

M-VAC SYSTEM IMPROVES DNA RECOVERY

A new tool from the United States is now enabling the improved recovery of DNA from difficult surfaces and materials in both quality and quantity. UK forensics expert Bob Milne takes a look at the M-VAC System and the results it has achieved for number of police services stateside.

The standard method for recovering DNA from most exhibits is to use sterile DNA free swabs. It should be noted that sterile swabs as used for medical uses may be sterile but not necessarily DNA free. It is important to ensure that swabs are certified and labelled DNA Free. In any event an evidence recovery swab is an absorbent tip on a small stick and once used is stored in a plastic tube.

This is fine for the recovery of DNA from body fluids or the removal of cells on non-porous surfaces. What about the microscopic traces of body fluids or cells in crevices, in fabrics below the surface? Here swabs can be ineffective and that is why the M-VAC originally designed to recover bacteria from food plants for analysis was utilised in its present form to enable the more effective recovery of DNA.



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scenarios. Both validations however showed a significant increase in performance.

The M-Vac enables the systematic search of clothing, rock and cement, or other porous surfaces and even large-surface sampling from human skin. Both casework and research has shown traditional methods are not as effective as the M-Vac on these substrates.

A recent study by the Philadelphia Office of Forensic Science, was two-fold. In the first part the M-Vac recovered 180 times more than the swabbing of diluted buccal cells from clean cloth swatches.

In the second part of DNA recovery of touch DNA on a variety of substrates the M-Vac recovery was on average 5 times more than swabbing in those

To give readers an appreciation of the effectiveness of the M-VAC system the cases covered in this article include a cold-case whereby useable DNA was recovered from a rough rock used as a murder weapon 18 years ago.

COLD CASE 1995

M-Vac System DNA Collection Device Helps Solve 18 year Old Cold Case

Bluffdale, Utah, 25 September 2013 – The M-Vac sampling device was instrumental in helping solve the 1995 murder of Krystal Lynn Beslanowitch. Utilising the M-Vac's unique wet-vacuum approach, investigators collected enough touch DNA from a rock to generate a full profile and move the case forward.

At the time of the murder 18 years ago, then Detective Todd Bonner was dispatched to the scene and found the body of Beslanowitch, who had been bludgeoned with one of the rocks that lay near her body. Many resources were devoted to solving the crime, but the evidence from the scene would not tell the story. Krystal's case went cold.



Aerial view of the Provo River: M-Vac gave US police critical DNA connections in the Provo River Murder Case in Utah in 1995.

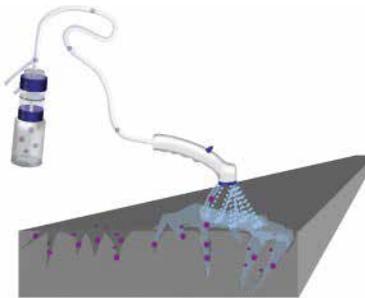
"It's a case that's haunted me for almost my whole career," said Bonner, now the Wasatch County Sheriff. On 17 September 2013, Sheriff Bonner was able to close the loop – he tracked the suspect to Florida and personally put the handcuffs on Joseph Michael Simpson.

Referring to the process of collecting Simpson's DNA from the rock, Cami Green of Sorenson Forensics stated: "In forensics, that's fairly new technology. It is the most sensitive collection method we have at our disposal." Wasatch County worked closely with other police agencies, crime labs and prosecutors from around the State of Utah and Florida to make

the arrest.

"Many officers, analysts and agencies need to be thanked for their part in solving the Beslanowitch homicide." Sheriff Bonner stated, adding: "Without a doubt, the M-Vac system is the major tool that allowed us to make critical DNA connections in this case."

How Does M-Vac Work? The M-Vac uses wet-vacuum principles to cause the DNA material to release from the substrates and then captures the cells. DNA free buffer is sprayed directly onto the surface while simultaneously vacuum is applied around the spray pattern to collect the buffer and suspended particles in the collection bottle.



