

# Cornell Guided Notes

Genetics of Disease (Medical Interventions) | 2027-03-04

Name

Period

Date

Lesson

## Lesson focus

Mutation, HGT, and superbugs

## Key words and questions

## Prepared details and student notes

**Essential question**  
**What is today's target?**

Explain how mutation and horizontal gene transfer spread resistance genes and create superbugs. Big idea: How can resistance genes jump between bacterial species in ways that make treating multi-drug-resistant superbugs nearly impossible?

**My notes, examples, and questions**

**Key words**  
**What vocabulary unlocks the lesson?**

- aseptic technique
- culture
- colony
- inhibition
- mutation
- horizontal gene transfer

**My notes, examples, and questions**

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## Cornell Notes - Continued

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#### Must-know ideas

What should I understand by the end?

- Horizontal gene transfer (HGT) moves DNA between bacteria via conjugation (plasmid transfer), transformation (environmental DNA uptake), or transduction (phage-mediated).
- Because resistance genes often travel on plasmids, a single HGT event can make a previously susceptible bacterium resistant to multiple antibiotics simultaneously.
- Superbugs (like MRSA and CRE) carry multiple resistance genes acquired through HGT over time; some are now resistant to all available antibiotics.

#### My notes, examples, and questions

#### Process notes

What happens during class?

- 0-10 min: Define mutation and horizontal gene transfer in notebook; list the three HGT mechanisms (conjugation, transformation, transduction)
- 10-25 min: Read how bacteria swap resistance genes via plasmid; summarize in two sentences
- 25-42 min: Draw a diagram: one resistant cell shares a resistance plasmid with a neighbor via conjugation; label all parts
- 42-55 min: Explain how one HGT event can confer resistance to multiple antibiotics simultaneously; connect to the antibiotic mechanism classes from the previous unit
- 55-68 min: Use your colony data: if one colony on your plate were resistant, how long and under what conditions would it take over the plate? Write your reasoning
- 68-80 min: Write the linking sentence: culturing produces data, resistance explains what the data means, stewardship is what we do about it

#### My notes, examples, and questions

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#### Steps and evidence What do I do and turn in?

- Define mutation and horizontal gene transfer in your own words.
- Read how bacteria swap resistance genes even between different strains.
- Draw how one resistant cell can share a resistance gene with neighbors.
- Connect this to why superbugs can resist several antibiotics at once.
- Use your colony data to imagine how a resistant colony could take over.
- Write one sentence linking culturing, resistance, and stewardship.

Evidence: Notebook check - HGT mechanism definitions, conjugation diagram with labeled parts, multi-resistance explanation, colony-data application scenario, and linking sentence connecting culturing to resistance to stewardship.

#### My notes, examples, and questions

#### Checks for understanding How do I know I got it?

- You will be able to explain mutation and horizontal gene transfer.
- You will be able to describe how resistance genes spread between bacteria.
- You will be able to explain how superbugs arise.

#### My notes, examples, and questions

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**Lab or safety notes**  
**What must I handle carefully?**

Supplies:  
- Agar plates (or culturing simulation)  
- Inoculating loop  
- Bunsen burner or sterile single-use loops  
- Bacterial sample or broth  
- Incubator  
- Labeling marker and tape

**My notes, examples, and questions**

### Summary

Today's lesson focused on Mutation, HGT, and superbugs. The main target was: Explain how mutation and horizontal gene transfer spread resistance genes and create superbugs. The evidence of learning is Notebook check: HGT mechanism definitions, conjugation diagram with labeled parts, multi-resistance explanation, colony-data application scenario, and linking sentence connecting culturing to resistance to stewardship.. In my own words, the most important idea from today is:

**My summary**

### My final question or connection