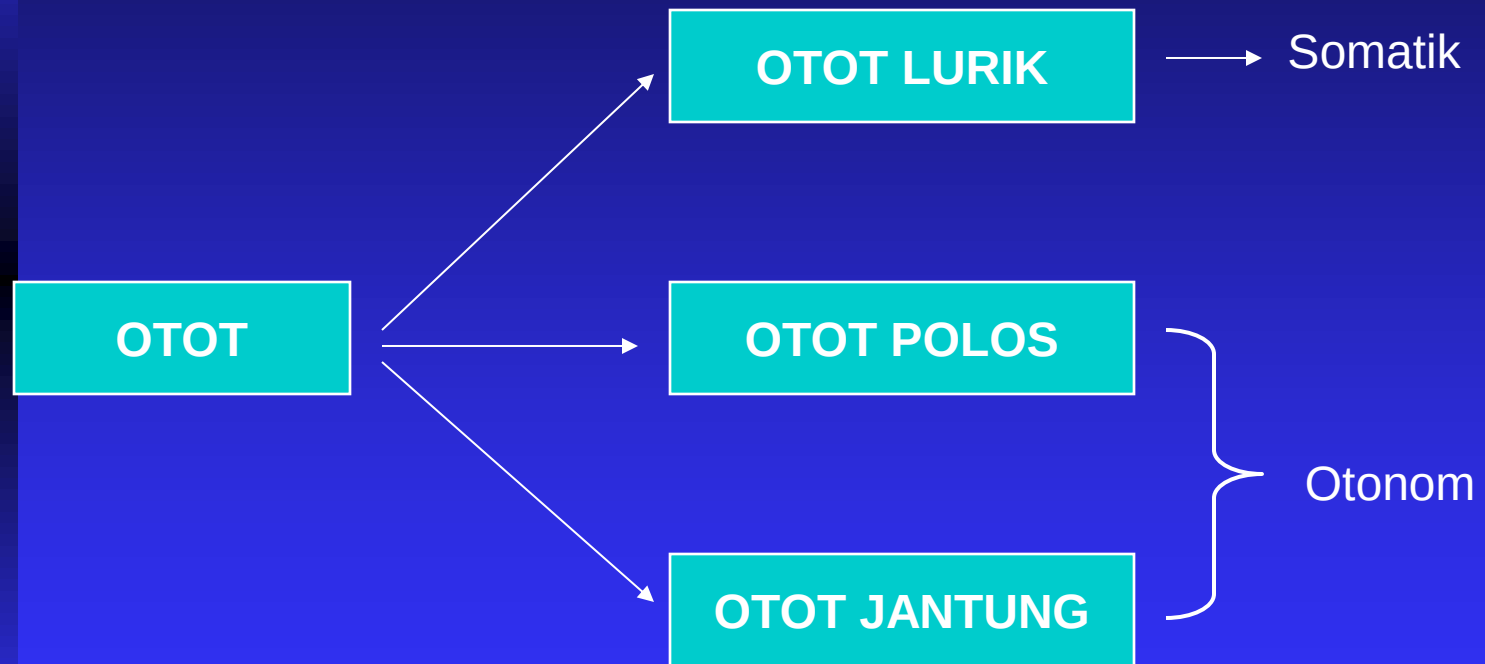


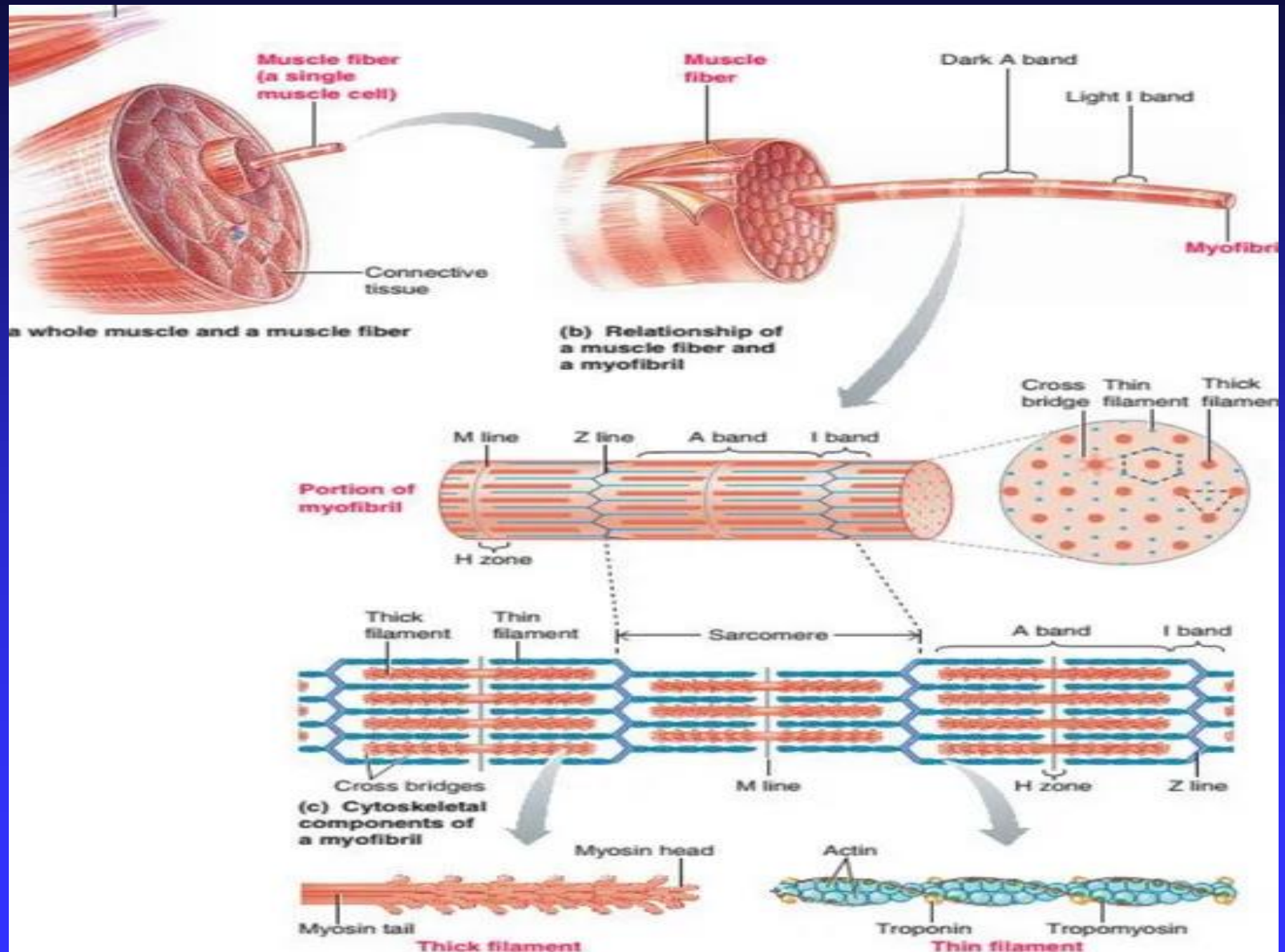
FISIOLOGI OTOT

Dr. Juni Chudri

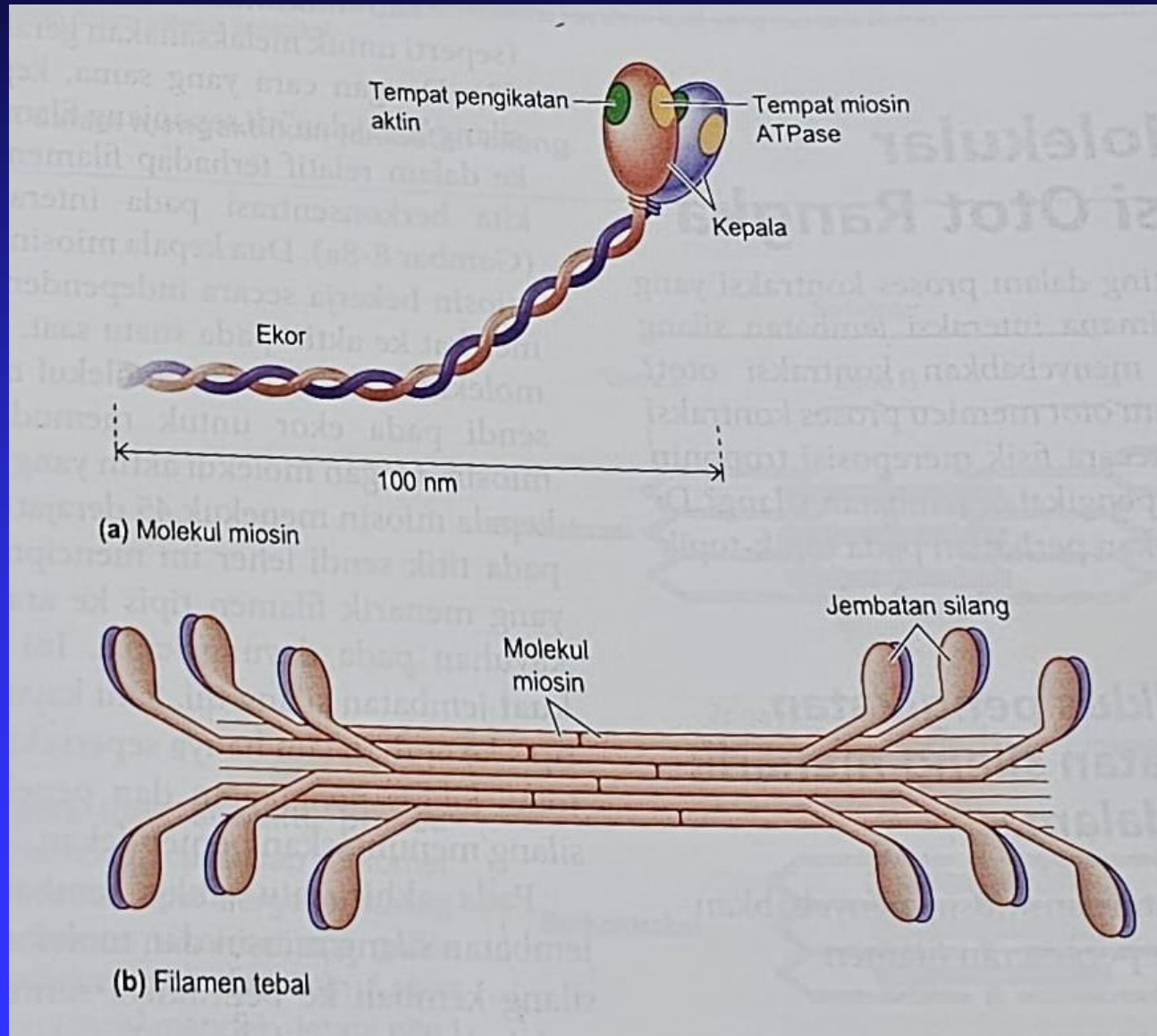
