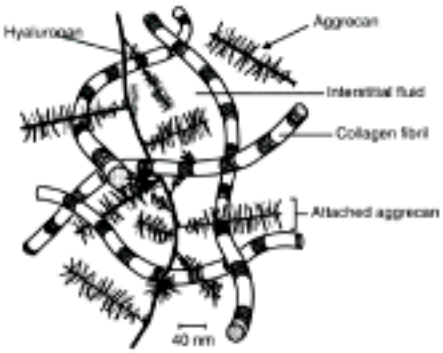
ME 482 Experimental Tissue Mechanics

Professor A. Wagoner Johnson

8/31/16 : Proteoglycans



Suggested reading: Nordin and Frenkel, Cartilage chapter

REMINDER

Brief assignment due in class ***Friday, Sept. 2***

- Fill in the information (next page) for your assigned fiber forming collagen (I, II, III, V, XI).
- Find and very briefly describe a disease that results from a mutation from your "assigned" collagen.
  - Those assigned to collagen I or II need to describe TWO diseases!
- We will take a little time to report to your groups (A-G) on Friday.
- Take notes, and turn in your assignment with your notes individually.
  - The coll assigned to you must be detailed. The information for the others can be brief.
- **Cite your sources.**

Classes of collagen: ~28 known types of collagen.
You need to know Types I, II, III well.

- Fiber forming collagens include Types I, II, III, V, and XI – these are in the homework!
- All about the same length
- 3 alpha chains in form of triple helix
- Synthesized as a procollagen molecule
- Aggregate into staggered arrays, microfibrils of 5 collagen molecules, then aggregate into fibers

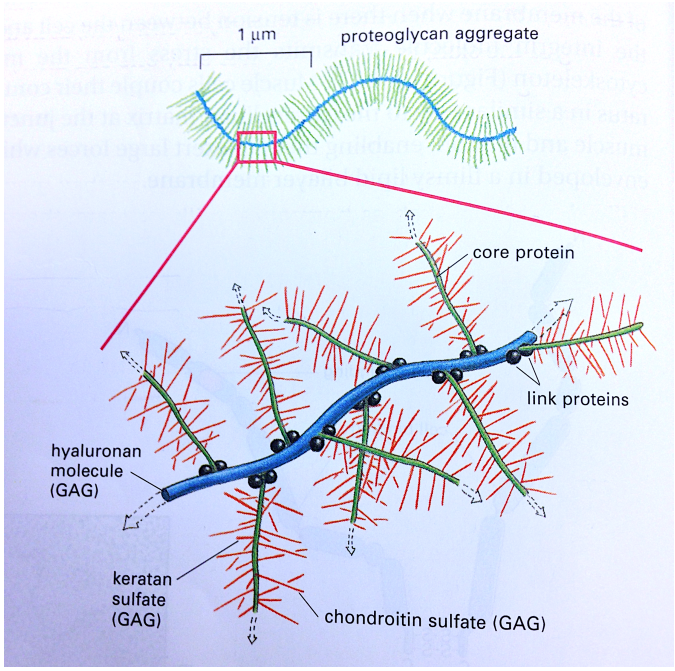
Type of Collagen	Location
I	• Where do you find it? In what tissues? • What are the collagen chains? • What disease is associated with mutations in this form of collagen? What does it do?
II	
III	
V	
XI	

	Col	Student Name			Col	NAME
	I	Anderson, Zachary C			I	Meyer, Joel I
	II	Bettinardi, Michael			II	Misurac, Rachel A
A	III	Bruno, Peter A		D	III	Muckatira, Sameer
	V	Chen, Mingze			V	Olbrich, Curtis E
	XI	Dupont, Gabriella R			XI	Pullen, Brendan R
	I	Edwardson, Elizabeth			I	Rappleye, Michael F
	II	Goldsmith, Sam W			II	Salehpour, Zaynab
B	III	Greenwell, Erik J		E	III	Schilling, Amelia J
	V	Halvorsen, Samuel C			V	Schuh, Sarah A
	XI	Hayani, Zayd			XI	Scully, Samuel W
	I	Kothari, Konik R			I	Secor, Erica J
	II	Kwiatkowski, Brandon			II	Shanley, John F
C	III	Lam, Peter D		F	III	Sherwin, Jeremiah M
	V	Livingston, Elizabet			V	Son, Jong Hyun
	XI	Lund, John R			XI	Thompson, Nicholas A
					I	Volkman, Kimberly M
					II	Westjohn, Cameron Y
				G	III	Xu, Yuchen
					V	Yan, Chenxi
					XI	Zhang, Zhichao
				A	I	Zhao, Yida
				B	II	Zhang, Yijie

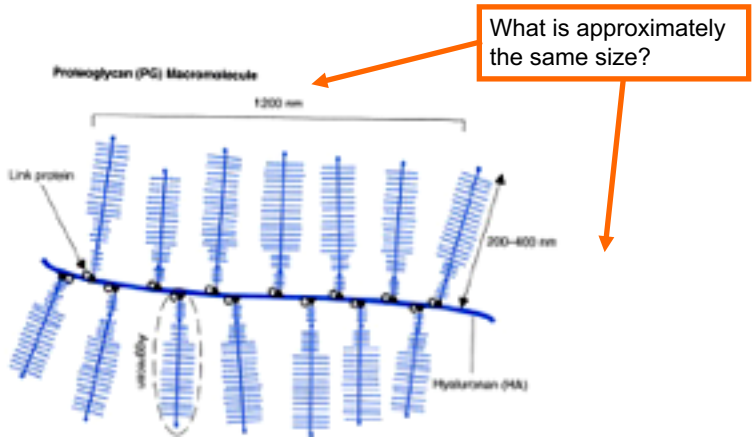
Today

- Proteoglycans (be able to answer questions below)
  - What are proteoglycans?
  - What are their functions?
  - Where are they found?
  - How does their size compare to collagen?

