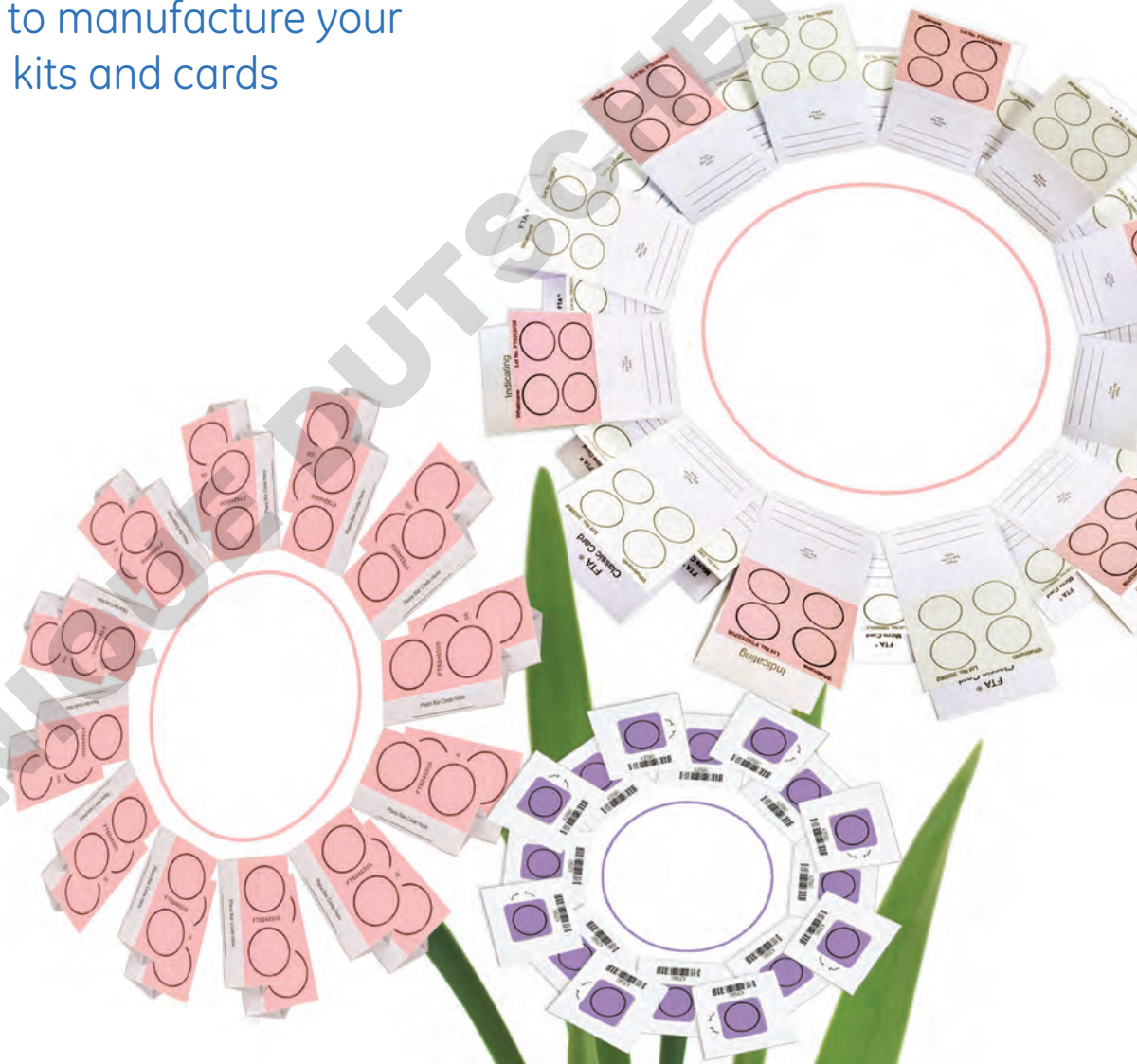


GE Healthcare  
Life Sciences

# Your forensic samples, our experience

Trust the experts behind Whatman™  
FTA™ technology to manufacture your  
sample collection kits and cards



imagination at work

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# Human sample collection

As global databases are being created and expanded, forensic laboratories are facing increasing numbers of samples that require processing. Although laboratory automation and new direct STR amplification chemistries are alleviating some of the bottlenecks experienced in the databasing process, laboratories still require standardized collection procedures, consistent DNA collection media, and stabilized nucleic acids that can be analyzed years after collection.

GE Healthcare Life Sciences addresses this need with its Whatman FTA technology and capability to manufacture high-quality custom sample collection cards and kits. GE Healthcare offers a wide range of off-the-shelf and custom FTA products for the collection of human blood, buccal (cheek) cells, and saliva.

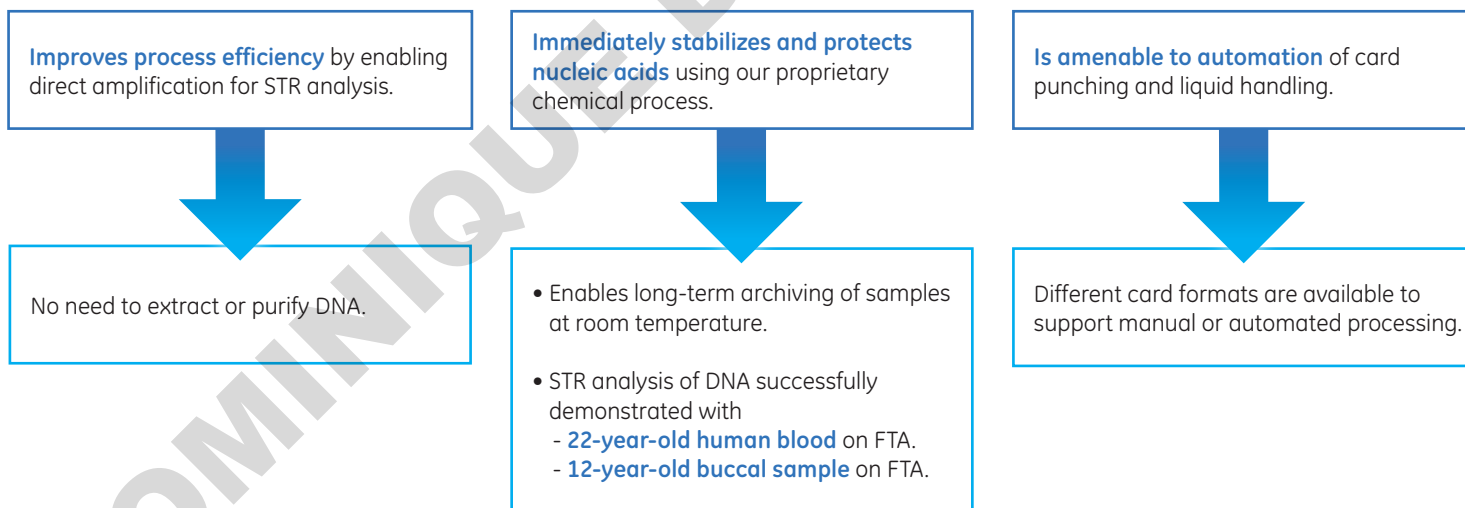
In addition to the advantages of FTA technology over untreated papers and swabs (below), FTA cards provide flexibility—one sample can be used with multiple downstream technologies.

## FTA fits into common forensic workflows, including:

- DNA extraction
  - using organic solvents or commercially available DNA extraction kits.
- DNA quantitation
  - using real-time PCR.
- STR\* analysis
  - using direct or standard (conventional) chemistries.
- Mitochondrial sequencing.
- SNP\* analysis.

*FTA technology has been used by the forensics community since 1984.*

## Advantages of FTA technology over untreated papers and swabs



\* SNP = single-nucleotide polymorphism; STR = short tandem repeat

# Products for sample collection



Untreated paper



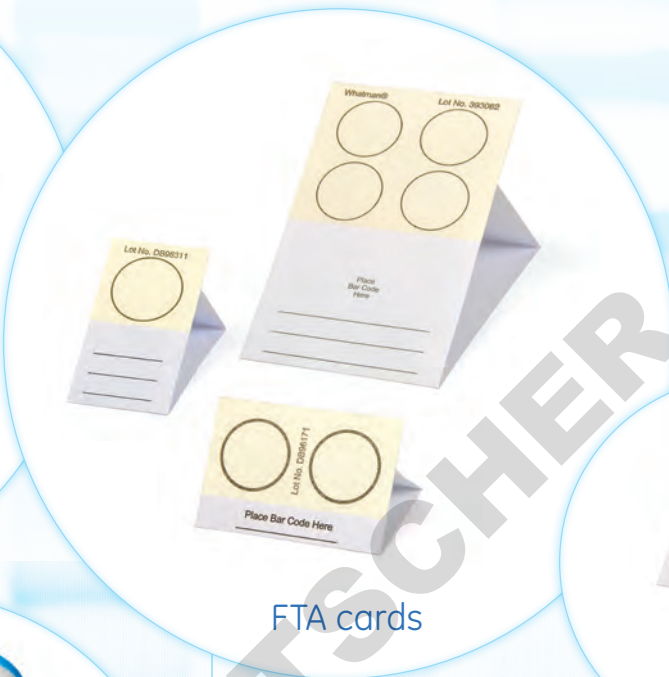
Swabs

Sample type: buccal	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Sample type: blood	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Can be used with direct STR amplification	<input type="checkbox"/>	<input type="checkbox"/>
Is a single product with foam applicator and FTA paper	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Stabilizes and protects DNA from degradation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Is suitable for long-term storage at room temperature	<input type="checkbox"/>	<input type="checkbox"/>
Is easily automated	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

● = Yes    ✗ = No    □ = Not recommended



Whatman Indicating FTA cards



FTA cards



FTA Elute cards



EasiCollect device



Indicating FTA Elute cards

●	●	□	●	□
□	□	●	□	●
●	●	●	□	□
×	●	×	×	×
●	●	●	●	●
●	●	●	●	●
●	●	●	●	●

## Field-based sample collection

Field-based sample collection often requires the use of multiple products, such as data collection forms, gloves, sterile wipes, and a collection product, as well as barcodes to help ensure chain of custody.

