

## **Case Study 2 Part 2**

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### **The Mystery of the Seven Deaths: A Case Study in Cellular Respiration**

#### **Part I - The Symptoms**

**1. Are there any similarities or connections between these seven individuals? What questions would you want to ask the families to answer these questions?**

1. We believe, yes, there are similarities between these seven individuals. They all appear to have had similar symptoms prior to death.
2. We would ask the following questions:
  - Did the patient take Tylenol?
  - If so, when?
  - What symptoms did they have prior to death?
  - When did those symptoms start?
  - Did they drink the tap water?

**2. In your opinion, are these seven deaths connected? Why or why not?**

We do believe these seven deaths are connected. We know that four of the patients lived in the same neighborhood. They all had similar symptoms. It is still however, unclear if the other three patients in fact live in the same neighborhood.

#### **Part II - Autopsy Report**

**1. Recalling your knowledge of the function of organelles, what function of the cells was interrupted in these patients? Could this loss of function lead to the death of these individuals? Why or why not?**

We believe the mitochondria of the cells were damaged. Because of the mitochondrial breakdown, the heart and lungs became weakened. This weakening caused a decrease in the bodies ability to properly filter and disperse oxygen throughout the body.

**2. Given the data in the autopsy, were there any reports that seemed inconsistent with the immediate cause of death?**

We think there are some inconsistencies. The cause of death was hypoxia, however, the autopsy report showed increased levels of oxygen in the blood. That is not consistent with hypoxia; hypoxia normally causes low levels of oxygen in the blood and tissues.

**Part III - Subcellular Metabolite Analysis**

**2. Are there any abnormalities in the levels of these metabolites in the victims? Develop a hypothesis about which pathway may be affected based on these abnormalities.**

Yes. NAD<sup>+</sup> is significantly low. NADH is significantly high.

**3. Explain your reasoning for your hypothesis.**

NAD<sup>+</sup> is low because the lungs are not able to disperse the oxygen properly. NADH is high because NAD<sup>+</sup> is not oxygenated. This would impact the lung pathway causing hypoxia.

**Part IV- Role of Cyanide**

**1. What affect would cyanide have on the electron transport chain and the production of ATP? Explain your answer.**

The cyanide prohibits the transport of electrons through the cell membrane which would interrupt the electron transport chain which in turn would not allow ATP production causing mitochondrial death and thus, causing tissue death.

**4. Looking back at the information you have about the people before they got sick, can you suggest a possible source of the cyanide poisoning? How should public health officials and police respond to this tragedy?**

We have a few thoughts on a possible source. If they are in fact in the same neighborhood, it could be from the water source or potentially a gas leak. Our initial thought was the Tylenol. More research is definitely needed to make a conclusion.