Bio121
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Review Questions
Lectures 14 & 15

1. Compare and contrast the three fibrous components of the cytoskeletal system. **On a different page, make a chart**! Across the top of your chart list the three filament types. Along the side write the comparisons, being sure to include: filament size, filament structure, what protein is it composed of, cellular location, structurally polarity (?), dynamic (?), molecular motors, common functions, how well conserved are the genes encoding filament proteins.

2. What type of actin is found in muscle? What type of actin is found in all other cells?

3. Where does actin nucleate? (Be sure to understand what nucleate means.)

4. What is the difference between g-actin and f-actin?

5. What role does ATP play during filament formation?

6. What does the structure of f-actin look like?

7. What does it mean for a filament to have structural polarity? What is the difference between the plus and minus end?

8. What are MFAPs and how do they help determine the structure and function of actin filaments?

9. Actin is dynamic. What does that mean and why is it important?

10. Where do MTs usually nucleate? Where do they emanate from their nucleation site?

11. Describe the structure of MTs. How is GTP involved?

12. MTs have dynamic instability? What does that mean?

13. What is the MTOC/centrosome? (What is it made of? Where is it located in the cell? What is its function?)

14. Do MTs have structural polarity? If so, which end is associated with the MTOC and which end emanates toward the cell membrane?

15. Are IFs in all eukaryotic cells? (Are actin and MTs found in all eukaryotic cells?)

16. What are lamins?

17. What is the function of molecular motors? How do they accomplish this function?

18. Name each molecular motor and its associated cytoskeletal component (if this was not already included as part of your chart in question 1).
19. What is nucleation? Why is it so important for actin filament polymerization?

20. What proteins nucleate actin filament polymerization? How are these proteins different?

21. Describe the interaction between ARP and activating factor. What kind of interaction is this?

22. How can a cell prevent actin polymerization by preventing nucleation by ARP without directly affecting ARP expression?

23. What proteins are important for the kinetics of actin filament polymerization? How are these proteins different?

24. What class of proteins determines actin filament shape? Describe how each protein influences actin shape.

25. Which filament binding proteins is used for actin bundles in the core of microvilli versus the contractile ring? What is the reason for the difference?

26. What class of proteins influences actin filament durability? Describe how each of these proteins influences durability.

27. How does profilin promote actin polymerization?

28. Give two examples of cellular processes that require actin polymerization.

29. What are MAPs? How are the MAPs tau and MAP2 similar to actinin, fimbrin, and filamin?

30. How is the MAP +TIPs similar to actin capping protein?

31. What are catastrophe factors? How are they similar to cofilin?

32. How is stathmin similar to thymosin?

33. Are katanin and spastin more similar to gelsolin or cofilin? Why?

34. What is the difference between an analog and a homolog?

35. What is interesting about the bacterial homologs to actin and tubulin?

36. What happens to lamins during cell division?