Station 2: The Mutant Strain – Evolution, DNA, & Mutation

- **Case File:** The Mutant Strain – Subject 47 & Subject 48
- **Genesis Biotech Classified Report**
- **Location:** Genesis Biotech Quarantine Lab – Sector 4
- **Date:** 72 Hours Post-Infection Event

Case Study: Subject 47 & 48

Message from Dr. Cross:

"These two patients are the key to everything. One turned within hours—the other never showed symptoms at all. Their DNA holds the answer. I need you to analyze their genetic sequences and figure out why one succumbed while the other survived. If we don't, the virus will adapt faster than we can stop it."

Subject 47 – The Survivor
Profile Summary:
Name: Elijah Reyes
Age: 21
Sex: Male
Height: 6'1" (185 cm)
Weight: 185 lbs (84 kg)
Preexisting Conditions: None recorded

- **Medical History:** Exceptional immune response, history of minor seasonal allergies (controlled)
- **Athletic Status:** Former collegiate soccer player, high cardiovascular endurance
- **Dietary Habits:** High-protein diet, plant-based nutrients, hydration focus

Symptoms Post-Exposure to Lazarus Virus:

- **Hour 1:** No reaction, normal vitals.
- **Hour 6:** Elevated heart rate, slight fever (99.8°F).
- **Hour 12:** Fever drops, vitals stabilize, immune markers show enhanced response.
- **Hour 24:** No signs of infection, immune system neutralizes virus.
- **Hour 48:** Remains fully functional, viral load undetectable.

Key Anomalies in Genetic Profile:

- Mutation present in chromosome 6, affecting immune response genes.
- Increased T-cell activity and cytokine response upon viral detection.
- Higher antibody production rate compared to average population.

"Subject 47 never turned. His body treated the Lazarus Virus like the common flu and eliminated it. If we can figure out how, we might be able to replicate this immunity. But we have to hurry—mutation rates in the virus are accelerating."

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Subject 48 – The Rapid Infection

📌 **Profile Summary:**

- **Name:** Lisa Carter
- **Age:** 27
- **Sex:** Female
- **Height:** 5'4" (162 cm)
- **Weight:** 150 lbs (68 kg)
- **Preexisting Conditions:** Asthma (mild), previous immune suppression due to long-term steroid medication use
- **Medical History:** Frequent respiratory infections, history of anemia
- **Athletic Status:** Office worker, sedentary lifestyle, low cardiovascular endurance
- **Dietary Habits:** High-carb, processed food intake, low protein consumption

Symptoms Post-Exposure to Lazarus Virus:

- **Hour 1:** Immediate fever (101.2°F), rapid pulse.
- **Hour 3:** Muscle weakness, disorientation, labored breathing.
- **Hour 6:** Skin pale, sweating profusely, white blood cell count dropping.
- **Hour 12:** Complete neurological deterioration, loss of higher cognitive function.
- **Hour 24:** Aggressive behavior, loss of coordination, full transition into infected state.

Key Anomalies in Genetic Profile:

- Mutation detected in chromosome 6, but this mutation reduces immune efficiency.
- Lower cytokine production, leading to delayed immune response.
- Increased virus replication rate in cells due to weakened metabolic defenses.

"Subject 48 never stood a chance. The virus tore through her immune system like it wasn't even there. By the time we detected the mutation, it was too late. If the virus keeps spreading, more people like Subject 48 will turn instantly. We need to act now."

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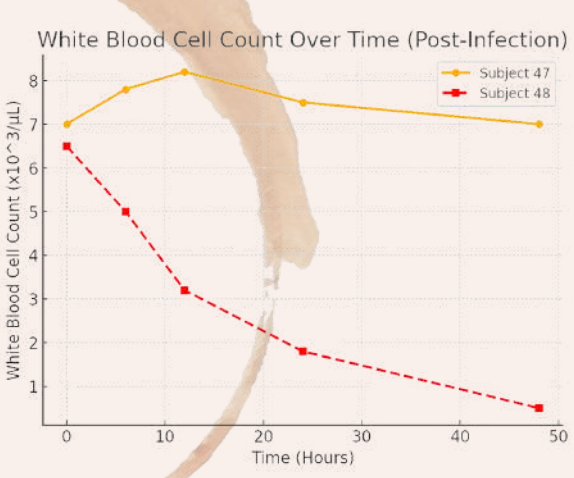
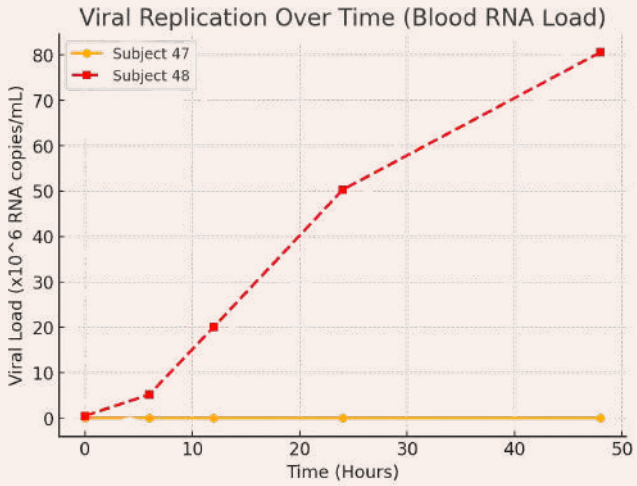
Student Challenge: Lazarus Virus Biological Analysis Report

Your Mission:

Analyze the Genesis Biotech Lab Data and use your knowledge of DNA, the Cell cycle, Viral replication, and body systems to answer the following questions. Your findings may hold the key to stopping the Lazarus Virus before it spreads beyond containment.