Klasifikasi otot



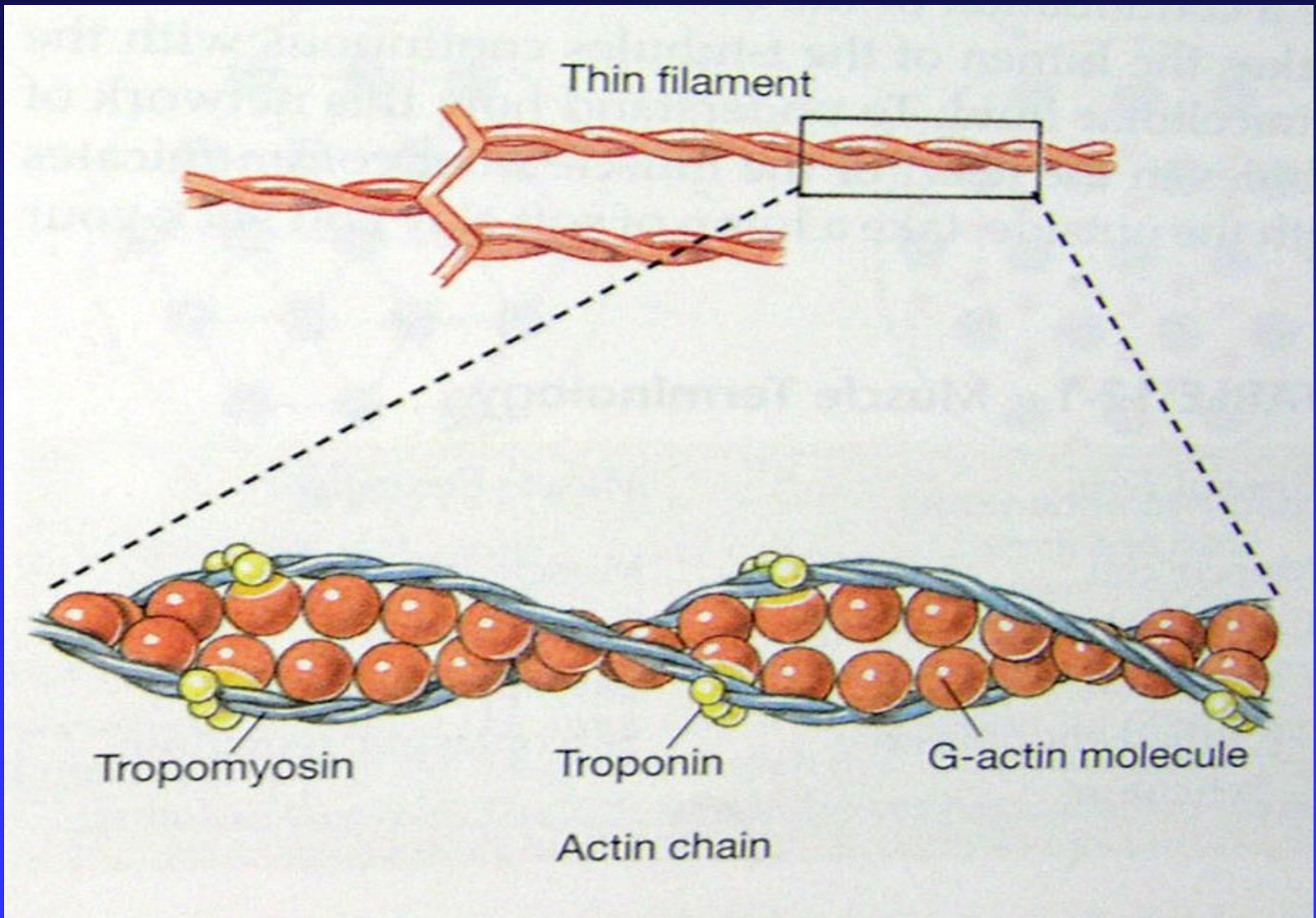
Otot Rangka

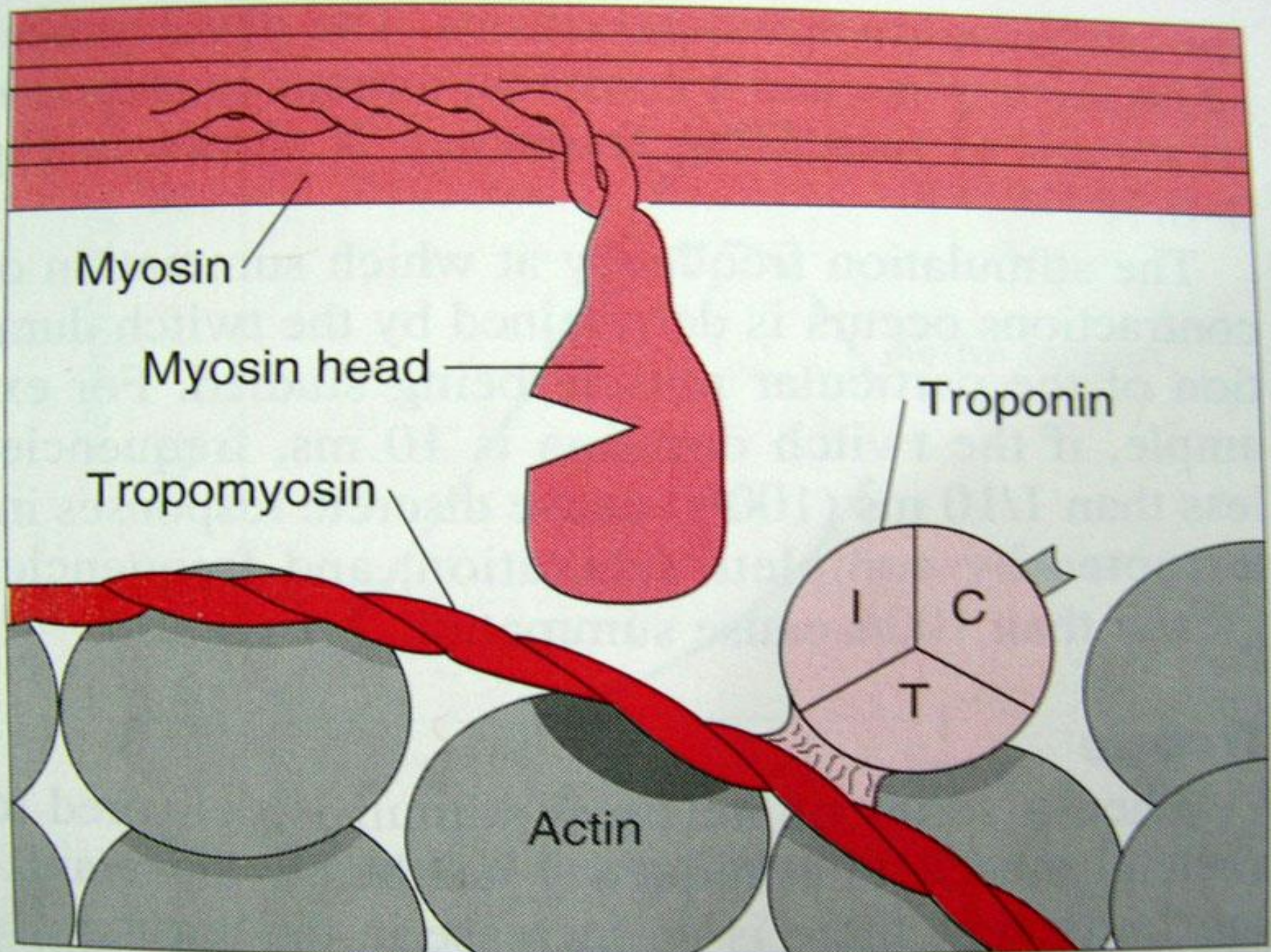


Miosin (Filamen tebal)



