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Arizona Department of Public Safety



And Phoenix Police Department

Oleoresin Capsicum Staff Study

Completed March 2003

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Executive Summary

The Arizona Department of Public Safety Training Bureau and Phoenix Police Department Training Bureau studied Oleoresin Capsicum (OC) sprays to determine if the departments were carrying the safest and most effective product on the market.

This study revealed that the product Punch II, currently carried by both departments supply is flammable, contains carcinogens, can only be sprayed in an upright position, and has a shelf life of only three years.

Flammability is a concern with the use of electronic energy devices such as the Advanced Air Taser, which are in common use, or other unforeseen sources of ignition. The City of Phoenix Industrial Hygienist has determined that the current product being carried contains chemicals that are carcinogenic. The current product carried can only be sprayed with the can in an upright position which is impractical in a dynamic confrontation. Our current product's three year shelf life expiration requires frequent purchasing and replacement.

Sabre Red, Bodyguard LE-10, Def-Tec Pepper 10, and Punch III were the four water-based products included in this study. Punch III, the water-based version of the current Punch II, was determined to be linked to liver cancer and was eliminated from the study prior to exposing any participants.

The three remaining products were tested for flammability, health concerns, and tactical deployability and shelf life. None these sprays were flammable or carcinogenic, all had an extended shelf life, however only one product could be sprayed at any angle. Surveys collected from the study's participants who were exposed to the products indicated that the performance levels of the test products were equal to or better than the current product in use.

The recommendation based on this study is that the department begin purchasing and issuing Sabre Red OC spray. Sabre Red is non-flammable, non-carcinogenic product, which has an extended shelf life, and is the best tactical spray of the group.

Problem Statement

The current Oleoresin Capsicum solution (Punch II) being carried by department personnel has not been reevaluated since 1996. Over the past five years the national standards have changed and great improvements have been made in the industry. We have four distinct problems with the current Oleoresin Capsicum (OC) that is being issued to department personnel.

1. Flammability: The Oleoresin Capsicum solution currently being carried by the personnel on this department is an oil-based solution with isobutane and propane as propellants. The entire solution is extremely flammable. Additionally, some units within the department are using less lethal electronic devices (M-26 Air Taser). If an Officer deployed Oleoresin Capsicum (using the current solution carried) and then deployed an Air Taser against the same suspect, the results could be deadly as the suspect may be ignited and seriously burned. Attached is a letter from the National Tactical Officer Association reference an incident that occurred where NYPD Emergency Services Unit ignited a suspect which resulted in 2nd degree burns to his hands, arms, face and neck.
2. Prolonged Decontamination: The current Oleoresin Capsicum solution is an oil-based product. The problem involves decontamination of the suspect, as the practice is to use a non-oil based soap and water solution to wash the effected area. Using soap and water to wash away oil is an extended procedure.
3. Product Effectiveness: The current Oleoresin Capsicum solution is reported to contain .675% capsaicin. Capsaicin is the active ingredient in Oleoresin Capsicum that causes the topical burning feeling on the skin, involuntary eye closure and respiratory compromise. The concentration of the solution is extremely important for the product to work properly. Unfortunately, manufactures of oleoresin capsicum and self-defense weaponry employ few, if any, analytical measures to determine the concentration of active ingredients in the product and to ensure consistent chemical composition.
4. Toxicity: The current Oleoresin Capsicum solution is mixed with strong industrial solvents that are not only flammable, but very toxic if ingested. The national standard is for the solution to be a food grade product. The current product that department Officers are issued was found by the City of Phoenix Industrial Hygienist to contain carcinogens that have been linked to cause liver cancer.

Research Background

For a number of years the Department of Public Safety has employed a less than lethal force option known as Oleoresin Capsicum (OC) spray. This spray is made using the oil from the cayenne pepper. It is suspended in some type of a base solution and then has a propellant that allows delivery of the agent by an aerosol spray. Currently the "Punch II" brand of OC spray is issued to the Officers on both the Arizona Department of Public Safety and the Phoenix Police Department. OC has proven to be an effective tool in certain situations.