Lab Test Data:





Mitosis Phase	Subject 47 (%)	Subject 48 (%)
Interphase	70	40
Prophase	10	20
Metaphase	8	15
Anaphase	7	15
Telophase	5	10

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Graphical Analysis for Student Interpretation

- **White Blood Cell Count Over Time:** Subject 47 maintains WBC levels (strong immune response).
- **Subject 48's WBC count plummets,** leading to total immune system failure.
- **Viral Replication Over Time:** Subject 47 shows no viral replication, meaning the immune system successfully neutralized the virus.
- **Subject 48's** viral load skyrockets, leading to rapid infection and transformation.

White Blood Cell & Immune System Response:

1. **What does the WBC graph suggest about the difference in immune function between Subject 47 and Subject 48?**
2. **Why does Subject 48's WBC count drop so drastically?**
3. **How does this data support the idea that Subject 47 has a mutation for immune resistance?**

Viral Replication & Infection Rates:

1. **How does the difference in viral load between the two subjects explain their outcomes?**
2. **What does this data tell us about how fast the virus mutates in an infected host?**

Cell Cycle & Viral Spread:

1. **According to the mitosis phase data, why is the virus more successful in Subject 48's cells?**
2. **How does the cell cycle affect how quickly the virus spreads in different tissues?**
3. **Why do nerve cells (which rarely divide) show little to no infection?**

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DNA Structure & Mutation Analysis – Chromosome 6 Investigation

Mission from Dr. Cross:

"We've sequenced part of Chromosome 6, and I've identified two mutations—one in Subject 47 (immune survivor) and one in Subject 48 (rapid infection). Your task is to analyze the DNA sequences, determine how the mutations affect protein synthesis, and classify the mutation types. This could be the key to unlocking immunity!"

Background Questions on DNA Structure & Function

1. **Describe the structure of DNA. What are its components (nucleotide bases, backbone, shape)?**
2. **How does DNA replicate? When does replication occur in the cell cycle?**
3. **Why is DNA replication necessary before mitosis and meiosis?**
4. **What is the role of mRNA in protein synthesis?**
5. **What happens if a mutation occurs during DNA replication?**

Experimental DNA Data from Subject 47 & 48

Normal (Healthy Individual) **DNA Sequence** – **Chromosome 6** (27 Codons)

ATG-GCA-TTC-GGG-CTT-ACC-GGA-AGT-TGC-CAA-CTG-TTT-AAG-GCC-TCG-ATA-ACC-GGG-TTA-TCC-GGT-ACT-CGA

Subject 47 (Mutation)

ATG-GCA-TTC-GGG-CTT-ACC-GGA-AGT-TGC-CAA-CTG-TTT-AAG-GCC-TCG-ATA-ACC-GGA-TTA-TCC-GGT-ACT-CGA

Subject 48 (Mutation)

ATG-GCA-TTC-GGG-CTT-ACC-GGA-AGT-TGC-CAA-CTG-TTT-AAG-GCC-TCG-ATA-ACC-AGG-TTA-TCC-GGT-ACT-CGA

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Student Challenge: Lazarus Virus Biological Analysis Report

Part 1: Identify Mutations

1. **Compare the sequences. What single base-pair change occurred in each subject?**
2. **What kind of mutation is found in Subject 47's DNA?** Explain why this mutation does not change the protein structure.
3. **What kind of mutation is found in Subject 48's DNA?** How does this affect the amino acid sequence and protein function?
4. **What is the difference between a silent mutation and a missense mutation?**

Part 2: Cell Cycle & Mutation

1. **When in the cell cycle would these mutations have occurred?** Would they happen in mitosis, meiosis, or both?
2. **How could Subject 47's mutation have helped them resist the virus while Subject 48's mutation made them more vulnerable?**
3. **What happens if a mutation occurs in DNA replication?** How does the body normally fix these errors?
4. **If Subject 47's mutation became widespread, how might this affect human evolution over generations?**

"These mutations are proof that evolution is happening right now. The virus is changing, but so are we. Some will survive, some won't. The next step is understanding how the virus takes over eukaryotic cells. Move to the next station to investigate cellular warfare."

Next Stop: Station 3 – Cellular Warfare: Why the Virus Targets Eukaryotic Cells