



Presentation to PSMC



Using DNA to Secure Military Components

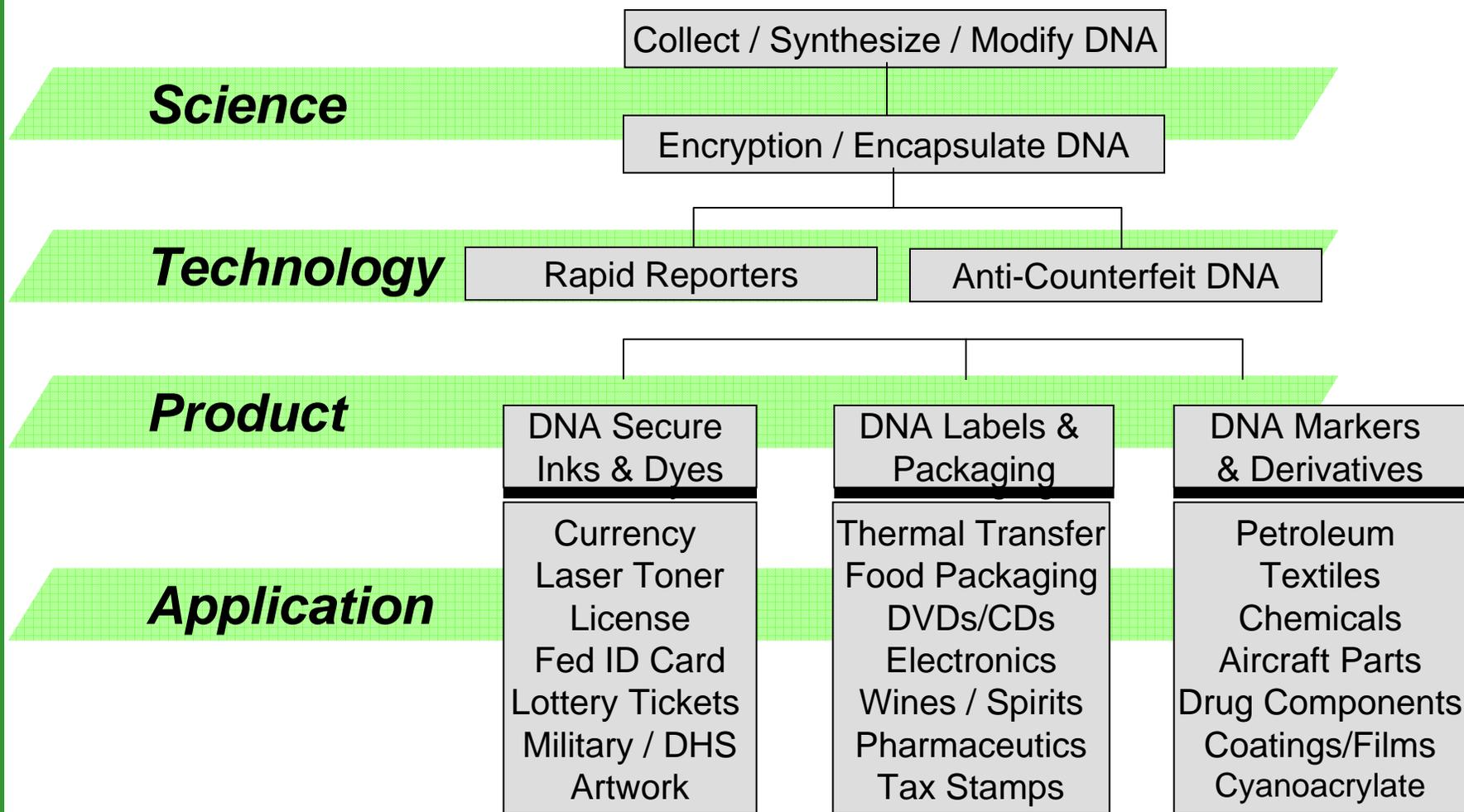
May 20, 2009



Outline

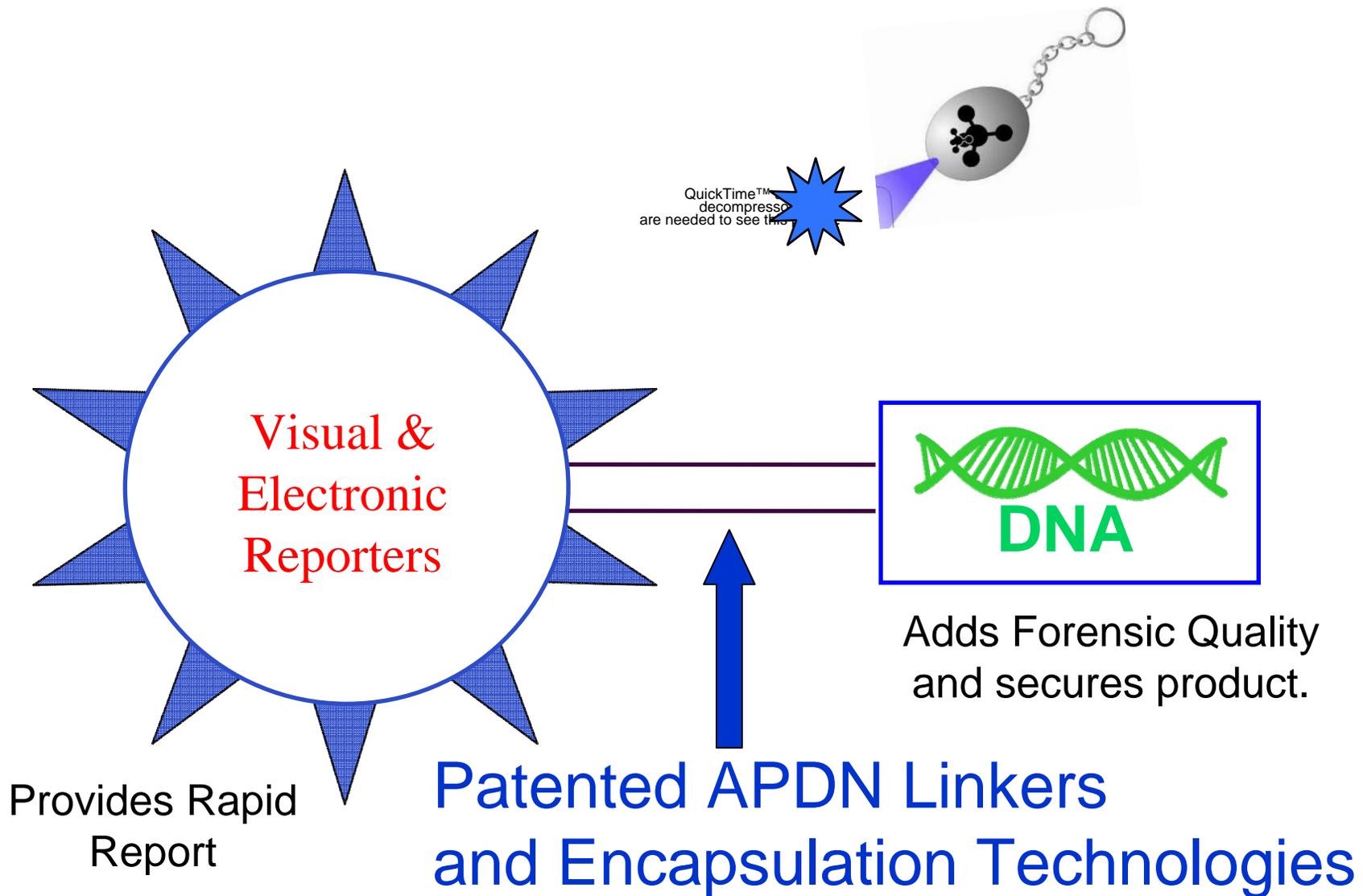
- Translating DNA Science into Product Protection
- Defending The Supply Chain
- Why DNA?
- Two Main Security Platforms
 - BioMaterial Genotyping™
 - SigNature® DNA Marker
- Authentication Procedures
- Cash-in-Transit Case Study
- Layered DNA Security Applications
- Summary

