

The use of the PDQ (Paint Data Query) database along with other resources to provide vehicle information for hit and run fatalities within Virginia

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ABSTRACT

Developing an investigative lead from the scene of a hit and run fatality with no witnesses has long been a difficult task for investigators. Often there are very few or no visible clues left behind. It becomes the task of the Trace Evidence Examiner to attempt to recover minute paint particles from the clothing of deceased pedestrians and use those particles to provide as much information as possible to the investigator.

Several case examples will be presented to illustrate that when detailed information is provided to the investigator, it takes less time and effort for the investigator to recover a suspect vehicle. The first case presented will show the use of PDQ to develop very general information about a suspect vehicle. In this case, the characteristics of the paint and searches of PDQ indicated that the paint was from an older vehicle. Only a general year range and the make of the vehicle were determined. No suspect vehicle has been located using this information. The second case presented will show somewhat broad make, model and year range information developed from PDQ, which also did not result in a suspect vehicle being identified. The paint in this second case was present in the form of a smear at the scene. The third case presented will show make, model and year information developed from PDQ that did assist in locating the suspect vehicle. This example will illustrate how “holes” in the database can affect searches but that key information can still be provided to investigators. The final case presented will show how PDQ and other resources can be used concurrently to

develop very specific information regarding a suspect vehicle. In this case, the very specific information allowed the investigators to narrow the pool of possibilities to a very few and to locate the suspect vehicle very quickly after the information was relayed from the laboratory. In these last two case examples, the laboratory information from the recovered paint was the instrumental investigative lead that allowed these cases to be solved. In addition to the evidence recovered and suspect vehicle information provided to the investigators, the search strategies used in these cases, including the role of the PDQ Maintenance Team, and the subsequent comparisons to the suspect vehicles will be presented.

INTRODUCTION

The implementation of the Paint Data Query (PDQ) (1) and its supporting resources has significantly improved the capability of the Virginia Department of Forensic Science to determine the automotive source of paint recovered from the scenes of hit and run fatalities. Four cases involving fatalities will be discussed that highlight the range of information obtained from the paint in these cases. Two of these cases may not have been solved had these resources not been available. Minute paint particles were recovered from the scene or clothing in each of the four cases. The circumstances of each incident are outlined as follows :

CASE 1 – A 57-year old Virginia man was riding his bicycle when he was struck and killed by an unknown vehicle. The victim's clothing and bicycle were submitted to the lab for analysis. The investigator also relayed that the bicyclist had been involved in

three previous accidents involving automobiles. The color of two of those vehicles was unknown.

CASE 2 – A woman was murdered in one jurisdiction and transported by automobile to a different jurisdiction where the body was dumped under an Interstate highway bridge.

Present near the body was a parking area which contained a wooden railroad tie used as a parking barrier. The wood appeared to have fresh damage and contained apparent paint smears. It was believed that the suspect vehicle had scraped across the wood during the dumping of the body. The damaged wood was submitted to the laboratory to determine if suspect vehicle information could be determined.

CASE 3 – A 29-year old Virginia man walking alongside a road at night was struck and killed by an unknown vehicle. Several automotive lens fragments and a hat were recovered from the scene. At autopsy, the medical examiner recovered several automotive paint particles. These and the victim's clothing were submitted to the laboratory for analysis.

CASE 4 – A 53-year old Virginia man was walking his dog in the early morning hours. Police responded to a call involving this man lying in the roadway. Their investigation revealed that an unidentified vehicle hit and dragged this man more than 200 feet. He died from injuries sustained by this incident. No witnesses were present and the police did not have any other leads regarding the suspect vehicle. A gold metallic painted plastic fragment recovered from the scene and the victim's clothing were submitted to the laboratory for analysis.

MATERIALS AND METHODS

Each of the four cases was approached the same way. The first step involved attempting to determine information from any lens fragments/painted plastic fragments found at the scene. Next any bicycle or other hard object was visually and microscopically searched for transferred paint using an illuminated magnifier as well as an Olympus Stereozoom microscope with 9–110x magnification. The final step was to document, visually search and then scrape the victim's clothing over clean, white, butcher paper. The debris collected from the scraping was collected and searched using a stereomicroscope. Any recovered automotive paint was isolated for further analysis. In each of these cases, the topcoat color of recovered paint was relayed to the investigator to assist in his investigation while laboratory exams continued to attempt to determine information on the vehicle of origin.