Custom kits enable you to handle all of these tasks with a single product that will fit into your agency's workflow. GE Healthcare can customize kits that include any of our Whatman FTA products or other sample collection products and accessories.

We can also provide custom FTA cards with the following options:

- Accommodations for areas to include offender's information and/or fingerprints.
- Inclusion of barcodes for tracking.
- Use of special inks for optical character recognition (OCR).

GE Healthcare packages FTA cards and custom kits in a clean-room environment to minimize DNA contamination.

Trust GE Healthcare's Whatman FTA technology to stabilize your forensic samples for DNA analysis in a format that enables you to perform direct STR amplification. Trust GE Healthcare, with its expertise, manufacturing capability, and quality systems, to manufacture your sample collection kits and cards.

The following are examples of custom sample collection kits and cards from GE Healthcare.

Custom blood kit



Custom FTA cards



Custom buccal kit (with swab)



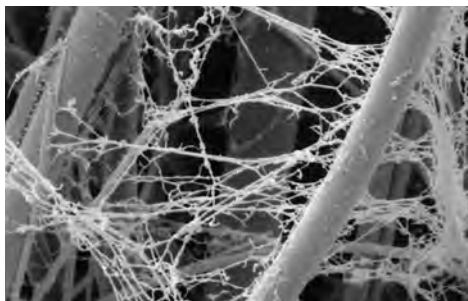
Custom buccal kit (with EasiCollect device)



# Whatman FTA technology overview

Whatman FTA cards from GE Healthcare are chemically coated matrices that have been shown to preserve DNA more efficiently than untreated matrices (pages 8 and 9).

Cells in biological samples deposited on FTA cards lyse on contact with the matrix, and DNA is captured on the card (Fig 1). DNA is protected from environmental and enzymatic damage by the FTA chemicals impregnated in the card. Biological samples on FTA cards have been shown to remain intact at ambient temperatures for years, so there is no need for freezers to archive samples. For example, DNA from 22-year-old blood and 12-year-old buccal samples on FTA cards has generated STR data with good signal strength in both direct and standard amplifications (Fig 5 and 6).



**Fig 1.** Electron micrograph showing DNA entrapped within the FTA matrix (magnification  $\times 10\,000$ ).

Whatman FTA technology consists of two distinct chemistries, both of which have the ability to lyse cells on contact, denature proteins, and protect DNA from degradation. FTA contains chemical denaturants and a free radical scavenger; FTA Elute contains a chaotropic salt. With FTA, the DNA remains tightly bound while proteins and inhibitors are washed from the matrix. With FTA Elute, proteins remain tightly bound while DNA is eluted from the matrix. There are three options for DNA analysis with FTA cards: direct amplification, standard amplification with rinsing ("punch-in" method), and extraction of DNA from the card. With FTA Elute, eluted DNA can be used for STR analysis (standard amplification), sequencing, and real-time PCR applications.

Both FTA and FTA Elute cards are available as Indicating cards for use with clear samples, such as buccal cells or saliva. The cards include a pink (FTA) or purple (FTA Elute) indicating dye that turns to white when a clear sample is applied.

EasiCollect is a sample collection instrument for buccal collection. It includes a built-in foam applicator and  $2 \times 2$  inch Indicating FTA card.



Indicating FTA Elute Micro Card with buccal sample (left) and no sample (right).



Buccal sample collection using EasiCollect.

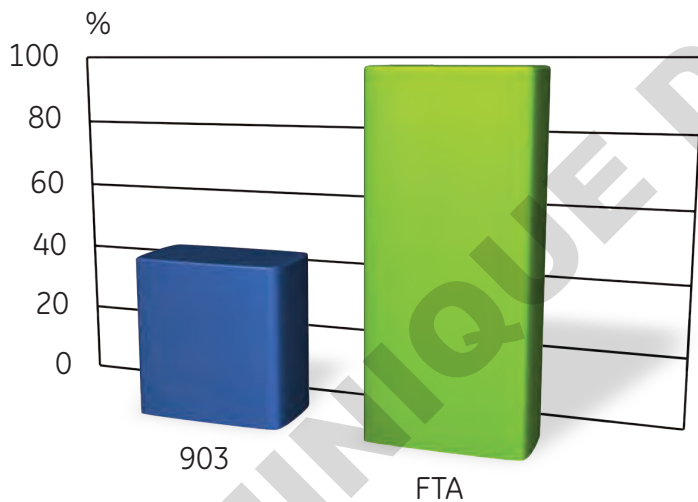
# Comparison of FTA and untreated paper

## Direct STR amplification

With the availability of direct amplification chemistries, sample processing is streamlined. Preparation of samples for use with direct amplification chemistry requires only the addition of an FTA punch to the STR reagent, eliminating the need for purification and wash steps. For evaluation in direct amplification, thirty-nine samples each were collected on 903™ paper (untreated) and FTA Indicating Micro Card. A 1.2 mm punch was taken from each paper for amplification using Applied Biosystems' AmpFLSTR™ Identifier™ Direct PCR Amplification Kit according to the manufacturer's protocols. The number of complete STR profiles, success rate, and total average peak height for each paper were assessed (Table 1).

**Table 1.** Performance of 903 and FTA papers in direct amplification

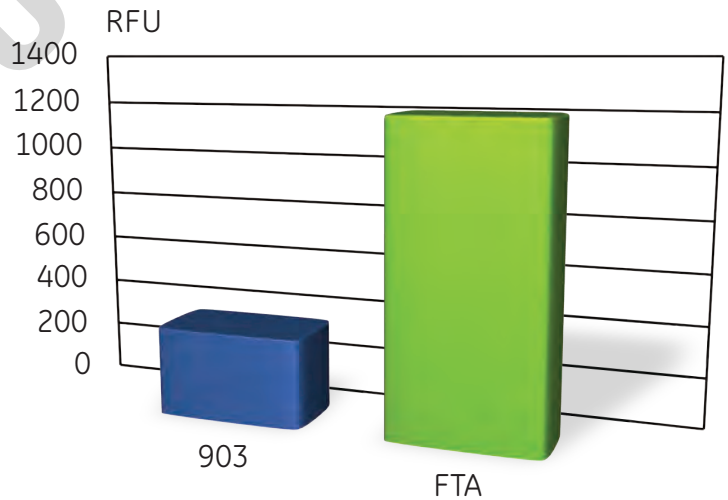
Paper	No. of complete profiles/total	Success rate	Total average peak height (RFU)
903	16/39	41%	306.4
FTA	38/39	97%	1192.3



**Fig 2.** Success rate (%) of 903 and FTA paper in STR analyses using AmpFLSTR Identifier Direct PCR Amplification Kit. Thirty-nine samples were analyzed for each paper type.

The data showed a substantial performance difference between 903 and FTA papers processed with the Identifier Direct chemistry. A success rate of 97% was observed with the FTA (treated) collection product compared with a 41% success rate using the 903 (untreated) paper (Table 1 and Fig 2). The untreated paper also exhibited PCR inhibition/inefficient amplification in many samples, as evidenced by the low overall average peak height (Table 1 and Fig 3).

These results underscore the fact that not all collection products are optimized for use with the new direct amplification chemistries. FTA paper, with its proprietary chemical treatment, is ready to use in direct amplification. However, other treated and untreated papers may require additional lysis steps or other optimization steps, both of which could negatively affect throughput and laboratory workflow.