Translating DNA Science into Secure Supply

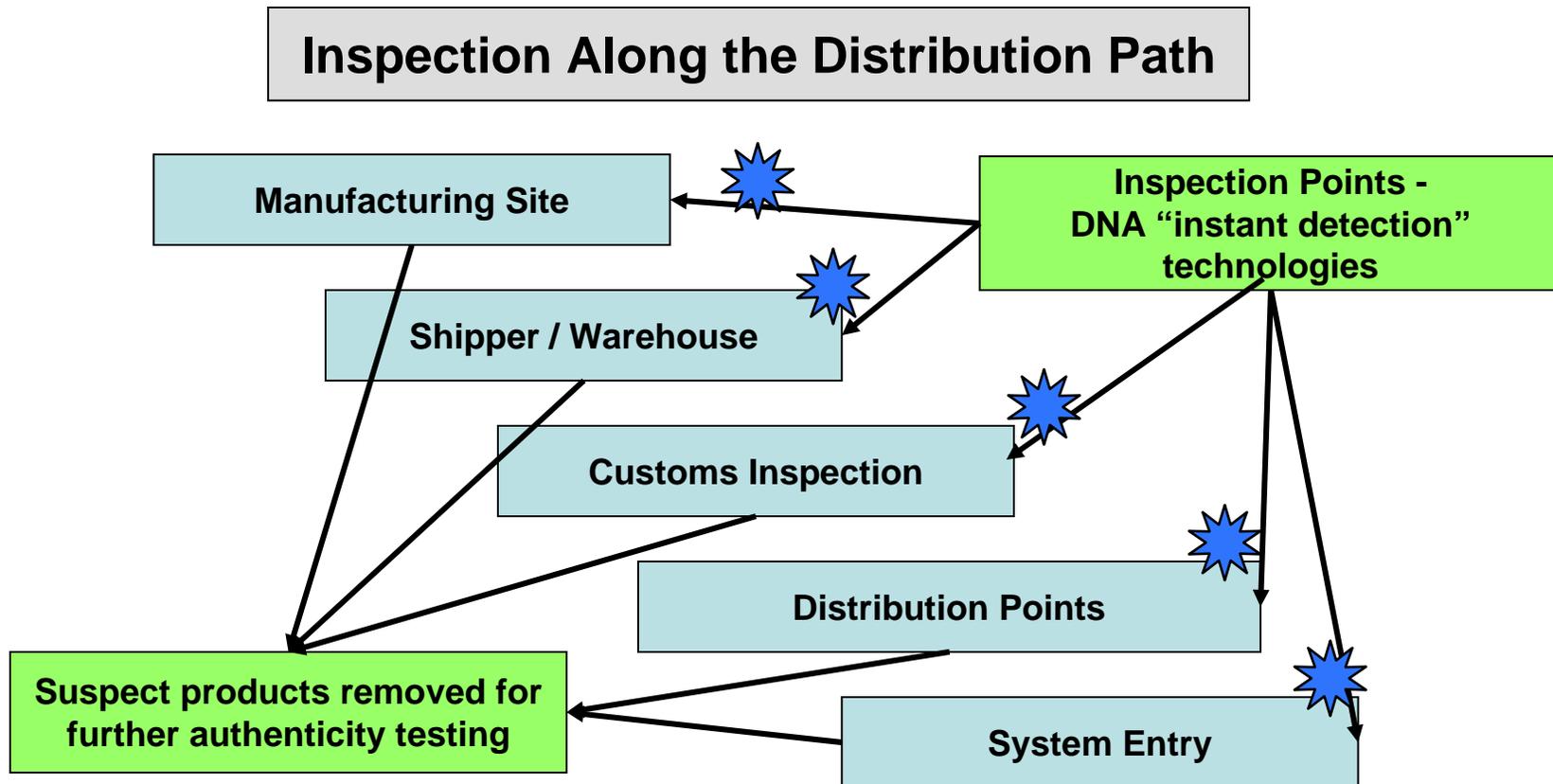


Rapid Screening Via Patented DNA-Reporter Adducts

Combine machine-read screening with forensic authentication



Defending The Supply Chain



Why DNA?

- **Can not be copied.** DNA is complex and would require significant investment to detect, decode and copy. *Embedment/encryption techniques.*
- **Forensic.** Accepted by courts as evidence.
- **Absolute Authentication.** DNA has exquisite sensitivity and resolution.
- **Affordable.** Each DNA mark is cost effective.
- **Green.** Botanical DNA markers. Sustainable.
- **Flexible.** Insert into existing Process Maps.

Proven Technology



- **Productized.** Over a billion commercial products marked.
- **Stable.** Established forensic quality authentication which has been independently validated by Idaho National Labs.
- **Virtually endless applications allowing for layered security.** Can mark components, labels, packages. You name it.
