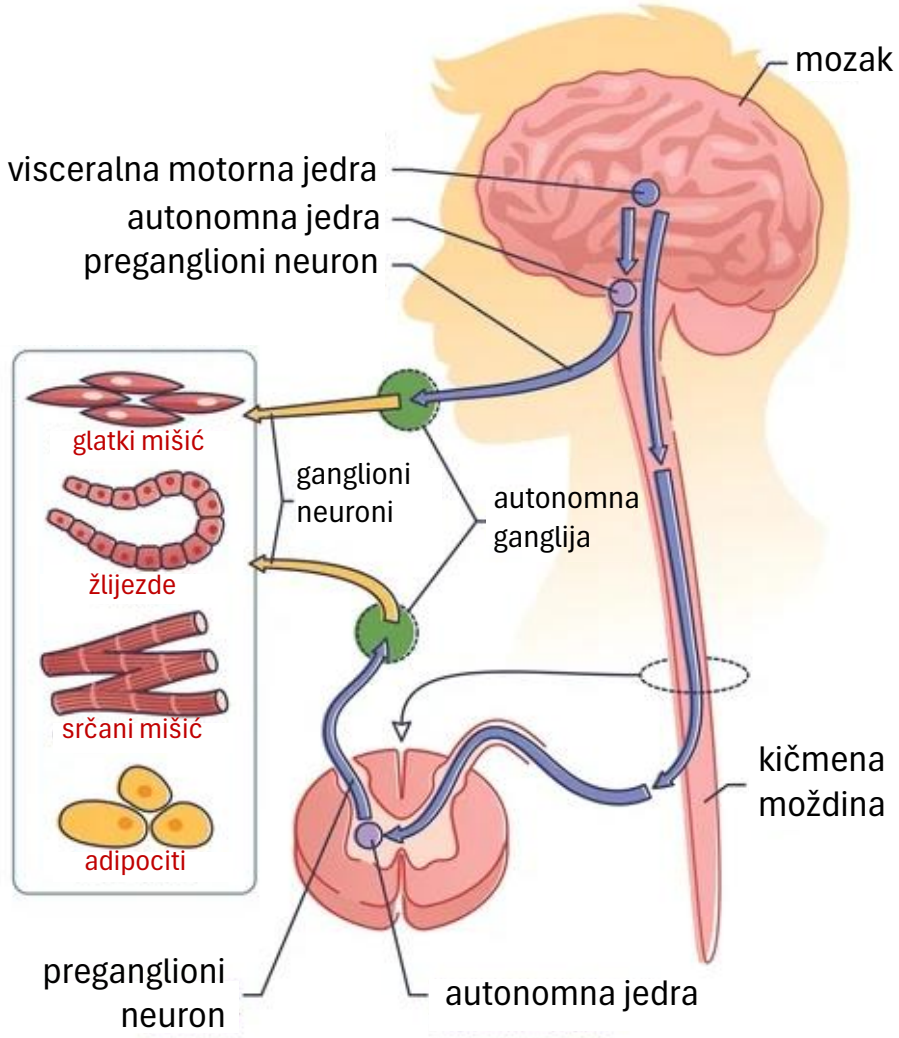


Eferentni nervni završeci

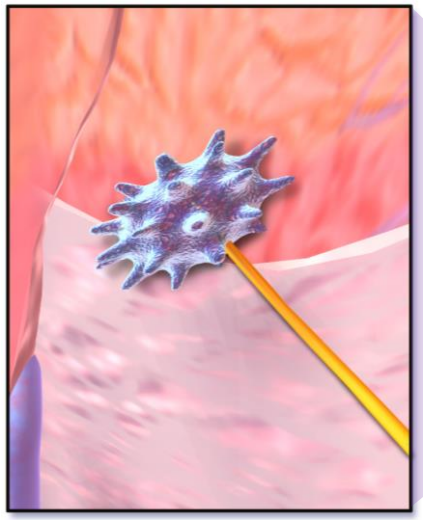
somatski
nervni sistem

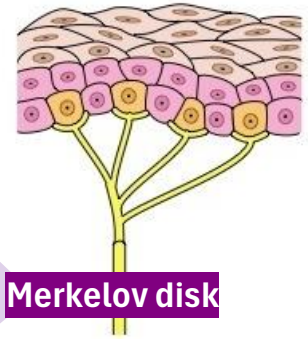


autonomni
nervni sistem

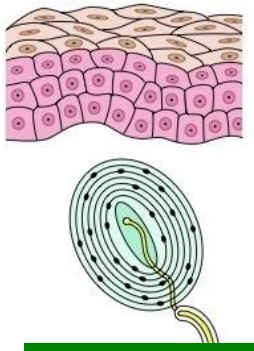


Aferentni nervni završeci

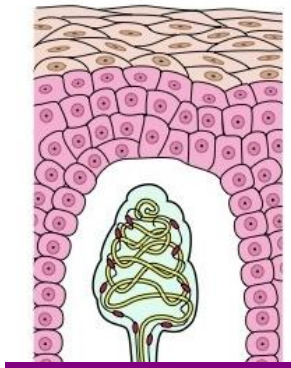




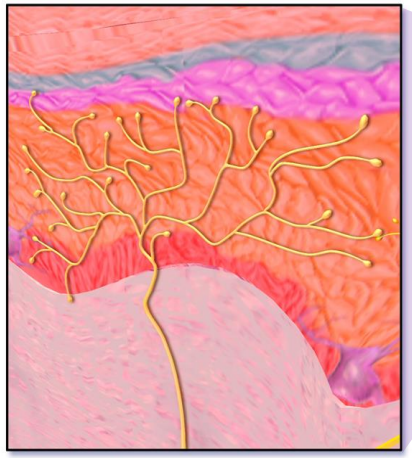
Merkelov disk



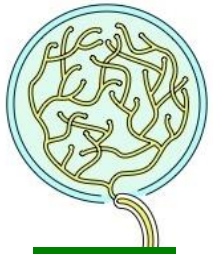
Fater-Pačinijevo tjelašce



Majsnerovo tjelašce

