Cytogenetics - I: Changes in chromosome structure

Genetics 371B Lecture 15 25 Oct. 1999

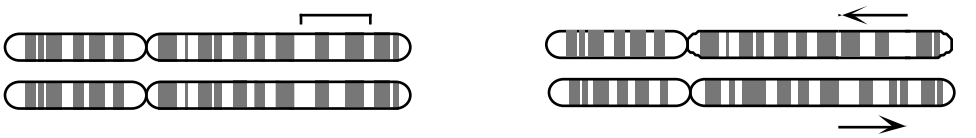
Chromosomal abnormalities

- Changes in chromosome number

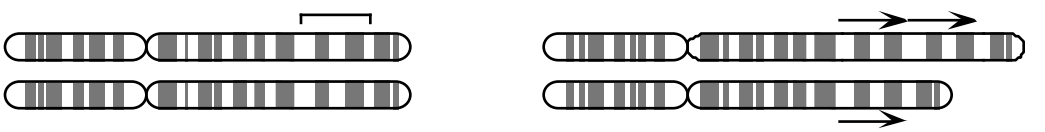
- Changes in chromosome structure

  - ◇ Deletions

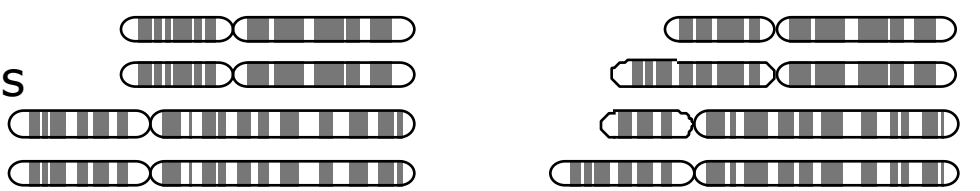
  - ◇ Inversions



  - ◇ Duplications



  - ◇ Translocations



What's the tolerance limit for "gene imbalance" ?

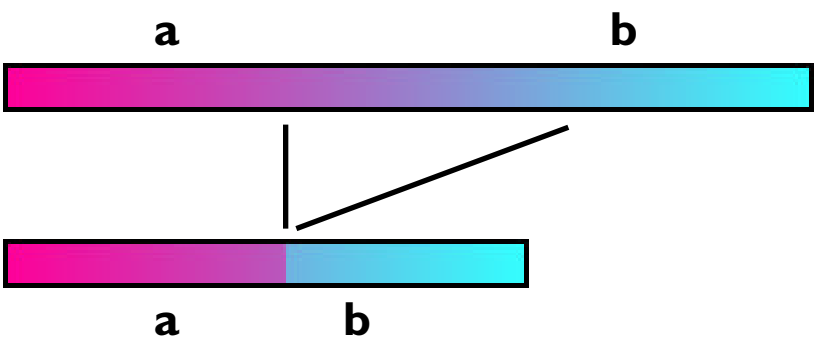
Deletions

- Terminal vs interstitial

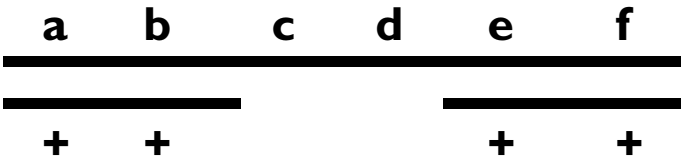
  - "cri du chat" syndrome in humans – terminal deletion in chr 5

- How are these deletion chromosomes transmitted?

- **Genetic consequences**
  - Reduced recombination frequency between markers flanking the deletion

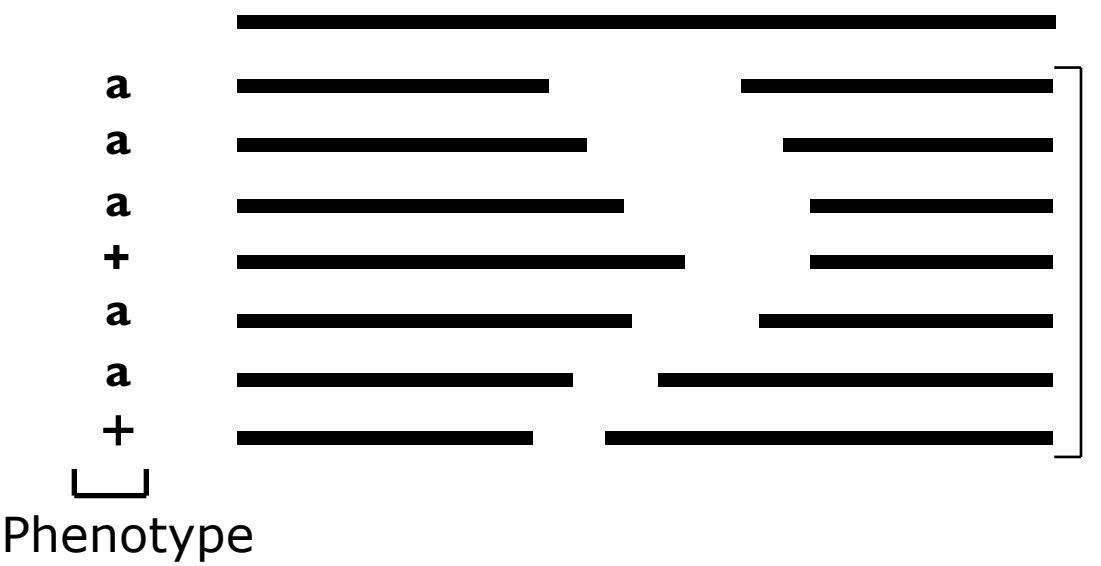


◇ Recessive alleles **uncovered**



Practical use: **deletion mapping** to locate genes

Set up crosses such that the progeny have the recessive allele of interest on one homolog and a deletion on the other… ask: which deletion uncovers the recessive allele?