No Elution: Many sampling methods require elution – removal of the cellular material from the sampling device – which can be problematic if the device is not designed to capture and release. Most sampling devices like swabs are not physically

capable of both. The M-Vac sample is contained in a collection bottle ready for concentration or enrichment, eliminating the elution step.

Patented Collection Method: The M-Vac's patented collection method applies a sterile solution to the surface and simultaneously vacuums up the DNA material from the targeted substrate.

The solution and DNA material are then captured in the attached collection bottle, which is then filtered and sent to the lab for further processing. The filter does not need to be dried or frozen. This unique collection method is both scalable and more sensitive so covering larger surface areas and/or collecting minute amounts of DNA are very feasible.

VALIDATIONS

The M-Vac has been extensively tested by universities, law enforcement agencies, laboratories and other companies.

UC Davis Sexual Assault Oriented Research: Project 2 Comparing the M-Vac to Standard DNA Collection Methods for Large Surface Areas

Conclusions: In some cases, a sexual assault victim will shower before they seek out a forensic exam. If the victim was unconscious during the assault, it may be hard to indicate where the victim was violated by the assailant. The traditional swab technique is limited to a small surface area, but the M-Vac can sample large regions of the body. In this study, the saliva location was known, potentially giving the swab an over-representation in the results. When the saliva location is unknown, the M-Vac would be more effective.

UC Davis Sexual Assault Oriented Research: Project 3 Comparing the M-Vac to Standard DNA Collection Methods for Large Surface Areas

Conclusions: Touch DNA is typically not visible to the naked eye, even with the use of an ALS (Alternative Light Source).

Therefore, using a collection technique that only covers a small area can limit the DNA recovered. Cuttings are typically restricted to a 1cm square fragment, whereas the M-Vac can collect one sample from a much larger area. Compared to cuttings, the M-Vac collects more touch DNA because it is capable of covering a much larger surface area.

In some trials, the cuttings result in little or no DNA; however, the M-Vac is capable of collecting touch DNA. Regardless of the collection method used, more touch DNA is recovered if the contributor has sweaty hands.

SYSTEM SUMMED UP

There is plenty of evidence from users and academic sources substantiating the M-Vac System as an efficient and cost-effective asset that is helping investigators to solve more crime.

Used alongside traditional methods the M-Vac System offers opportunities to recover DNA in situations where the traditional methods could be ineffective.

The results in cold case reviews and in difficult cases such as homicides and sexual assaults are encouraging. The M-Vac gives cases a second chance.

This article was first published in Crime Scene Technology magazine. The author thanks Jared Bradley and the team at M-Vac Systems Inc. for their help and co-operation. For a demo or trial email sales@csiequipment.com call +44-1908-58-50-58 or visit www.m-vac.com/

ABOUT THE AUTHOR

Robert Milne has completed nearly 40 years of service with the Metropolitan Police Forensic Services Directorate, New Scotland Yard, as a forensic practitioner in the roles of ACPO registered fingerprint expert, crime scene examiner, and manager.



He has written and presented on electrostatic mark lifting, the mathematics of scene linking, the crime mapping of forensic evidence, forensic intelligence in arson investigation, the design of self-contained sequential treatment fingerprint laboratories, and on the subject of forensics in intelligence-led policing.

Milne is the inventor of the Pathfinder three-electrode wireless electrostatic dust mark lifter system, used by crime scene investigators worldwide. Since retiring from the Met Police in 2008, he has worked in the role of technical consultant with Crime Scene Investigation Equipment Ltd, developing and improving crime scene examination equipment and forensics software applications.

In 2011, he became an associate fire investigator with Fire Investigations (UK) LLP and Fire Investigations Global LLP, a role that is ongoing.

On a final note, congratulations from 'Emergency Services Ireland' to Robert Milne on his recent local government election success in Essex, where he has won a seat on the District Council!