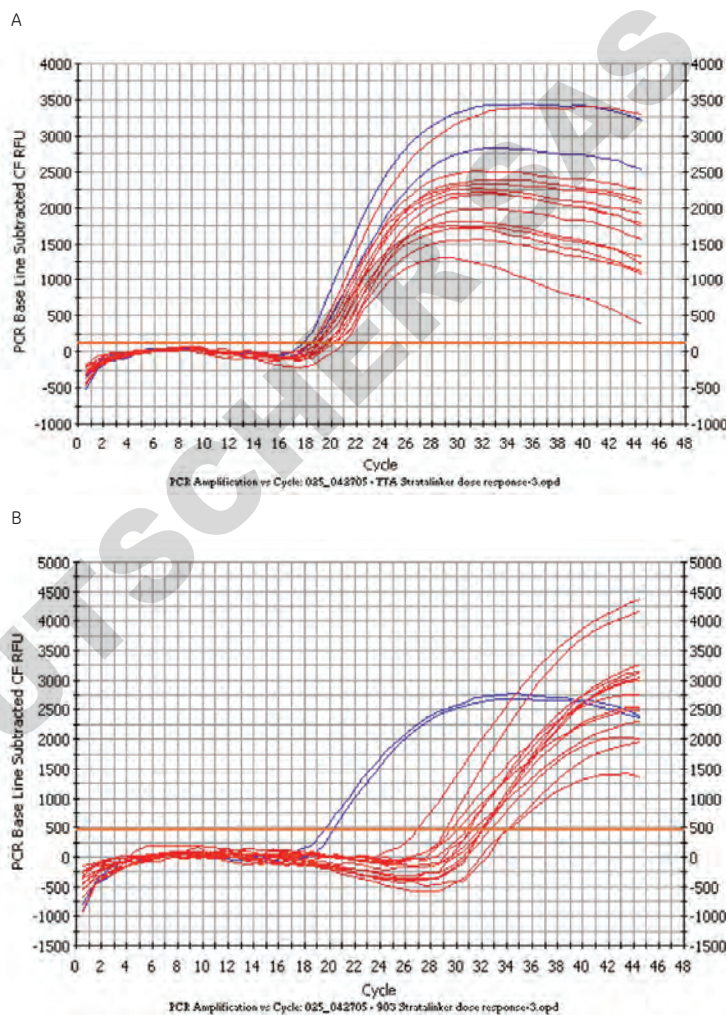
**Fig 3.** Total average peak height (RFU) for 903 and FTA paper in STR analyses using AmpFLSTR Identifier Direct PCR Amplification Kit. Thirty-nine samples were analyzed for each paper type. RFU = relative fluorescence units.



## DNA protection

One of the characteristics of FTA paper that enables long-term archiving of DNA is its protection against UV radiation. Exposure to UV can cause degradation of DNA in your sample, compromising the long-term stability of archived samples. FTA chemistry protects DNA from the harsh impact of UV exposure to increase the stability of your archived samples.

Purified DNA spotted on FTA (treated) and untreated cotton fiber-based Whatman 903 paper was exposed to  $9.9 \times 10^5$   $\mu$ Joules of UV radiation and then quantitated using real-time PCR. These results were compared to those from samples that were stored in the dark. Samples stored on FTA and exposed to UV radiation showed an average  $C_q$  shift of 1.42 cycles, which represents a 2.7-fold decrease in DNA integrity (Fig 4A). UV exposure of samples stored on an untreated matrix resulted in an average  $C_q$  shift of 9.75 cycles, which equals an 862-fold decrease in DNA integrity (Fig 4B). The minimal  $C_q$  shift with FTA reflects the high quality of intact template DNA and the enhanced level of protection offered by FTA. This data demonstrates that FTA paper provides greater protection for DNA than untreated paper.



**Fig 4.** DNA damage induced by UV irradiation and quantitated by real-time PCR. Real-time PCR data from A) FTA (treated) cards and B) untreated 903 paper. Each graph consists of two nonirradiated controls (blue amplification curves) and 14 samples exposed to UV radiation (red amplification curves). The target region is 403 bp in length.  $C_q$  = quantification cycle. Data supplied by Midwest Research Institute.

# Long-term stability of DNA in buccal and blood samples on FTA

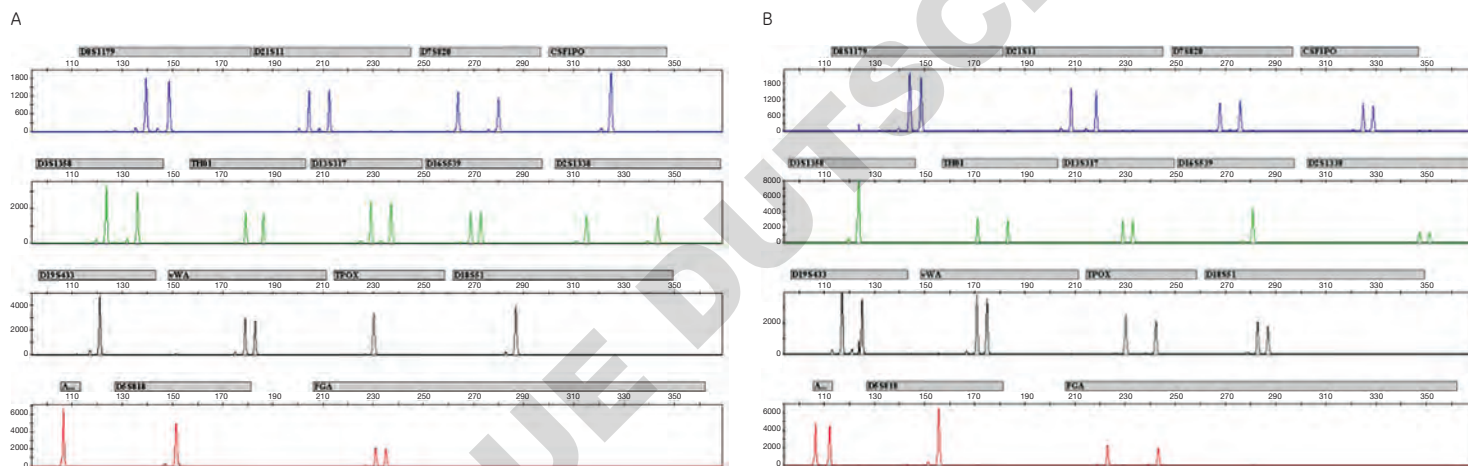
Several countries have laws that require long-term archiving and retesting of samples years after collection.

For example, in the United States, several states require post-conviction testing, which may occur years after samples are collected. The chemical matrix on FTA protects nucleic acids from UV radiation (Fig 4) and other environmental factors. These protective characteristics of Whatman FTA chemistry enable the long-term archiving of samples. Samples that have been stored for over a decade in multi-barrier pouches (with desiccant) at ambient temperatures have shown successful amplification (Fig 5 and 6). Samples stored on FTA can be amplified using either direct STR amplification or conventional (standard) STR amplification.

When you are ready to purify DNA for downstream applications, simply remove the card from the pouch, take a punch from the card, and process. The remainder of the card can be re-archived in a multi-barrier pouch for future use.

## Direct STR amplification

Direct amplification chemistries streamline sample processing because they eliminate purification and washing. Buccal and blood samples on FTA stored at ambient temperatures for 12 and 22 years, respectively, were subjected to amplification using Applied Biosystems' AmpFLSTR Identifiler Direct PCR Amplification Kit. Both sample types showed strong signals and good quality peaks (Fig 5A and 5B).

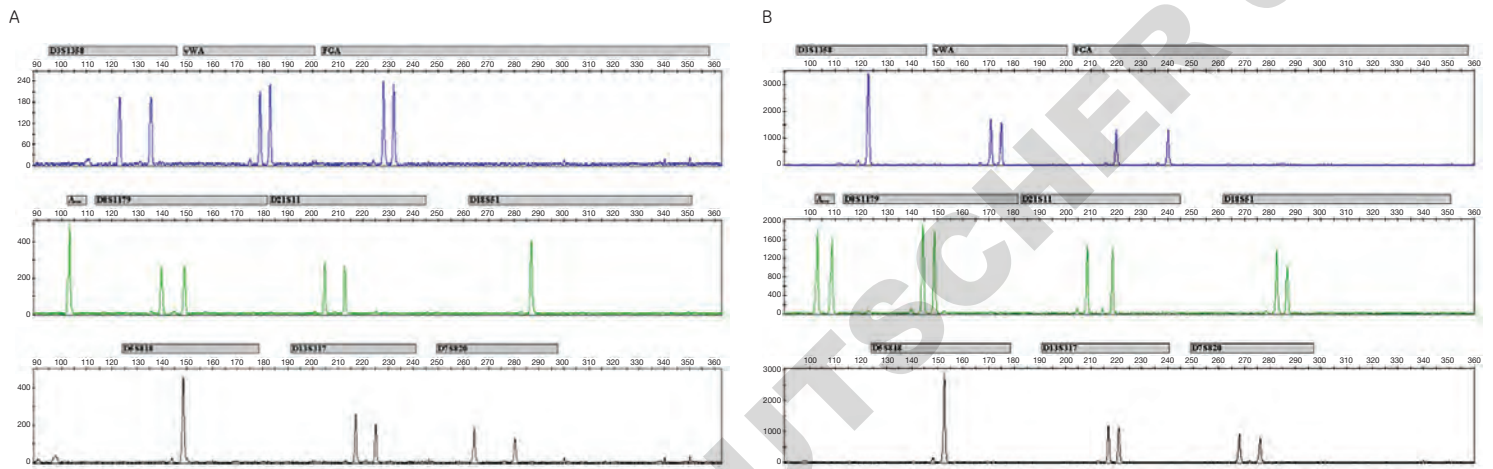


**Fig 5.** STR profiles of A) a 12-year-old buccal sample collected on Indicating FTA paper and B) a 22-year-old blood sample collected on FTA paper. Both samples were processed using an AmpFLSTR Identifiler Direct PCR Amplification Kit (Applied Biosystems) and the manufacturer's standard protocol. The samples were run on an Applied Biosystems 3130xl Capillary Electrophoresis Genetic Analyzer using standard conditions. The samples were analyzed using GeneMapper™ ID 3.2 (Applied Biosystems).

