

The Mystery of the Toxic Flea Dip* – Be the first to solve the case!

The Case:

You're working at the medical examiner's office at Mass General Hospital in Boston. It has been a particularly light day, with only one homicide and a dead chipmunk that you checked over for rabies. The chipmunk didn't have rabies, and you are ready to go home. Just as you're leaving, you get a call from your secretary. "Francesca," he says. "We've got a kid up here that you'll want to look at right away. Might be foul play."

Thinking of your four year old daughter waiting for you at home, you grimace. "Ok Jon. I'm heading to the morgue." Performing autopsies on kids is the least favorite part of your job. But you are paid to solve medical mysteries, and it looks like you've got one here.

In the morgue, you find the report from the hospital. Glancing over it, you notice a narrative of the girl's last hours and read it carefully:

At 10 am, mother returns home from the store to find girl vomiting, not feeling well, and sleepy. Mother put girl to bed. Ten minutes later, she noticed that the child's breathing became irregular and slow. She tried to wake her daughter but was not able to do so. The child became comatose. At noon, the girl was admitted to the hospital, with no heartbeat or spontaneous breathing.

A police report states the following:

The parents discovered that the girl had been giving her dog a bath using a flea dip called Fleacide. According to the label on the container, Fleacide is an insecticide made of only plant material and appropriate for external use on animals.

You **request to see the label of the bottle.**

You think about the information stated in the narrative and police report, examine the bottle of Fleacide, and begin to complete the dreaded paperwork required in every investigation. While you don't have all of the information yet, you can start to piece the mystery together.

1. Is there anything in the flea dip that could have killed the girl? What could it have been?
2. If the flea dip is the cause of death, how could a product that is normally harmless to humans and pets have killed the girl?

After your initial observations, your next step is always to **request the autopsy report.**

After examining the autopsy report, and thinking back to your knowledge about the functions of different cellular organelles, you are able to answer a few more questions.

3. What process in the girl's cells did the Fleacide affect?

Names _____ Section _____ Date _____

4. Why were tissues of many different organs affected?

You still need more specific information, and decide to **request a more detailed analysis of the girl's cells**. From this information, you are able to determine:

5. What cellular process (or processes) was impaired by the fleacide?

The scientist who performed the cellular analysis informs you that he can do a more detailed analysis of subcellular components in the heart cells of the girl, if the information would help in your investigation. You authorize him to do the analysis, and then **request the subcellular component data** from him the following day.

After examining the data, you wish that you had requested this analysis immediately. It contains all of the information you need to solve the mystery, and you are able to complete your report.

6. Given this new information, what specific cellular process do you think was affected by the Fleacide? What information supports your belief?

7. Some health food stores sell supplements containing NAD⁺. If you administered the supplement to the girl, could you have saved her? Why or why not?

8. Would artificial respiration or oxygenation have saved the girl? Why or why not?

Ingredients:

Ethereal oil of cinnamon
Ethereal oil of cloves
Ethereal oil of fir
Ethereal oil of rosemary
Rotenone (pure)

Natural Product – Non Toxic

FLEACIDE

Flea Dip

Only the Best for your dog!

New and
Improved!!

Instructions: Add 1/2 cup per bathtub full of water. Dunk your dog. Rinse. Repeat if necessary.

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Autopsy Report

- The girl died within two hours of first vomiting
- Immediate cause of death was hypoxia (lack of oxygen)
- Tissue sections from the kidneys, lungs, thymus, and heart show massive cell death
- Staining with cellular dyes indicates that the mitochondria within the affected tissues were damaged

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Subcellular Analysis

Key Highlights:

Component	Autopsy Finding (micromol)	Normal Levels (micromol)
Glucose	102	100
Pyruvate	23	25
NAD+	6	75
NADH	383	50

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