Actin (Filamen tipis)





Myosin

Myosin head

Troponin

Tropomyosin

Actin

Kontraksi otot

- Kontraksi otot terjadi karena adanya impuls listrik dari motoneuron yang disampaikan ke sel otot
- Proses kontraksi otot disebut juga dengan *excitation-contraction coupling*
- Peristiwa pemindahan impuls yang terjadi $\approx$ pada sinaps

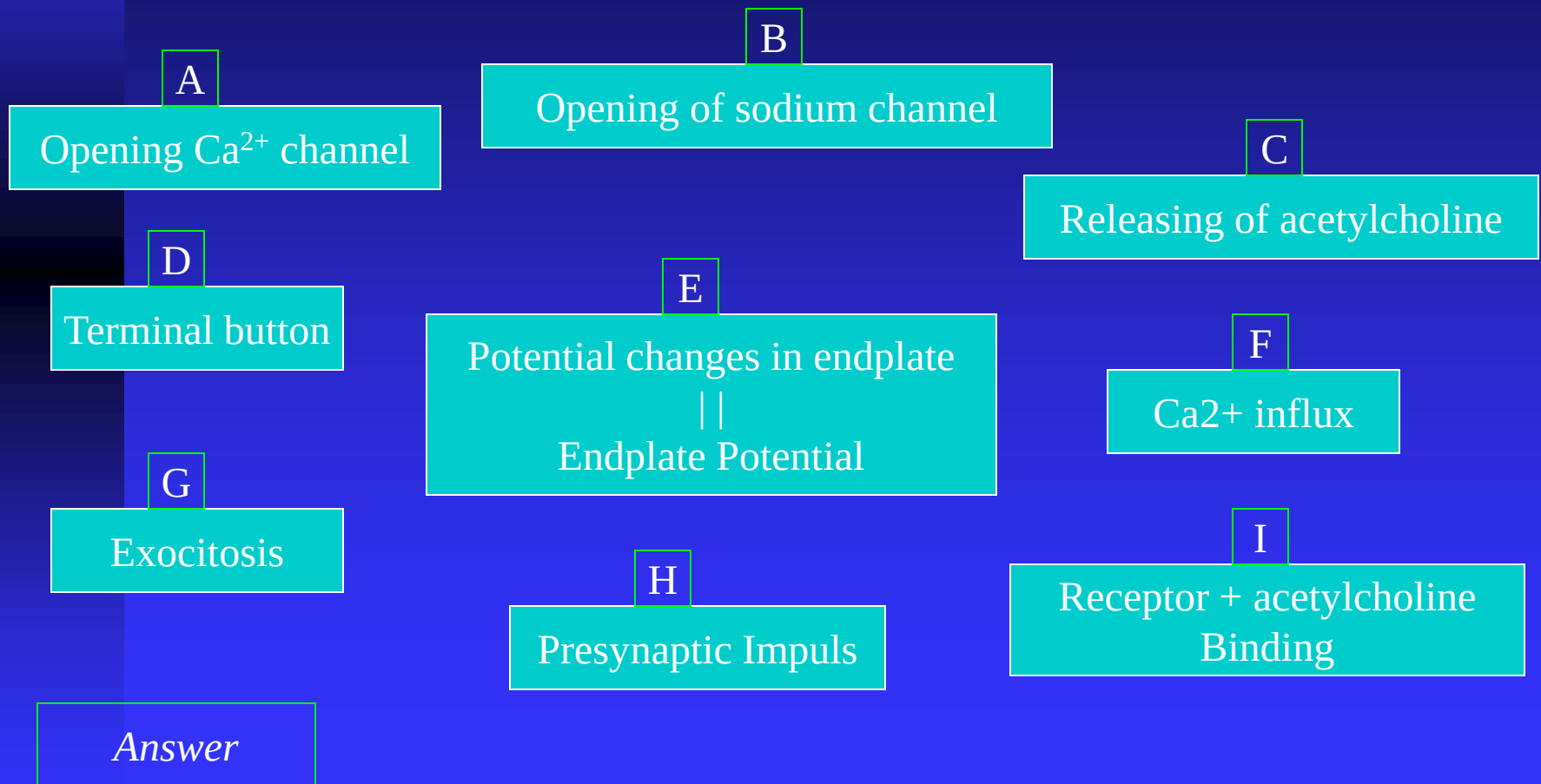


REVIEW :

Bagaimana penghantaran
impuls melalui sinaps ?



Hubungan saraf-otot rangka



EXCITATION CONTRACTION COUPLING

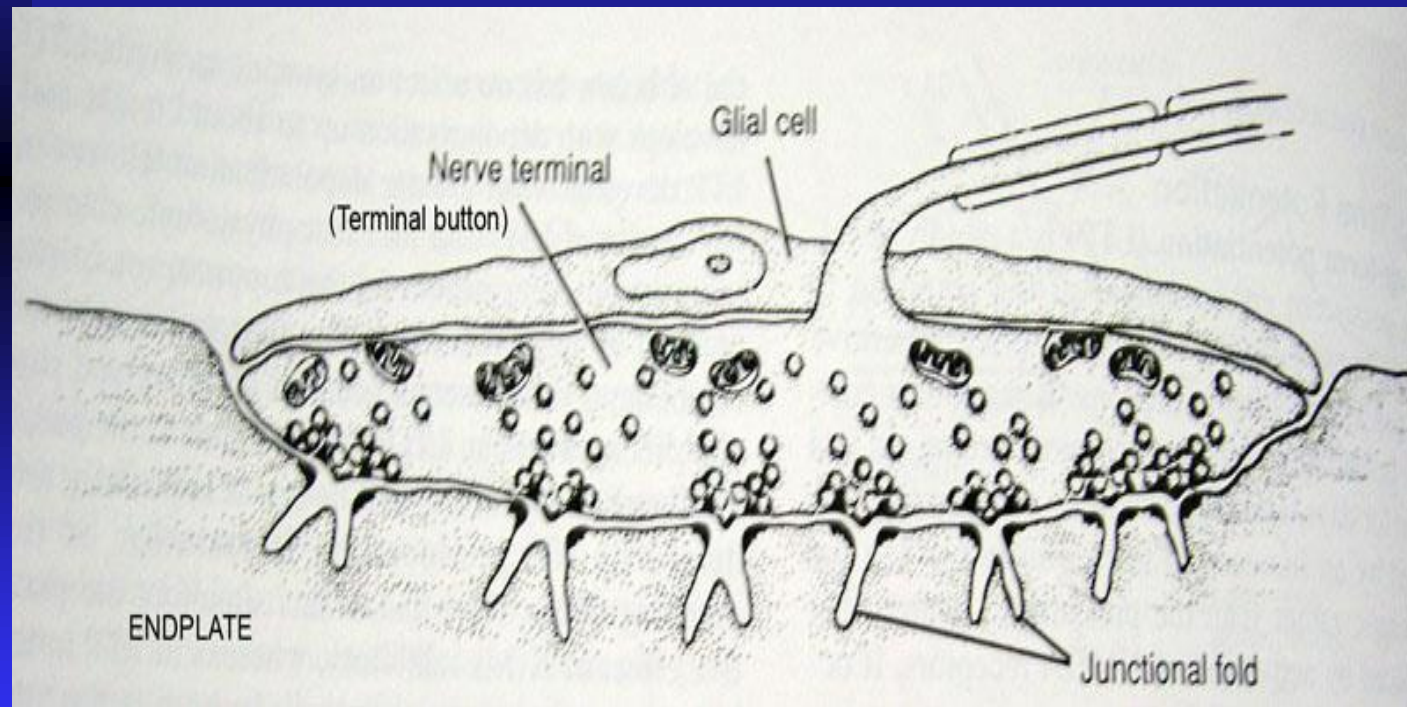
- Discharge of motorneuron
- Release of transmitter (Ach) at motor endplate
- Binding of Ach + receptors
- Increased permeability of endplate membrane to Na^+ and K^+
- Generation of endplate potential

