# Tetrad Analysis

Suppose three genes have the following map:

$$a \text{—} 10\,\text{mu} \text{—} b \text{——} 20\,\text{mu} \text{——} c$$

What meiotic events produced the chromosomes that gave rise to this map?
Assume no interference (I = 0).

First, dco chromsomes must arise at a rate of 2% - and they can be produced only by $E_2$ tetrads.

## $E_2$ tetrads generate chromatids that are:

| | nonrecombinant chromosomes | single crossovers in *a-b* interval | single crossovers in *b-c* interval | double crossovers in *a-c* interval |
|---|---|---|---|---|
| two-strand dco | 2 | | | 2 |
| 3-strand dco | 1 | 1 | 1 | 1 |
| 3-strand dco | 1 | 1 | 1 | 1 |
| 4-strand dco | | 2 | 2 | |
| overall frequencies from $E_2$ (based on 16 chromatids) | 0.25 | 0.25 | 0.25 | 0.25 |

So, in order that dco chromosomes be produced at a rate of 2%,
the $E_2$ tetrads must have occurred at a rate of 8%.

**Tetrad analysis - continued**

If 8% of meioses produced $E_2$ tetrads, then those meioses account for 4% of crossovers betwe
(2% from the dco chromosomes and 2% from the sco chromosomes coming from $E_2$ tetrads), a
similarly, 4% of crossovers between b-c.

Then we still have to account for 6% recombinants between a-b and 16% recombinants betwee
These must all have come from $E_1$ meioses.

| | nonrecombinant chromosomes | single crossovers in *a-b* interval | single crossovers in *b-c* interval |
|---|---|---|---|
| sco in a-b | 2 | 2 | |
| sco in b-c | 2 | | 2 |
| nco | 4 | | |

Since only half of the products of an $E_1$ meiosis are crossover chromosomes, the $E_1$ meioses with an exchange in the a-b interval must occur 12% of the time, and the $E_1$ meioses with an exchange in the b-c interval must occur 32% of the time.

The frequency of $E_0$ meioses must then be 100 - (8 + 12 + 32) = 48%

---

Suppose I had been 0.5 - then we would have arrived at:
$E_2$ = 4%(because only 1% dco chromosomes are produced) ;
$E_{1a\text{-}b}$ = 16% ; $E_{1b\text{-}c}$ = 36% ; $E_0$ = 44%