- Good ref: Nordin and Frenkel chapter on Collagen

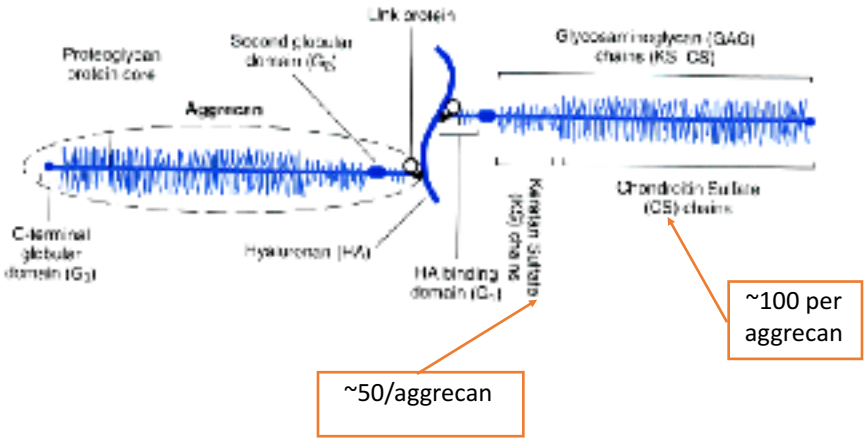


Proteoglycans are large protein-polysaccharide molecules with mol wt in the millions.



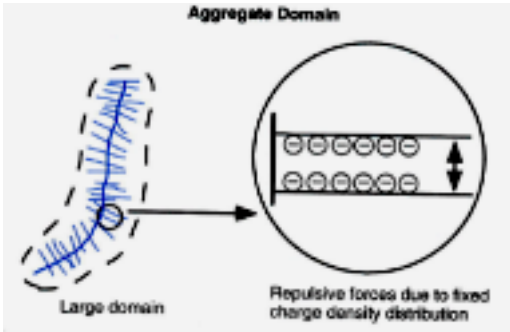
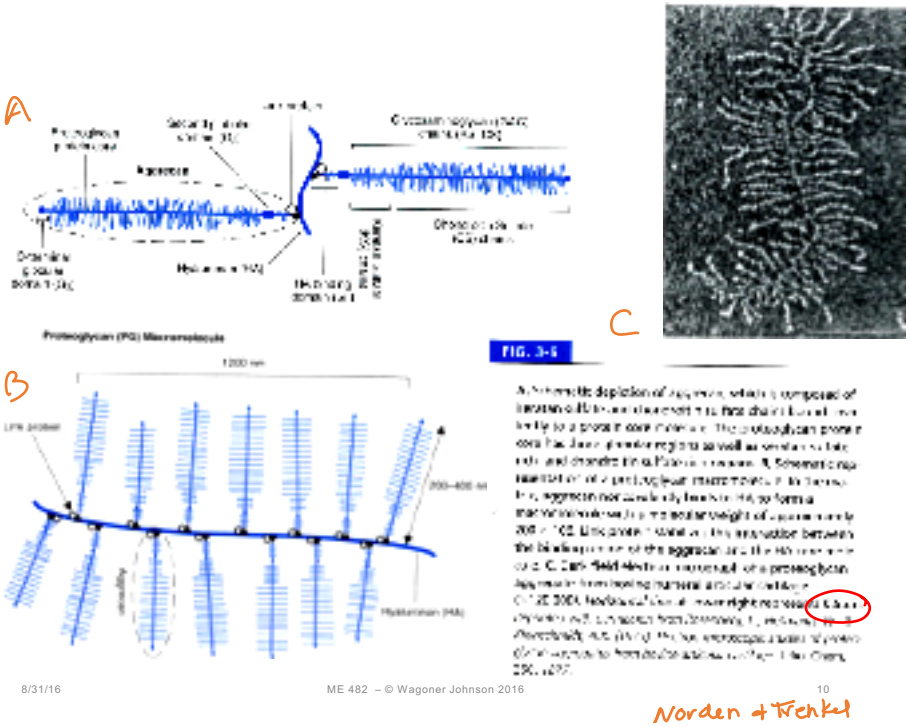
Norden and Frankel

Aggrecan is part of the large PG aggregate in cartilage and contains particular GAGs in certain locations



Norden and Frankel

GAGs are negatively charged and repel one another locally. This can extend the macromolecules to occupy large volumes.



(Nordin and Frankel, 3-7)