EXCITATION CONTRACTION COUPLING

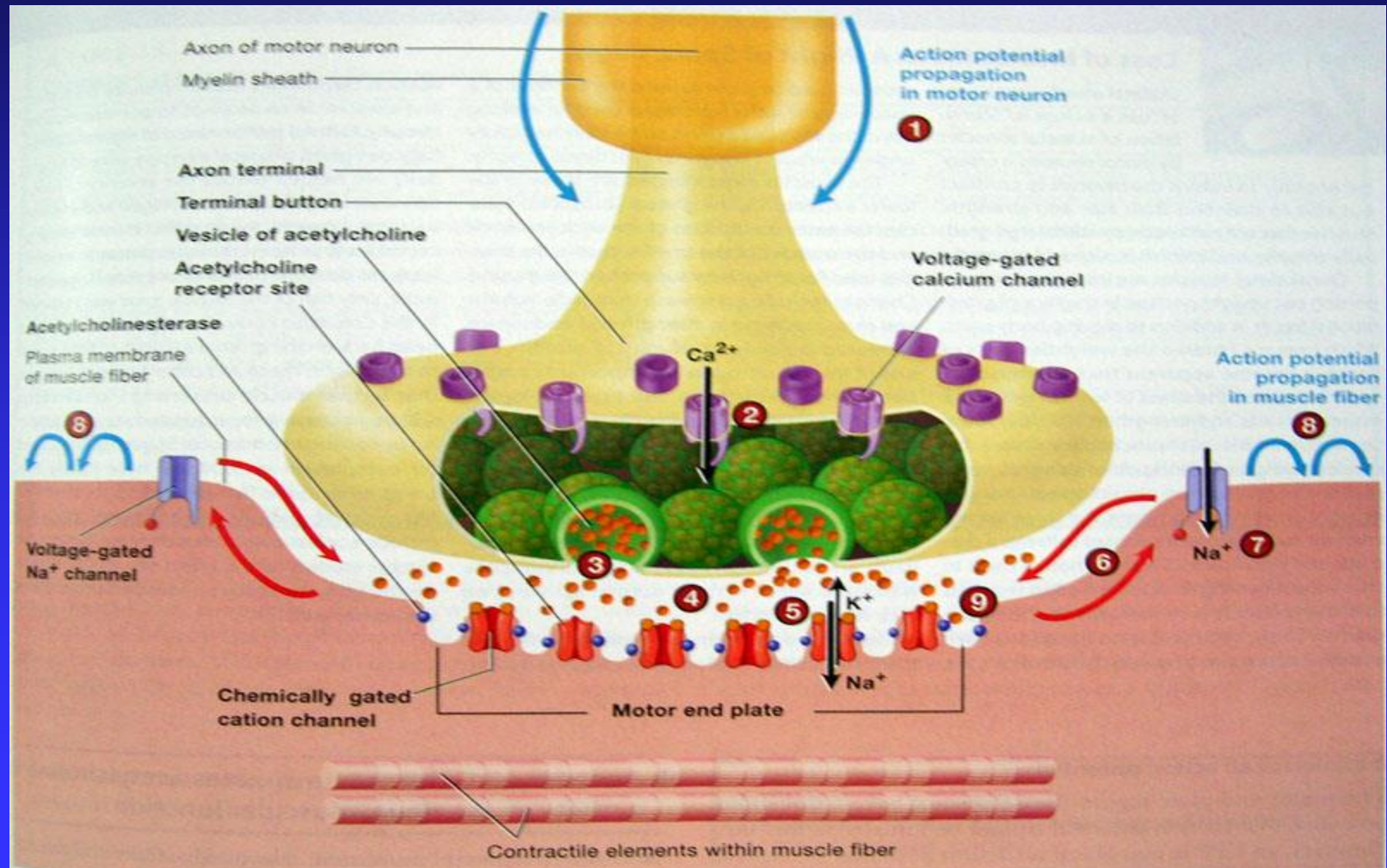
- Generation of action potential in muscle fibers
- Inward spread of depolarization along T tubules
- Release of Ca^{2+} from lateral sacs of sarcoplasmic reticulum and diffusion to thick and thin filaments
- Binding of Ca^{2+} to Troponin C uncovering binding site on actin
- Formation of cross linkages between actin and myosin and sliding of thin on thick filaments producing shortening

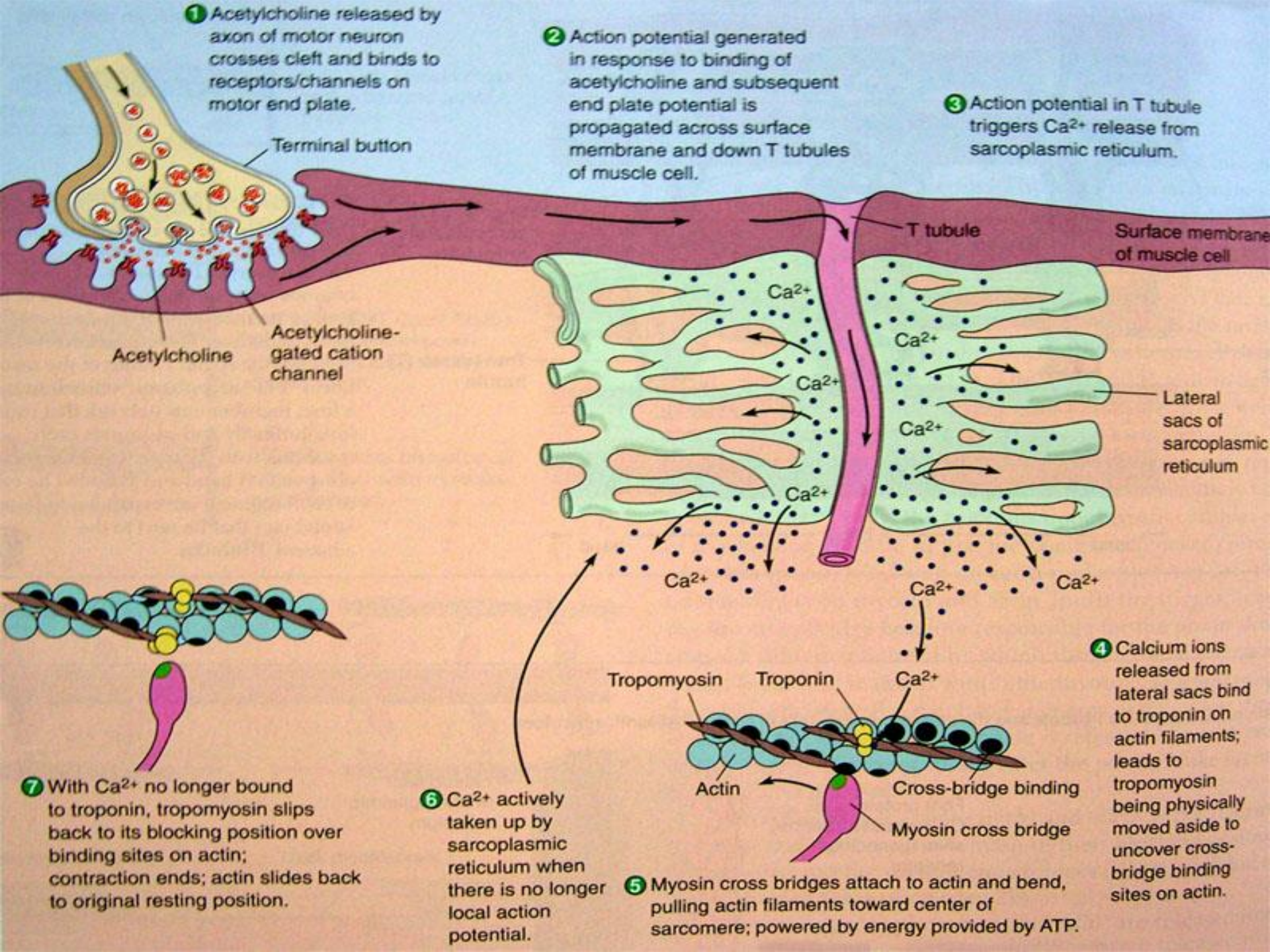
Hubungan saraf-otot rangka (Neuromuscular junction)

■ Gambar neuromuscular junction



Hubungan saraf-otot rangka (Neuromuscular junction)





