Case – The Suspicious Powder.

Fire Department, Hazardous Materials Technician

John B works for the Fire and Rescue Service. He has twelve years experience, nine in routine firefighting roles and three years in his fire brigade's hazardous materials (HAZMAT) team. John has a variety of experience in the fire service and has worked in urban, suburban, and rural fire stations.

A magistrate in the local courthouse, only 5 minutes away from the fire station where John is based, has received a letter containing a threatening message and an unknown white coloured powder. Unlike some instances in the past, the letter does not claim to contain anthrax, merely that the powder is toxic. The court system has had sporadic problems with nuisances such as fire alarms and bomb threats, in order to delay court cases.

The local police agency has a long-standing arrangement with the hazmat team for assistance in such situations. While there are police assets for use in such investigations, they are many hours away in a major city. It could take half a day or more for a response team to arrive. The police are asking for the support of John's team to determine whether this is a hazardous situation or not. This sort of situation used to cause many hours of chaos, but now that sophisticated technology can be brought to bear on the problem at the incident site rather than days later in a laboratory, most suspicious powder situations can be quickly assessed as low-risk.

While his team are getting their equipment together, John is able to speak on his mobile phone to the adminstrative assistant, who opened the letter. She is in no obvious ill health, other than understandable stress from reading the the threatening letter. John asks her to send him a digital photo of the powder and letter using her smart phone, which she does. This arrives on John's laptop and in turn he uses this to start a new "incident" on his ChemDash software.

Like most well-trained hazmat teams, John's team now has a well-defined algorithm to help them determine if this particular situation represents a hazard to the building or the wider public. The true biological warfare agent hazards, such as viable anthrax spores, can be difficult to exactly identify in field settings with high accuracy, often requiring expensive technology. But existing technology is quite good at identifying nearly everything else that a suspicious powder might be, as well as defining the conditions where a biological agent might actually be present or not.

John dons a disposable coverall, gloves, and a filter respirator. He has a bag of equipment that he will take into the room to assess the suspicious powder. He has a radiation detector, the same photoionization detector (PID) he used at the barrel incident, a wet chemistry kit for checking pH and detecting proteins, and his Serstech 100 indicator. His colleague out in the hallway has a larger, briefcase-sized Fourier Transform Infrared (FTIR) device.

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John approaches the powder, which is on a table. He uses his radiation detector to rule out the presence of radioactivity. (Theoretically, the powder could be a radioactive substance.) He also uses his PID to see if there are any gases or vapours coming off of the unknown powder. Again, this is rare, but a powder could be used to absorb some sort of liquid. Or sometimes nuisance incidents have turned out to be things like pet flea powder, which will have a component that might evaporate slowly. John only sees normal background radiation and detects no volatile organic chemicals from the powder. Use a small sterile disposable plastic spoon, he conducts his simple pH test. The pH is neutral. This does not rule out a biological warfare agent, although a very high or very low pH would be an environment quite unfriendly to microbes.

John now uses another small spoon to do his quick test for the presence of proteins. Microbes (such as bacteria like anthrax) are composed of proteins and biological toxins (such as ricin or botulinum toxin) are actually protein compounds. Interestingly, his protein test is showing no indications of protein. John can now presumptively rule out a serious biological terror incident. But this does not mean that the situation is safe, as we still do not know what the powder may be or if it is something dangerous. Using yet another small spoon, he divides out another small sample of the powder.

Using a laser-based detector, such as the Serstech device, he wants to make sure that if the product is highly flammable or explosive, it does not cause any serious problems. By dividing a small sample and doing the test well away from the rest of the powder, this problem is mitigated. In this case, the concern, although justified and part of a rigorous safety protocol, is not warranted. The spectra of the powder shows that it is sugar. The spectra is nearly a textbook match to the library spectrum for sucrose, common table sugar. John declares the incident is safe. To be on the safe side, he also processes a sample on his FTIR device.

The situation is turned back over to the police. The powder and letter will be examined again in the police crime laboratory. To assist that forensic evaluation, John finishes in putting data into the ChemDash incident report. Later that afternoon, he emails a report from ChemDash to the forensic laboratory. An astute police department will have ChemDash to help manage such incidents and will be able to upload the information into the incident log.