## Standard STR amplification

Both the 12-year-old buccal sample and the 22-year-old blood sample were subjected to amplification using the AmpFLSTR Profiler™ Plus or COfiler™ PCR Amplification Kit (both from Applied Biosystems). STR results were compared with the results from the same samples after 7 and 17 years of storage, respectively. Both the buccal and blood

samples showed 100% concordance with the earlier STR samples (data not shown) and produced high-quality results that were above minimum thresholds. Figure 6 shows Profiler Plus data for a 12-year-old buccal sample (Fig 6A) and a 22-year-old blood sample (Fig 6B). Similar results were obtained with the COfiler kit (data not shown).



**Fig 6.** STR profiles of A) a 12-year-old buccal sample collected on Indicating FTA paper and B) a 22-year-old blood sample collected on FTA paper. DNA was amplified using AmpFLSTR Profiler Plus PCR Amplification Kit and a modified procedure. The samples were run on an Applied Biosystems 3130xl Capillary Electrophoresis Genetic Analyzer using standard conditions. Results were analyzed using GeneMapper ID 3.2.

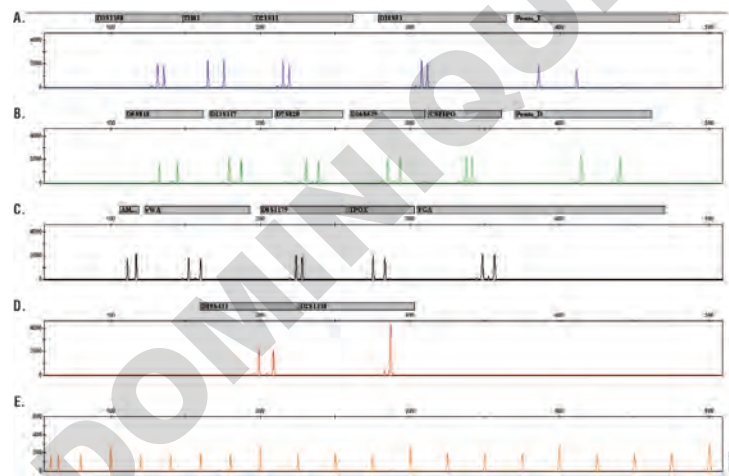
# Quicker sample processing and greater flexibility with FTA

The use of FTA for DNA collection enables your laboratory to reduce processing time while maintaining data quality. Punches from blood and buccal samples collected on FTA cards or EasiCollect device can be processed for direct STR amplification chemistries in 5 minutes. If speed is not a concern, samples can be processed with standard chemistries in 30 minutes.\* For additional flexibility, DNA can be extracted from FTA using several commercially available extraction reagents and purification kits.

## From punch to direct amplification in 5 minutes

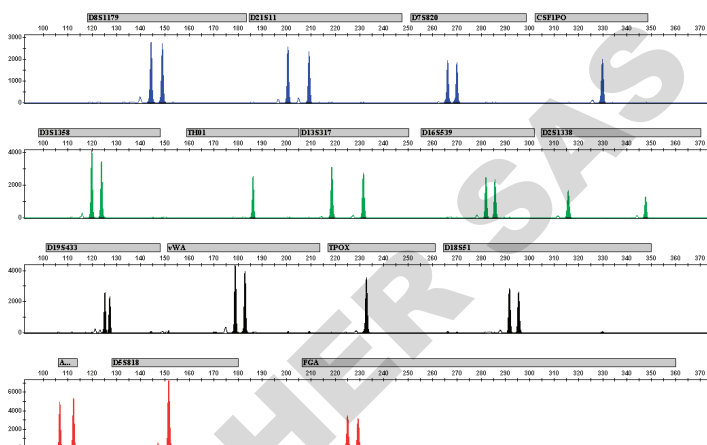
For single-source samples, direct amplification is fast and simple with FTA. The use of FTA with either Applied Biosystems' Identifiler Direct PCR Amplification Kit or Promega's PowerPlex™ 18D System eliminates extraction, elution, and quantitation steps to streamline laboratory processes. When using FTA, there is no need for additional reagents. Simply place an FTA card punch into a PCR plate or tube, add the reagents for direct amplification, and amplify.

DNA collected on FTA paper was successfully amplified using both PowerPlex 18D (Fig 7) and Identifiler Direct (Fig 8). Samples collected on FTA gave strong signals and even peaks heights when used with both chemistries.



**Fig 7.** Direct amplification of 18 loci from a buccal sample collected on FTA. 1.2 mm samples taken from Indicating FTA paper were amplified using Promega PowerPlex 18D System. Amplified samples were run on an Applied Biosystems 3130xl Genetic Analyzer using a 3kV, 5-sec injection. Results were analyzed using GeneMapper ID 3.2. *Figure printed with permission from Promega Corporation.*

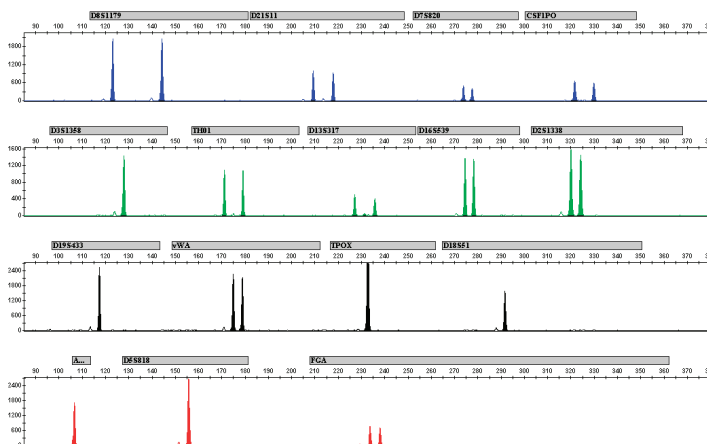
\* Does not include optional drying step



**Fig 8.** Direct amplification of 16 loci from a buccal sample collected on FTA. 1.2 mm samples taken from the Indicating FTA card in EasiCollect, were amplified using AmpFLSTR Identifiler Direct DNA Amplification Kit (Applied Biosystems) according to the manufacturer's instructions. The samples were run on an Applied Biosystems 3130xl Genetic Analyzer using a 10 kV, 5-sec injection. Results were analyzed using GeneMapper ID v3.2. *Data provided by Sorenson Genomics.*

## From punch to standard STR amplification in 30 minutes ("punch-in" method)

For nondirect (standard) amplification chemistries, you can purify DNA for downstream applications in less than 30 minutes using FTA technology. No purification kits are required; DNA preparation only requires the use of Whatman FTA Purification Reagent. After washing with the reagent, DNA can be analyzed immediately while on the paper ("punch-in" method) or can be isolated using common DNA extraction methods (page 13). FTA card punches placed in a 96-well plate can be washed and processed automatically using several brands of liquid-handling robots. Figure 9 shows STR profiles from buccal cells collected on Indicating FTA paper and prepared using the "punch-in" method.



**Fig 9.** Data generated using the "punch-in" method. 1.2 mm samples were taken from Indicating FTA and amplified using AmpFLSTR Identifiler PCR Amplification Kit (Applied Biosystems). Amplified samples were run on an Applied Biosystems 3130xl Genetic Analyzer using a 10kV, 5 sec injection. Results were analyzed using GeneMapper ID 3.2. *Data provided by Sorenson Genomics.*

## DNA extraction option

As an alternative to direct amplification and the “punch-in” method, samples can be extracted from the FTA card into solution for downstream analysis.<sup>1</sup> For example, four common DNA extraction methods were used to extract DNA from fresh blood or buccal samples on FTA cards. Two methods were reagent-based: Chelex™ resin and organic extraction; two were commercial kit-based: DNA IQ™ and QIAamp™. For all four methods DNA from blood and buccal samples were of sufficient quantity and quality for STR profiling.<sup>2</sup>

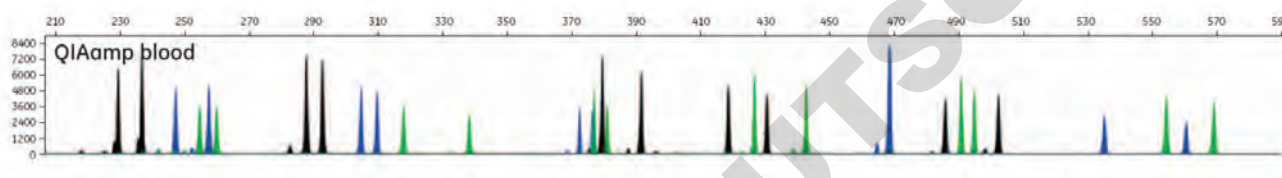
Allele calling results for 18 samples for each extraction method are provided in Table 2. Figure 10 shows the STR profile for a buccal sample extracted using one of the four methods, QIAamp. These data illustrate that commonly used DNA extraction methods and kits provide DNA of sufficient quantity and quality to support allele calling accuracy as high as 100% in STR analysis.