- **Reliable.** Negligible false positives.
- **Intellectual Property.** Broad scope of intellectual property rights - 7 patents issued, 14 patents pending, 2 registered trademarks, and 2 trademarks pending.

Two Main Security Platforms



- **“Intrinsic” or Genomic DNA** present in a natural material.
- **Example:** identifying American Pima Cotton, distinguishing source cotton by country in a finished fabric.
- **Military application:** we can GenoType military C&T. Ensure C&T quality and origins.



- **“Extrinsic” DNA Marker** designed to mark an original item.
- **Example:** providing 400 million unique DNA markers for a national security card program.
- **Military application:** can SigNature mark items from rivets to micro chips to C&T. Rapid screening methods would screen out those samples requiring full forensic assessment.

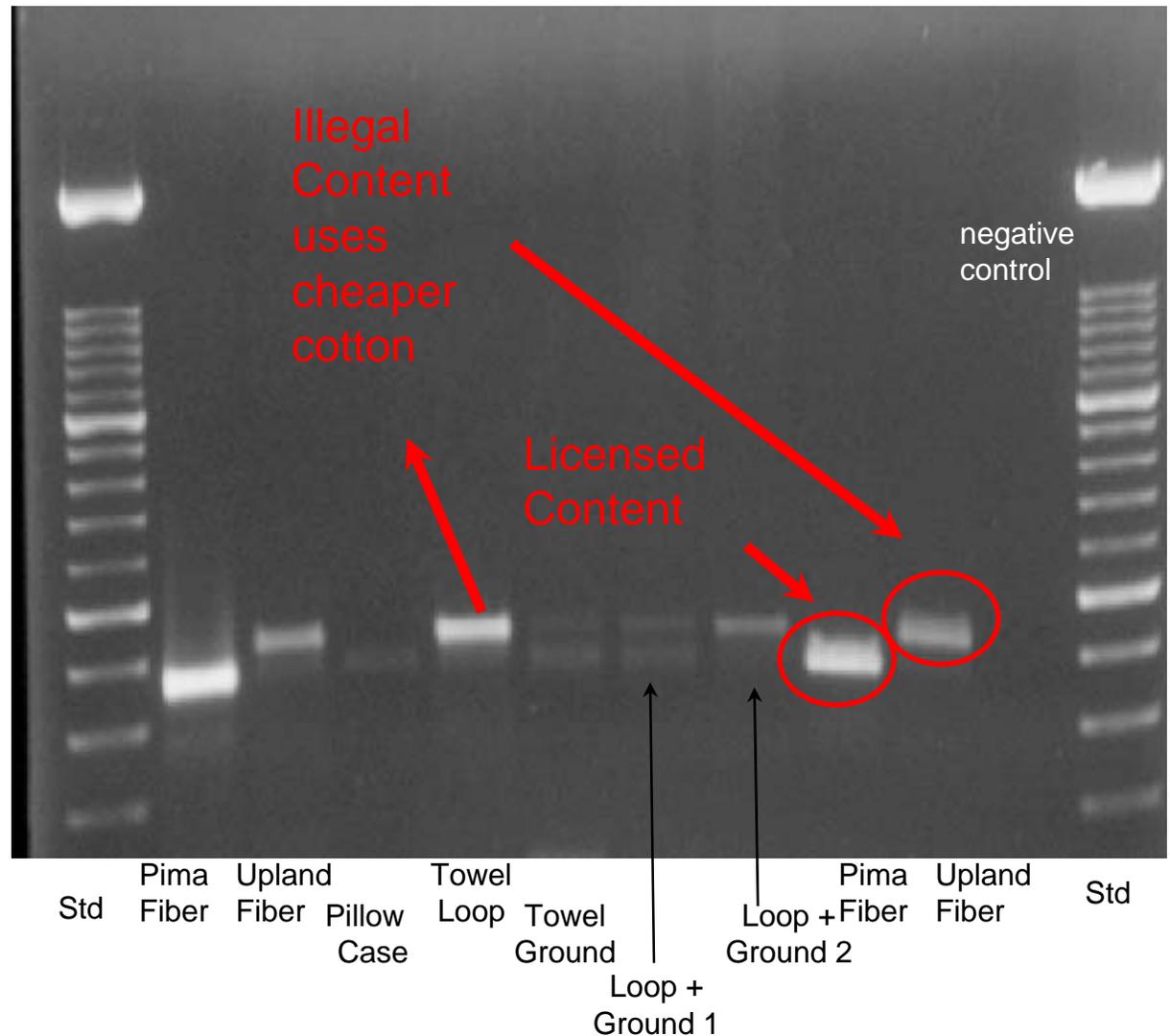
Cotton Genotyping to Authenticate Heritage of Textiles