Once automotive paint was isolated, the layer sequence including the color and texture of each layer was determined and recorded. This was done using the Olympus Stereozoom microscope, an Olympus BX-40 microscope (~40-400 magnification), and a number 11 scalpel, as needed. The paint was classified as original finish or repaint. FTIR spectra were obtained for each original finish layer using a diamond microcompression cell and a Thermo Nicolet 6700 FTIR with Thermo Nicolet Continuum IR microscope accessory or a Nicolet Magna 560 FTIR with Spectra Tech IR-Plan Advantage microscope accessory. The spectra were evaluated to determine the chemical composition of the paint and to code the composition for input into the Paint Data Query (PDQ) database (1). As needed, the searches were refined by determining and adding the Munsell color information (2) for the primer surfacer and/or primer layer.

The search results from the Paint Data Query were also evaluated using KnowItAll (3) software to view the database spectra and by comparing the topcoat color from the recovered paint to topcoat colors present in the PPG automotive repaint books (4, 5). The Royal Canadian Mounted Police (RCMP) PDQ maintenance team was used as an integral resource as needed to assist in the evaluation of the spectra and to help narrow the results obtained from the searches.

RESULTS

CASE 1 – Two minute two-layered dark blue metallic paint particles were recovered from the debris obtained by scraping the victim's clothing. Additionally, multilayered white nonmetallic paint particles were recovered from the victim's bicycle. Both of these paints appeared consistent with automotive paint.

FTIR spectra were obtained for each layer of the two paint systems. Initial searches of the Paint Data Query database for the blue metallic paint yielded almost 600 records. Initial searches of the Paint Data Query database for the white nonmetallic paint yielded only two records. Each of these records indicated that the paint was on a black plastic substrate. The plastic substrate of the recovered paint was a light gray color. These two hits were therefore eliminated.

Assistance from the RCMP PDQ maintenance team was requested for both paints. The maintenance team was able to refine the search for the blue metallic paint and reduce the number of hits to 101. The hits were composed almost entirely of Ford and Mercury vehicles. Using the automotive refinish books to compare the topcoat color as well as the layer sequence of the paint (i.e. no clear coat), the best possibility for a vehicle of origin

was determined to be an early to mid 1980's Ford truck or vehicle. The maintenance team was not able to assist in determining a possible vehicle of origin of the white nonmetallic paint on a plastic substrate.

The information regarding both paints was relayed to the investigator. No suspect vehicle has been developed for comparison to the recovered paints.

CASE 2 – Automotive paint smears were present on the wood recovered from the scene. A progression of colors was visible across the smeared area which appeared to contain at least white and three shades of gray paint. FTIR spectra were obtained from these layers and the PDQ was searched resulting in 88 hits. The RCMP maintenance team was consulted and provided the information that the first gray layer was a monotone layer typical of General Motors paint systems and the third gray layer was an antichip layer. They also conveyed that the paint system seemed to be incomplete, missing the e-coat. It was suggested that additional sampling might yield this missing layer.

Several additional paint particles were recovered from the smeared area on the wood and one of these yielded FTIR spectra that were consistent with an e-coat layer. Using this information, it was determined that this paint system may have come from one of three automotive plants and was likely applied between the years 1984-1987. The makes/models reported to the investigator included: one Buick model, two Chevrolet models, two Oldsmobile models and one Pontiac model. No suspect vehicle has been located for comparison.

CASE 3 – Many multilayered blue metallic paint particles were recovered from the debris obtained by scraping the clothing. These particles were consistent with the particles recovered by the medical examiner at autopsy. A laboratory analysis of these

paint particles revealed that they contained the original factory paint system as well as three repaint layers. FTIR spectra were obtained for the original finish layers and the results of analysis entered into PDQ. The original searches yielded over 400 potential hits.

The brown-orange primer surfacer color was matched to the best corresponding color in the Munsell color book (2). This information, in addition to assistance from the RCMP PDQ maintenance team, allowed the number of hits to be narrowed to 17. Two of these hits could be excluded, leaving 15 hits, all from late 1980's to mid 1990's Jeeps made at the Toledo factory. A report received from the RCMP PDQ Maintenance team indicated that 1989-1994 vehicles built at the Jeep Plant in Toledo were a strong possibility. This information, along with the Jeep makes from the plant, was relayed to the investigator. To assist in their search for the suspect vehicle, repaint codes were provided of a matching topcoat color to facilitate the investigators obtaining a sample for preliminary field comparison.