**Table 2.** STR data from blood samples on FTA

	Chelex	Organic extraction	DNA IQ	QIAamp
Total samples	18	18	18	18
Total possible allele calls	288	288	288	288
Total correct allele calls	288	288 <sup>†</sup>	288 <sup>‡</sup>	288
Accuracy	100%	100% <sup>†</sup>	100% <sup>‡</sup>	100%

<sup>†</sup> After two sample reinjections due to failed capillaries

<sup>‡</sup> After one sample reinjection due to failed capillary



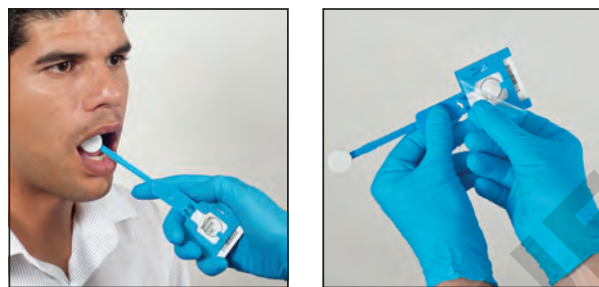
**Fig 10.** STR profile of blood sample on FTA after DNA purification using QIAamp DNA Investigator Kit (Qiagen) according to the manufacturer's instructions. STR analysis of extracted DNA was conducted using the PowerPlex 16 System (Promega) according to the manufacturer's instructions. Amplification was performed in a 9700 thermal cycler (Applied Biosystems), and amplification products were analyzed on an ABI PRISM™ 3130XL Genetic Analyzer (Applied Biosystems) according to the manufacturer's instructions.

<sup>1</sup> Direct amplification and the wash ("punch-in") method were optimized for FTA. Due to the binding characteristics of FTA, some common extraction methods in your laboratory may give lower yields.

<sup>2</sup> Application note: Reliable extraction of DNA from Whatman FTA cards, GE Healthcare, 28-9822-22, Edition AA (2010).

# EasiCollect for buccal cell collection, transport, and archiving

With the expansion of legislation on types of offender and arrestee samples, and the increasing number of agencies collecting samples, a consistent, reliable collection system is key for successful downstream analysis. GE Healthcare's Whatman EasiCollect device integrates the swab and FTA card into a single product that facilitates ambient-temperature DNA collection, transport, and archiving. The EasiCollect design enables the uniform collection and transfer of buccal cells onto Indicating FTA paper. EasiCollect requires less training than swabbing does, making sample collection more accessible to agencies that have not been trained in forensic sample collection and analysis. The steps for using EasiCollect device are illustrated in Figure 11.

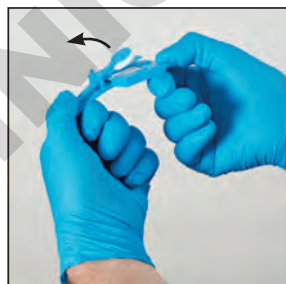


1. Swab the inside of each cheek for 15 sec.

2. Peel off the protective film to expose the Indicating FTA card.



3. Close the EasiCollect device to transfer the sample to the Indicating FTA card.



4. To air dry, open the device by bending back the handle to release the foam applicator from under the snap clips.

Fig 11. Steps in using Whatman EasiCollect device for buccal sample collection.

## Uniform and consistent collection with EasiCollect

Historically, buccal cell collection has been a notoriously difficult process. The difficulties have been attributed to the differences in the ability of various individuals to shed cells, as well as the variability introduced with manual collection of the buccal cells. EasiCollect simplifies buccal cell collection. The novel design has been engineered for maximal cell collection and uniform application to FTA. An optimized foam collection surface has been specifically selected for its ability to capture the largest number of cells to overcome individual differences. The pressure clips molded into the EasiCollect device ensure a uniform and constant pressure for the reproducible transfer of cells to FTA. In order to examine the distribution and uniformity of cells applied using EasiCollect, a map of the sample area on the Indicating FTA card was prepared (Fig 12A). Eighty-eight discs were amplified for a portion of the  $\beta$ -globin gene. DNA was amplified from all but one disc (Fig 12B). These results represent a 99% success rate from all regions of the sample area. The graph in Figure 12C shows a very tight distribution of DNA in duplicate samples from four individuals.

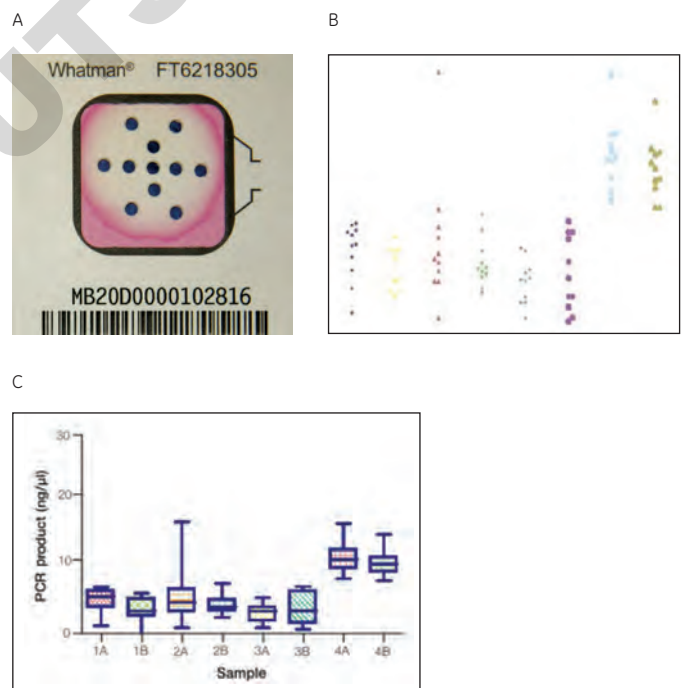


Fig 12. Discs (2 mm) were taken from the Indicating FTA card in EasiCollect in a specific pattern (A) to cover the sample area including the periphery. Each disc was amplified for a 268 bp portion of the  $\beta$ -globin gene and quantitated using an Expiration™ Automated Electrophoresis System (Bio-Rad) by running 1K chips according to the manufacturer's instructions. B) Analysis of 88 discs. C) Distribution of DNA in duplicate samples from four individuals.

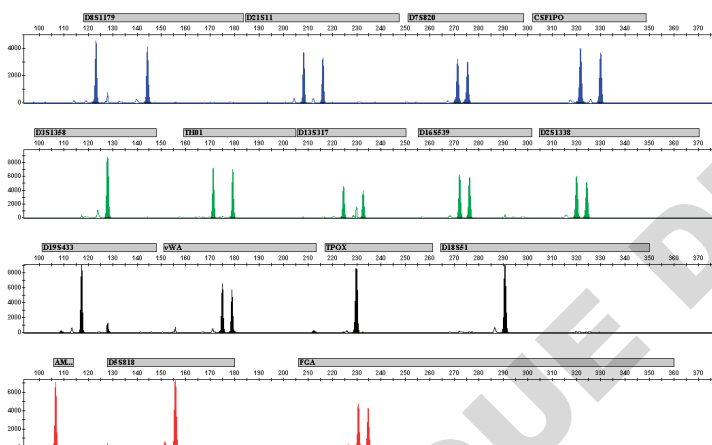
## Easy to automate

EasiCollect device includes a removable 2 × 2 inch Indicating FTA card. These cards are compatible with several semi-automated and automated punching systems, removing the bottleneck of manual FTA punching.

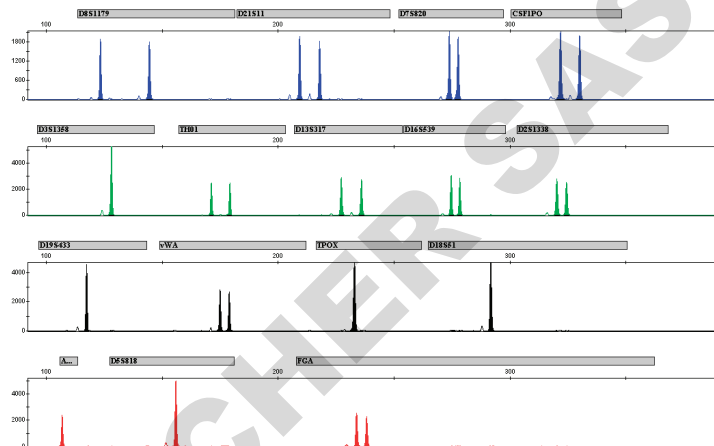
## Compatible with direct and standard STR chemistries

EasiCollect uses a Whatman Indicating FTA card that works with both direct amplification and standard STR chemistries. Data show high-quality STR profiles with uniform peak heights and balanced STRs for both direct (Fig 14) and standard (Fig 13) STR amplification.

