Lecture 22 – Maternal effect and epigenetic inheritance

I. Maternal effect

A. snail shell coiling in *Limnaea peregra*

B. early *Drosophila* development genes

C. maternal effect genes: summary
- usually little or not transcription early in development
- RNAs and proteins synthesized by mom, deposited in egg and function in early development
- phenotype depends on nuclear genotype of mom

II. Extranuclear inheritance

A. Some cytoplasmic organelles include their own genotypes

B. Tend to show uniparental inheritance

C. eg. Mitochondria
   1. mitochondrial function
   2. small genome, encodes few genes for mitochondrial function, tRNA and rRNAs
   3. most mitochondrial proteins encoded in nucleus
   4. inherited from mother
   5. sometimes mix of mutant and wild type
6. mitochondrial mutations tend to reduce ATP production

7. Example of mitochondrial inheritance
   a. Human myoclonic epilepsy with ragged-red muscle (MERRF) - epilepsy, also hearing loss, ataxia, diabetes, cardiomyopathy and dementia
   b. mitochondria are maternally inherited

8. evidence supporting endosymbiont origin
   a. circular genome
   b. translation more bacterial-like: eg. fMet initiator
   c. streamlined genome
   d. different codon usage in animal mtDNA

9. cytoplasmic male sterility in plants
D. chloroplast – like mitochondria, include their own genome
   1. genomes ~120 – 160kb
   2. inheritance usually maternal (biparental in some such as geranium)
   3. example:
      a. variegation in 4 o’clocks

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  green ♀ X white ♂ → green
  white ♀ X green ♂ → white
  variegated ♀ X green ♂ → variegated
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E. cytoplasmic symbionts
   1. Wolbachia in insects
      a. cytoplasmic endosymbiont
      b. transmitted only by female; in egg but not sperm
      c. cause several different phenotypes