- DNA has never before been identified in mature cotton fibers.
- Applied DNA Sciences and Supima have initiated a soft-launch of our FiberTyping™ Assay:
 - Developed enhanced DNA detection from fibers
 - Discovered that fiber DNA could be detected in washed, finished garments
 - Can now detect the DNA signature from the original plant in single fibers removed from a garment
 - Can determine in a single assay whether the cotton is Pima or Upland
 - Can determine the country of Pima origin

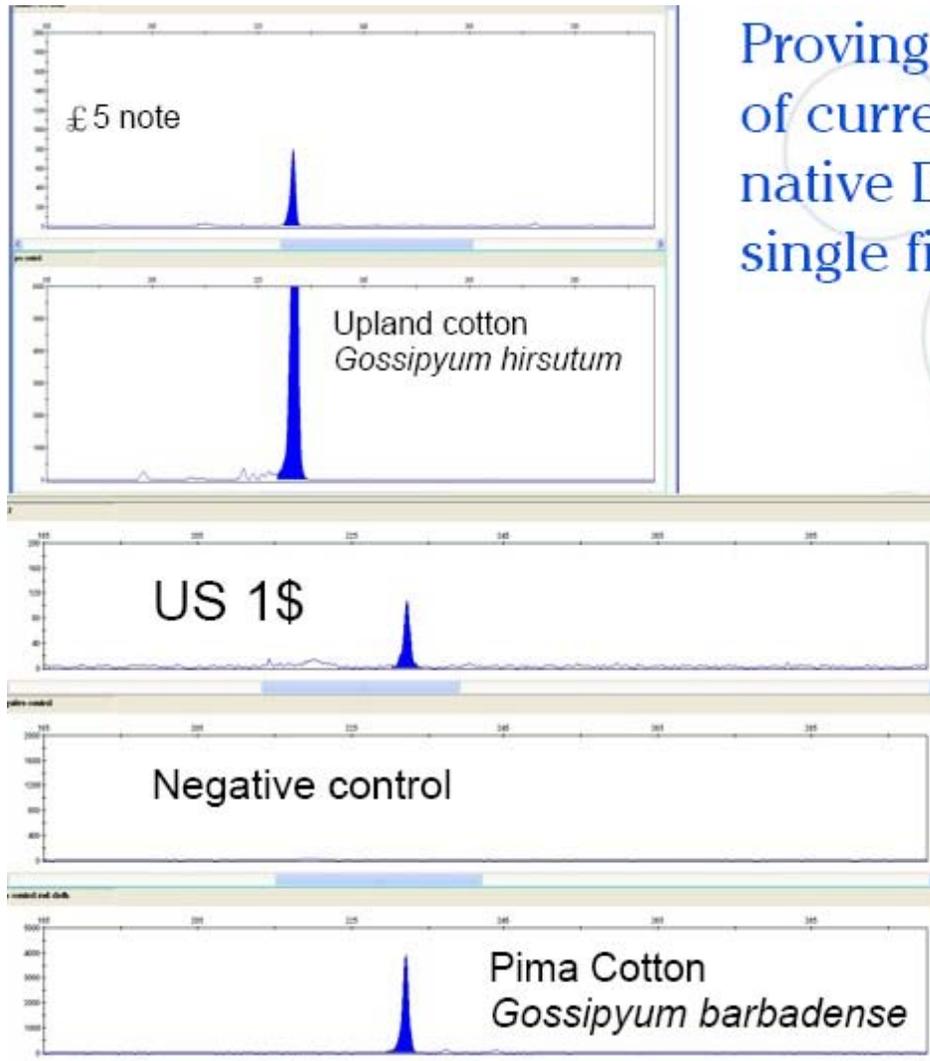
Authentication of Cotton Heritage Reveals Fraudulent Fabric Composition

By detecting non-compliance with license terms, Applied DNA Sciences protects:

- the consumer,
- the brand owner,
- the manufacturer,
- the retailer,
- the industry, and Government trade relations.