See page 21 for EasiCollect ordering information.



**Fig 13.** Standard ("punch-in") amplification. A 1.2 mm punch was taken from the Indicating FTA Card in EasiCollect. The punch was washed three times using 200  $\mu$ l of FTA Purification Reagent followed by two washes using 200  $\mu$ l of TE<sup>-4</sup> buffer (10 mM Tris, 0.1mM EDTA, pH 8.0). The punch was allowed to dry for 60 minutes and amplified using AmpFLSTR Identifier PCR Amplification Kit (Applied Biosystems) according to the manufacturer's instructions. The samples were run on an Applied Biosystems 3130xl Capillary Electrophoresis Genetic Analyzer using a standard 10kV, 5-sec injection. Results were analyzed using GeneMapper ID 3.2. *Data provided by Sorenson Genomics.*



**Fig 14.** Direct amplification of 16 loci from a buccal sample collected using EasiCollect. Samples were amplified using AmpFLSTR Identifier Direct PCR Amplification Kit (Applied Biosystems) according to the manufacturer's instructions. The samples were run on an Applied Biosystems 3130xl Capillary Electrophoresis Genetic Analyzer using a standard 10kV, 5-sec injection. Results were analyzed using GeneMapper ID 3.2.

## GE Healthcare custom sample collection kits and cards

Forensic scientists worldwide use GE Healthcare's Whatman FTA products to collect, stabilize, process, transport, and archive their DNA samples. With custom and off-the-shelf products available for blood or buccal cell collection, FTA and FTA Elute technology can also be used by law enforcement personnel to quickly and easily collect samples from suspects and offenders. In the laboratory, FTA and FTA Elute technology enables a wide range of downstream applications including direct and standard STR analysis, SNP analysis, real-time PCR quantitation, and mitochondrial sequencing. The ease of use and reliability of FTA and FTA Elute minimizes the need for expensive repeat analyses.

### Whatman FTA and FTA Elute products enable:

- Rapid and reliable collection of DNA samples.
- Configurations amenable to semi-automated and automated punching and automated liquid handling, reducing hands-on time and minimizing manual errors.
- Off-the-shelf and custom options allow you to choose products that work well with your laboratory's standard operating procedures (SOPs).
- Shipping and archiving samples without refrigeration, allowing you to reduce your costs. FTA and FTA Elute chemistries stabilize nucleic acids at room temperature.
- Long-term storage. Since 1984, the forensics community has used FTA for long-term archiving of samples.

In addition to FTA and FTA Elute cards and EasiCollect (pages 20–21), GE Healthcare offers several FTA accessories for manual punching, transport, and archiving of samples (pages 22–25). Our non-FTA product offering includes swabs and foam applicators for buccal/saliva collection. We can manufacture a custom sample collection kit to meet your specific needs, which could contain any of our sample collection products.



### Example of a custom buccal kit (with swab)

Custom buccal kits, blood kits, FTA cards, and FTA Elute cards expand your laboratory's collection options while minimizing changes to its data processes. GE Healthcare will work closely with your organization to develop a custom FTA format that contains the features required by your laboratory's processes. Our kits are manufactured to ISO9001:2008 standards.

#### Custom buccal and blood collection kits

Field-based sample collection often requires the use of multiple products, such as data collection forms, gloves, sterile wipes, finger print ink, mask, and a DNA collector, as well as barcodes to help ensure chain of custody.

GE Healthcare configures and manufactures ready-to-use kits customized for your specific applications, ensuring that the tools you need for optimal sample collection are available on-site for immediate use and distribution to your agencies that are collecting DNA.

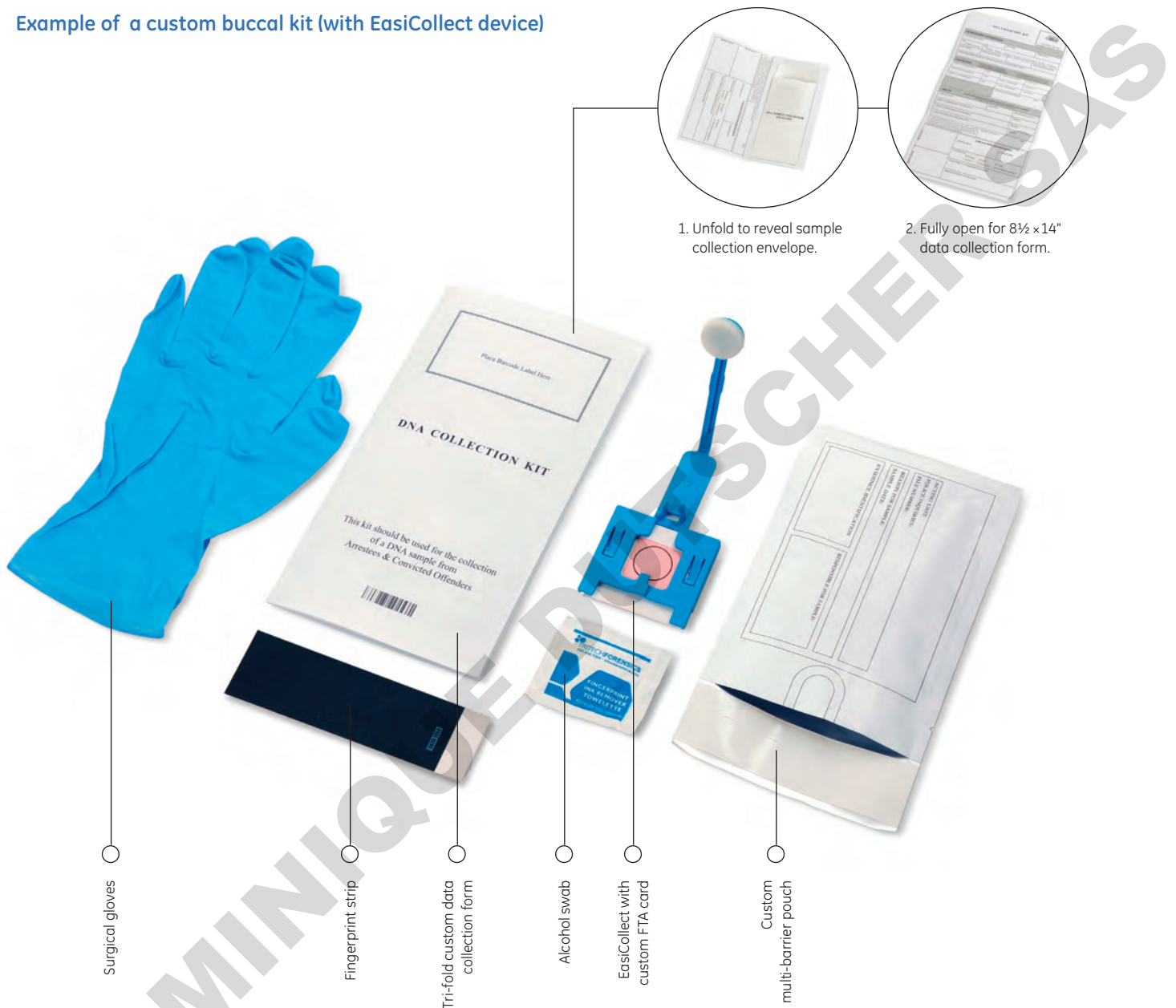
Whatman FTA sample collection kits are simple and reliable to use. Blood collection requires just one or two drops of blood onto an FTA card. For buccal cell collection, EasiCollect device allows you to uniformly collect and apply cells to the surface of an Indicating FTA card for subsequent DNA capture. An FTA card plus sterile foam applicator is an alternative to EasiCollect for buccal collection.

