

Gene mapping - I: Three-point test cross

Genetics 371B Lecture 10

13 Oct. 1999

What is the maximum recombination frequency in any interval?

The range of possibilities:

Tightly linked



Independent assortment

Unlinked loci:

Loci can appear to be unlinked because:

3-point test cross – what is it; why do it?

Requirements for successful 3-point test cross:

- ◆ Triply heterozygous strain (producer of recombinant gametes)
- ◆ A cross that will reveal the genotypes of the gametes...

Example 1. Predict the progeny phenotypes and numbers for this cross

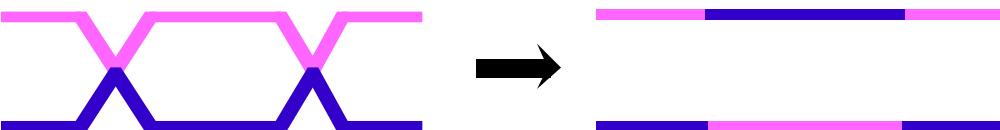
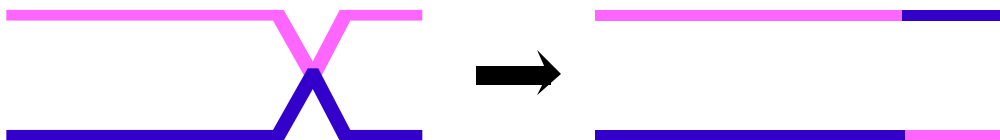
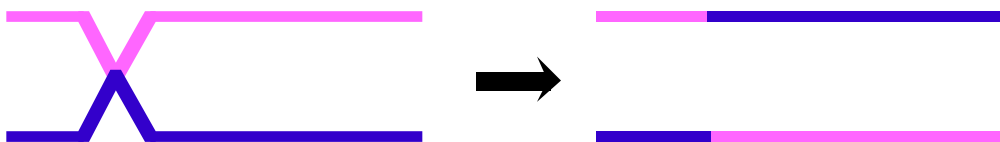
Parent 1: $\frac{+ + a}{b c +}$ 

Parent 2: $\frac{b c a}{b c a}$...count 10000 progeny

Step 1. Determine the phenotype and number of the double-crossover (DCO) products

Step 2. Determine the phenotype and number of the single-crossover (SCO) products

Step 3. Determine the number of the parental (non-crossover, NCO) types



Example 2. Construct a linkage map (order and distance) for the following genes

Genes:

- cu (curled wing)
- sr (stripe body)
- st (scarlet eye)

Parents:

Female:	cn/+	rd/+	vg/+
Male:	cn/cn	rd/rd	vg/vg

Progeny phenotypes:

cn vg	4202
rd	4258
cn rd	28
vg	32
cn rd vg	264
+ + +	276
rd vg	482
cn	458

Step 1. Identify the parental, SCO and DCO classes

Step 2. Determine the gene order—

Knowing the allele composition of the parental class, what gene order could generate the observed DCO classes? (Trial and error!)

Step 3. Add up the recombination frequencies to obtain the map distances

Genetic maps may not correspond directly to physical maps

What could cause the genetic map to deviate from the physical map?

- ◇ Map expansion:
- ◇ Map contraction:

Interference and **coefficient of coincidence**