Cotton DNA in Currency

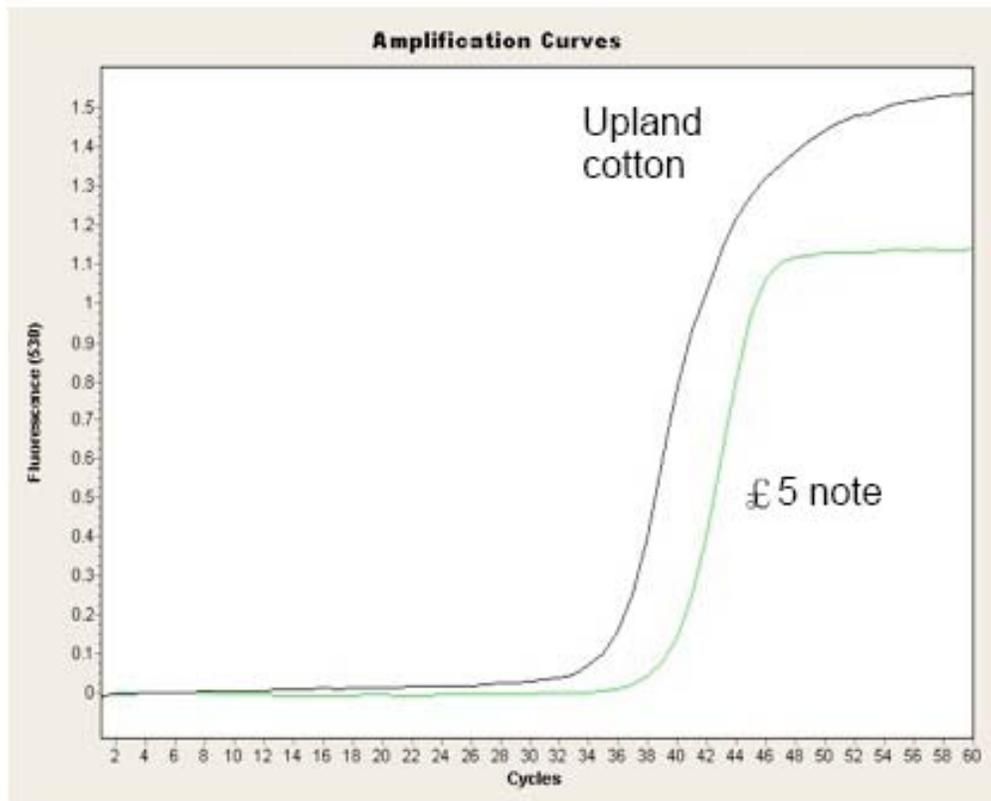


Proving the authenticity of currency paper via native DNA content of single fibers

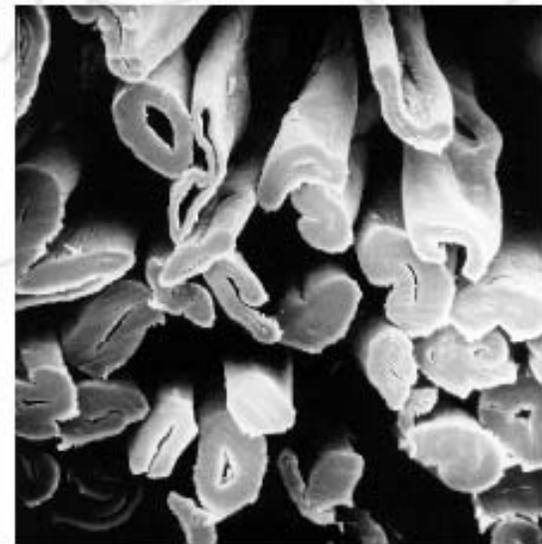
The genetic diversity of natural fibers (cotton, linen) can be used to confirm currency authenticity from a single fiber

US and UK currencies use different cotton cultivars

Rapid PCR assay confirms cotton content of UK currency



Single fiber assay

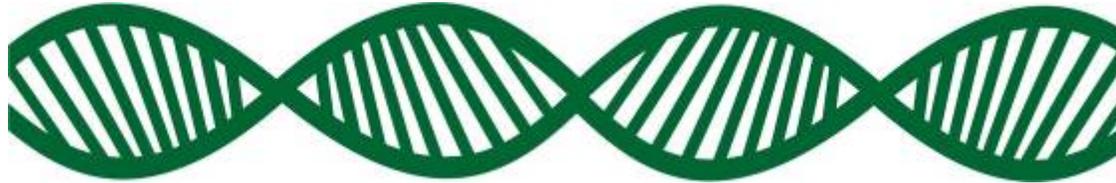


Confidential.