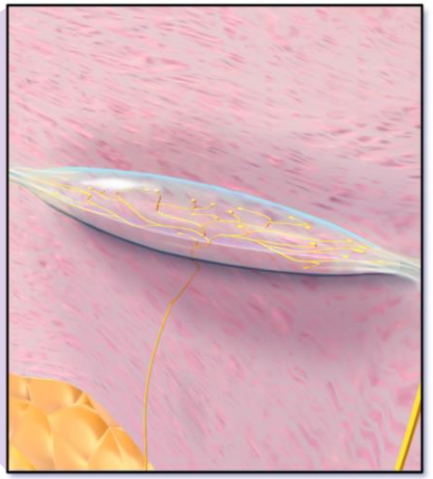


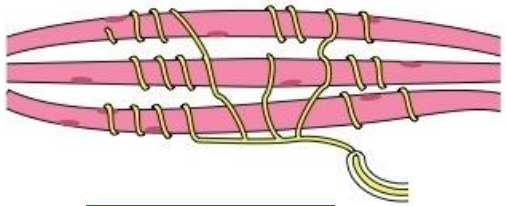
slobodni nervni završeci



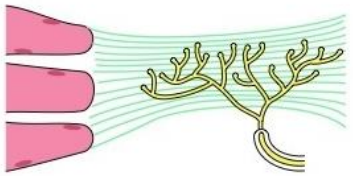
Krauzeov završni organ

Rufinijevo tjelašce



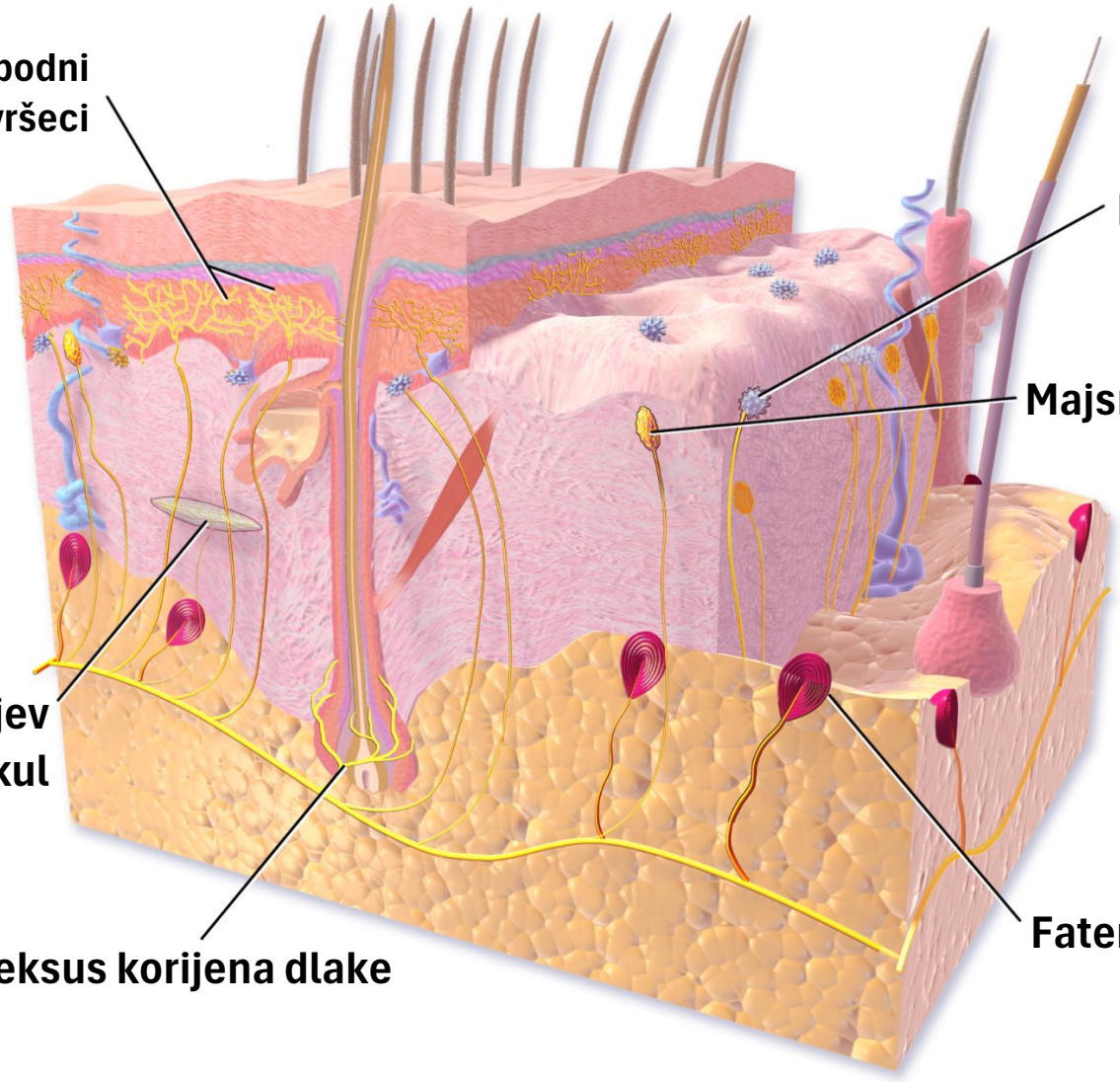


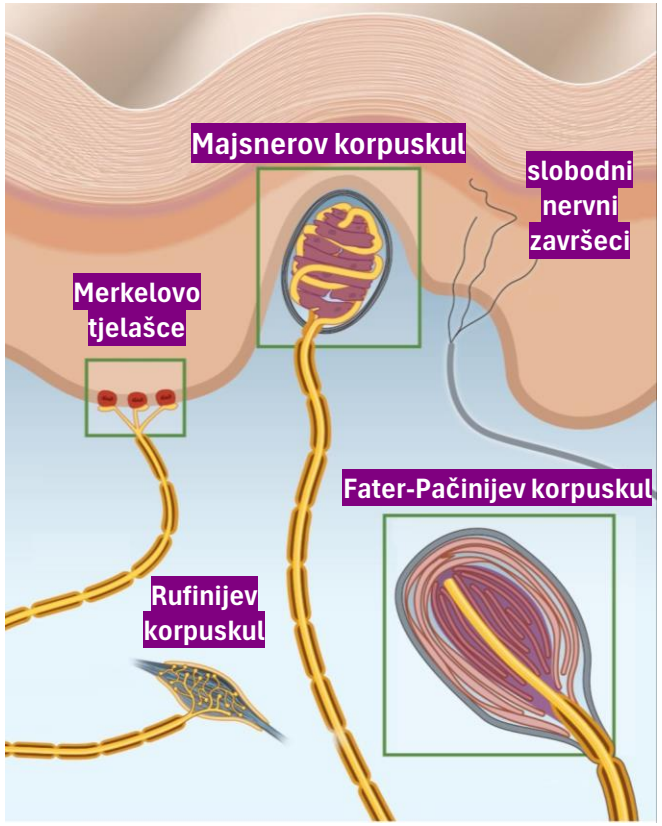
mišićno vreteno



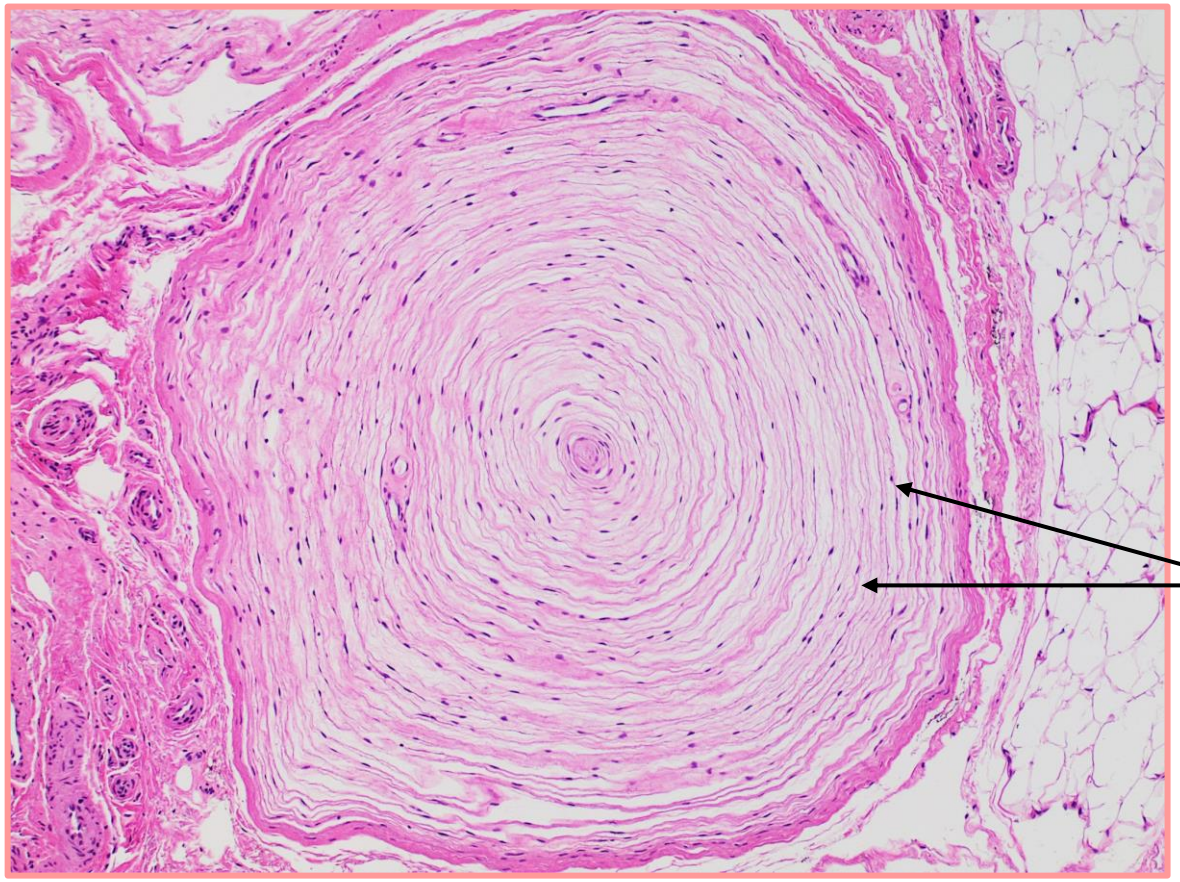
Goldžijev tetivni organ

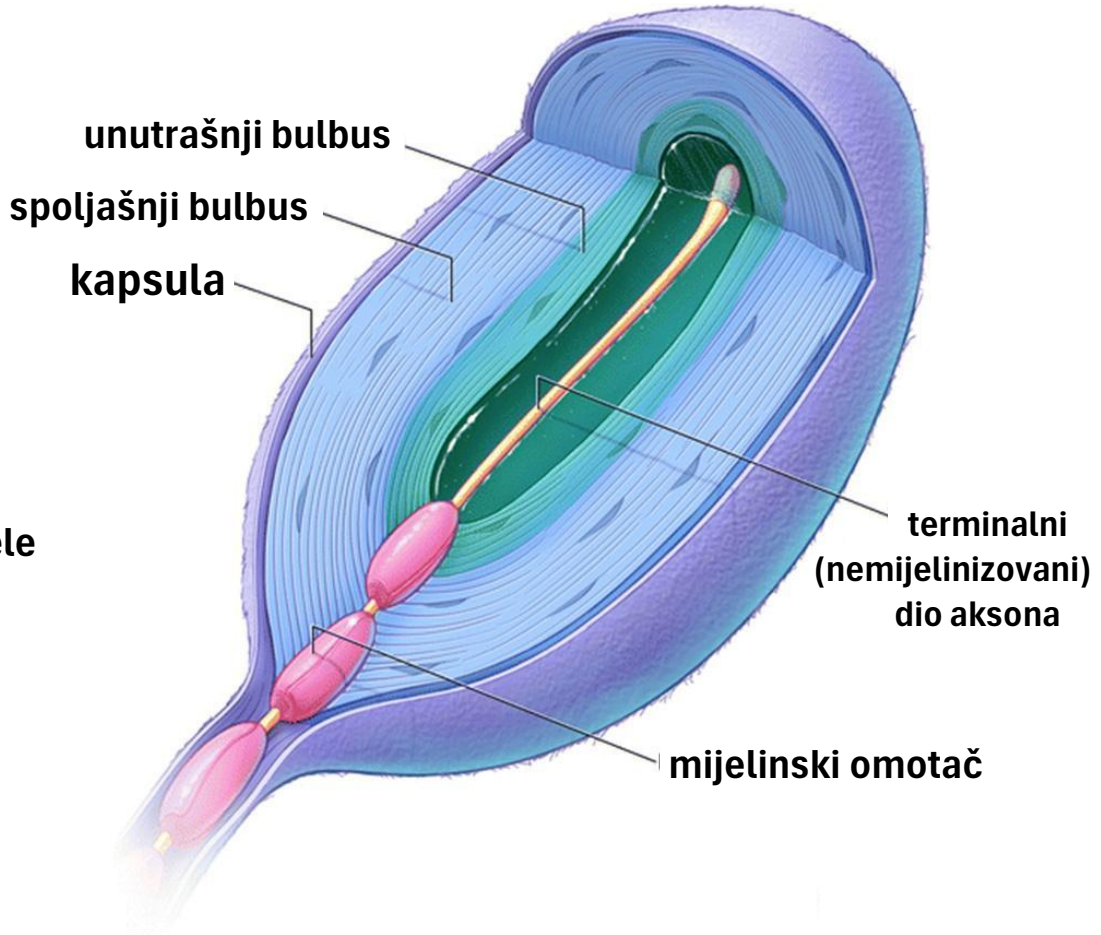
Slobodni i inkapsulirani nervni završeci u koži



