

## Re: frequency of crossovers at meiosis

---

*Source:* <http://sci.tech-archive.net/Archive/sci.bio.evolution/2008-02/msg00133.html>

---

- *From:* dhoyt <[Dale.Hoyt@xxxxxxxxxx](mailto:Dale.Hoyt@xxxxxxxxxx)>
  - *Date:* Sun, 24 Feb 2008 14:09:55 -0500 (EST)
- 

On Feb 19, 2:19 pm, psl...@xxxxxxxxxx wrote:

I read that Mendel's second law (saying that traits are inherited independently) if either

- 1) the genes regulating the traits reside on different chromosomes
- 2) the genes are far from each other on the same chromosome

Can this really be true for 2) ?

If even nr of crossovers (including 0) is as common as odd, the traits are more likely to follow each other than if the genes are at separate chromosomes.

Am I thinking about this wrong ?

Maybe this will help clear up your confusion.

Consider two loci (genes) that are on the same chromosome but far enough apart so that there is ALWAYS at least a single crossover between them. Since a crossover involves only a pair of chromatids, there will be a pair of non-recombinant chromatids for every pair of recombinant chromatids. (This just says that AB, ab, Ab, and aB gametes will be equally frequent.) Therefore the % recombination between the A and B loci will be 50% when there is always one crossover between them.

But what if there are some meioses with a double crossover? These will also produce the 4 gametic types in equal frequencies. Why? Because there are three types of double crossovers: two-strand doubles, three-strand doubles, and four-strand doubles. If you can find an older genetic text it will show you the genetic consequences of each type of double exchange. It turns out that the 4 gametic types, AB, ab, Ab, and aB are produced in equal frequencies, just like in the single exchange.

So, if two loci are far enough apart that there is at least one crossover between them in 100% of the meioses they will show 50% recombination, even if there are also some meioses that have a double exchange.