appliednasciences 

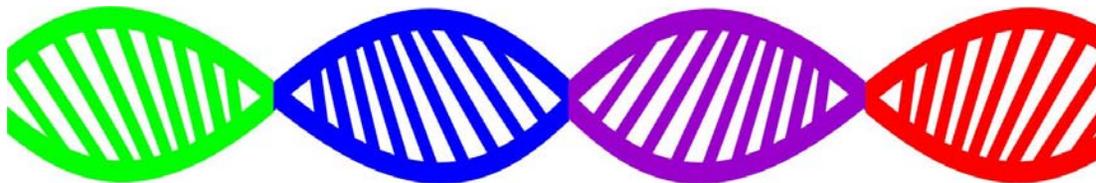
Creating a SigNature[®] DNA Marker



Large Botanical DNA is acquired



DNA is segmented

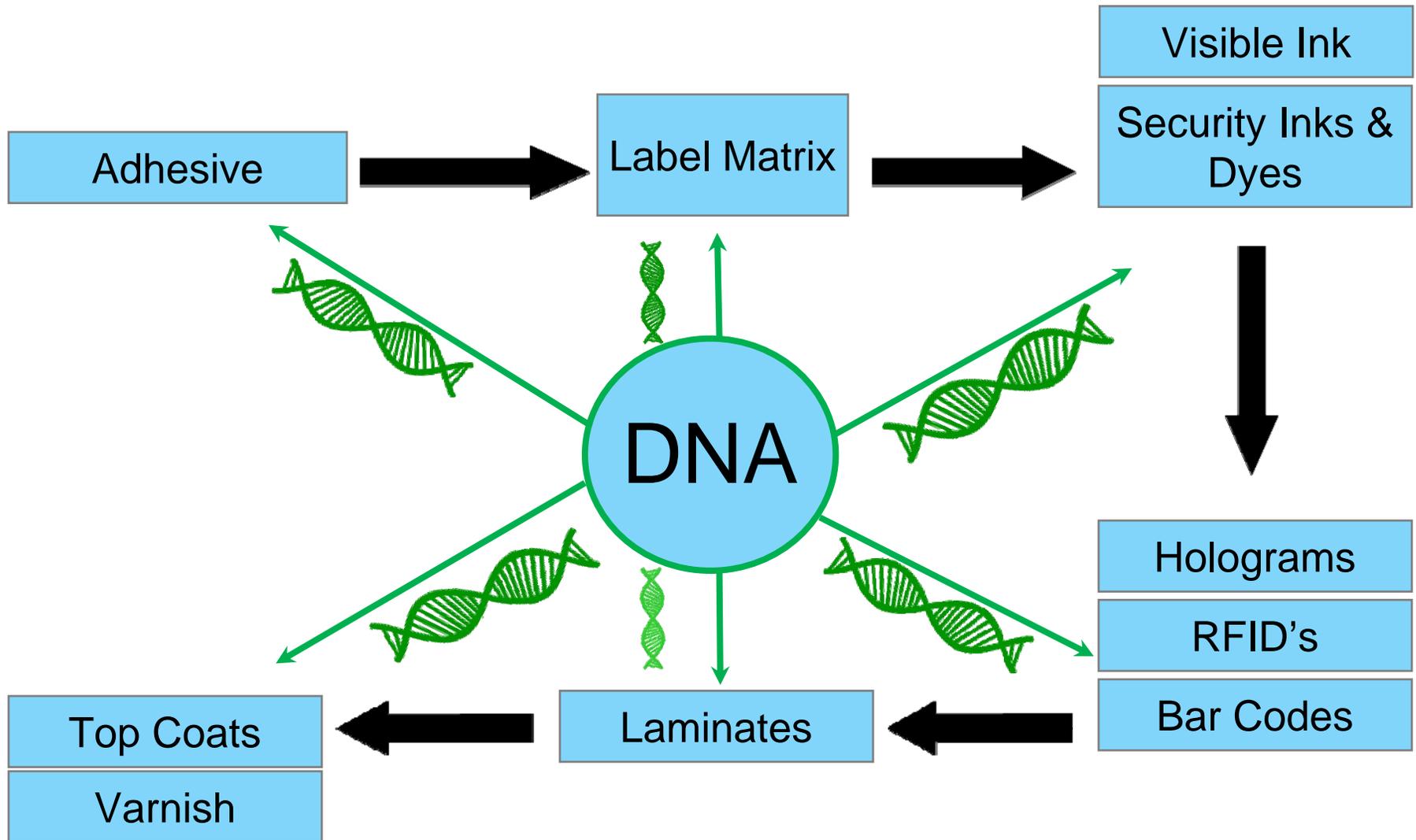


Segments are shuffled, reassembled and encrypted to form a unique, secure DNA marker.

SigNature[®] DNA is Very Stable

Category	Testing Contents	Result
UV energy	Equivalent to 350 years of UV energy accumulation in Denver	Stable
X-Ray	4 times X-Ray exposure by X-Ray scanning machine of airport	Stable
γ-Ray	30 kGy kilo-Gray radiation exposure by Gamma-ray sterilization machine	Stable
pH Thermal	pH 1~ 14 over night >250 deg C, >4 hours	Stable

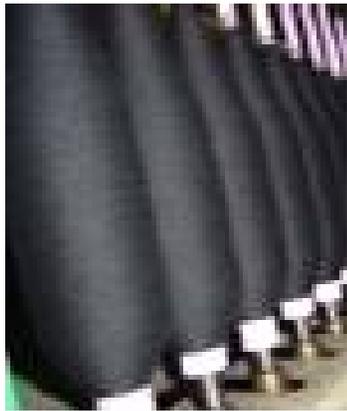
On Labels, DNA can be applied at every step



Using SigNature[®] DNA to Mark and Authenticate Yorkshire Textiles



Fiber



Yarn & Textiles



Fabric



Woven Labels



Finished Garment

DNA-UCP adducts protect the entire custody chain

Authentication



Pin Stripe Yarn



SigNature® DNA-UCP In Pin Stripe Detected



DNA Analysis of pin stripe yarn using fabric treatment shows that SigNature DNA-UCP persists after multiple washings.