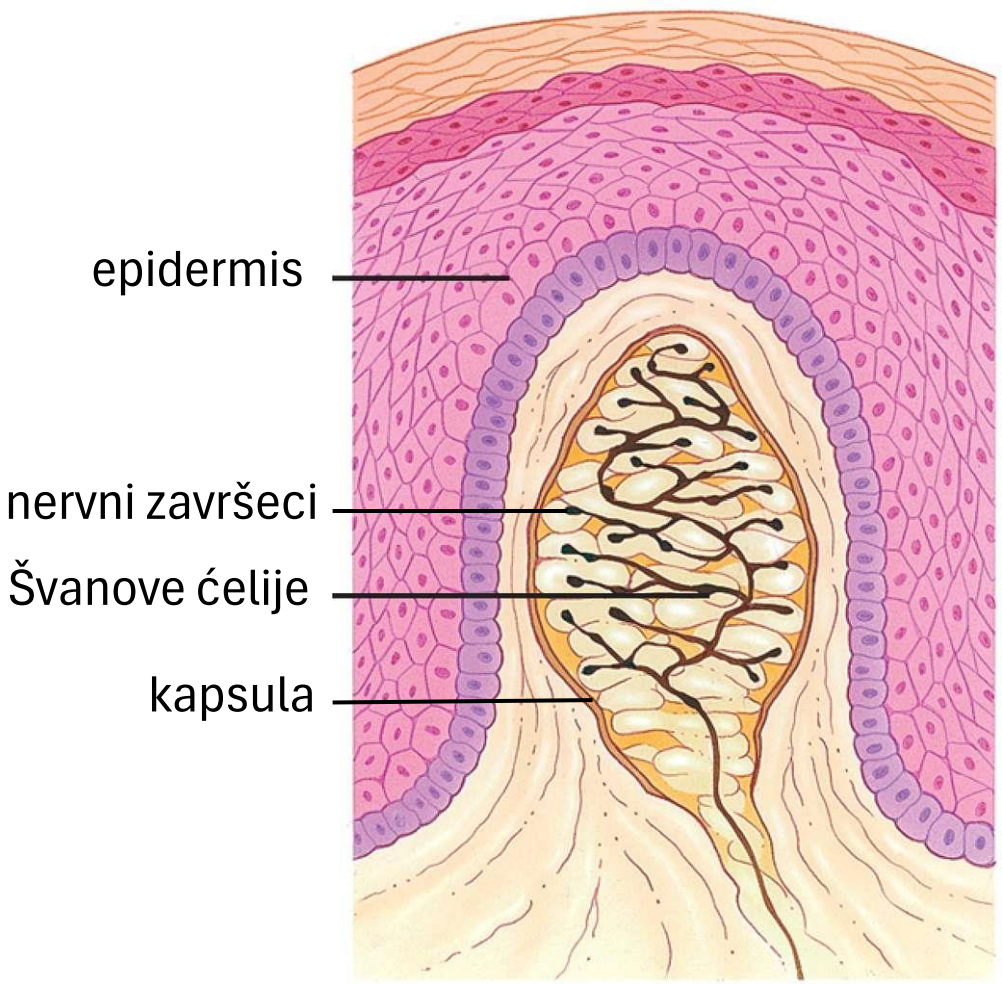


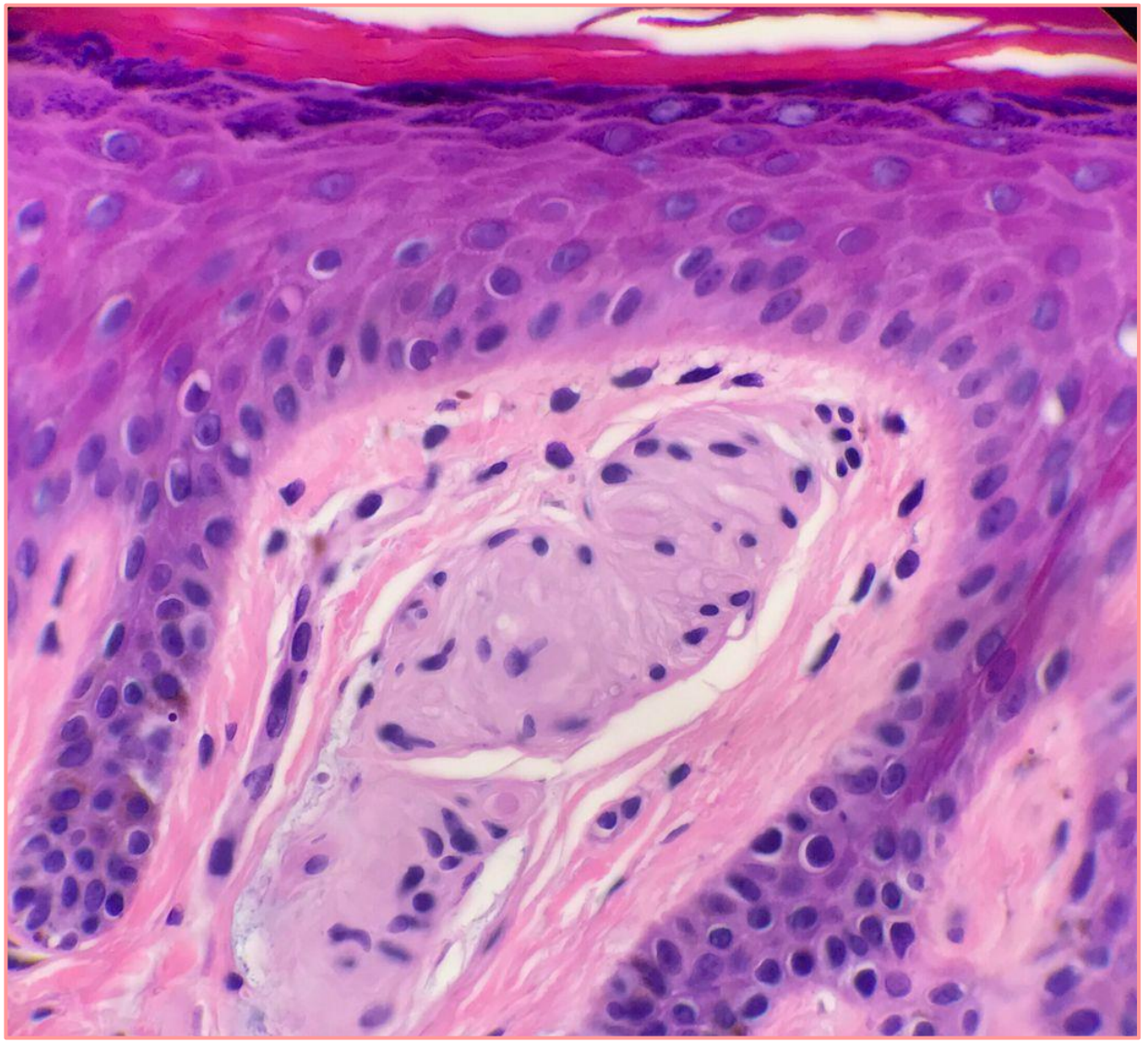
Fater-Pačinijev korpuskul



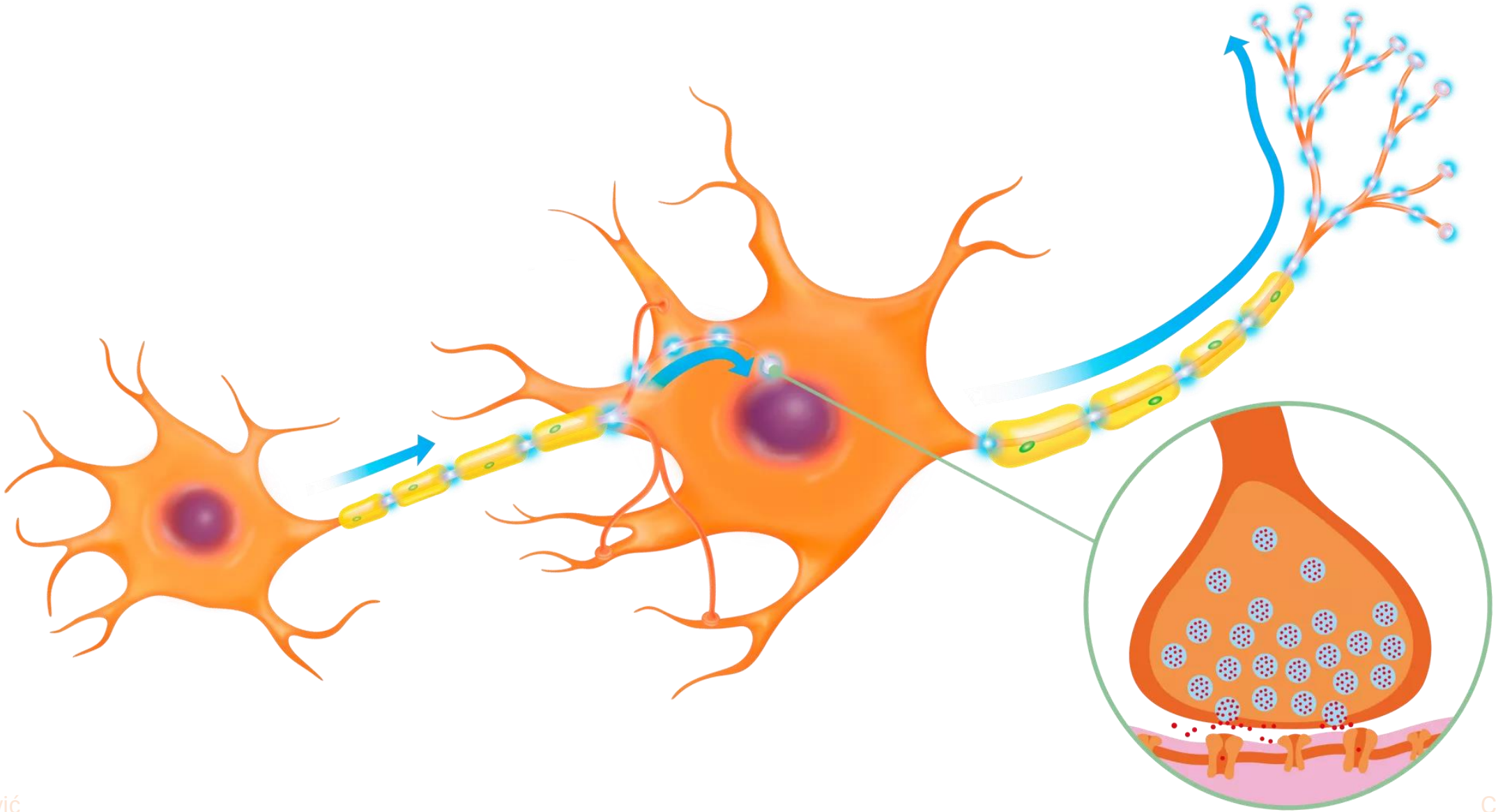


Majsnerov korpuskul

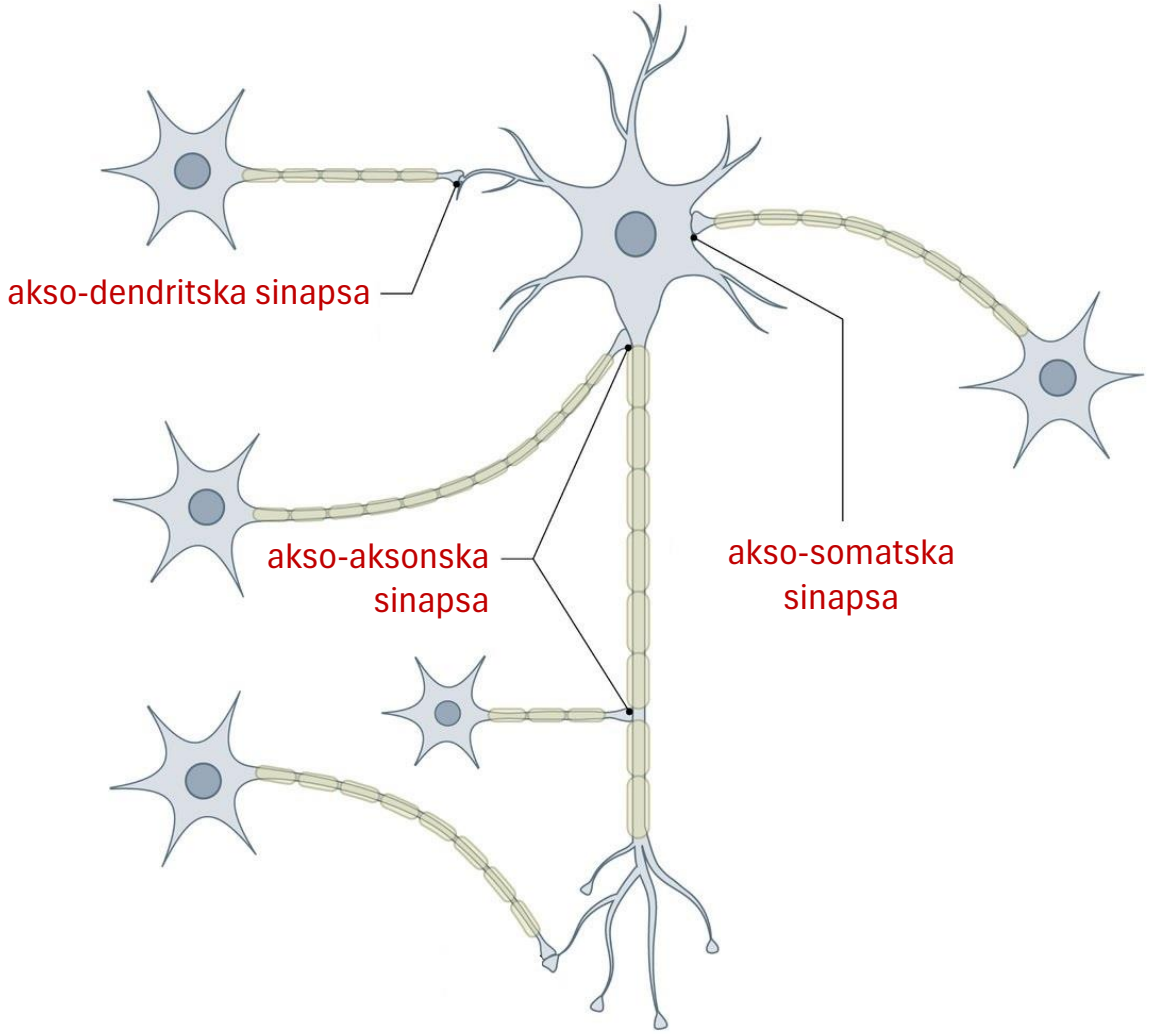


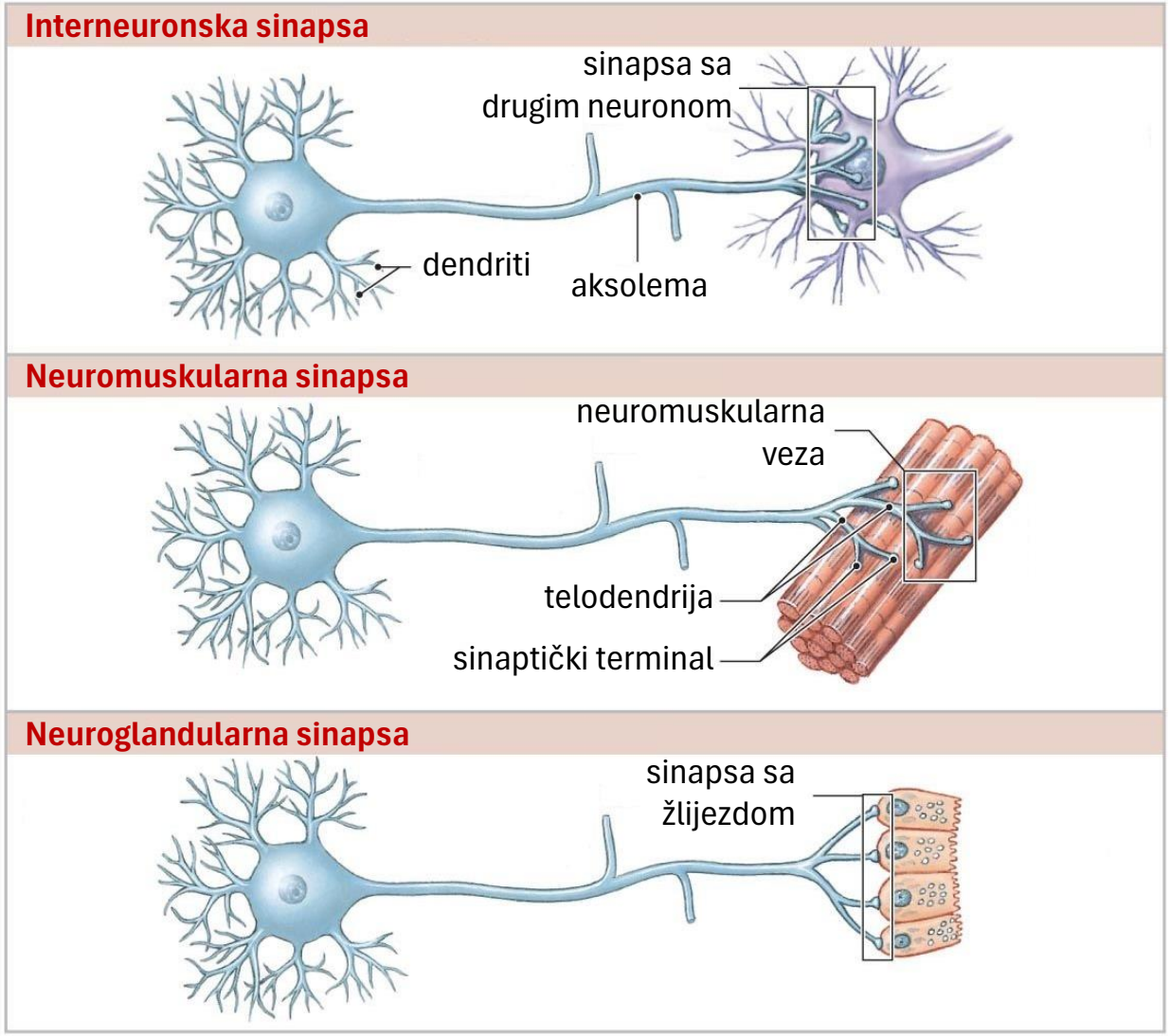


Sinapse

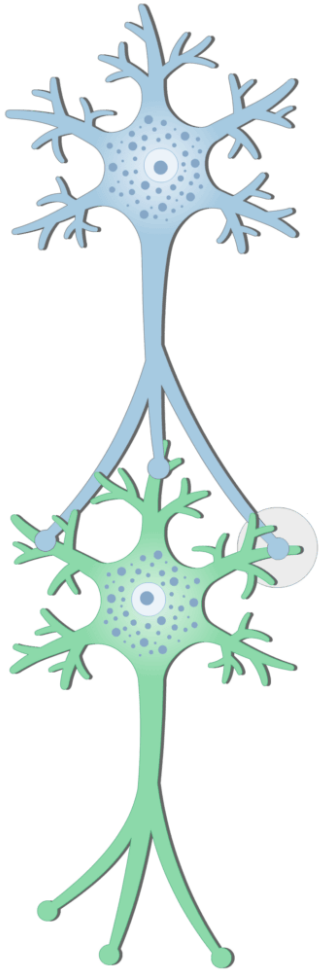


Tipovi sinapsi

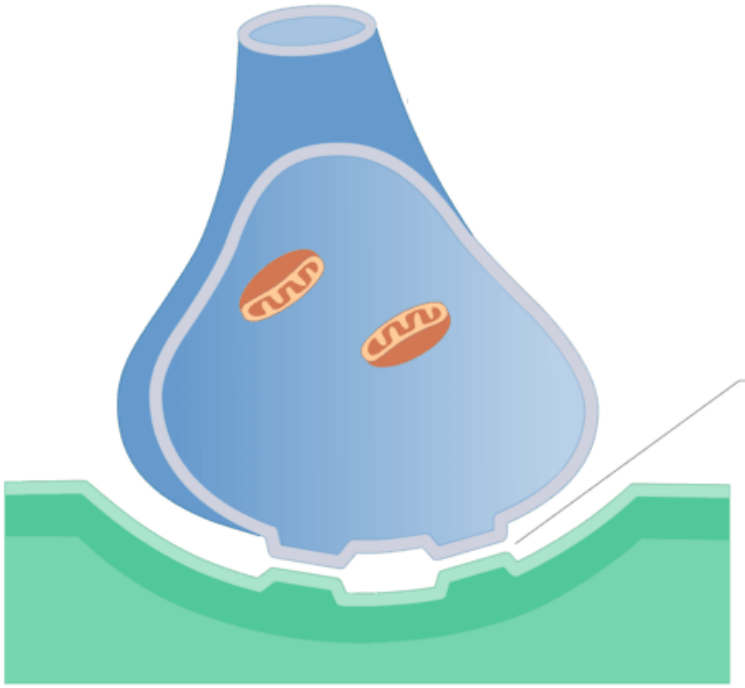




Električna sinapsa

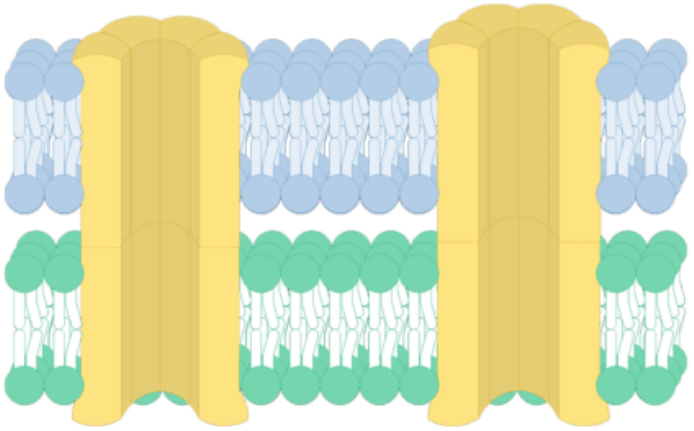


presinaptički
neuron

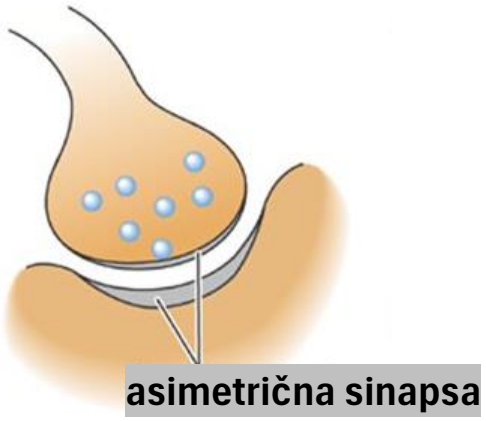


postsinaptički
neuron

gap junction

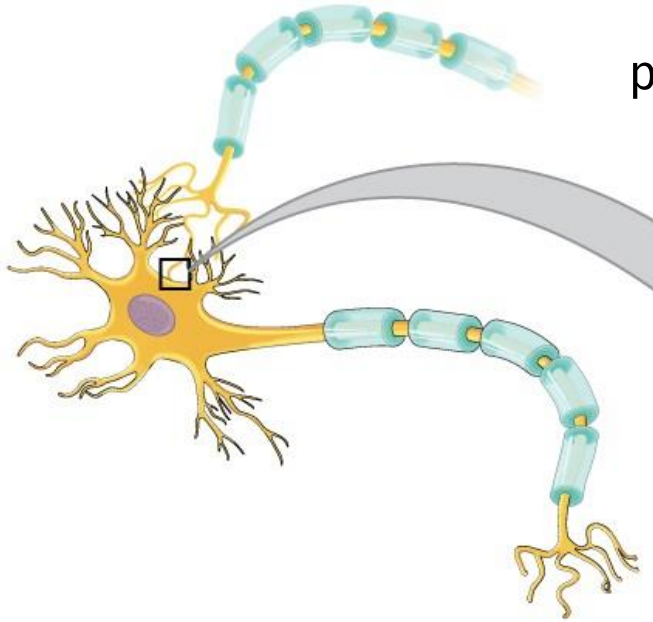


Hemijska sinapsa



asimetrična sinapsa

simetrična sinapsa



presinaptički neuron