### Example of a custom buccal kit (with swab)



# GE Healthcare custom sample collection kits and cards

## Example of a custom buccal kit (with EasiCollect device)



### Customize your kit to:

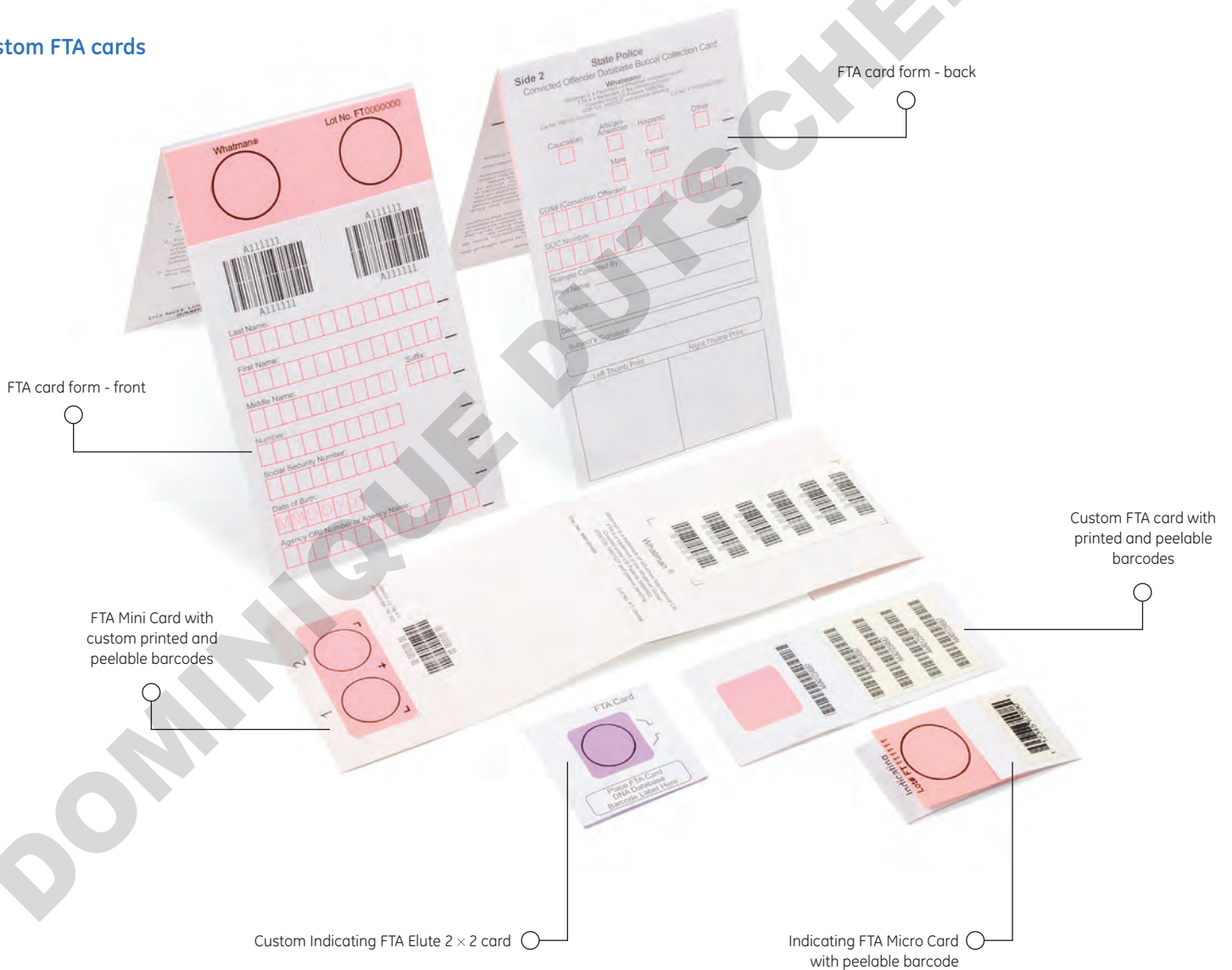
- Improve sample tracking.
  - Integrate EasiCollect device and FTA cards into your data tracking system.
  - Select the barcode type and sequential or nonsequential number.
- Customize instructions for sample collection and shipping procedures.
  - Include instructions in the kit to reinforce training.
- Create agency-specific data forms.
  - Address your agency's data collection needs (e.g., agency information, agency logo, demographics, and fingerprints) using forms that you design.
- Include the tools needed for successful sample collection and transport.

Accessory options include: Custom shipping envelopes with preprinted labels; desiccant for shipping and archiving samples; foam collection swabs; gloves; masks; Benchkote™ paper; and fingerprint strips.

**Custom collection cards**

To further expand your options for data collected on a card, GE Healthcare can customize our Indicating FTA and FTA card formats through our Custom Service Group. We will work closely with your organization to develop a custom FTA format to meet your needs. Customizations for cards include: Accommodation for areas to include offender's information and/or fingerprints; inclusion of barcodes for tracking; use of special inks for optical character recognition (OCR); and other options.

**Custom FTA cards**



# GE Healthcare off-the-shelf EasiCollect and cards

## FTA products

Whether you are collecting buccal or blood samples from offenders, GE Healthcare offers several off-the-shelf configurations to meet your needs. For blood collection, simply stick the finger and add one or two drops of blood onto the FTA card of choice.

The collection and archiving of buccal cells is straightforward with the use of our Indicating FTA card products. These cards are designed for use with colorless samples, such as buccal cells and saliva. Indicating FTA card products are formulated to change from pink (FTA) or purple (FTA Elute) to white when a sample is applied, making it easier to verify sample transfer and locate sample position for downstream processing.

For convenient buccal sample collection and application, use an EasiCollect device or an FTA card with a GE Healthcare Sterile Foam-Tipped Applicator.

FTA and Indicating FTA cards can be used in workflows for both direct and standard STR amplification. Since both card types enable consistent sample collection and reliable long-term storage of your samples, STR profiles from samples on FTA and Indicating FTA exhibit strong, balanced signals and consistent peak morphology (Fig 7, 8, 9, 13, and 14). Because FTA products are compatible with multiple forensic applications, blood and buccal sample collection is simple.



EasiCollect



Indicating FTA Micro Card



Indicating FTA Mini Card



Indicating FTA Classic Card



Indicating FTA Elute Micro Card



FTA Micro Card



FTA Mini Card



FTA Classic Card



FTA Elute Micro Card

Product	Notes	Sample areas/card	Cards/pack	Code number
<b>Indicating cards</b>	<b>For buccal and saliva samples</b>			
EasiCollect	<ul style="list-style-type: none"> <li>Contains a 2 × 2 inch Indicating FTA card plus foam collection pad.</li> <li>Can be used with direct STR amplification.</li> </ul>	1	50	WB120462
Indicating FTA Micro Card	<ul style="list-style-type: none"> <li>Recommended when only one sample is needed.</li> <li>Can be used with direct STR amplification.</li> </ul>	1	25	WB120311
		1	100	WB120211
Indicating FTA Mini Card	<ul style="list-style-type: none"> <li>Each sample can be processed independently.</li> <li>Can be used with direct STR amplification.</li> </ul>	2	25	WB120356
		2	100	WB120056
Indicating FTA Classic Card	<ul style="list-style-type: none"> <li>Convenient for multiple applications of the same sample on one card.</li> <li>Each sample can be processed independently.</li> <li>Can be used with direct STR amplification.</li> </ul>	4	25	WB120306
		4	100	WB120206
Indicating FTA Elute Micro Card	<ul style="list-style-type: none"> <li>For water elution of DNA.</li> </ul>	1	25	WB120412
		1	100	WB120411
<b>Non-indicating cards</b>	<b>For blood samples</b>			
FTA Micro Card	<ul style="list-style-type: none"> <li>Recommended when only one sample is needed.</li> <li>Can be used with direct STR amplification.</li> </ul>	1	25	WB120310
		1	100	WB120210
FTA Mini Card	<ul style="list-style-type: none"> <li>Convenient for protocols that require different locations for testing and archiving of samples.</li> <li>Each sample can be processed independently.</li> <li>Can be used with direct STR amplification.</li> </ul>	2	25	WB120355
		2	100	WB120055
FTA Classic Card	<ul style="list-style-type: none"> <li>Convenient for multiple applications of the same sample on one card.</li> <li>Each sample can be processed independently.</li> <li>Can be used with direct STR amplification.</li> </ul>	4	25	WB120305
		4	100	WB120205
FTA Elute Micro Card	<ul style="list-style-type: none"> <li>For water elution of DNA.</li> </ul>	4	25	WB120401
		4	100	WB120410

# GE Healthcare punching tools for FTA cards

## Manual and semi-automated punching of FTA cards

GE Healthcare offers several manual and semi-automated punching tools that address your laboratory's punching requirements.

### Manual punching of FTA cards

Two different manual punch tools are available for use with FTA cards—Harris Micro-Punch and Harris Uni-Core Punch. The Harris Uni-Core and Micro-Punch products are designed with a very sharp, stainless steel cutting edge. The Harris Uni-Core is a disposable punch that provides up to 500 punches. The Harris Micro-Punch has a replaceable polished steel tip that is case hardened and can be sterilized. Each tip provides up to 2000 punches.

Both punches are available in 1.2, 2.0, and 3.0 mm diameters. There is no sample carryover with either type of punch tool when recommended procedures are followed.<sup>1</sup> The cutting mat ensures clean sample cuts and extends the life of the cutting tip.

### Semi-Automated punching of FTA cards

The GE Healthcare Harris e-Core™ tool is a compact, versatile, electric coring instrument designed for unrestricted sampling of FTA and FTA Elute cards. The e-Core utilizes 1.2, 2.0 and 3.0 mm replaceable Harris Micro-Punch Tips. The razor sharp cutting edge on the Micro-Punch Tip cleanly and precisely cores discs from FTA, all but eliminating the creation of potential cross-contamination between sampling.

The ergonomic “joy stick” grip and simple operation of the Harris e-Core provides comfort and efficiency, integrating smoothly into multiple levels of laboratory sample throughput. You have complete control over the disc recovery process, coring speed, and disc delivery.

The Harris e-Core ejection system allows you to control both the speed and delivery of the ejected disc. Most importantly, the Harris e-Core ejection system does not generate static, ensuring accurate disc delivery.