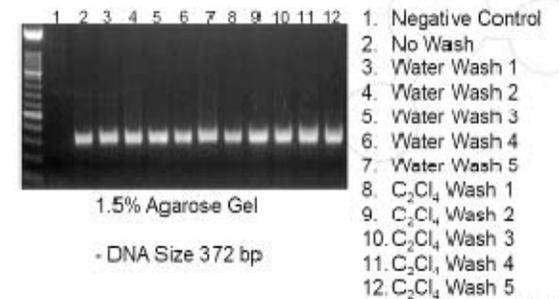
SigNature® DNA-UCP In Woven Label Detected



SigNature® DNA In Fabric

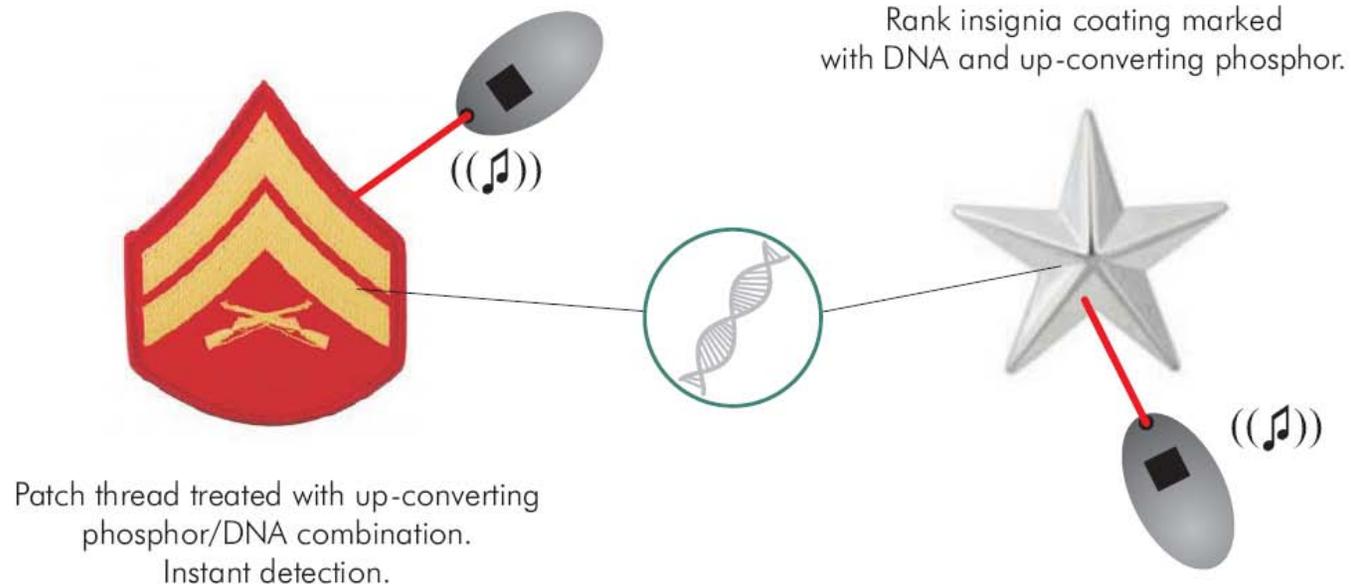


Fabric - RUCOFIN GWS



Uniform Protection – DNA Adducts provide easy detection of military textile and apparel

SigNature® DNA Security Measures



DNA Marker Hosts

- Varnishes, Plastics, Adhesives, Cyanoacrylate
- Labels, Seals, Tapes, Laminates
- Fibers, Yarns, Fabrics, Woven labels
- Wide Range of Security Inks
 - Compatible with flexography, offset, gravure
 - Assortment of paper, labels, packaging
- Laser and Inkjet Ink
- Cash Degradation ink
- Thermal Transfer ribbons
- Textile treatments, binders, yarn, fabric
 - Direct application onto the product itself



Can you Tell the Difference?



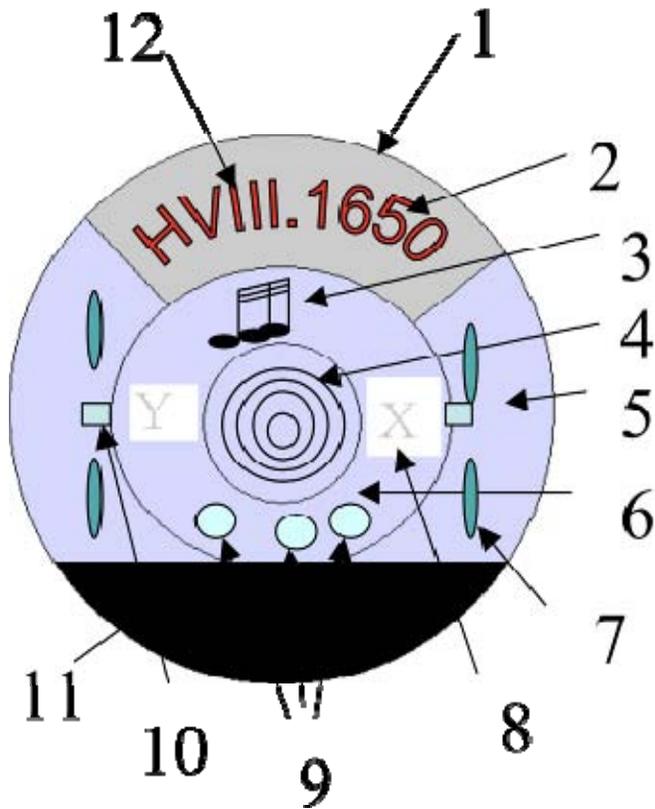
Real



Fake

We Can.

