Disc 6 GBPs Questions

1. What is a lectin? What is a CRD? If every lectin has a carbohydrate-recognition domain (CRD), is every protein with a CRD a lectin?

2. Compare and contrast glycan recognition by a transferase from glycan recognition by a GBP. What are the circumstances in which a transferase might be considered a GBP?

3. Why are sulfated GAG binding proteins distinguished from lectins? Why are HA-binding proteins considered lectins, but proteins that bind to sulfated glycosaminoglycans are not? How do these two classes of glycan-binding proteins differ?

4. What determines the affinity of a glycan for a GBP? Cholera toxin binds to the ganglioside GM1 with high affinity (Kd ~ 0.1 nM) relative to the binding of many other GBPs to their ligands (which exhibit Kds in the range of 0.1 μM to 0.1 mM). How do you explain this observation?

5. Most glycan–protein interactions are low affinity, but high avidity is achieved by clustering receptors and ligands. What are the advantages and disadvantages of achieving high-affinity interactions through multivalency?

6. How does the density of carbohydrate ligands affect binding of a GBP? Is this relevant in vivo?

7. Consider the observation that in the hundreds of known GAG-binding proteins, there are few examples known of specific GAG and protein sequences involved in these interactions. Yet, interactions between proteins and sulfated glycosaminoglycans are crucial in development and play important roles in various physiological and pathophysiological settings.

8. Would you predict the existence of GBPs that bind to the tips of GAG chains? What would be the advantages and disadvantages of this binding mode?