

## Forensic Technology Testing & Evaluation

### Forensic Technologies Center of Excellence (FTCoE)

Cooperative Agreement Award #2008-MU-MU-K003

<b>Project Title:</b> BioTx Innovac <sup>®</sup> II Vacuum Device	<b>Start Date:</b> April 1, 2010
<b>Evaluation Type:</b> Instrument	<b>End Date:</b> June 7, 2010
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#### Evaluation Team:

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#### Manufacturer Information for product(s) being evaluated

Manufacturer	Address	Contact Person	Phone
BioTX Automation	16753 Donwick Drive Suite A-6 Conroe, Texas 77385	James D. Frost III	877-ASK-BIOTX

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## Evaluation Overview

### Evaluation Summary:

Collection and transport of biological material is an integral part of the DNA analysis process. If biological material is collected properly and retained in a manner that minimizes degradation and contamination for transport and storage, this increases the chances of developing a useable DNA profile. The most common method of collection is swabbing; while effective and affordable, this presents some drawbacks. For example, the swabs need to be air-dried before packaging to avoid the possibility of bacteria and mold growth which will degrade the DNA. Furthermore, studies have demonstrated that extraction of biological material from swabs is inefficient.

The BioTX Innovac™ II Vacuum Device is a small, lightweight apparatus designed to collect solubilized material directly into sealable tubes that can come prefilled with a preservative such as EDTA. This allows the biological material to be stored at room temperature without the need to wait for the material to dry after collection and will allow for a more efficient extraction of the biological material. The person collecting the evidence simply caps the tube, labels it, and starts again with a new tube.

The objective of this study is to determine how effective the Innovac II vacuum device is for the collection of biological material. Ease of use, cost effectiveness and the potential for contamination will all be assessed. This device may prove beneficial to the forensic community by providing a simple, novel way to collect biological material that results in a preserved sample that is easier to take through to the DNA extraction process.

### Experimental Design:

- 20µl of blood were placed on the substrates listed below in triplicate and allowed to dry for 24 hours:
  - Cloth (Cotton)
  - Glass
  - Denim
  - Black leather from shoe
  - Red silk
- The first set of samples was collected using the Innovac II Vacuum Device.
- The second set of samples was collected using the double swab technique (wet swab followed by a dry swab).

- The third set of samples was collected by taking cuttings of the material. In the case of the glass, the sample was collected by taking a scraping of the stain.

All samples were processed using the following protocol:

- Extracted using the QIAGEN EZ1 Extraction Robot – “Trace Tip Dance Protocol” – Final volume 50µl
- Quantitated using Applied Biosystems™ Quantifiler Duo Kit with the 7500 Real-Time PCR Instrument
- Amplified using Applied Biosystems Identifiler Kit with the 9700 using manufacturer’s recommendations
- Separated using Applied Biosystems 3130XL Genetic Analyzer using manufacturer’s recommended running conditions
- Analyzed using Genemapper® ID v3.2 software
- Results compared based on quantity obtained and quality of data from the Genetic Analyzer

**Standards, Controls and Samples Interrogated During Evaluation:**

- Positive Control
- Reagent Controls
- NIST SRM Standards
- Allelic Ladder

**Product(s) Specifications:**

**Brief description of Product(s)/Technology/Procedure being evaluated:**

Product Name(s)	Model Number:	Serial/Lot Number:	Dimensions:
Innovac II Vacuum Device	15-502	–	5”L x 2.5”W x 1.75”D
	<b>Cost:</b>	<b>Weight:</b>	<b>Power Req.:</b>
	<b>\$249.23</b>	<b>1lb</b>	<b>1 9V battery</b>
<b>Storage Conditions</b>	<b>Room Temperature</b>		
<b>Operational Conditions:</b>	<b>Room Temperature</b>		
<b>Associated costs:</b> (consumables, maintenance, etc.)	<b>\$3,243.00</b>		

**Photo/Image of Product(s):**



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**Evaluation  
Instrumentation**

**Instrument Setup Performed by:**

- Manufacturer  
 Manufacturer and Evaluator(s)  
 Evaluator(s) only

**Instrument Setup Comments:**

Instrument is very easy to set up. Changing tips and tubing is also very easy to perform.

**Level of Operator Knowledge as Set by Manufacturer:**

Non-Scientist  
 Technician  
 Scientist

## Results of Evaluation (Tables, Graphs)

### Quantitation Results:

Quantitation Results (ng/μl)		
Cutting	BioTx Vacuum Device	Double Swab Technique
<b>Blood on Silk</b>		
3.5	0.674	2.6
2.55	0.0367	3.57
3.02	0.181	2.87
<b>Blood on Leather</b>		
4.85	0.228	2.21
2.48	0.225	1.72
2.78	0.483	0.42
<b>Blood on Glass</b>		
7.08	1.42	2.35
6.33	1.68	2.63
5.71	1.39	1.79
<b>Blood on Cotton</b>		
1.60	0.182	0.553
1.84	0.337	0.527
1.73	0.265	0.636
<b>Blood on Denim</b>		
1.41	0.817	1.38
1.27	2.12	1.22
1.62	0.906	1.27

From the Quantitation results, taking a cutting or using the double swab technique retrieves more sample than using the Innovac Vacuum device. The vacuum device was most effective on a non-porous surface when compared to the quantity of DNA collected from a porous surface. On porous surfaces the sterile water placed on the stain to solubilize it was absorbed into the material, so when the vacuum device was placed on it to suck up the stain, not much sample was recovered. With the cotton and denim, an additional 200μl of sterile water was used in an attempt to retrieve more of the stain. However, the final volume collected was less than 200μl.

Substrates that cause inhibition, for example, the red silk, leather and denim, did not factor into the final results. The Quantitation showed no signs of inhibition using any collection method. This could be due to the EZ1 Extraction being effective at removing inhibitors.

All samples that should have provided a full profile based on Quantitation results did provide full profiles, except for one sample collected with the Vacuum device. This may be due to pipetting error as opposed to the collection device, since no other sample collected with the device had a similar problem.

## Post-Evaluation Findings

### Strengths/Results:

- Vacuum device was effective on non-porous material when compared to porous surfaces.
- Since the sample was collected in a liquid form, the amount of reagents needed for extraction did not have to be adjusted. With the cuttings and swabbings, the reagents used had to be doubled so the entire substrate was covered by the reagents; however, the concentrations remained the same.
- After collection, the samples could be extracted immediately unlike swabs which required time to dry. This resulted in an overall faster processing time.
- No problems were encountered retrieving DNA from the samples collected using the device and developing full DNA profiles.

### Areas for Improvement:

- The extension tips provided easily fall off once they are rubbed against a surface. For this study the tips were not used because they could not withstand the force of being rubbed against a surface.
- A more rugged tip that has a tighter connection to the collection tube may be needed to rub against materials and non-porous surfaces.
- For porous surfaces, liquid disperses too quickly so the device is not able to suck it up along with the sample.

**Training Requirements:**

Minimal.

**Health and Safety Issues:**

None.

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