Jen Johnson BIOL 310 HW1

Nuclear Membranes were an evolutionary advantage.

**Diversification**

autogenous origins. [1]

Saw generic endomembrane compartment, then basic functional division, then functional elaboration. [1]

Gene duplication, redundancy, new functions, diversification. Increased fitness.

“facilitate functional differentiation” [2]

Differentiation allows for more efficiency. For example, there can be other organelles.

Provide protection from stuff like lysosomes/lysozymes.

**Transition**

Compare to a cell membrane. Selective permeability.

Breaking down waste is efficient, but would be very inefficient if it impacted the DNA.

**DNA stability**

Prevent excessive contamination/degradation

Own compartment/Histones

1. Prevent excess/incorrect access to DNA/stabilize DNA, Stabilizes DNA [2]
   1. Condensation for easier segregation of chromosomes
   2. Easier transport/segregation with mitosis. [3] Fewer errors (ie Down Syndrome)
   3. Protein components suggest that evolution of nuclear structure was tightly coupled to genome partitioning during mitosis. [3]
2. Condensation for increased capacity of the genome

Larger size, more genes, gene duplication, increased fitness. **Relate back to the first point**

**Conclusion**

First Euk. Lacked nuclear morphology. [3]

Conclusion: why don’t prokaryotes have one.

Similar case: cellular respiration was an advantage, so many organisms all got it at once to remain competitive. However, not all organisms did, since there are niches where it is unnecessary. Likewise, many Euk got a Nuclear membrane as an advantage, but Prokaryotes do not need it because they have other ways to survive.

“radical innovation” [1]

[1] J. B. Dacks and M. C. Field, “Evolution of the eukaryotic membrane-trafficking system: origin, tempo and mode,” *J. Cell Sci.*, vol. 120, no. 17, pp. 2977–2985, 2007.

[2] D. P. Devos, R. Gräf, and M. C. Field, “Evolution of the nucleus,” *Curr. Opin. Cell Biol.*, vol. 28, no. 1, pp. 8–15, 2014.

[3] K. L. Wilson and S. C. Dawson, “Functional evolution of nuclear structure,” *J. Cell Biol.*, vol. 195, no. 2, pp. 171–181, 2011.