

Interrupted Mating Experiments Activity Guide

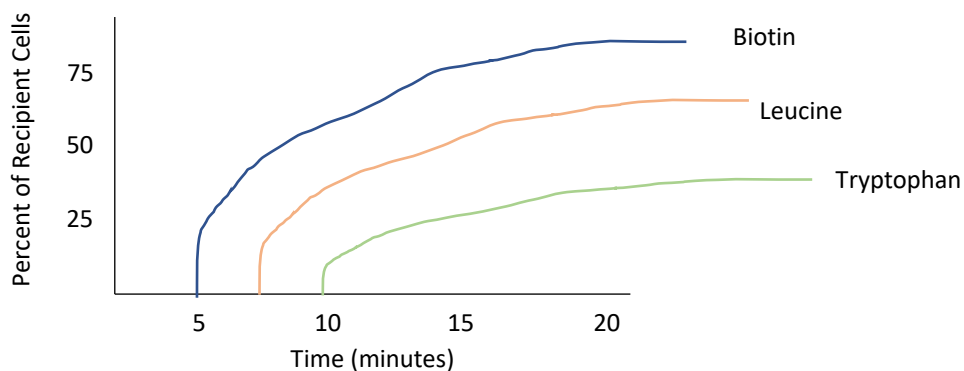
Overview:

Interrupted mating experiments use the process of conjugation to map the order of genes on a bacterial chromosome. In conjugation, the donor cell's chromosome gets pushed slowly through a sex pilus as a single linear strand until it enters the recipient cell. The chromosome has a specific origin of transfer. The recipient cell gets genes in the order they are in the donor's chromosome.

Gene mapping can be done by interrupting the conjugation at multiple times and taking account of which genes the recipient cell has. Genes that take longer to enter the recipient cell are further from the origin. The percentage of recipient cells with a given gene also provides information on the order of genes on a chromosome. The sex pilus can randomly break at any time. When a gene takes a longer amount of time to enter a recipient cell (because it is further from the origin), there will be more chances that the sex pilus could break before it is donated. Because there are more chances for conjugation to stop, less recipient cells have genes far from the origin. The fertility factor Hfr is the last gene to enter a recipient cell so very few recipient cells receive it.

Something important to remember for interrupted mating experiment data is what the percentages mean. On a graph, the horizontal axis (x-axis) represents time, and the vertical axis (y-axis) represents the percentage or number of recipient cells. The x-intercept, where the line for a given gene starts, is when the recipient cells can start receiving the gene because it is in the sex pilus. This is not when recipient cells have the gene incorporated into their chromosome and can use it. When 0% of recipient cells have a nutrient gene, there will be no growth on a plate lacking that nutrient. Only after the time it enters the recipient cell will you see growth.

Below is an example of this situation. At 5 minutes, 0% of the recipient cells have received the biotin gene. This means that the recipient cells cannot grow in a media without biotin at 5 minutes. Any time after 5 minutes some recipient cells will have biotin incorporated into their chromosome and then can survive.



Learning Objectives:

- Be able to read an exconjugant graph and understand all of the important information it provides.
- Use an exconjugant graph to predict when growth will be seen on a plate.
- Map a chromosome given an exconjugant graph.
- Be able to identify on a chromosome map where the origin of transfer is located.

Order of Activities:

1. Review the different types of horizontal gene transfer including conjugation.
2. Review how selective media can be used to identify genotype.
3. Complete the [hands-on activity](#) to model interrupted mating experiments.
4. Use this interactive problem to understand how gene mapping can be completed through interrupted mating experiments. <http://www.dnafb.org/18/problem.html>
5. Test yourself by completing the [corresponding worksheet for this material](#). Attempt to first complete this on your own, then pair up with a partner or group to discuss when possible. There is [an answer key provided](#) so you can check your work and read through all explanations for the questions. Any questions you get wrong or confused about you should attempt to explain why the answer is correct and then complete again after you finish the activities in this guide.
6. After reviewing any topic, it is a good idea to have a metacognition check. Ask yourself the following questions:
 - What are my emotional responses to learning this material? Which material am I frustrated with and need aid in understanding?
 - What difficulties have I had with the learning tasks? What specific tasks will I do to master this content?
 - Do I understand all of the learning goals? Can I explain each of them out loud to someone clearly and concisely?
 - How is what I learned related to other things I have learned in this class? How is it related to other classes, my career, and my life?
7. If you would like to have more aid in learning this material, please reach out. There are numerous individuals who want to help you feel confident in your understanding. If your course has learning assistants or teaching assistant(s), you should reach out to them to review concepts you want to learn more about. Your professor is also a great resource to go to when you do not understand a topic. You can study with your peers or receive academic support through the LRC as well. If you would like help identifying how to receive the support you need, do not hesitate to contact the CU Denver Learning Resources Center at LRC@ucdenver.edu or stop by our front desk in the learning commons building.