Membran permukaan serat otot

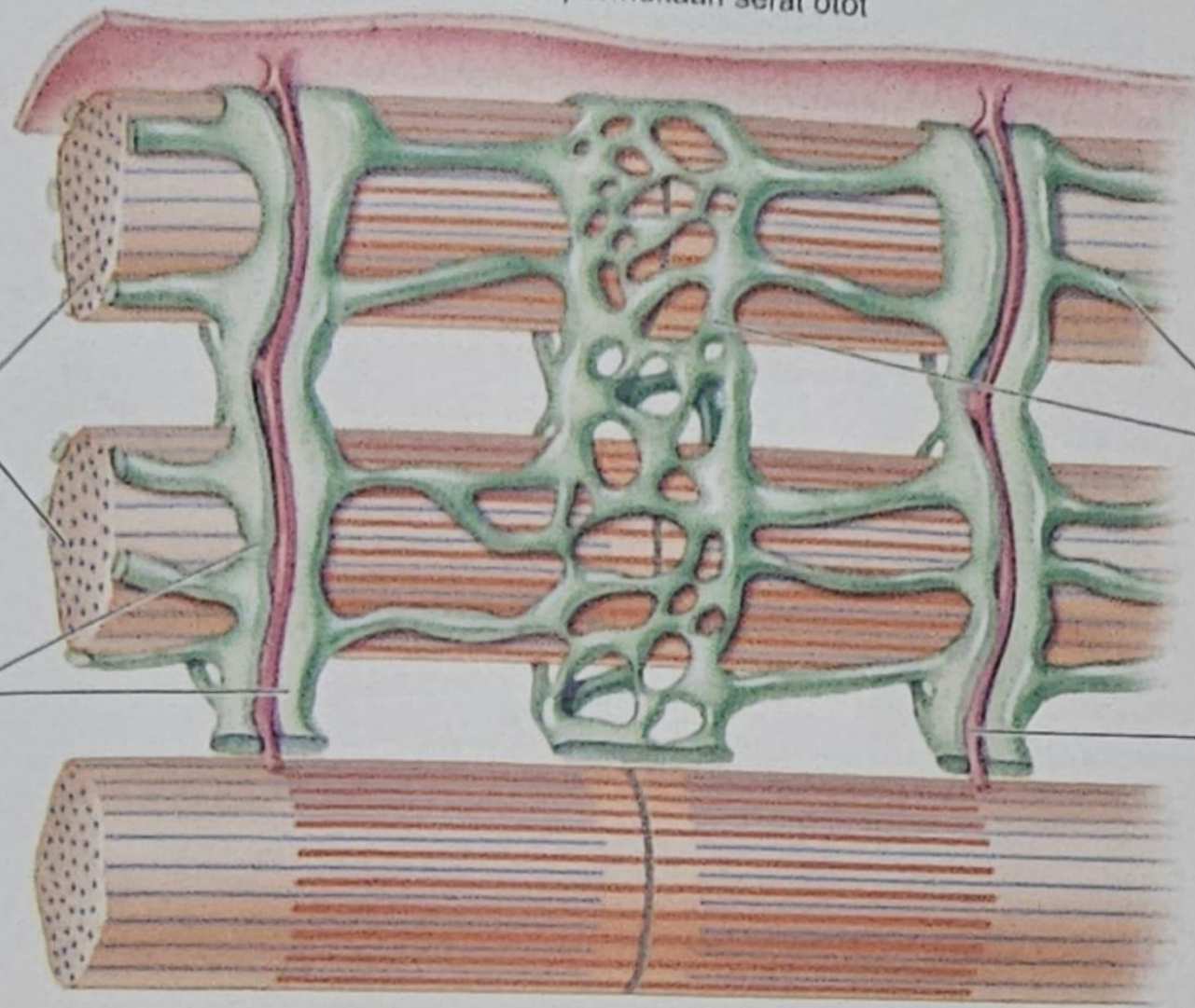
Miofibril

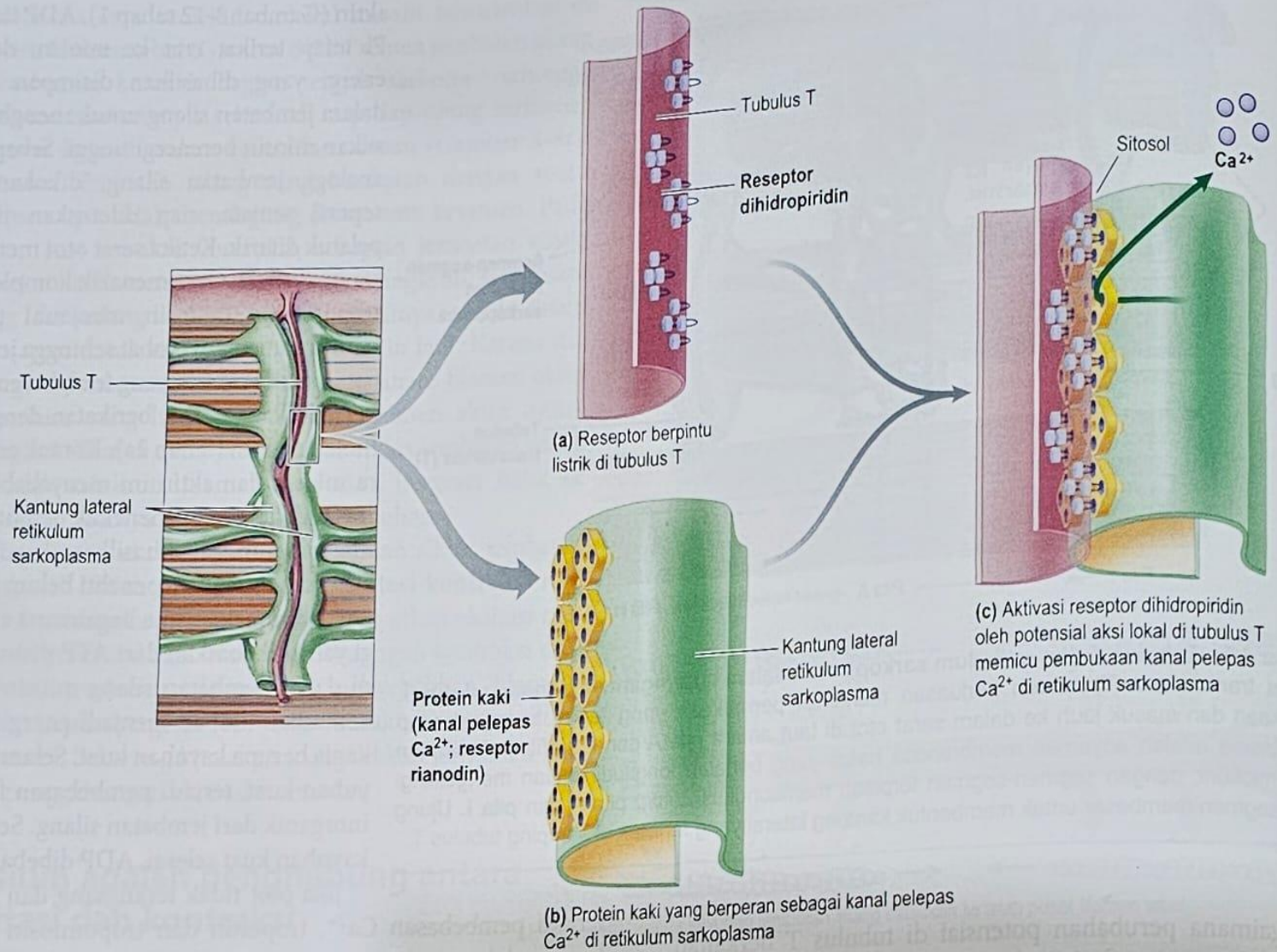
Kantung lateral

Segmen-segmen retikulum sarkoplasma

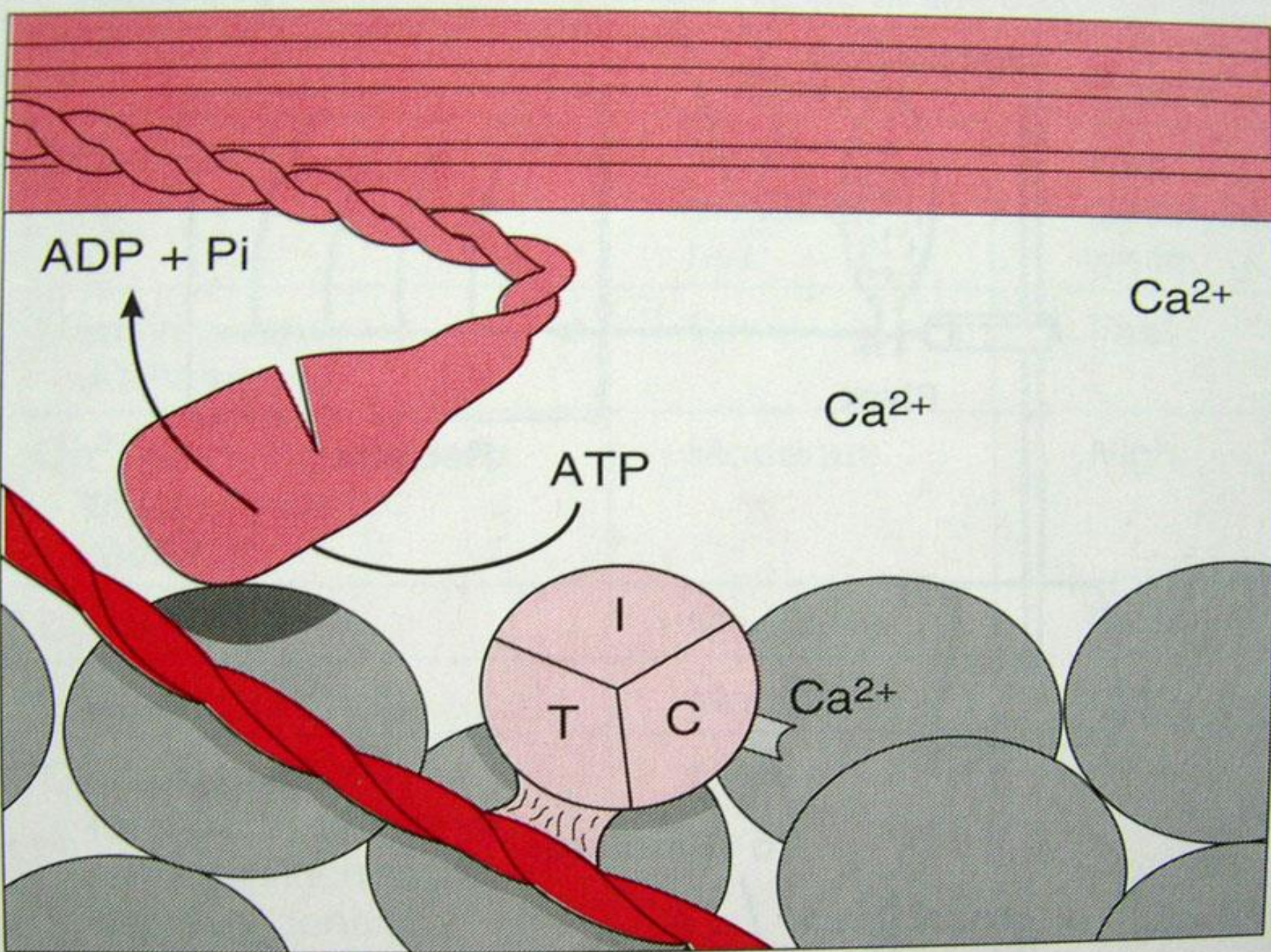
Tubulus transversus (T)

