CONCEPT: TRANSPOSABLE ELEMENTS IN EUKARYOTES

● Eukaryotes have two _____ of transposable elements

□ **Retrotransposons (class I elements)** use an RNA intermediate to jump

- Often, these comes from RNA viruses (retroviruses) that use ssRNA as their genetic material

- *Reverse transcriptase* transcribes RNA into DNA

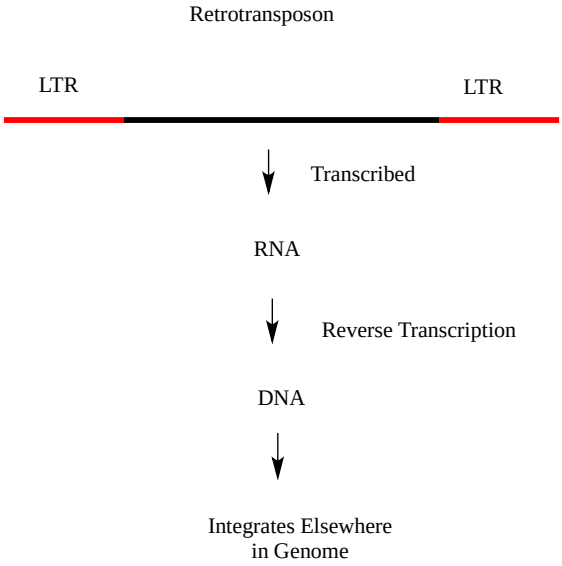
- The **provirus** is the DNA that integrates into the genome

- Ex: **Long-terminal repeat (LTR) retrotransposons** have long repeats on each end

- Use "copy and paste" method to transpose

□ **DNA transposons (class II elements)** use DNA to jump

EXAMPLE:



Drosophila P Element

● *Drosophila* P element was one of the first eukaryotic _____ identified

□ The P element is a transposon that can severely disrupt the genome

- Strains of flies with this transposon are called P strains

□ If you mate a male P strain with a female M strain (without P element):

- **Hybrid dysgenesis** defines the multiple serious defects of the offspring (mutations, sterility, breakage)

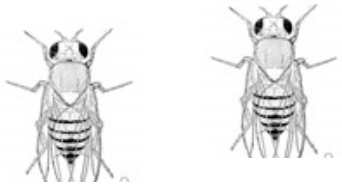
□ If you mate a female P strain with a male M strain (without P element):

- You get normal offspring

□ Why? The egg in the female P strain can suppress the P element transposons

EXAMPLE:

Male P Female M X Male M Female P



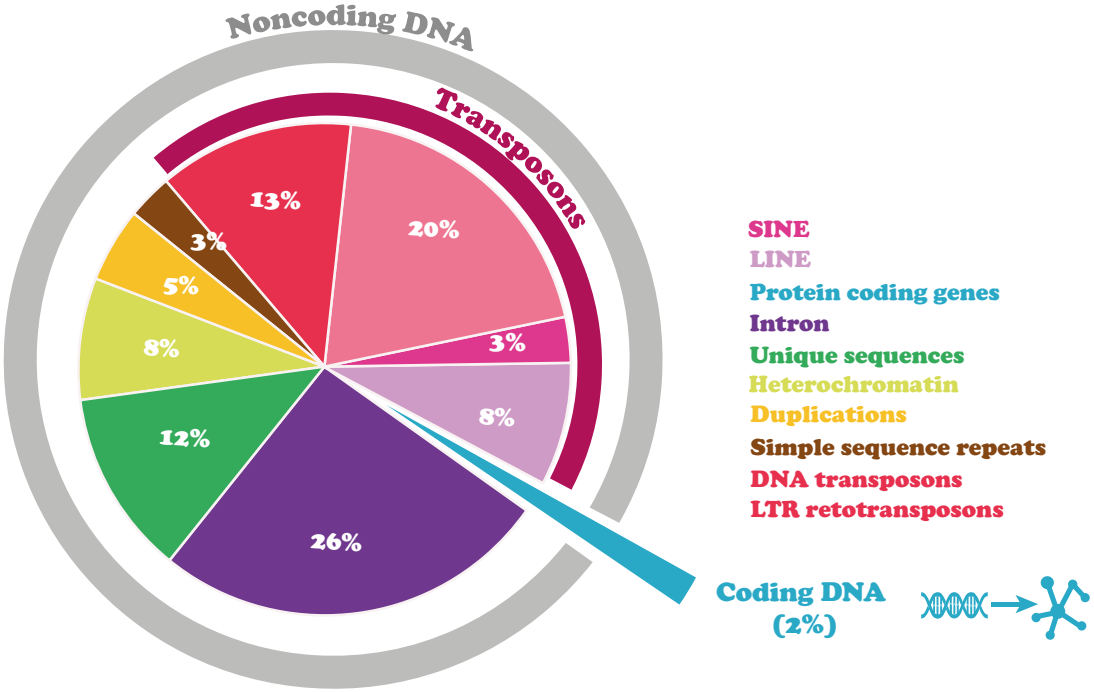
Hybrid dysgenesis
(mutated, sterile flies)

Normal Offspring

Human Transposable Elements

- Humans also contain _____ transposable elements
  - □ **Short interspersed nuclear elements (SINEs)** are one common class of retrotransposons
    - ***Alu*** is the most common SINE in humans (300,000 copies)
  - □ **Long interspersed nuclear elements (LINEs)** are a second common class of retrotransposons
    - ***L1*** is the most common LINE in humans (20,000 copies)
  - □ Although most human transposable elements do not move, some still do and can cause disease
    - When they do just most do in **safe havens**, which are non-gene regions safe for genes to jump (introns)

EXAMPLE:



- Transposons have a great impact on genome evolution
  - □ They can cause gene mutations by inserting inside of a gene or a gene regulatory region
  - □ They can cause chromosomal rearrangements
  - □ They can relocate genes to new regions