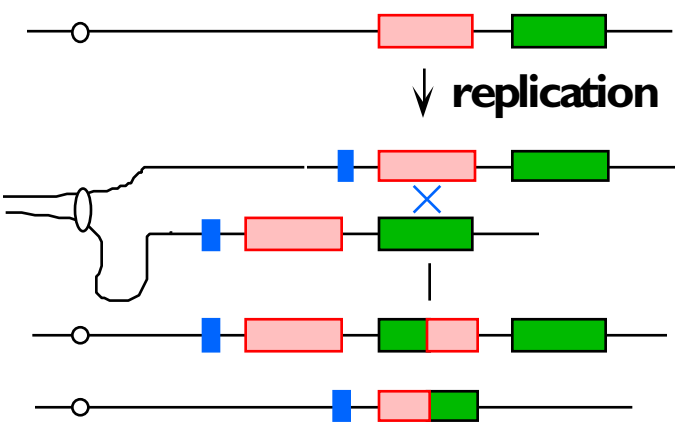
Duplications

- Large-scale – e.g.,

  Charcot-Marie-Tooth syndrome

chr 17

- Microscopic/submicroscopic
  Can be caused by **unequal sister chromatid exchange** – e.g., one form of red-green color blindness

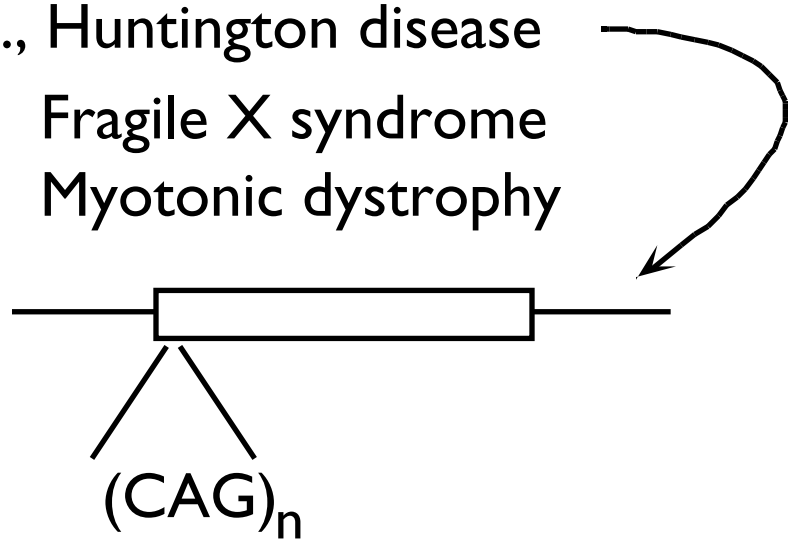


- **Trinucleotide repeat expansion**

e.g., Huntington disease

Fragile X syndrome

Myotonic dystrophy



For Huntington…Normal n = 9 - 30

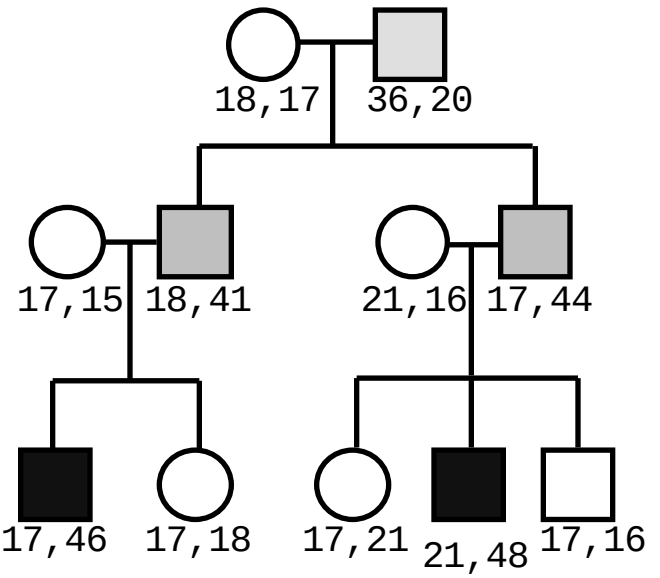
30 – 35 = "premutation"

≥36 : disease

Age of onset a number of repeats

Repeat #	Age of onset
≤40	42-84
41	30-66
42	35-59
43	23-61
44-45	22-54
46-49	21-48
50-55	20-44
≥56	7-23

“Anticipation” – progressively earlier onset



Mechanism of disease?

Mechanism of expansion?