aksonski završetak

sinaptičke vezikule

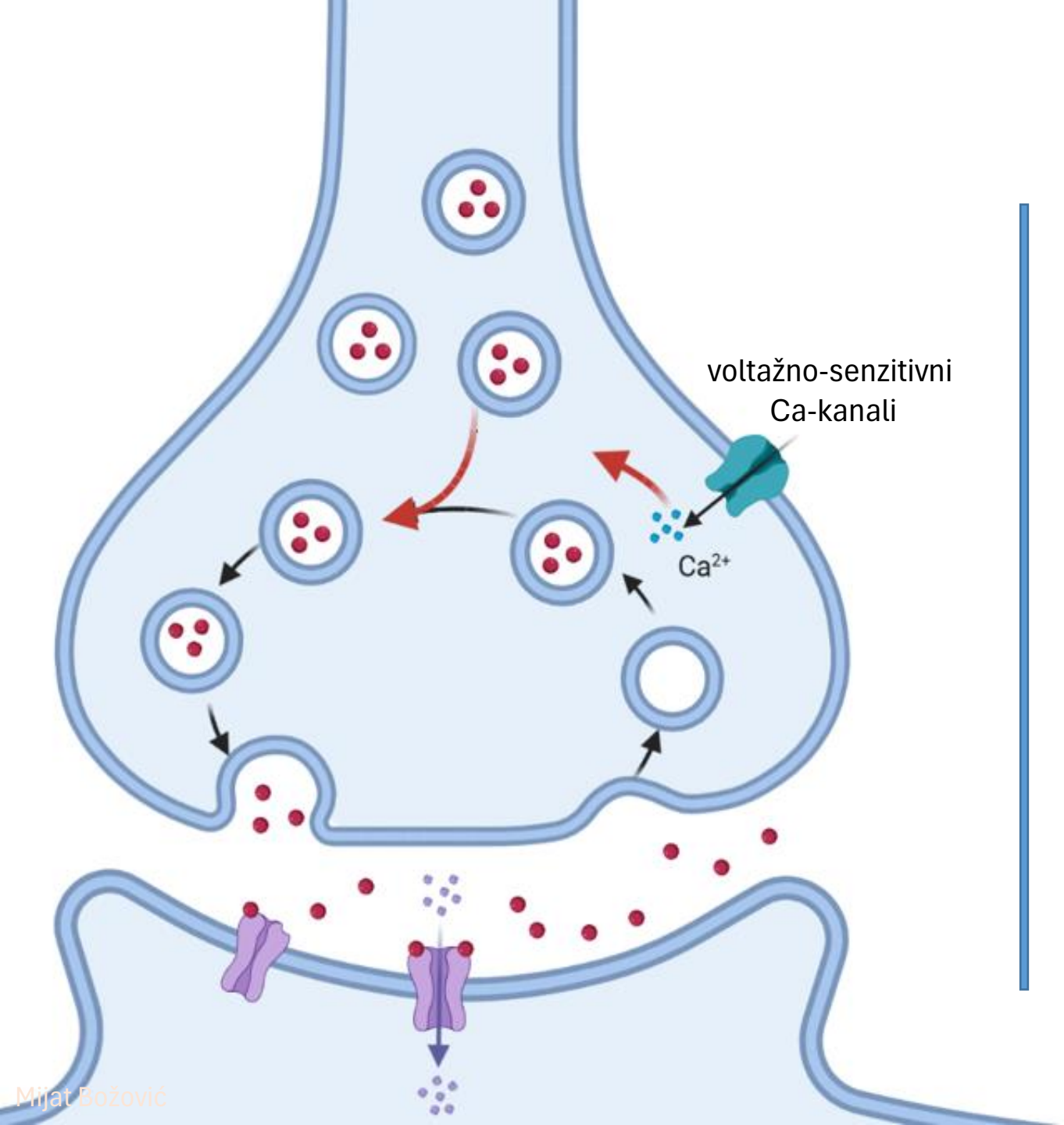
neurotransmiteri

sinaptički prostor

receptor za neurotransmiter na postsinaptičkom neuronu

postsinaptički neuron

Sinaptička transmisija



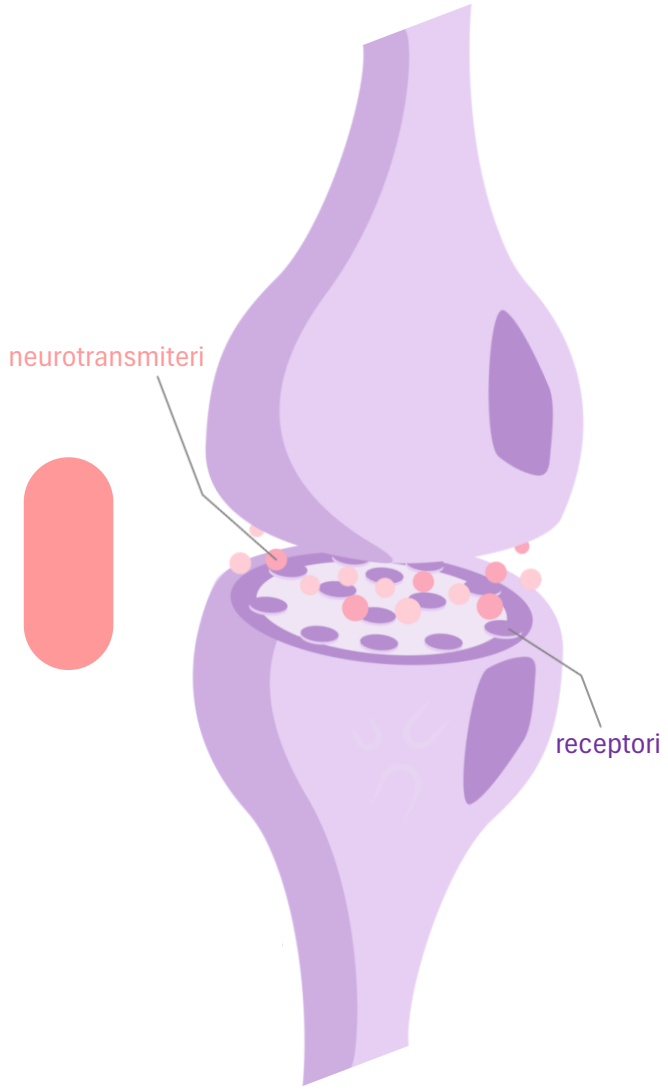
- talas depolarizacije zahvata aksonski završetak
- Ca-kanali se otvaraju i Ca difunduje u sinaptički čvor
- visoka koncentracija Ca-jona dovodi do pokretanja sinaptičkih vezikula i oslobađanja neurotransmitera iz njih u sinaptičku pukotinu
- vezivanje neurotransmitera za receptore koji se nalaze na postsinaptičkoj membrani pokreće se proces depolarizacije ili hiperpolarizacije

