

Filthy Lucre: A Case Study Involving the Chemical Detection of Cocaine-Contaminated Currency

by

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Part I – Busted

Tom Brown raced through the airport to catch his plane. A Landscape Management major at Illinois A&M, Tom was returning to school after Christmas break. He was in a particularly good mood because Grandma Brown had given him \$200 in cash as a Christmas present to spend “on something fun” at school. Tom had tucked the cash into his carry-on, which he held tightly in his hand. “I don’t want to leave this bag out of my sight,” he thought as he pondered ways he could spend the money.

He was suddenly jolted back to reality by a loud voice.

“Sir?”

“Yes,” replied Tom.

“Officer Adams, Drug Enforcement Agency. You’re under arrest. You have the right to remain silent....”

Tom didn’t hear the rest of the words. His mind was racing. “What’s going on here? What had he done?”

The voice of Officer Adams registered again. “Our drug sniffing dogs detected cocaine in your carry-on. You’re under arrest on suspicion of drug trafficking.”

“How could this be,” Tom thought, as Officer Adams led him into a nearby interrogation room. “I’ve never had anything to do with drugs.”

Background

This case study is based on an incident that happened in 1991. Willie Jones, a Nashville, Tennessee, landscaper, was arrested in an airport after dogs detected cocaine in his suitcase. Agents seized the suitcase, which contained \$9,000 in cash. Under the provisions of the Racketeer Influenced and Corrupt Organizations (RICO) Act, the government kept the money. The government argued that since the money was contaminated with cocaine, it must have been used in the commission of a crime, namely drug trafficking. Mr. Jones later sued the government for the return of the money. His defense: cocaine contamination of money is now so widespread that detecting traces of it does not indicate it was used in drug trafficking.

Does Mr. Jones have a case (and, by extension, our friend Tom Brown)? Should the government return his money or not?

Questions

1. What is the Racketeer Influenced and Corrupt Organizations (RICO) Act?
2. Why did Congress enact RICO and what is its intent?
3. Do you think RICO was applied properly in Mr. Jones's case? Why or why not? Can you find other instances where RICO was applied in a court case? Was RICO applied correctly in these cases? Why or why not?
4. What is cocaine? What is its chemical structure? How does cocaine affect the body?
5. How are dogs trained and used to detect drugs? How sensitive are their noses? What are some of the advantages and disadvantages of using dogs to "sniff out" drugs?
6. Mr. Jones's defense in this case was that cocaine contamination is so widespread that the mere presence of cocaine on money is not indicative of criminal activity. How widespread is cocaine contamination in our money?
7. Put yourself in Mr. Jones's defense attorney's place. Design an experiment to determine what percentage of paper currency is contaminated with cocaine. Consider such things as: (1) sampling; (2) the method of analysis to use; (3) what is "contamination"; (4) what level of cocaine in money indicates criminal activity; and (5) how reliable are the results you might obtain from your experiment.
8. What is "sampling"? How do scientists obtain a representative sample from a group?
9. How does money become contaminated with cocaine in the first place?
10. If you were the judge in this case, how would you rule? Why?

Part II – Lab Work

If you have access to a gas chromatograph/mass spectrometer, you can perform the experiment(s) you designed in Part I.

Pre-Lab Work

Experimental methods exist to screen paper currency for the presence of cocaine (i.e., determine if cocaine is present in money or not). Before you begin any experimental work, however, compile a list of questions, or experimental variables, you should consider in order to help you decide if Mr. Jones does indeed have a case. Try to make the list as complete as possible. You do not have to know the answers to your questions, and some of your questions may not be answerable, but try to ask as many as you can. Here are three example questions to get you started in your thinking:

- How many paper bills are in circulation?
- How many do we need to test?
- How do we know we are measuring cocaine in our tests?

There are many more questions that we could ask about this problem. Try to generate as long a list as you can to add to these three.

Experimental Work

An instrument called a gas chromatograph/mass spectrometer (GC/MS, for short) is used to detect cocaine. You may not know what a GC/MS is, but you have probably heard of one. When athletes are tested for the use of banned performance-enhancing drugs, a GC/MS is the instrument used to do the tests.

Your instructor will tell you how much you must know about GC/MS. Here is a brief “big picture” overview of GC/MS for those of you who are not at all familiar with the technique. Gas chromatography (the “GC” part) is a powerful technique used to separate the components of a mixture. Mass spectrometry (the “MS” part) is then used to identify the components of the mixture. A urine sample from an athlete, for example, is injected into a GC. The GC then separates all the proteins, metabolites, drugs, etc., present in the urine into individual components. The individual components are then passed into the MS, which identifies what each component is.

In this project, paper currency will be treated with methanol to extract any cocaine present in the money. The extract will then be injected into the GC/MS, which will determine if any cocaine is present in the extract. Your instructor will tell you the maximum number of bills you can test. (The number will depend upon the size of the class, the time and equipment available, how much money you have, etc.) The procedure for extracting a bill is given below:

1. Roll the bill and place it into a clean vial.
2. Add 2 mL of methanol to the vial.
3. Cap the vial and shake for 1 minute.
4. Using a glass Pasteur pipette, transfer enough methanol to an autosampler vial to fill the vial about three-quarters full.
5. Remove the bill from the vial when you are finished using a forceps.

Results

After all the bills have been extracted, your instructor will run them on the GC/MS. Your instructor will explain how and where you can get the printout of the analysis of your bill. Be sure your class compiles a table of results for the entire class.

Questions

1. Based on the class results, what percentage of paper currency is contaminated with cocaine?
2. How confident are you that the class results represent all paper currency in circulation? Is there some way you could increase your level of confidence?
3. How many bills do you think you would have to test to get a representative sample of all bills in circulation? On what basis did you formulate your answer?
4. Did you observe any patterns to the contamination (for example, based on denomination or geography)?
5. What might you do in order to get quantitative results (i.e., determine how much cocaine was present in your bill)?
6. Based on the results of your experiments, if you were the judge in the Jones case, how would you rule? Why? Has your opinion of the case changed now that you have completed your experimental work?
7. Why is GC/MS the preferred method of choice for determining cocaine?
8. GC/MS is used to test athletes for banned performance-enhancing drugs. What are some of the advantages, disadvantages, and limitations to GC/MS for this purpose?

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