The Arizona Department of Public Safety is constantly looking for new technologies and methods to improve performance and professionalism. Less lethal tools play an important part in the Arizona Department of Public Safety's use of force options. Within the last year the Arizona Department of Public Safety and the Phoenix Police Department began the acquisition of an electrical energy device called the Advanced Air Taser. This device fires two tethered probes at an individual and then delivers electrical current along those tethers. The 26 watts of electricity can capture skeletal muscle tissue and override the central nervous system and incapacitate a suspect for a short period of time.

The Arizona Department of Public Safety and Phoenix Police Department anticipated the advent of the Advanced Air Taser would alter the type of OC spray the departments currently use. The current OC spray is an oil-base solution that contains alcohol. The problem exists when electrical sparks from the Advanced Air Taser or any other ignition source cause the OC spray to ignite. Suspects exposed to OC spray are at risk of catching fire when exposed to any ignition source. The short term solution for this was that the current Taser training for both departments states that if an individual has had OC deployed against them that a Taser will not be used. With these concerns in mind the Arizona Department of Public Safety's Training Bureau in conjunction with the Phoenix Police Department's Training Bureau began testing non-flammable OC sprays in order to come up with a long-term solution to these problems.

Beginning in early 2002 members of the Arizona Department of Public Safety's Training Bureau and Phoenix Police Department's Training Bureau began their assessment of non-flammable OC sprays. The Officers conducting the study were Officer G. H. "Bud" Clark from the Arizona Department of Public Safety and Officer Mark Stratton from the Phoenix Police Department. They collected samples of non-flammable OC products from a variety of companies, including Def Tec, Sabre, Bodyguard, and Punch III. Punch III was eliminated from the study by the City of Phoenix Industrial Hygienist as it was found to contain large amounts of carcinogens. The three remaining OC products were also examined and the carcinogen problem did not exist with those products.

Study Results

Over the course of this study approximately 130 people were subjected to the three OC sprays. It is a standard part of the Arizona Law Enforcement Training Academy curriculum to subject recruits to the effect of OC spray. This training allows them to become familiar with the effects of the spray and learn that it is possible for an individual to fight through the effects of the spray. The recruits are typically sprayed and then required to perform a series of tasks, including: shielding themselves, protecting their firearms, delivering strikes, creating distance, identifying a possible threat, giving commands, and communicating on the radio. Normally the recruits are sprayed with the type and brand of spray that they would actually be carrying on the streets. For the purposes of testing however, Phoenix and Department of Public Safety (DPS) recruits were sprayed with one of the three brands being evaluated. A few individuals going through defensive tactics training for the Department of Motor Vehicles and individuals attending a defensive tactics Instructor course were also sprayed. Over the course of the study approximately 130 people were subjected to the three OC sprays. It should be noted that each individual was sprayed with only one brand of spray and no one was required to be sprayed with each of the OC products.

All individuals were sprayed from a distance of 10 feet with a 1 second burst of OC sprayed at the forehead area. After individuals were exposed they completed the required tasks and Officers Clark and Stratton observed the participants to determine product effectiveness. The test subjects were asked about the effectiveness of the product and asked to determine a time of maximum effect. The study also sought to identify a clear leader in decontamination, by documenting the amount of time between exposure and decontamination. During the study, the dominant effect of the OC spray was topical burning sensation on the skin. Involuntary eye closure was a secondary result that was observed. The least effect observed was respiratory difficulty.

In general the effects of OC spray on an individual depends on a variety of factors. These factors can include, mind set, level of intoxication or the individual's ability to withstand pain. Due to the fact that some of these factors are subjective it was impossible for our study to produce clinical results regarding effectiveness. What was clear to the evaluators was that each of the product's effectiveness was consistent with the results that we currently can expect from our existing OC spray (Punch II).