← Pita I — * ————— Pita A ————— * — Pita I →

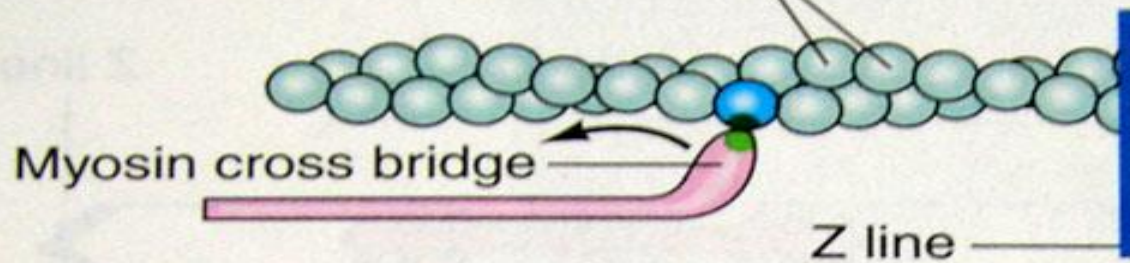




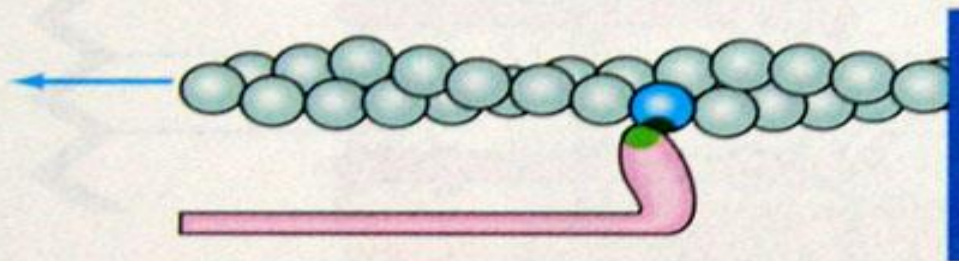
Gambar 8-10 Hubungan antara reseptor dihidropiridin di tubulus T dan protein kaki (kanal pelepas Ca^{2+} ; reseptor rianodin) di kantung lateral retikulum endoplasma sekitar.



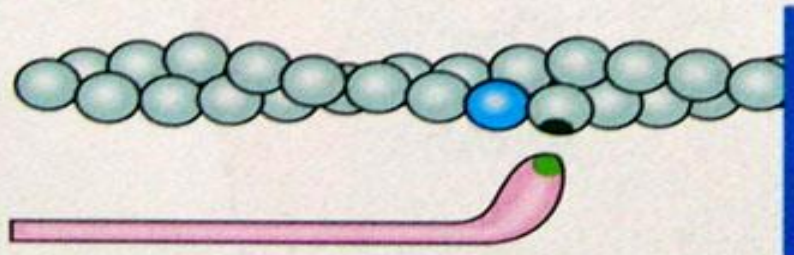
Actin molecules in thin myofilament



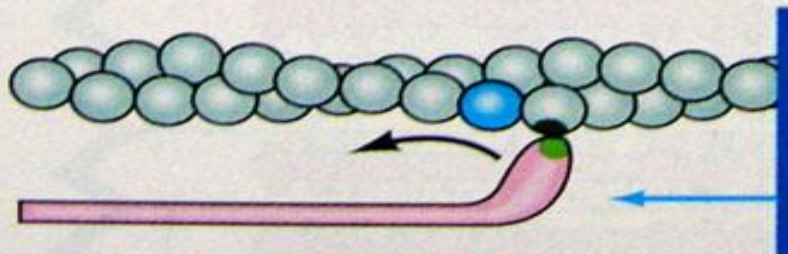
BINDING Myosin cross bridge binds to actin molecule.



POWER STROKE Cross bridge bends, pulling thin myofilament inward.

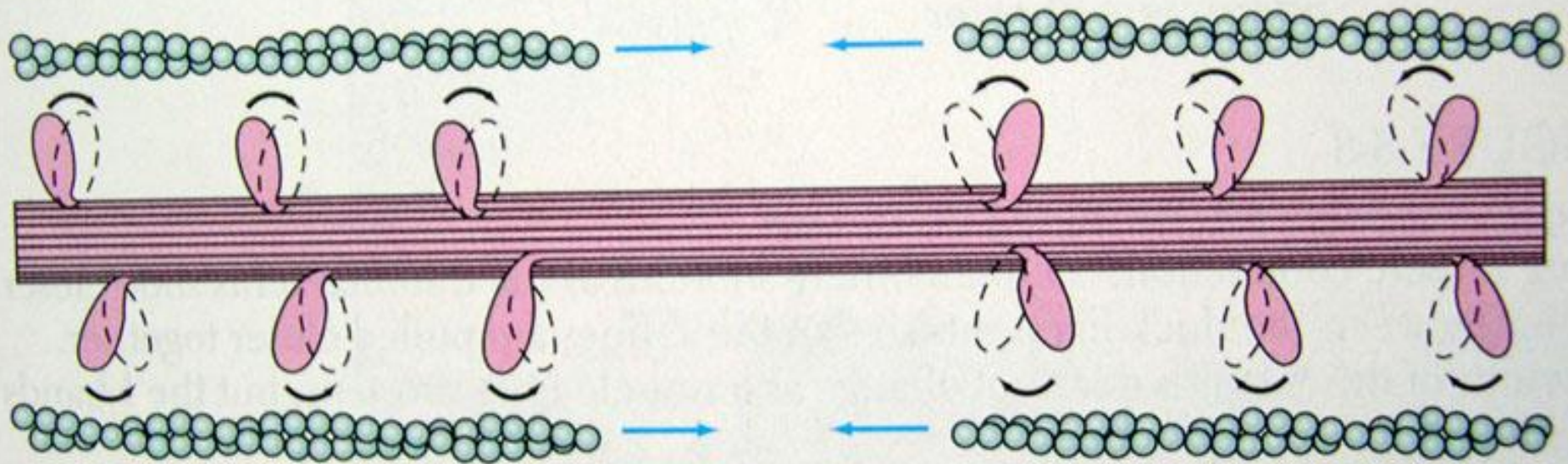


DETACHMENT Cross bridge detaches at end of power stroke and returns to original conformation.



BINDING Cross bridge binds to more distal actin molecule; cycle repeated.

