



# The Hot Tub Mystery: The Story of a Very HOT Tub

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## Part I—The Discovery

### *Cast of Characters*

- Sam Garrison—Detective
- Roma and Clint Underhill—The *hot* couple
- Kavita Dickson and Larry Gonzales—EMT paramedics
- Renee Volenbach—Physiologist in the Biology Department at Noletown University

### *Friday, 7PM*

Roma and Clint Underhill had both had a long day. They were the owners of a successful real estate company in Desert Palm. Each had several clients, and the strain of the current real estate market was getting to them. It had been an unusually cool day for January, with temperatures hovering around 60 degrees. On coming home they decided to relax in their hot tub with some wine. While Roma changed from her work clothes, Clint said that he would join her in the hot tub after he took his Lasix.

### *Saturday, 8AM*

“911... Please state your emergency.”

“Oh, Oh, I... I...”

“Ma’am, please calm down and tell me the address.”

“I think..., yes, OK, it’s... it’s 2560 Oak Creek Drive.”

“What is the problem, please?”

“I’m the maid for Mr. and Mrs. Underhill and... and I didn’t find them in the house when I came in this morning, so I looked around outside. I just found them in their hot tub out back. They are under the water. Please come, please come now!”

“Yes, ma’am, I’m alerting the EMTs and an ambulance will be on the way. Please go out front and wait, so the paramedics can find the address quickly.”

### *Saturday, 8:10AM*

Paramedics Kavita Dickson and Larry Gonzales brought the ambulance to a stop at the end of a long driveway next to an impressive two-story mansion. The maid was on the front steps and quickly directed them to the back patio where the hot tub could be seen.

Empty bottles of wine were on the ledge surrounding the hot tub. Kavita quickly climbed up the steps and saw the bodies of the Underhills on the bottom of the hot tub. As she got into the water, she exclaimed, “This water seems really hot. Let’s see if we can get them out.” Larry climbed in after her and together they

dragged the bodies out of the hot tub and onto the patio. It was obvious that both had been dead for some time. Kavita called the dispatcher.

“Listen, Linda, this hot tub case is a DOA, but something is not right. How about sending the medical examiner and a detective out to look the situation over. Tell them to bring a thermometer!”

### ***Questions***

1. What observations did the paramedics make?
2. List the questions raised about this situation or that you think that the investigators should ask of the maid.
3. List any physiological effects that you think would be associated with this situation.
4. How might these physiological effects have contributed to the Underhills' death?
5. Make an initial speculation about the cause of the Underhills' death.



## Part II—The Investigation

### *Saturday, 9:30AM*

“115 degrees! What is this thing doing so hot?” Sam Garrison asked Kavita as he removed the thermometer from the water.

He was investigating the death of Roma and Clint Underhill, prominent real estate brokers in Desert Palm.

“This hot tub should be no more than 109 degrees.”

He remembered reading a Consumer Product Safety Commission flyer on hot tubs and wondered if the tub was associated with the death. The bodies were being taken away for autopsy as he took in the scene.

“Hmm. What about these bottles of wine? It looks like they had a party—all by themselves! The medical examiner will check their blood alcohol level (BAL, or blood alcohol concentration—BAC) and we’ll be able to see his complete report on Monday. We may even be able to determine their cause of death with that information. I’ll ask the maid about any medications.”

He went into the sunroom off of the patio to where the maid was being consoled by another officer.

“Ma’am, can you tell me if the Underhills were taking any medicine?”

“Well, sir, I know he was complaining about having to use the bathroom a lot since he returned from the doctor’s office about two weeks ago. You might look in the cabinet over the sink where they keep aspirin and such.”

Sam looked where she indicated and found a recently filled bottle of Lasix.

### *Monday Afternoon*

Monday afternoon, the medical examiner phoned Sam with the following information:

- BAL of the couple was 0.20
- Roma weighed 120 lbs; Clint weighed 160 lbs
- Time of death estimated at 2AM Saturday morning
- There was a therapeutic level of Lasix in Mr. Underhill’s blood, but none in Mrs. Underhill’s blood

### *Questions*

1. Do you think that the couple died before or as a result of going under the water of the hot tub? Explain your reasoning.
2. What is the effect of Lasix on Mr. Underhill?
3. What is meant by “blood alcohol level” (also know as “blood alcohol concentration”)?
4. What are the general effects of alcohol on the brain? On other parts of the body?
5. How fast is alcohol metabolized?
6. What are the effects of a .20% BAL on a 160lb man and on a 120lb woman?



## Part III—The Final Report

### *Later Monday Afternoon*

Detective Garrison returned to police headquarters and, after reading the medical examiner's complete report, began the process of writing his own explanation of what happened to the Underhills. As he wrote, he thought about all that had happened and began to wonder about the physiology associated with the couple's death. The level of alcohol found by the medical examiner was high but was not necessarily sufficient to cause their death, but was it a contributing factor? Sam knew that Lasix was used to treat high blood pressure and that both alcohol and heat will reduce blood pressure, but he was unsure of the mechanism. He decided to go to Noletown University and talk to Renee Volenbach, a physiologist in the biology department, in her office in the McWhirter Biology building. Renee patiently explained her answer to each of the following questions posed by the detective.

### **Questions**

1. How does the body regulate blood pressure?
2. What were the specific effects of the Lasix, hot water, and alcohol on the couple's blood pressure?
3. What could the body have done to reverse the decreasing blood pressure, if it had been possible?
4. Identify several procedures that might have helped save the couple if they had been found unconscious but still above water and alive.

### **Essay**

Put yourself in the role of Detective Garrison. You must now write a report explaining what Renee might have said with regard to the above questions. You should use all of your knowledge about blood pressure and the information from this case to explain each of the following aspects of blood pressure and discuss their relation to the above questions. Describe the role of the nervous system, adrenal glands, kidneys and pituitary as appropriate to the relation of each of the seven factors listed below:

1. Peripheral resistance
2. Heart rate
3. Venous return
4. Stroke volume
5. Cardiac output
6. End systolic and diastolic volumes
7. Blood viscosity

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