<sup>1</sup> Application note: Cross-contamination study: Carryover does not occur during punching and processing of FTA or CloneSaver™ cards, GE Healthcare, 51621.



Harris Micro-Punch 1.2 mm, with cutting mat



Harris Uni-Core Punch 1.2 mm



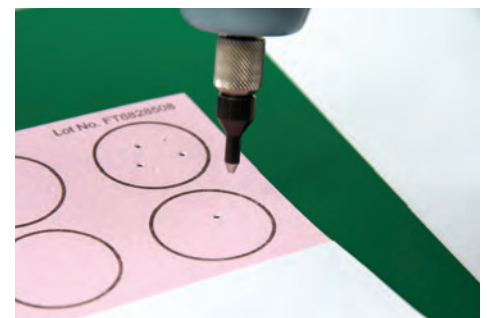
Harris Uni-Core Punch 3.0 mm



Harris Uni-Core Punch 2.0 mm



Harris e-Core punch



Harris e-Core tool punching an Indicating FTA Classic Card

Product	Notes	Quantity/ pack	Code number
<b>Manual punching of FTA cards</b>			
Harris Micro-Punch	<ul style="list-style-type: none"> <li>No sample carryover when recommended procedures are used.</li> <li>Tips provide up to 2000 punches.</li> <li>Cutting mat ensures clean sample cuts and extends the life of cutting tip.</li> </ul>		
Harris Micro-Punch 1.2 mm, with cutting mat	<ul style="list-style-type: none"> <li>For use with FTA cards containing whole blood or buccal cells.</li> </ul>	1	WB100005
Replacement Tip 1.2 mm		1	WB100006
Harris Micro-Punch 1.2 mm, replacement plunger		1	WB100025
Replacement Cutting Mat		1	WB100020
Harris Micro-Punch 2.0 mm, with cutting mat	<ul style="list-style-type: none"> <li>For use with FTA cards containing buccal cells.</li> </ul>	1	WB100007
Replacement Tip 2.0 mm		1	WB100008
Harris Micro-Punch 2.0 mm, replacement plunger		1	WB100026
Harris Micro-Punch 3.0 mm, with cutting mat	<ul style="list-style-type: none"> <li>For use with FTA Elute.</li> </ul>	1	WB100038
Replacement Tip 3.0 mm		1	WB100042
Harris Micro-Punch 3.0 mm, replacement plunger		1	WB100041
Harris Uni-Core Punch	<ul style="list-style-type: none"> <li>Disposable punch.</li> <li>No sample carryover when recommended procedures are used.</li> <li>Tips provide up to 500 punches.</li> </ul>		
Harris Uni-Core Punch 1.2 mm	<ul style="list-style-type: none"> <li>For use with FTA cards containing whole blood or buccal cells.</li> <li>Can use one or two 1.2 mm punches with buccal samples.</li> </ul>	4	WB100028
Harris Uni-Core Punch 2.0 mm	<ul style="list-style-type: none"> <li>For use with FTA cards containing buccal samples.</li> </ul>	4	WB100029
Harris Uni-Core Punch 3.0 mm	<ul style="list-style-type: none"> <li>For use with FTA Elute.</li> </ul>	4	WB100039
Harris Uni-Core Punch 6.0 mm	<ul style="list-style-type: none"> <li>For use with FTA cards containing whole blood or buccal cells.</li> </ul>	4	WB100040
<b>Semi-Automated punching of FTA cards</b>			
Harris e-Core 1.2 mm	<ul style="list-style-type: none"> <li>For use with FTA cards containing whole blood or buccal cells.</li> </ul>	1	WB100052
Harris e-Core 2.0 mm	<ul style="list-style-type: none"> <li>For use with FTA cards containing buccal cells.</li> </ul>	1	WB100048
Harris e-Core 3.0 mm	<ul style="list-style-type: none"> <li>For use with FTA Elute.</li> </ul>	1	WB100049
Replacement Tip 1.2 mm		1	WB100006
Replacement Tip 2.0 mm		1	WB100008
Replacement Tip 3.0 mm		1	WB100042

## Other GE Healthcare products for sample collection

### FTA accessories and other products

#### Buccal sample collection

GE Healthcare offers two products for buccal cell/saliva collection when archiving is not needed—OmniSwab and Sterile Foam-Tipped Applicators. OmniSwab enables sterile buccal cell collection and easy purification of DNA from the swab. OmniSwab is made of absorbent material specifically designed for the collection of buccal cells. The single-use swab has a unique, injectable collection pad to assist in processing samples. DNA can be extracted directly from the swab using standard purification protocols.

The Sterile Foam-Tipped Applicator is intended for use with Indicating FTA and Indicating FTA Elute cards. Simply swab the cheek, then apply the applicator head to the card.

#### DNA purification from FTA cards

FTA Purification Reagent is used to purify DNA stored on FTA cards. This reagent can be used to wash punches in the "punch-in" procedure for standard STR amplification (page 12 , Fig 9). Alternatively, samples can be subjected to direct amplification (page 12 , Fig 7 and 8), which does not require the reagent.

#### Sample transport and storage

Sample integrity during transport and storage will be maximized by placing your FTA cards in a multi-barrier pouch with a desiccant pack. Multi-Barrier Pouches may be used for transporting or storing FTA cards. The pouches feature a tamper-evident seal. Two sizes are available—large and small. Desiccant packets ensure that the FTA matrix remains dry during transport or storage. Additional product information is provided in the table.

### Laboratory surface protection

#### BenchKote™

Benchkote™ is an absorbent, impermeable material designed to protect laboratory surfaces against hazardous spills. The material features a high-quality, smooth, absorbent Whatman paper which quickly absorbs liquid spills and a laminated polyethylene layer that prevent flow through to the working surface. After use the sheet is incinerated or disposed of according to local regulations.

#### Benchkote Plus

Benchkote Plus is a thicker, more absorbent material for more demanding applications and can absorb in excess of 0.75 liters of water per square meter.

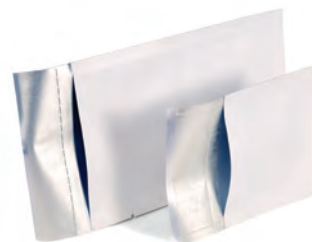


Sterile OmniSwab

Sterile Foam-Tipped Applicator



FTA Purification Reagent



Large and small Multi-Barrier Pouches



Product	Notes	Quantity/ pack	Code number
<b>Buccal sample collection</b>			
Sterile OmniSwab	<ul style="list-style-type: none"> <li>For collection of buccal cells and saliva.</li> <li>Features a brush-like swab head that easily ejects from the stem of the swab for transfer of samples into tubes.</li> <li>For laboratories that collect samples that do not require archiving.</li> </ul>	100	WB100035
Sterile Foam-Tipped Applicators	<ul style="list-style-type: none"> <li>Easy-to-use applicator.</li> <li>For collection and transfer of buccal cells and saliva to FTA cards.</li> <li>The nonabrasive foam head is the same size as the sample area on Indicating FTA cards to facilitate sample application.</li> </ul>	100	WB100032
<b>DNA purification from FTA cards</b>			
FTA Purification Reagent	<ul style="list-style-type: none"> <li>For the purification of nucleic acids stored on FTA cards.</li> <li>Ensures excellent quality DNA for STR analysis.</li> <li>Removes heme, a PCR inhibitor, and other potential contaminants.</li> <li>500 ml bottle.</li> </ul>	1	WB120204
<b>Sample transport and storage</b>			
Multi-Barrier Pouch, large	<ul style="list-style-type: none"> <li>For transport or storage of FTA Classic Cards.</li> <li>Seven laminated layers protect the card from exposure to gas or liquid contamination.</li> <li>Tamper-evident seal maintains sample security.</li> <li>Outer paper surface for labeling or writing.</li> <li>9 × 15 cm.</li> </ul>	100	WB100037
Multi-Barrier Pouch, small	<ul style="list-style-type: none"> <li>Same construction in a smaller size for storage of FTA Mini Cards or FTA Micro Cards.</li> <li>Also suitable for FTA Elute Micro Cards.</li> <li>8 × 7 cm.</li> </ul>	100	WB100036
Desiccant Packets	<ul style="list-style-type: none"> <li>Ensure that the FTA matrix remains dry during transport or storage.</li> <li>1 g packets.</li> </ul>	1000	WB100003
<b>Laboratory surface protection</b>			
Benchkote	Benchkote Surface Protector, sheets, 460 × 570 mm	50	2300-916
	Benchkote Surface Protector, sheets, 460 × 570 mm	100	2300-917
	Benchkote Surface Protector, pad, 460 × 570 mm (available in US)	50	2300-594
	Benchkote Surface Protector, pad, 460 × 570 mm, 50 sheets per pad (available in EU)	1	2300-599
	Benchkote Surface Protector, reel, 460 mm × 50 m	1	2300-731
	Benchkote Surface Protector, reel, 920 mm × 50 m	1	2300-772
BenchKote Plus	Benchkote Plus Surface Protector, sheets, 500 × 600 mm	50	2301-6150
	Benchkote Plus Surface Protector, reel, 600 mm × 50 m	1	2301-6160

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