Lecture 20 - Chromosomal abnormalities – structural

I. Types of abnormalities
A. deletion
B. duplication
C. inversion
   1. paracentric
   2. pericentric
D. reciprocal translocation
   1. Robertsonian translocation – special type of translocation that fuses 2 acrocentric/telocentric chromosomes.
E. position effects

II. Chromosomal deletions
A. effects of deletion
B. How can you tell if deletion present?
   a) deletion results in loss of part of chromosome
   b) can test for deletion by test cross to see if multiple genes are missing
   1) these progeny are A B C D E in phenotype
   2) these progeny are A b c d E in phenotype

C. deletion mapping

D. Several human genetic diseases result from chromosomal deletions
   1. Cri-du-chat – results from deletion of part of chromosome 5
   2. Wolf-Hirschorn – results from deletion of part of chromosome 4
III. Duplication  
A. Duplication repeats part of chromosome  

B. Tandem duplications can be further amplified by unequal crossover  

C. A few points about duplications  
1. How can you detect their presence?  
   - eg. duplication of fly Bar gene causes Barred eyes  
   - can detect cytologically (chromosome stain)  
2. Duplications important in evolution  
3. Large duplications often deleterious  

IV. Inversion  
A. Inversion reverses sequence of part of chromosome  

B. Inversion affects synapsis  
   - inversion causes no problem unless crossover occurs within inverted sequence  
   - inversion bearing chromosomes are crossover “suppressors” because recombinant chromosomes generally not recovered  

C. Two types of inversions  
1. paracentric inversion
2. pericentric inversion

V. Reciprocal translocation
A. reciprocal exchange of DNA between non-homologues
   1. heterozygous for translocation
   2. homozygous for translocation

B. reciprocal translocation often causes “semi-sterility”
C. Roberstonian translocation
- special type of non-reciprocal translocation in which 2 acrocentric telocentric chromosomes fuse

14 21
rob(14; 21)
in humans, leads to high probability of Down syndrome if chromosome 21 is involved

metaphase 1

first segregation in this orientation
first segregation in this orientation
first segregation in this orientation

produces trisomy 21
produces trisomy 21
produces trisomy 21

trisomy 14 (lethal)
trisomy 14 (lethal)
trisomy 14 (lethal)

aneuploid (lethal)
aneuploid (lethal)
aneuploid (lethal)

translocation carrier
translocation carrier
translocation carrier

VI. Rearrangements may also cause mutations if they break within genes
A. eg. Inversion:
B. Duplication?