Sinaptički transmiteri

ACh i biogeni amini

brzo-djelujući

aminokiseline



opioidni peptidi

gastrointestinalni peptidi

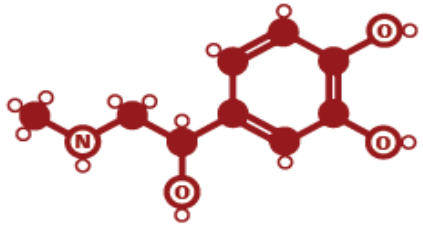
sporo-djelujući

neurohormoni

gasovi

Najvažniji neurotransmiteri

ADRENALIN



fight & flight neurotransmiter

NORADRENALIN

neurotransmiter koncentracije

DOPAMIN

neurotransmiter zadovoljstva

SEROTONIN

neurotransmiter raspoloženja

GABA

umirujući neurotransmiter

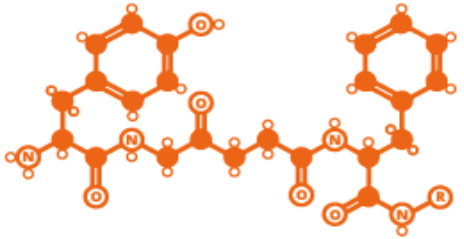
ACETILHOLIN

neurotransmiter učenja

GLUTAMAT