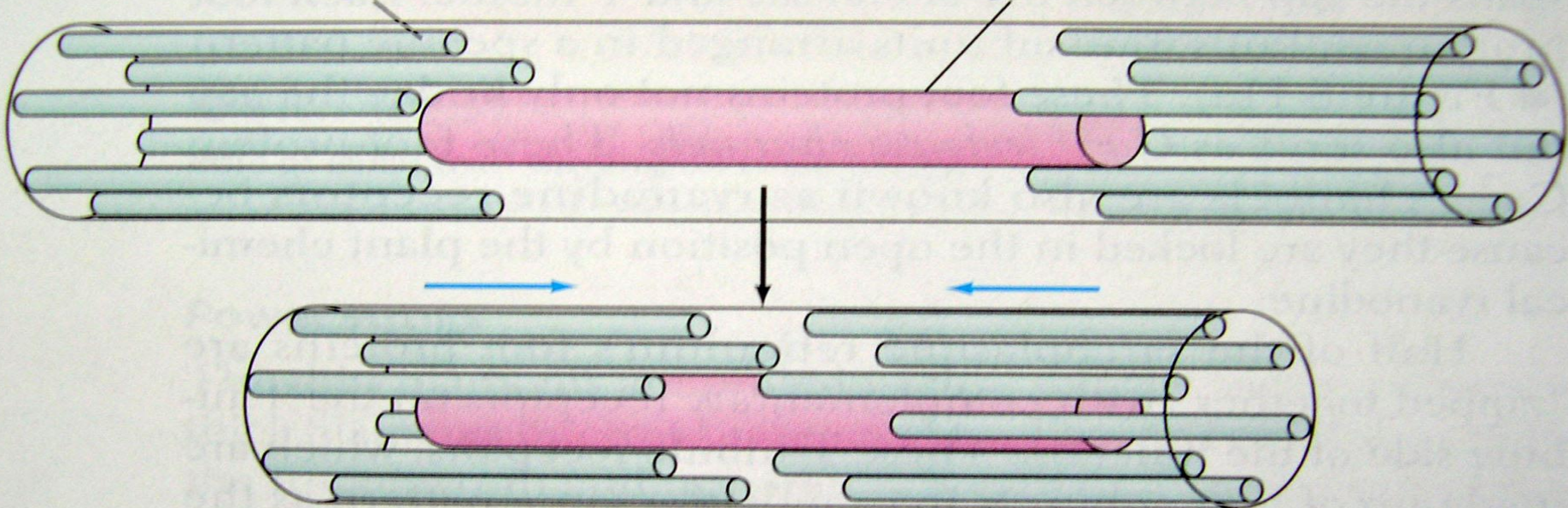
(a)



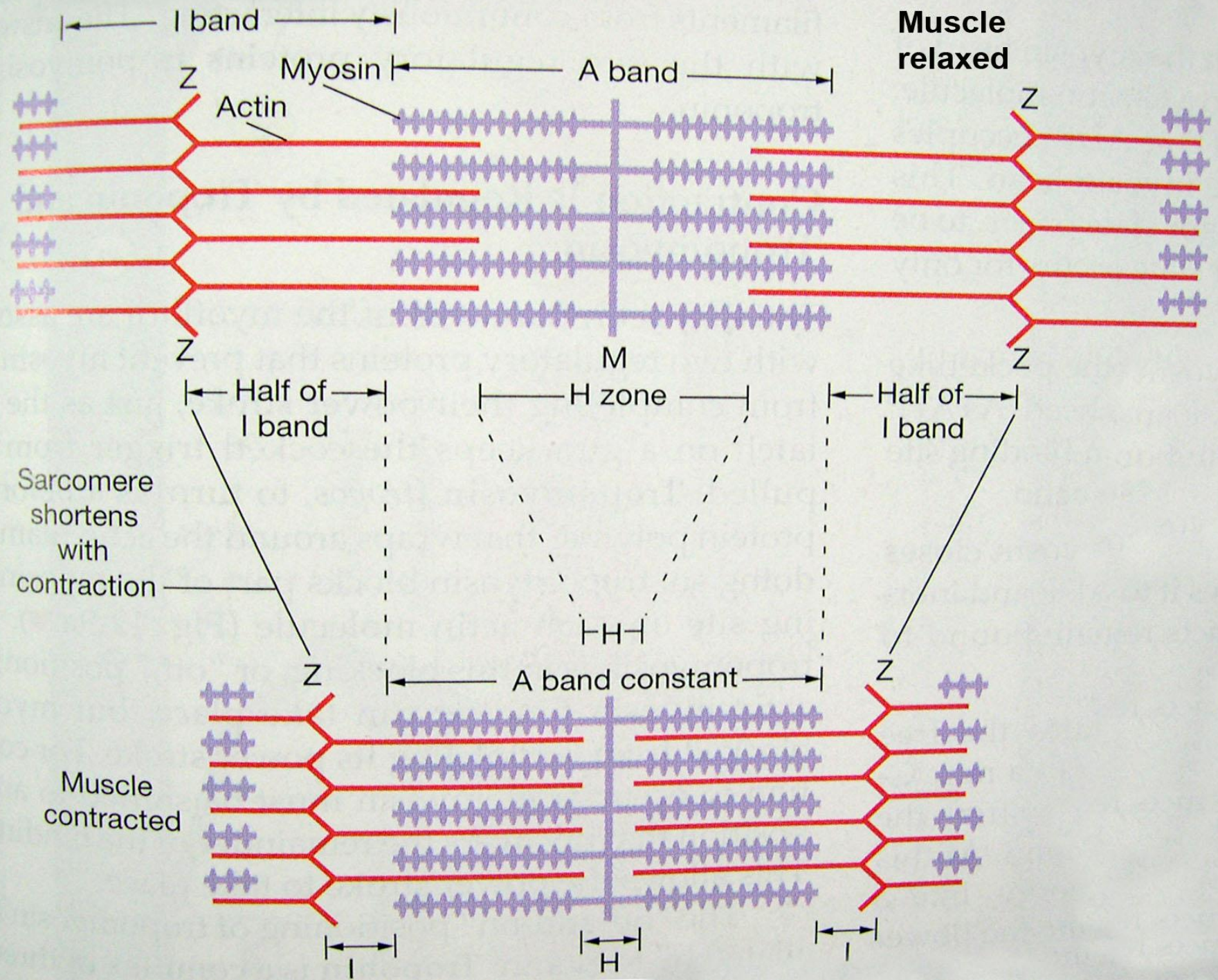
(b)