Two months following the release of the report, the investigator called to say that they had developed a suspect vehicle from a crime line tip. The vehicle was being stored under a tarp in the suspect's back yard, had recent body work, new lenses ready to install, and a fresh coat of apparent spray paint. The vehicle, a 1986 Jeep CJ7, was not among the years and models reported, but was manufactured at the Toledo plant.

Nine paint samples from the suspect vehicle were submitted for comparison to the samples recovered from the scene. These paint samples represented numerous layer sequences. A few of these samples contained original finish layers, which matched the corresponding original finish layers on the samples from the scene. The repaint layers

found on the samples from the scene were not represented among these samples.

Subsequent sampling of the vehicle resulted in locating matching repaint layers for comparison to the samples from the scene.

The results of the paint comparison, 4 loci DNA correlation of genetic material recovered from the hat and the suspect, and the persistence of the investigators to obtain statements from passengers in the vehicle the night of the incident, convinced the suspect to enter a guilty plea. He served one year in jail.

Following the comparison of the paint, the PDQ database was searched to locate any vehicles similar to the suspect vehicle. The database did not contain any entries of vehicles made at the Toledo plant in 1986. Only one CJ7 (made in 1985) was present in the database and its layer sequence and spectral information were different from the paint recovered at the scene. The suspect vehicle in this case therefore represents a “hole” in the database.

CASE 4 – Several gold metallic paint particles were recovered from the debris obtained by scraping the clothing. The majority of these particles contained only top-coats, while one very minute particle contained two primer layers and a very limited amount of topcoat. Although the color of the primer surfacer layer was consistent with that typically associated with Ford, the size of the particle made this difficult to confirm. FTIR spectra were obtained for the paint layers and an unusual translucent epoxy deposit located between the primer layers. PDQ searches were attempted, both including and excluding the epoxy deposit/layer.

The RCMP PDQ maintenance team was contacted for assistance with this case to both evaluate the epoxy deposit/layer as well as narrow the number of results from the

searches. The RCMP PDQ maintenance team advised searching the paint sample without the epoxy deposit/layer and that the spectra from this particle and the paint on the plastic fragment were indicating a 1990 or newer Ford product.

The most discriminating aspect of this paint was the unusual looking gold metallic top-coat color. A search of automotive repaint books yielded only one color that closely matched the paint recovered in this case. The color was Aztec Gold Metallic and was only used on 1997 Ford Mustangs (4, 6).

The results of the examination were relayed via telephone to the investigator. The investigator quickly determined that only 11,000 1997 Ford Mustangs were produced in Aztec Gold Metallic. Only two of these vehicles were registered, and had been previously stopped, in the jurisdiction of the offense. Ninety minutes after the make/model/year information was relayed to the investigator, he called back to say that an officer was standing in front of a 1997 Aztec Gold Ford Mustang with scratches on its hood and a piece of painted plastic missing from the flair molding on the left side. The flair molding and paint samples were collected from the vehicle and submitted for comparison to the materials recovered from the scene and victim's clothing. The painted plastic piece was physically fitted together with the flair molding and the recovered paint was consistent with paint samples taken from the suspect vehicle.

Although these results provided some closure to the victim's family, the suspect was deported to El Salvador the day before the information was provided to the investigator.

DISCUSSION

The use of PDQ and its supporting resources have significantly impacted the ability of the Virginia Department of Forensic Science to provide vehicle information to the investigating agencies from automotive paint recovered from the scene and/or clothing of hit and run fatalities or other cases where automotive paint was left behind. Although the information provided to the investigators in the first two cases presented has not yet aided in locating a suspect vehicle, the information provided to the investigators in the last two cases presented proved instrumental in locating the suspect vehicle and subsequently solving the cases.

Automotive paint is not recovered from the scenes or victim's clothing of all hit and run incidents, and occasionally when paint is recovered, it is not suitable for search in the database. However, when suitable automotive paint is recovered, the time and resources spent evaluating and searching the paint proves worthwhile when suspect vehicle information is determined, which assists in solving the case. The investigator is often left with absolutely no leads in such cases, so any information provided from the laboratory, even only color or general vehicle information, may be the key information needed to solve the case.

LITERATURE CITATIONS

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