neurotransmiter pamćenja

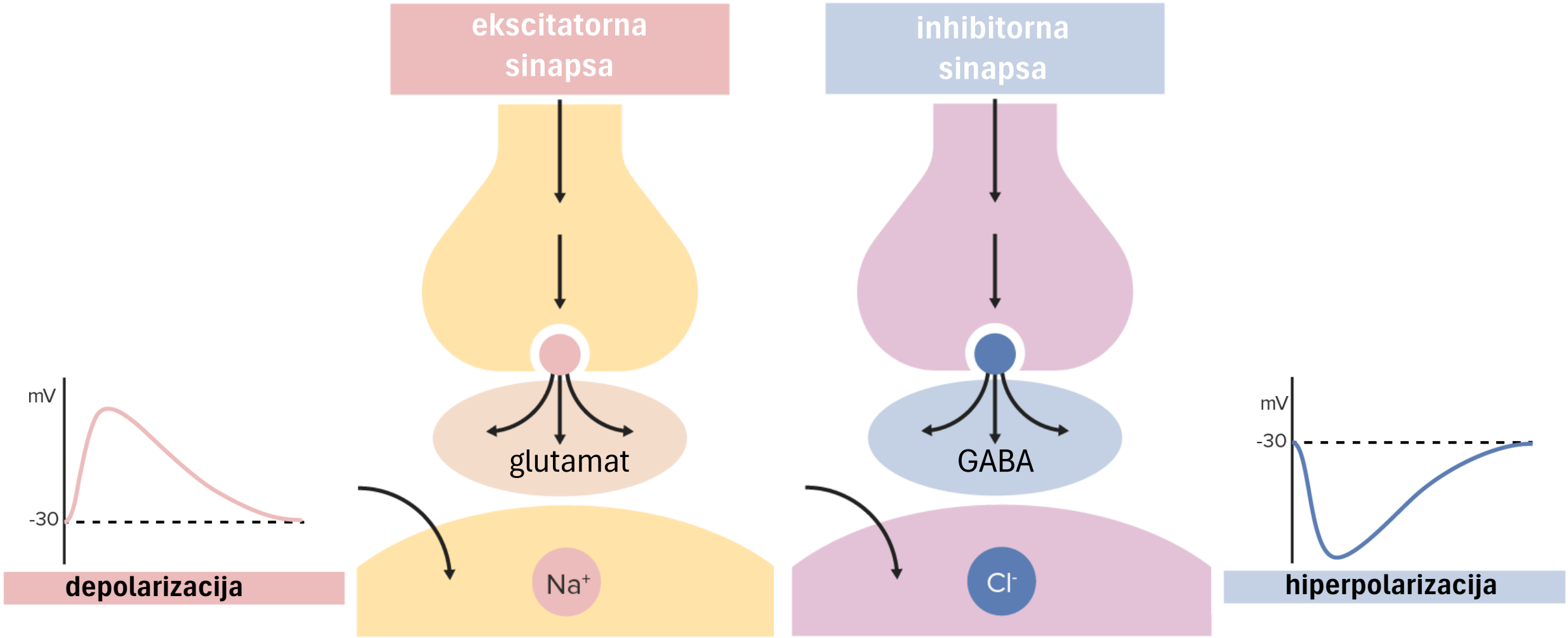
ENDORFIN



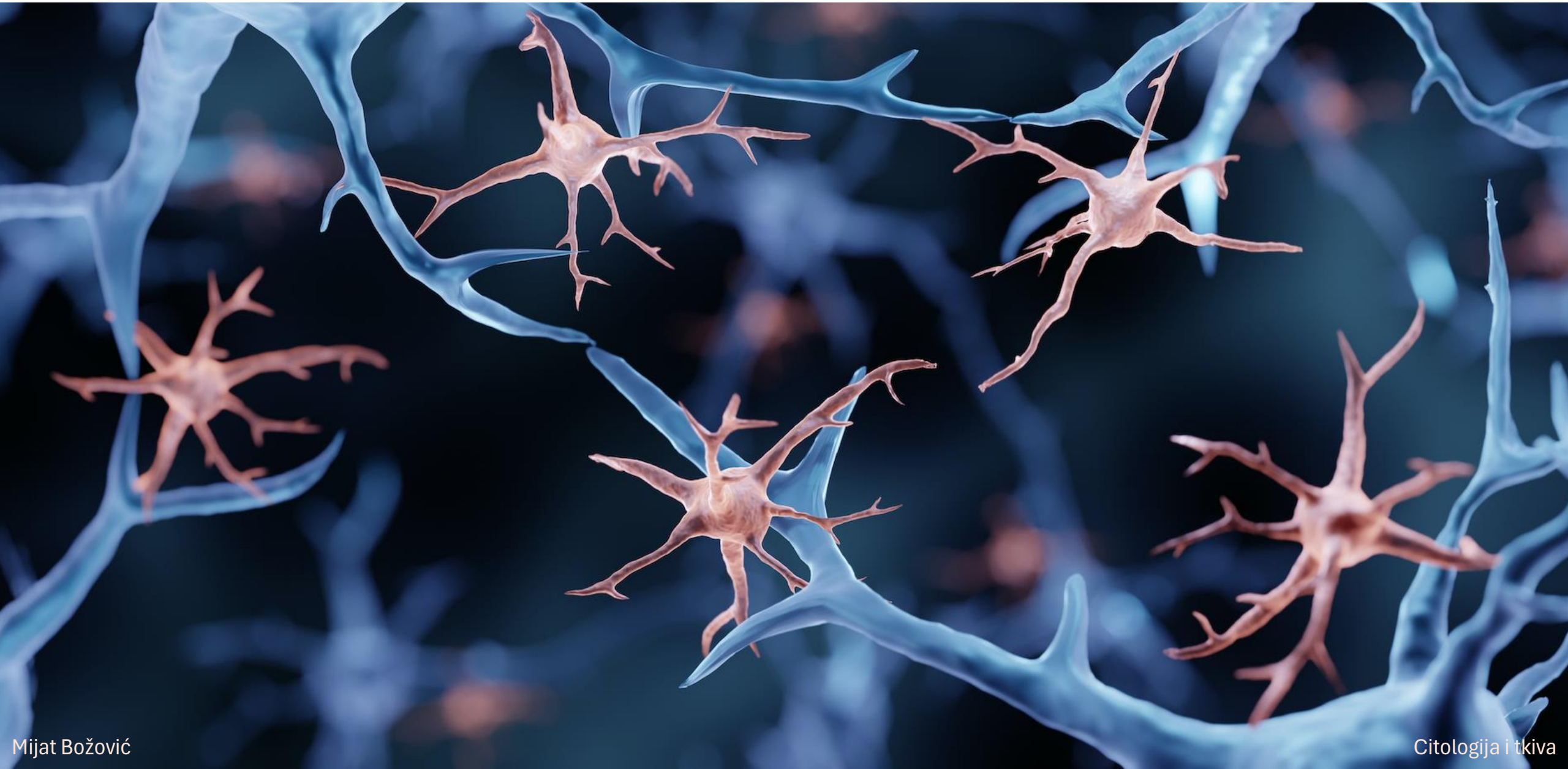
neurotransmiter euforije

KLJUČ STRUKTURA: ● C-atom ○ H-atom Ⓞ O-atom Ⓝ N-atom Ⓡ ostatak molekula

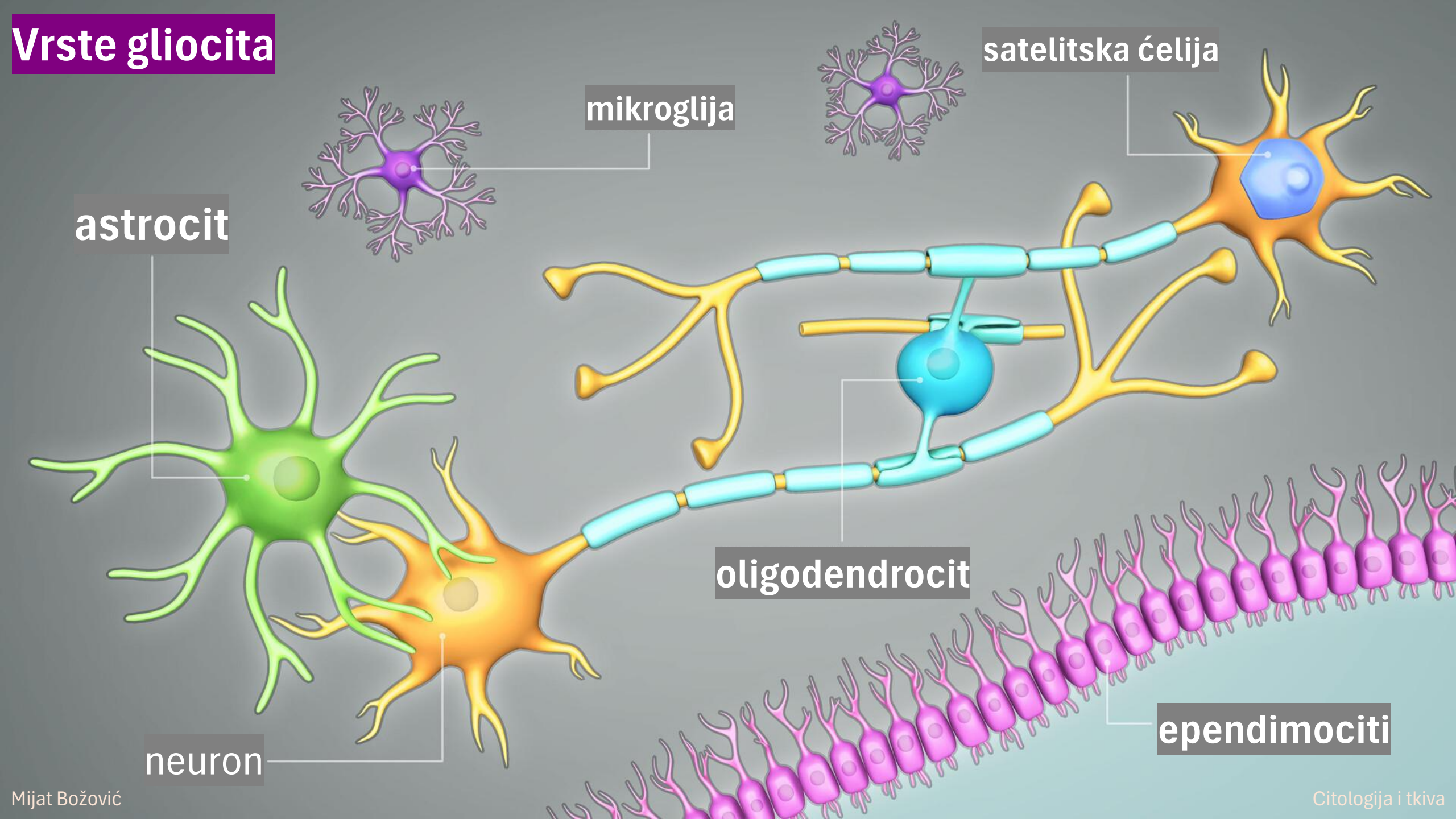
Tipovi sinapsi sa funkcionalnog aspekta



Glija ćelije

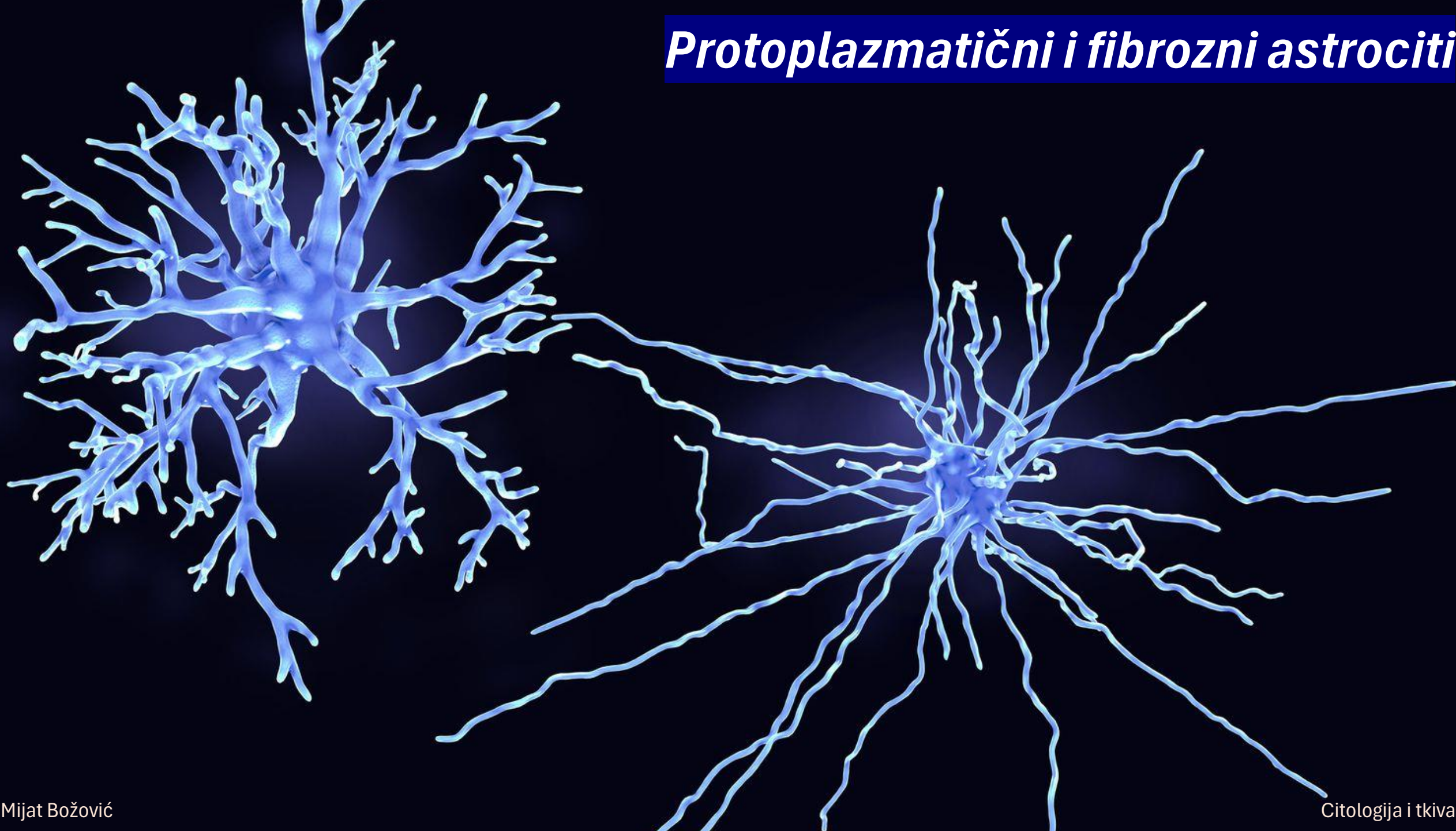


Vrste gliocita

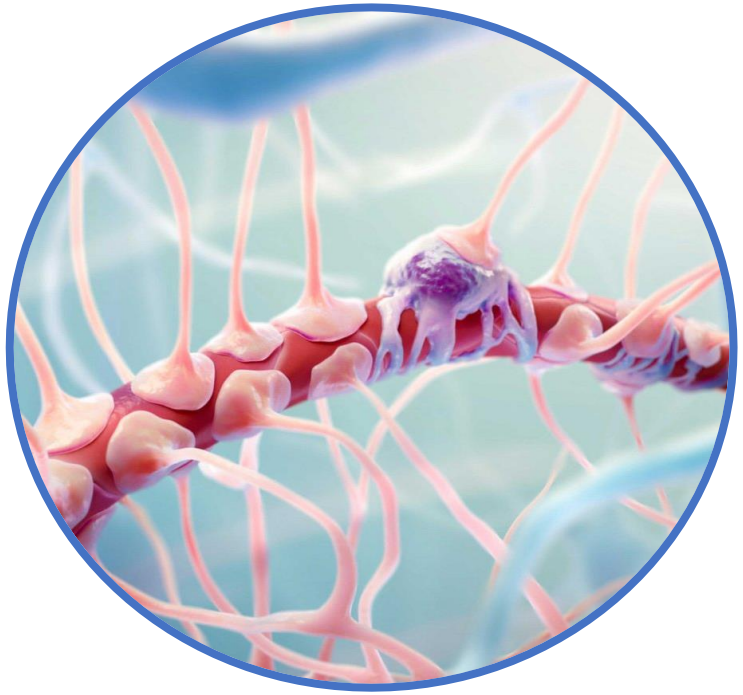


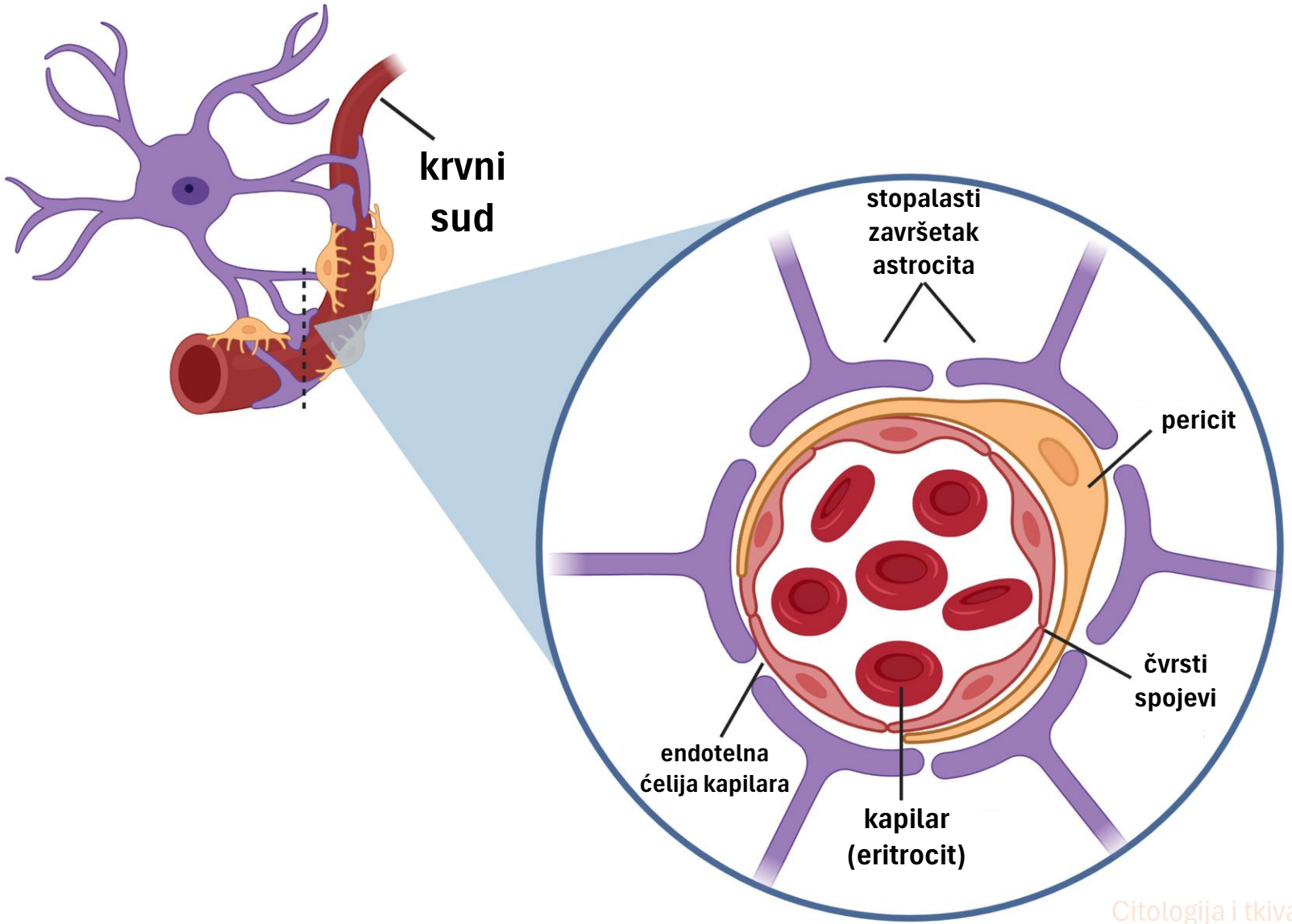
Astrocit

Protoplazmatični i fibrozni astrociti

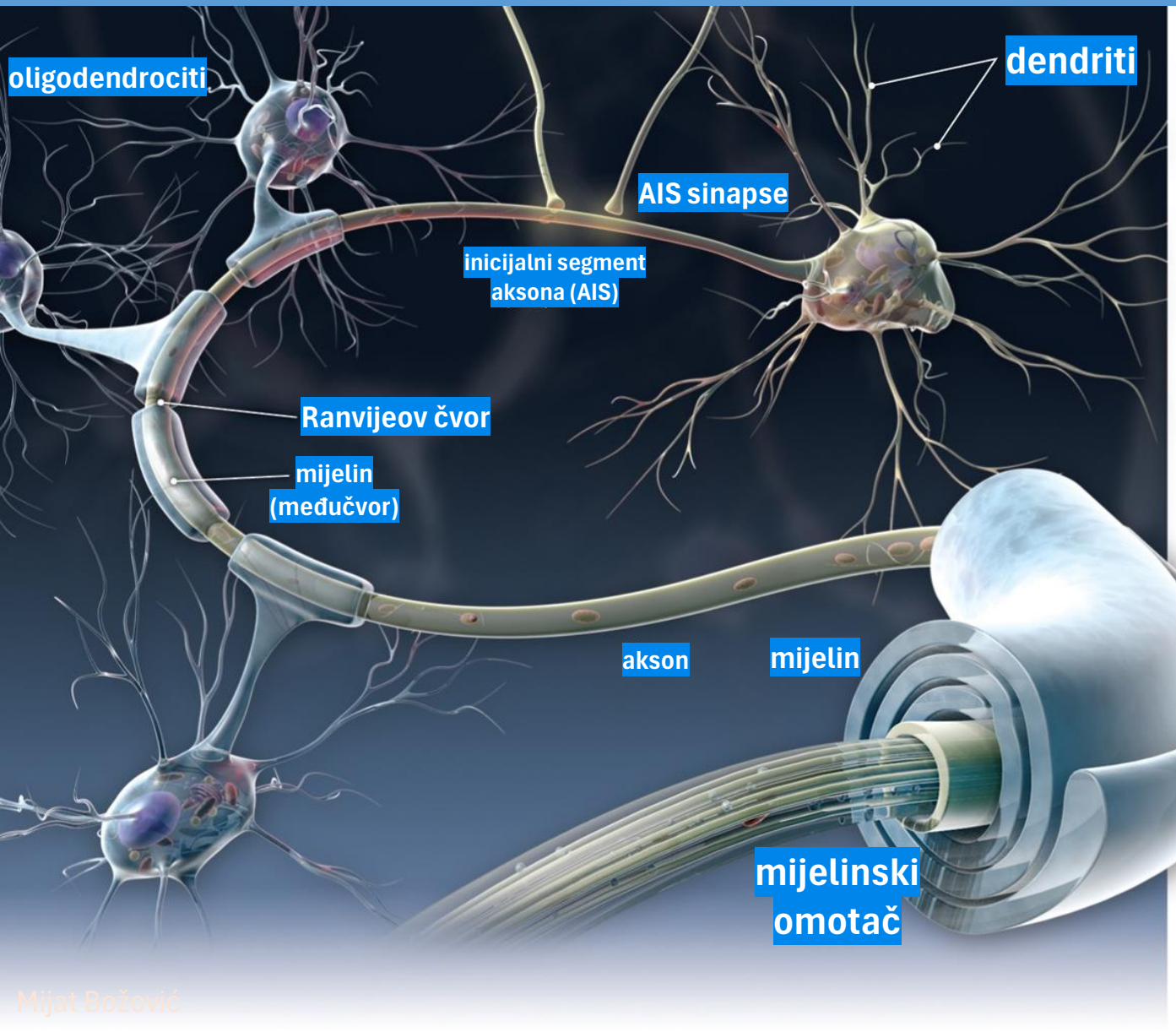