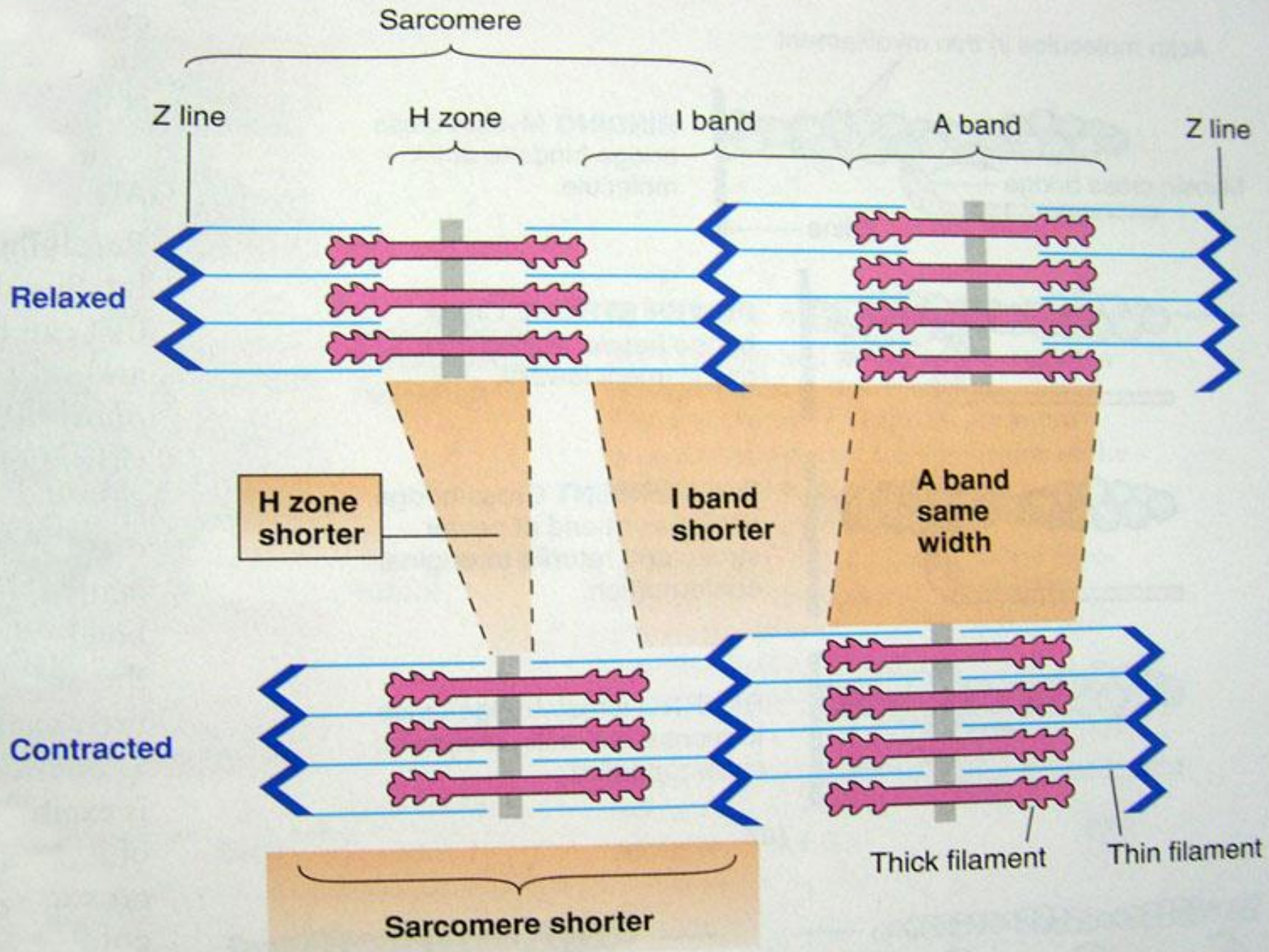
Thin myofilament

Thick myofilament



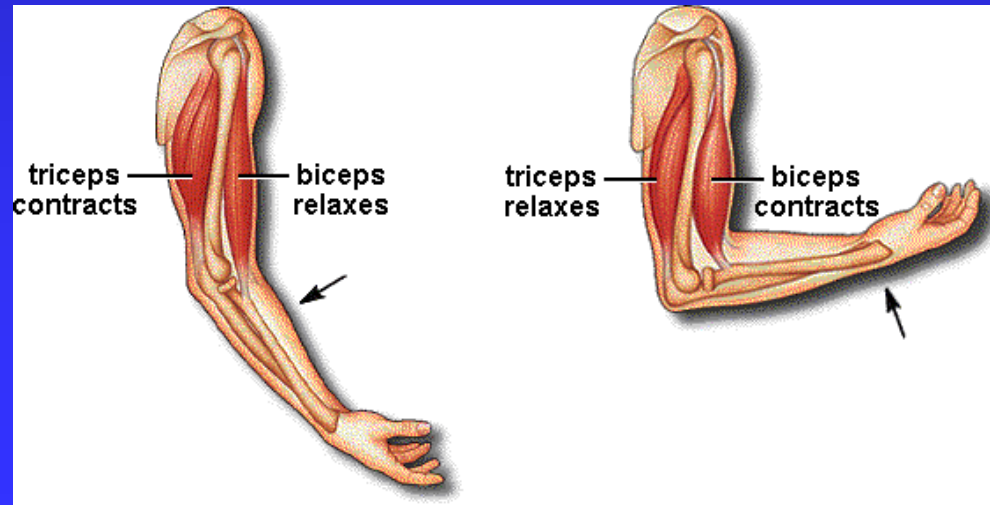
(c)

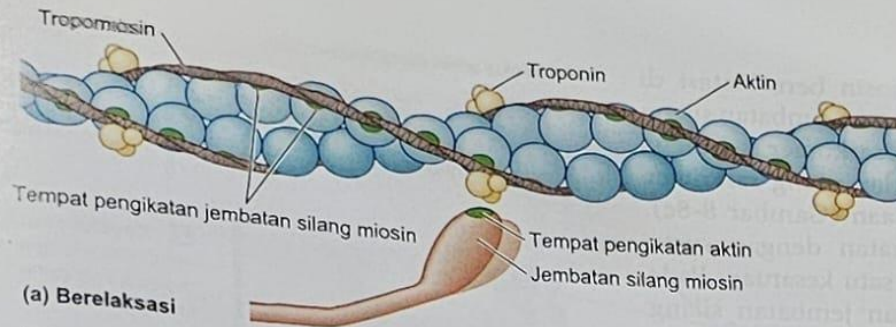




Steps in relaxation

- Ca^{2+} pumped back into sarcoplasmic reticulum
- Release of Ca^{2+} from troponin
- Cessation of interaction between actin and myosin





(a) Berelaksasi

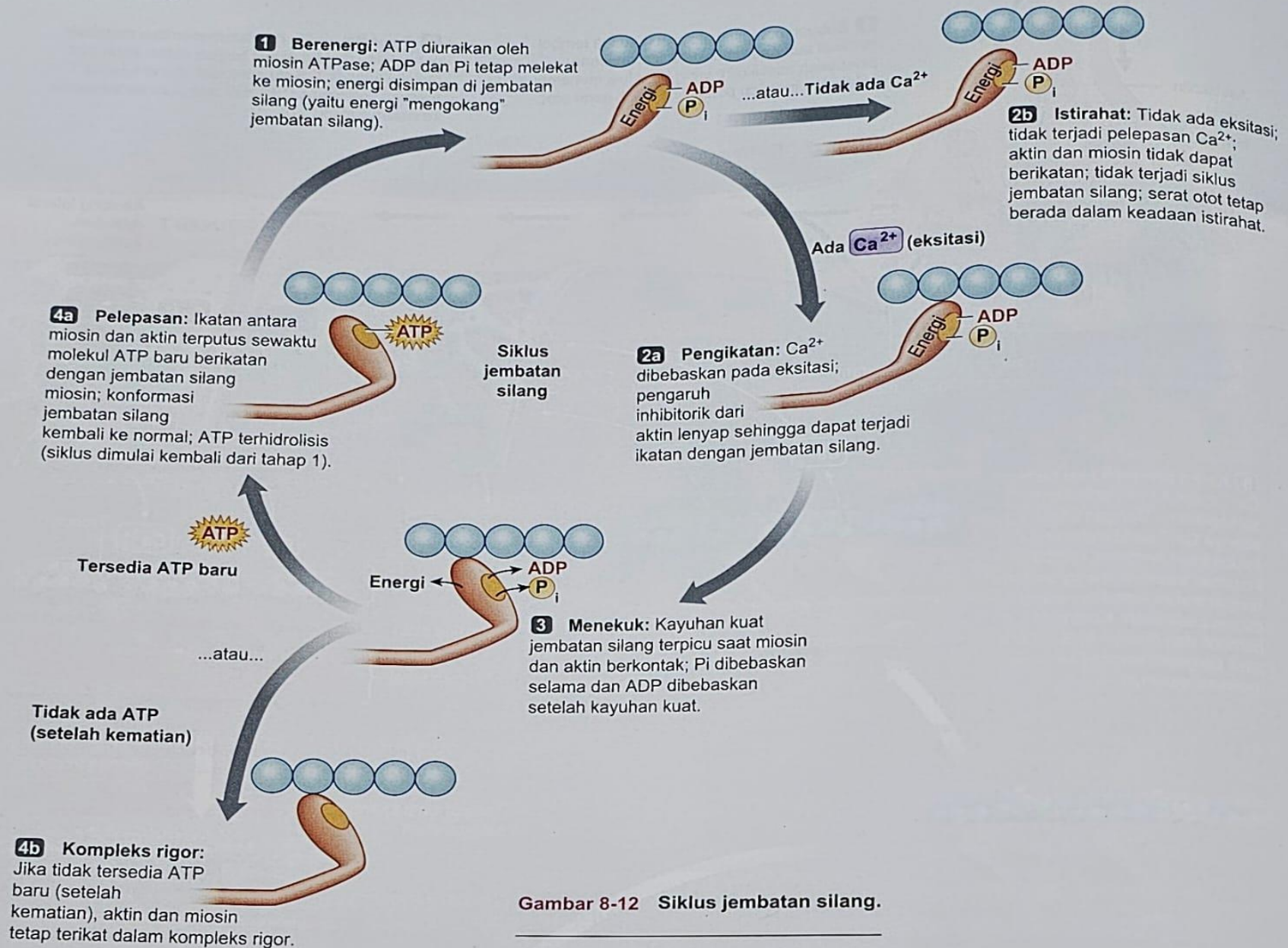
- 1 Tidak ada eksitasi.
- 2 Tidak ada pengikatan jembatan silang karena tempat pengikatan pada aktin secara fisik tertutupi oleh kompleks troponin-tropomiosin.
- 3 Serat otot berelaksasi.



(b) Tereksitasi

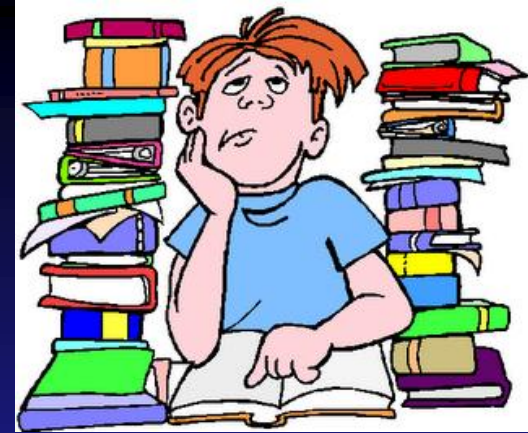
- 1 Serat otot tereksitasi dan Ca^{2+} dilepaskan.
- 2 Ca^{2+} yang dilepaskan berikatan dengan troponin, menarik kompleks troponin-tropomiosin ke samping sehingga tempat pengikatan jembatan silang terpapar.
- 3 Terjadi pengikatan jembatan silang
- 4 Pengikatan aktin dan jembatan silang miosin memicu kayuhan kuat yang menarik filamen tipis ke arah dalam selama kontraksi.

Gambar 8-6 Peran kalsium dalam mengaktifkan jembatan silang.



Gambar 8-12 Siklus jembatan silang.

Reminder :



- Bagaimana penghantaran impuls melalui sinaps ?
- Penggunaan energi pada mekanisme kontraksi otot terjadi pada saat ?
- Dari mana saja sumber energi untuk kontraksi otot ?



Physiology Department
Faculty of Medicine
Trisakti University