

Study Guide — MI Unit 1: How to Fight Infection (Pretest)

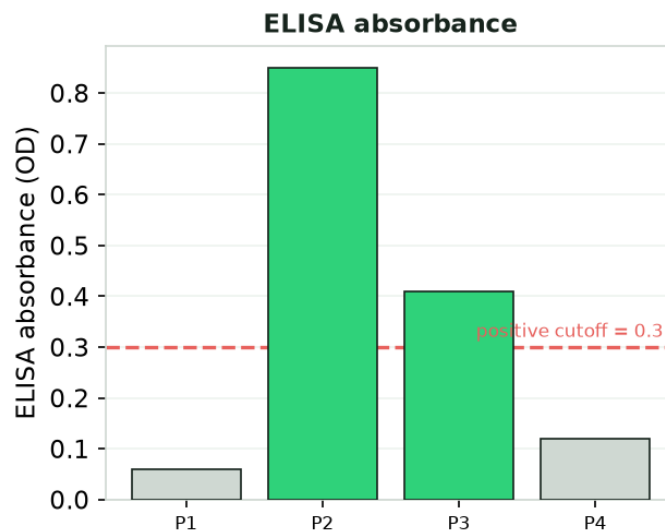
Medical Interventions (Genetics of Disease) · Unit 1 — How to Fight Infection · Modeled on the PLTW Guided Review format

Vocabulary to know cold

Term	Definition
Pathogen	A disease-causing agent (bacterium, virus, fungus, or parasite).
Antigen	A molecule (often on a pathogen) that the immune system recognizes as foreign.
Antibody	An immune protein that binds a specific antigen; the basis of ELISA detection.
ELISA	Enzyme-Linked Immunosorbent Assay; a color/absorbance test for a specific antigen or antibody.
Absorbance (OD)	How much light a well absorbs; higher OD = more signal. Compared to a cutoff to call positive/negative.
PCR	Polymerase Chain Reaction; amplifies a specific DNA sequence through repeated cycles.
Denaturation / Annealing / Extension	The three PCR steps: strands separate, primers bind, new DNA is synthesized.
Primer	A short DNA piece that marks where copying starts; defines the target.
NTC (No-Template Control)	A PCR reaction with no DNA added; should show NO band. A band = contamination.
BLAST	A database tool that compares a sequence to known sequences to identify an organism/gene.
Aseptic technique	Sterile lab practices that prevent contamination of samples and cultures.

Worked examples (follow the reasoning)

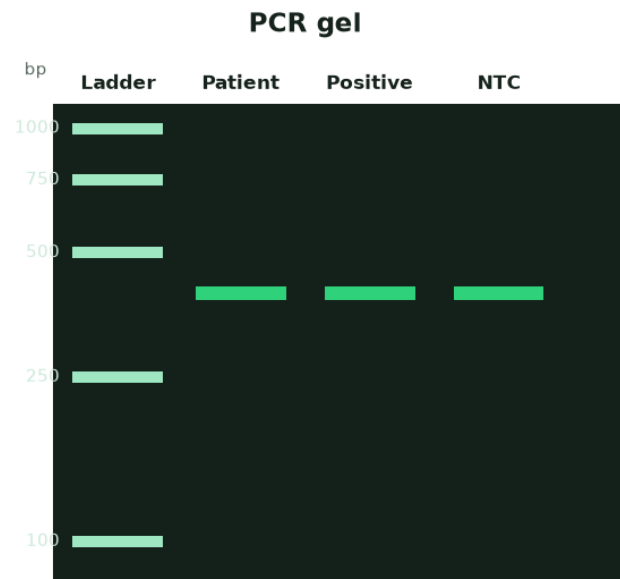
Example 1. Four patients are screened by ELISA with a positive cutoff of 0.30. Which patients are positive, and how do you know?



- Find the cutoff line (0.30, dashed).
- Compare each bar to the cutoff.
- P2 (0.85) and P3 (0.41) are at/above 0.30 → positive.
- P1 (0.06) and P4 (0.12) are below → negative.

Answer: P2 and P3 are positive because their absorbance is at or above the 0.30 cutoff.

Example 2. A lab runs PCR on a patient sample, a positive control, and an NTC. The patient and positive both show a 400 bp band; the NTC also shows a faint 400 bp band. What does the NTC result mean?



- Recall: the NTC has NO template DNA, so it should show NO band.
- A band in the NTC means DNA got into a reaction it shouldn't have.
- That is contamination — so the run is not trustworthy and should be repeated.

Answer: The NTC band indicates contamination; the results are invalid and the PCR must be repeated.

Practice questions (with reasoning)

1. Which step of PCR uses primers binding to the template?

- A. Denaturation
- B. Annealing
- C. Extension
- D. Ligation

Answer: B. Annealing is when primers bind the single-stranded template before extension.

2. A patient does not improve on antibiotics. The infection is most likely:

- A. Bacterial
- B. Viral
- C. A fracture
- D. Dehydration

Answer: B. Antibiotics treat bacteria, not viruses; no response points to a viral cause.

3. Why is BLAST run after sequencing a pathogen's DNA?

- A. To copy the DNA
- B. To identify the organism by matching known sequences
- C. To stain the gel
- D. To measure temperature

Answer: B. BLAST matches the unknown sequence to databases to identify the most likely organism.