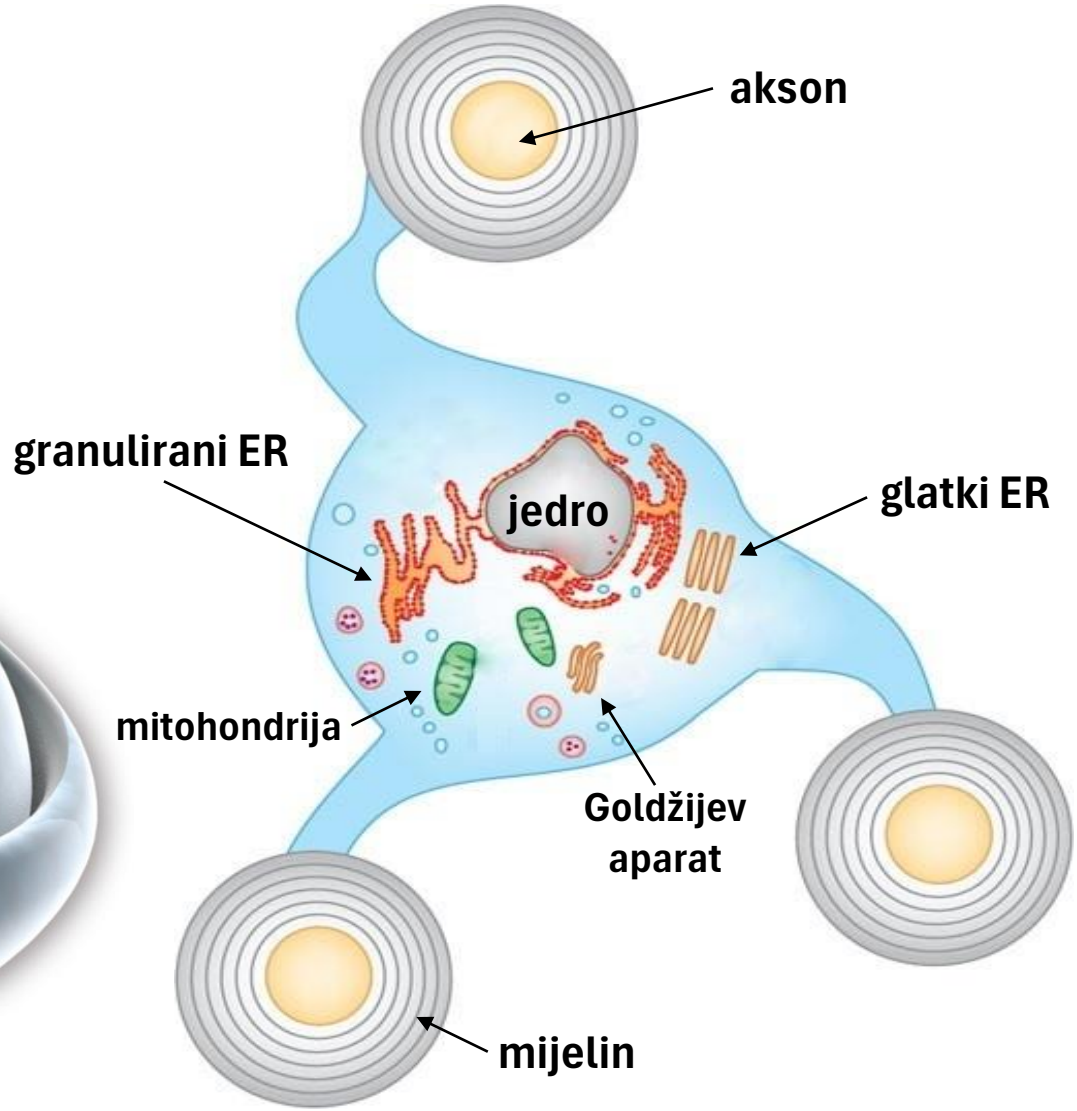
Krvno-moždana barijera



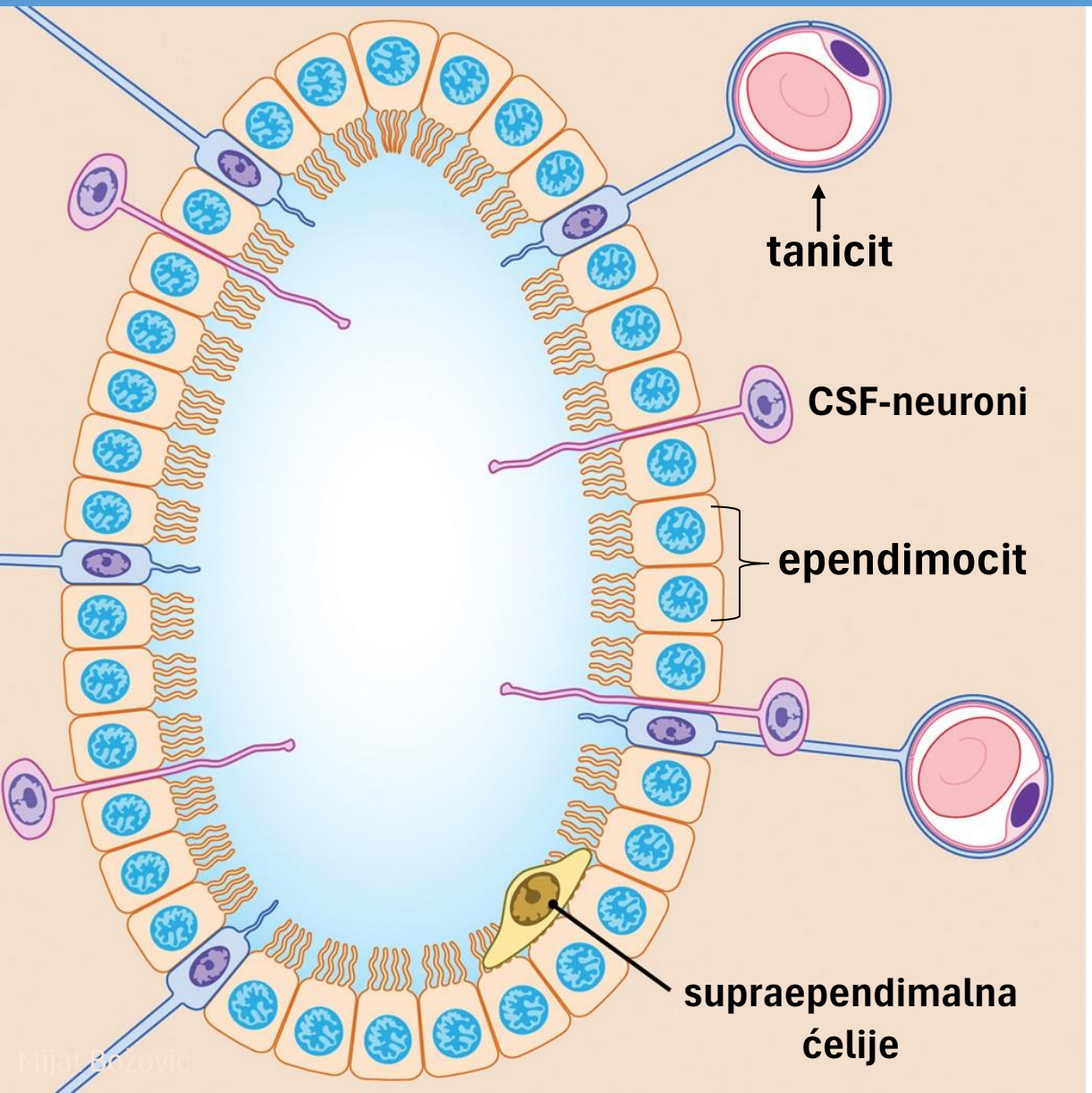


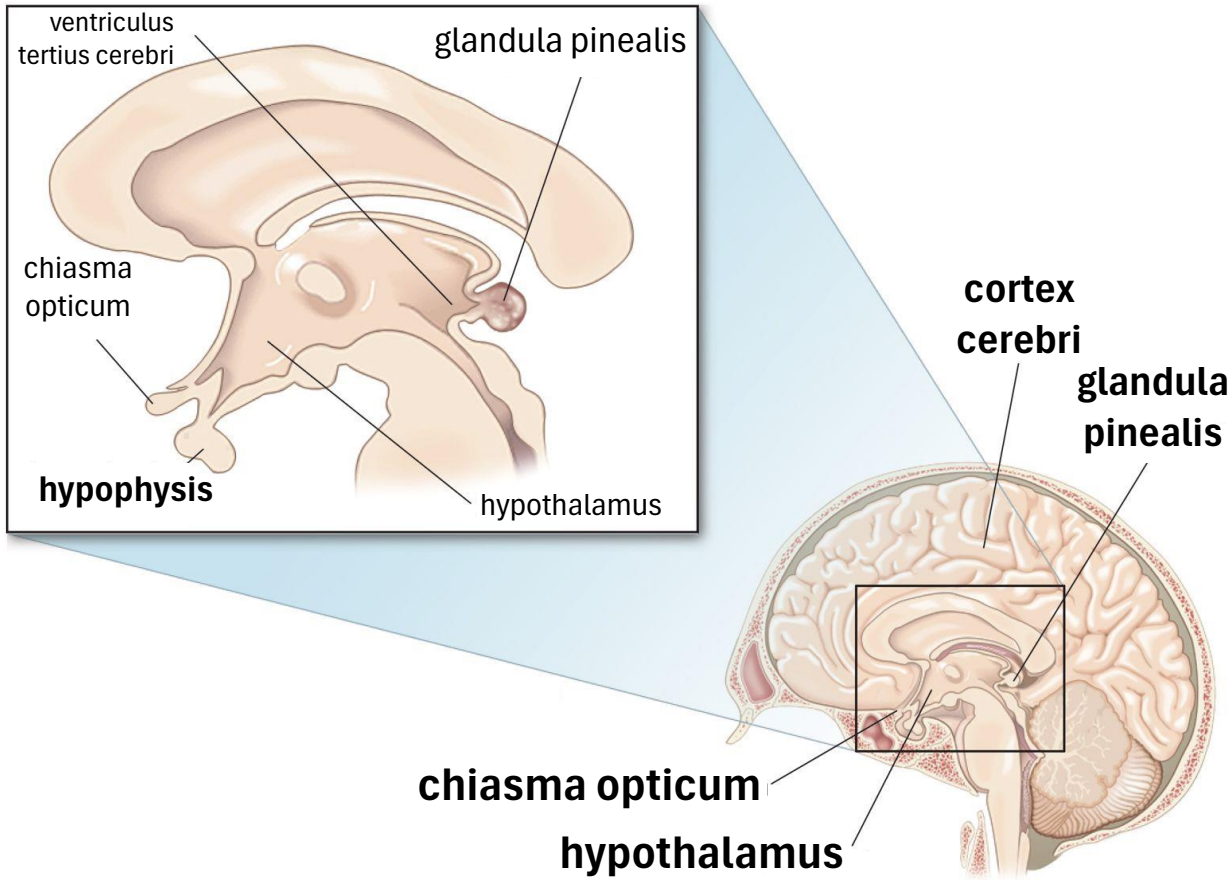
Oligodendrociti



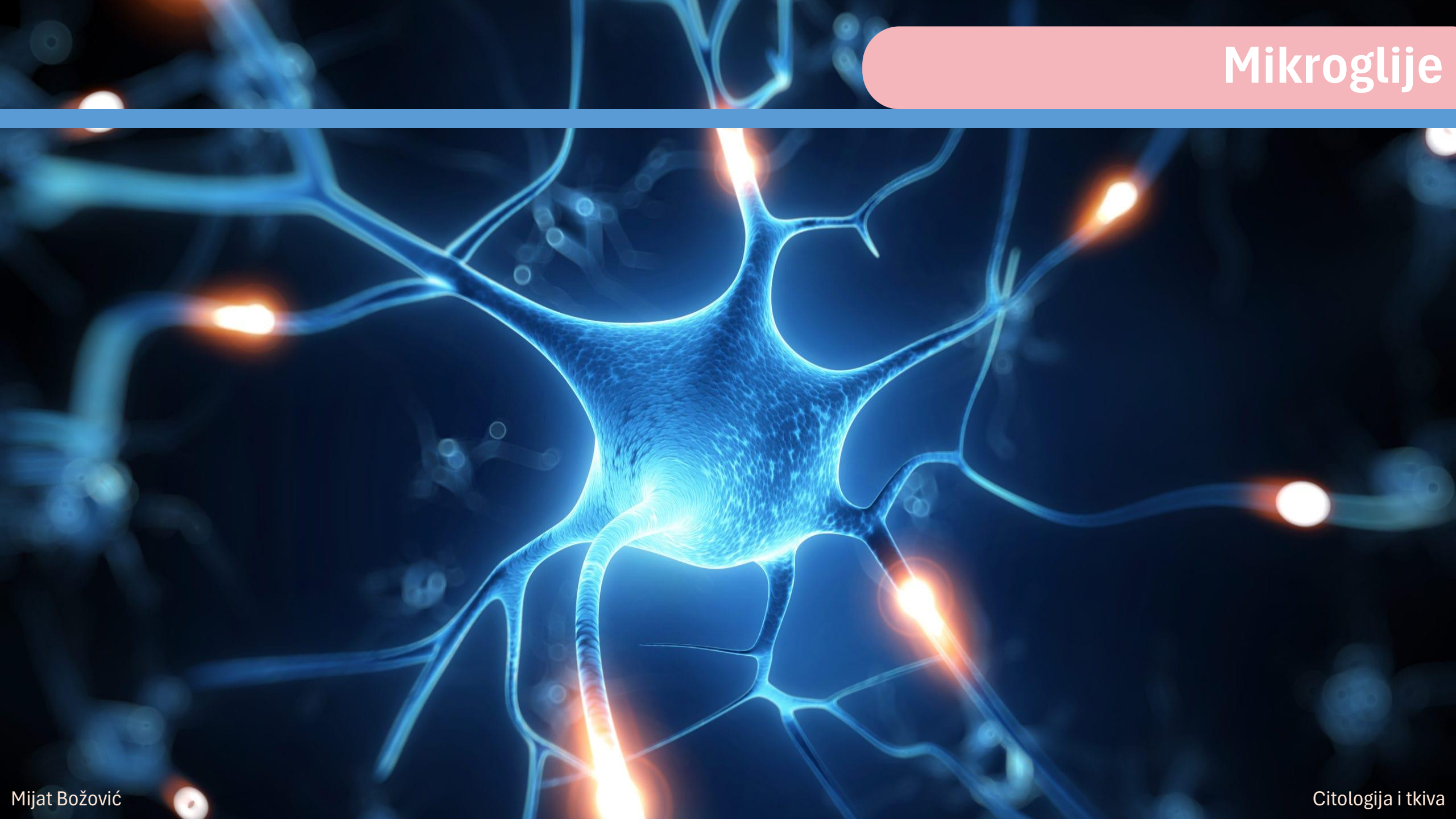


Ependimociti

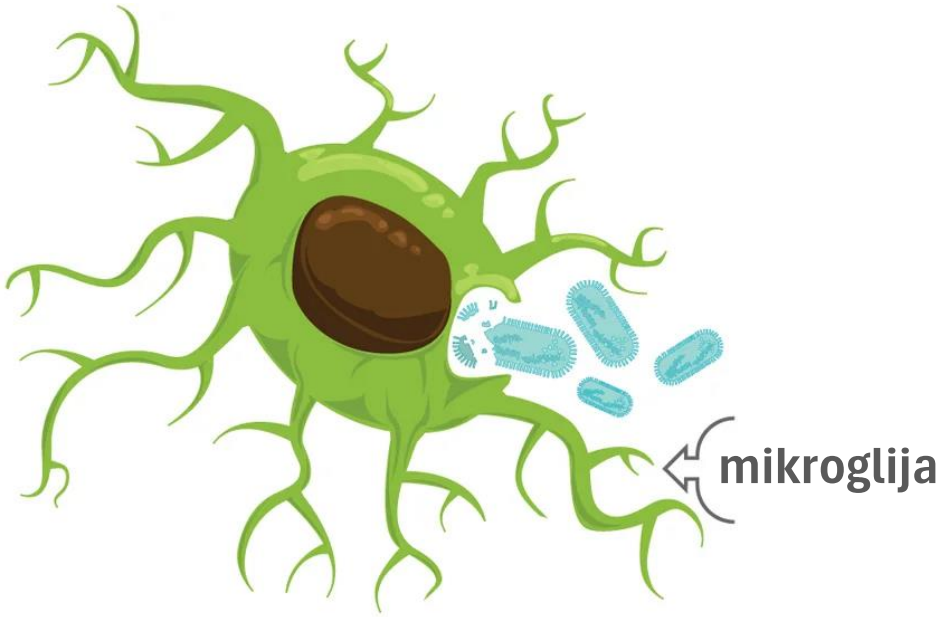


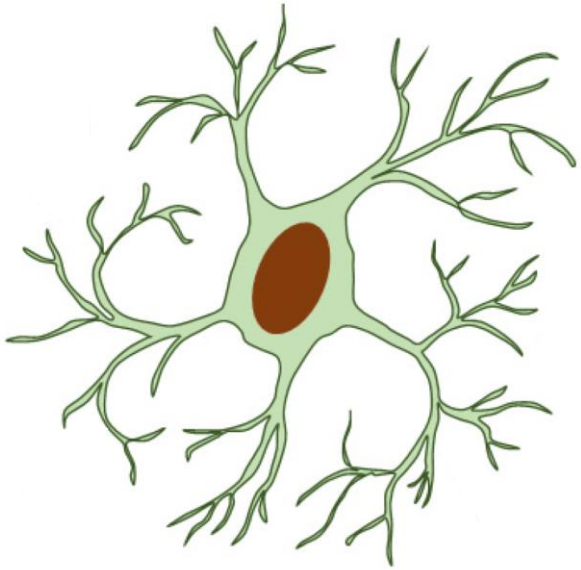


Mikroglije



Mikroglije: makrofagi CNS-a



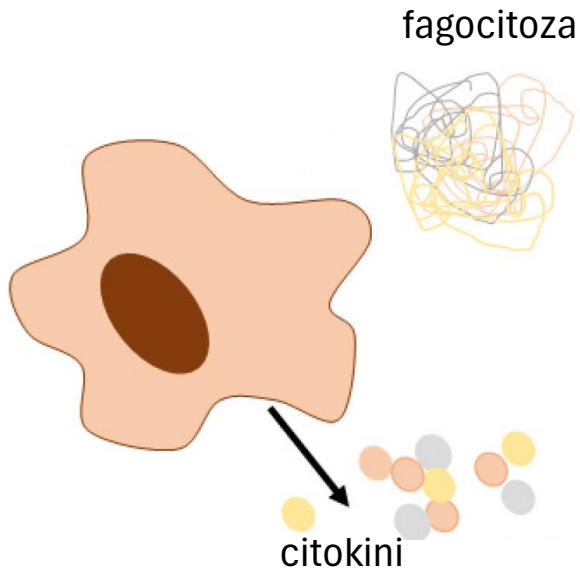


fiziološki uslovi:
mirujući oblik sa trnolikim nastavcima

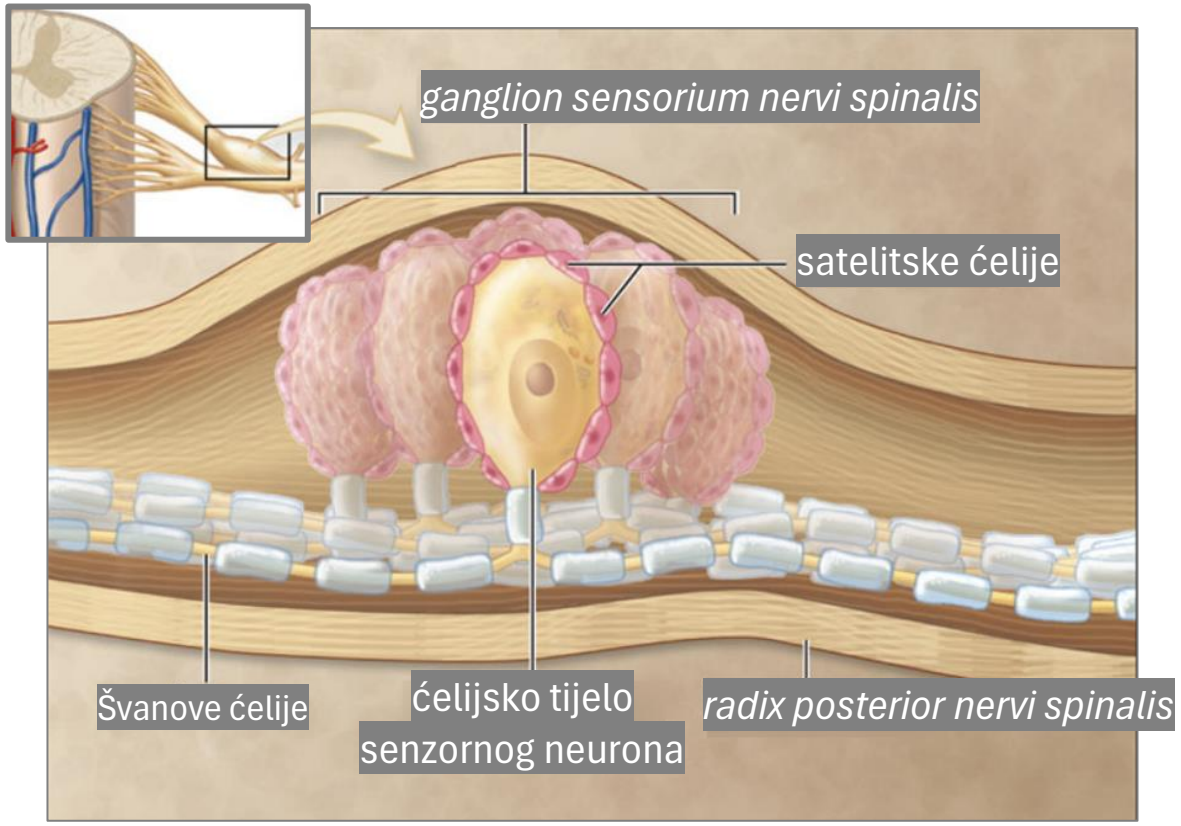
neuroprotektivni efekat