After determining that all of the tested products were consistent with our current level of OC spray, two other factors were considered: 1. Quality control, and 2. Tactical deployment.

- Quality Control - One of the brands assures more consistency with its OC spray in regards to the spray's strength. The Sabre brand utilizes a lab to test the capsaicin amount in each batch of spray produced. Sabre owns it's own high pressure liquid chromatography (HPLC) testing unit to analyze the capsaicin amount in each batch produced. The quality control procedures for Def-Tec and Bodyguard were not disclosed to us during this study.
- Tactical Deployment - The Sabre brand OC spray utilizes a delivery system that enables the spray to be utilized regardless of the angle of the can. This provides an enormous advantage

during a dynamic and dangerous physical encounter with a suspect. Def-Tec and Bodyguard stopped spraying product when not held in the upright position.

To test product flammability Officer Clark used the following procedures. A target was placed in an outdoor environment with an Advanced Taser target taped to the target frame. A t-shirt was attached over top of the Taser target and each OC spray was sprayed on a clean t-shirt for approximately 3 second burst. A second 3 second burst was sprayed and simultaneously the Advanced Air Taser was fired. The only OC spray that ignited was the oil-based (Punch II) currently carried by the respective departments. All three of the sprays in the study passed the flammability test.

Professor Crouch of the University of Utah recently conducted extensive testing on Oleoresin Capsicum Defense Sprays. A summary of his findings is published in the Journal of Forensic Sciences, May 2001 in the article titled, "Quantitative Analysis of Capsaicinoids in Fresh Peppers, Oleoresin Capsicum and Pepper Spray Products." The following points are the important facts covered in the article.

1. Capsaicinoids are the active and pain producing components of the Cayenne pepper.
2. Capsaicinoid variability was observed among products from different manufacturers as well as from different product lots from the same manufactures.
3. "Variability explains why pepper sprays have been shown to be only 70% effective in discouraging attacks by aggressive individuals."
4. "Scoville Heat Unit values were sometimes overstated by a factor of > 100 times the actual product level."
5. "Variability could alter potency and ultimately jeopardize the safety and health of users and assailants."
6. Manufactures of oleoresin capsicum and self-defense weaponry employ few, if any, analytical measures to determine the concentration of active ingredients in the product and to ensure consistent chemical composition.

Oleoresin Capsicum spray strength is measured by a scale called Scoville Heat Units. The strength of a spray based upon Scoville heat units can change even when the formula utilized is the exact same for each batch produced. This change occurs because the strength of the cayenne peppers used can vary from harvest to harvest.

Recommendation

In order to effectively address and solve all four of the issues presented in the Problem Statement of this staff study, I recommend that the department change the issued Oleoresin Capsicum to the water-based solution Sabre Red.

Benefits to the Department

The benefit to the department is liability reduction and long-term financial savings related to:

1. **Non-Flammable Contents** : Sabre Red is water-based and will not put suspects or officers at risk of being burned.
2. **Decreased Decontamination Time** : Because Sabre Red is water-based, its decontamination time is less than that of our current OC spray. Reduced decontamination time reduces the risk of sudden in custody death syndrome.
3. **Product Effectiveness** : Sabre Red has documented and guaranteed concentration quality control performed at the point of manufacture, Security Equipment Corporation.
4. **Non-Toxic**: Sabre Red was determined by the City of Phoenix Industrial Hygienist to be safe for use on suspects and did not contain carcinogens.
5. **Financial Savings** : The proposed product has an increased shelf life that would extend the length of use in the field in which we would not have to replace unused canisters as often.
6. **Level III - 1.33% Major Capsaicinoids**: At 1.33% Major Capsaicinoids, Sabre Red doubles the OC strength of our current spray. Sabre Red provides the Department of Public Safety Officers with the greatest chance of gaining control of a “goal oriented” or alcohol and/or drug induced subject via usage of only their defense spray. By reducing use of force escalation, Sabre Red will also reduce injuries and liability.