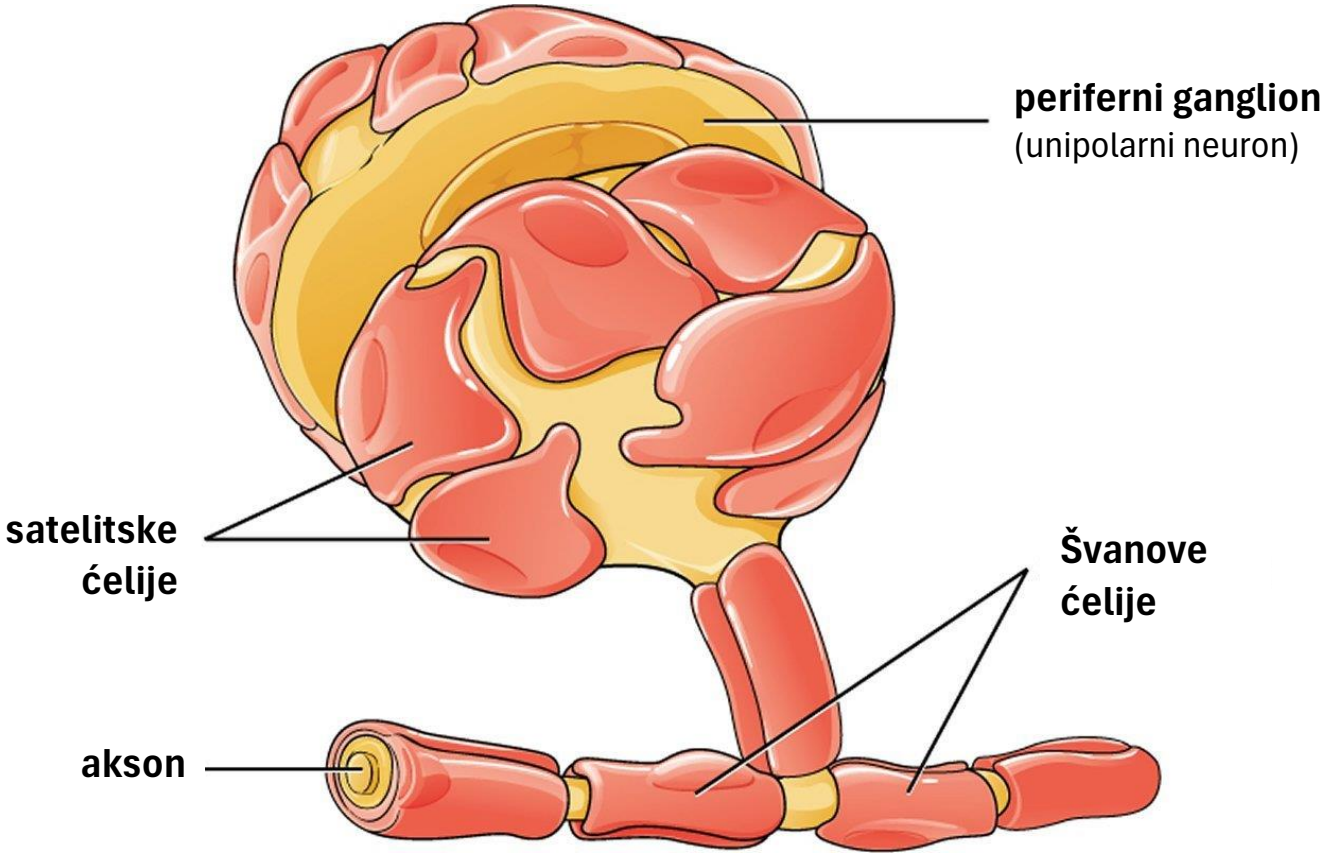
patološki uslovi:
aktivirani, ameboidni oblik

neuroprotektivni ili neurotoksični efekat

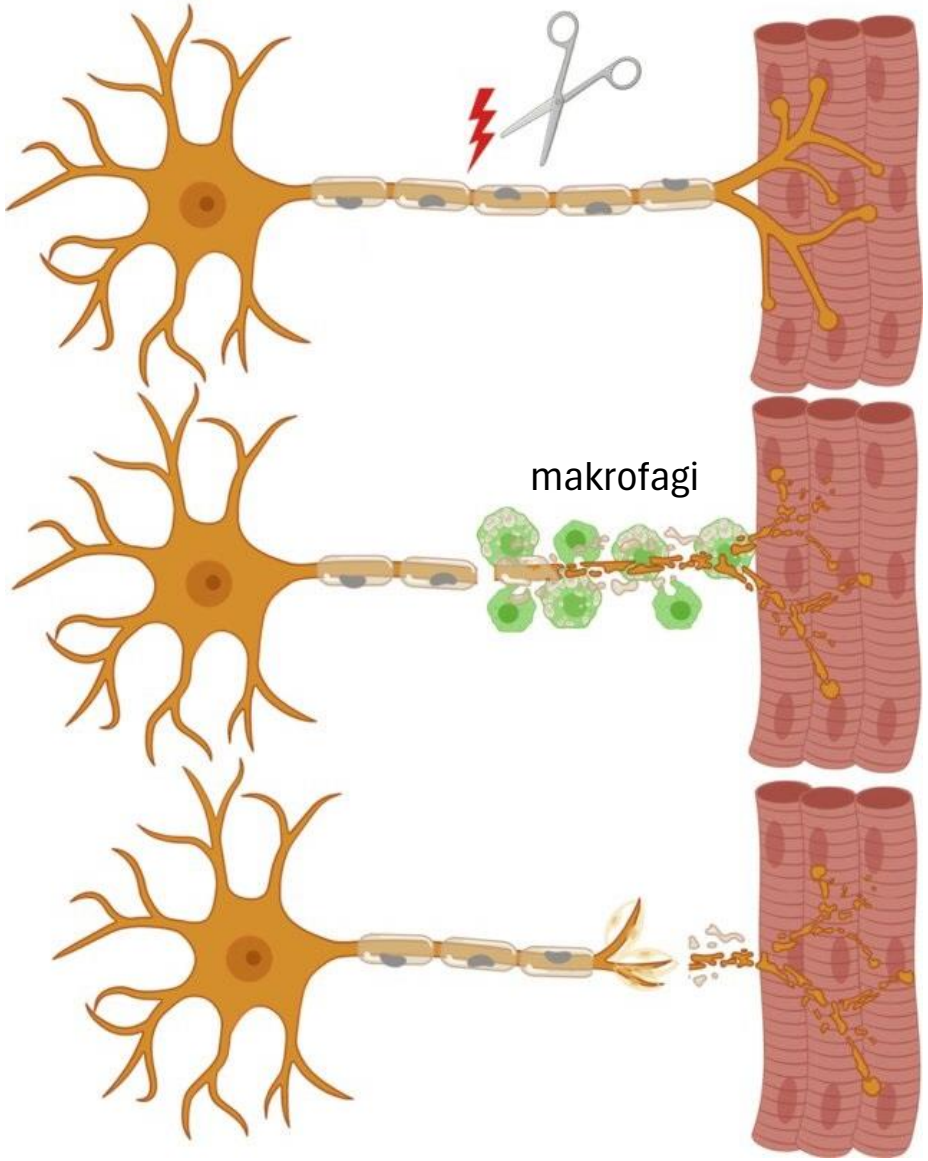


Periferna neuroglija





Regeneracija nervnog tkiva



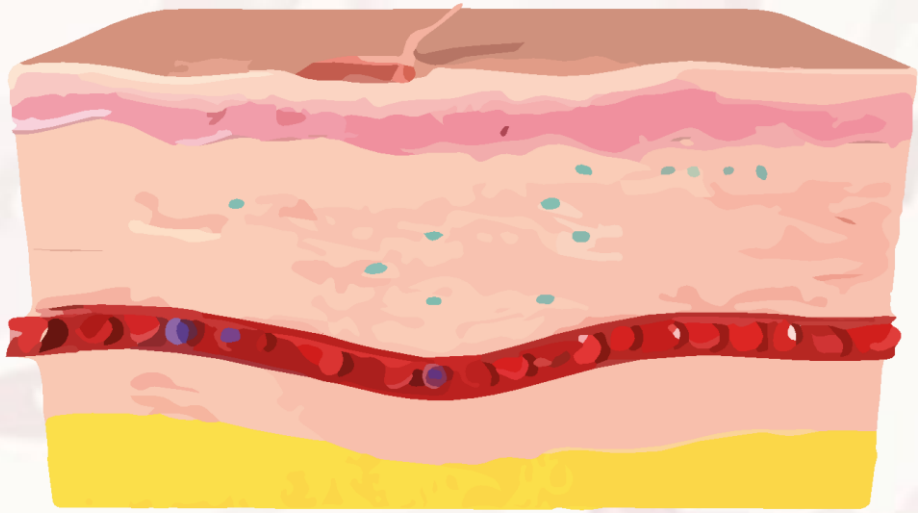
presijecanje aksona
normalnog, multipolarnog neurona

dezintegracija aksona i mijelinskog omotača
distalno od mjesta presjeka

klijanje aksona i regeneracija neurona
nakon proliferacije Švanovih ćelija

Citologija i tkiva

Mijat BOŽOVIĆ



PITANJA?