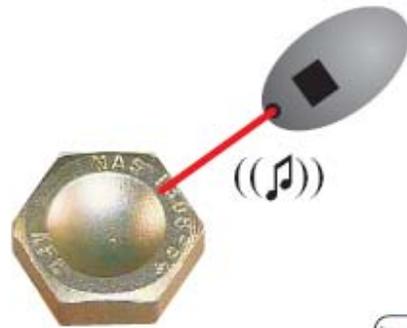
The Only Uncopiable Taggant



1. PET Al sputtered foil release label
2. Fluorescent red ink turns orange with red laser
3. Musical note hologram: shape shift/color change
4. 10 concentric circles. Shapes shift when tilted
5. X,Y microdots visible under 30X magnification
6. Random interference lines
7. 4 microprints of 'CHINA AUDIO VIDIO' (sic)
8. Shine red laser 300 from top of X and Chinese 'culture' projects on paper 450 below.
9. Three circles encoded with Characters
10. Microprint 'CHINA AUDIO VIDIO' (sic)
11. Machine readable encrypted codes
12. **DNA embedded** in #2 fluorescent ink

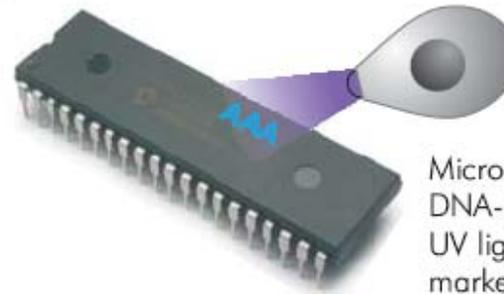
Level 1: Rapid Screening

SigNature[®] DNA Security Measures



Bolt head with DNA-marked coating. Up-converting phosphor provides instant marker detection

Invisible 2-D barcode with DNA marker



Microchip screen with DNA-marked fluorescing ink. UV light provides instant marker detection



DNA-marked Critical Documents

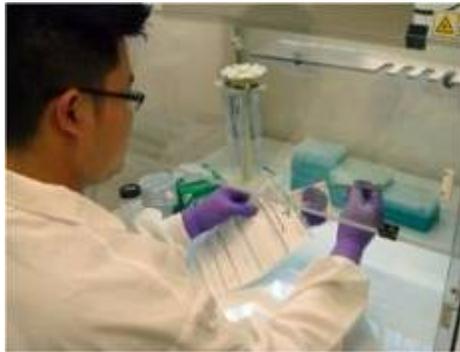
Level 2: In-Field DNA Authentication

- Hand-held PCR-based device
- Quick end-point analysis, enabling non-technical users with minimal training to operate the system with confidence.
- Applied DNA “primer kit” for each specific corporate DNA(s)

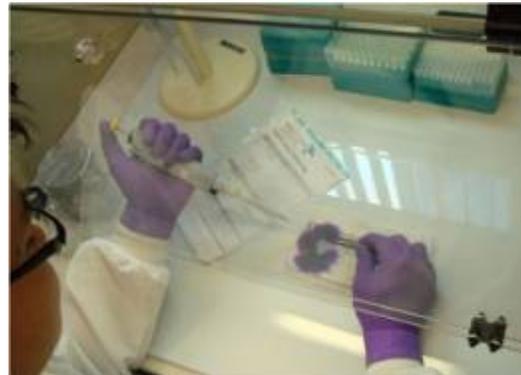


Applied DNA is collaborating with Smiths Detection, a subsidiary of Smiths PLC (UK) to co-develop, market and sell In-Field detectors for Level 2 DNA authentication.

Level 3: Full Forensic Authentication



Sample of DNA obtained



Prepare for DNA testing



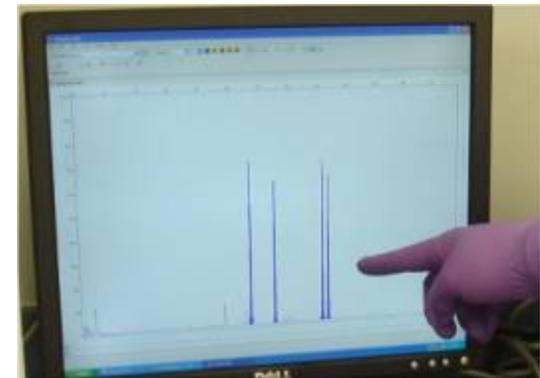
Purified DNA sample into vial



DNA authenticated using PCR machine and/ CE analysis.



DNA is amplified if the exact SigNAture Full DNA sequence is present. Results are absolute and definitive.



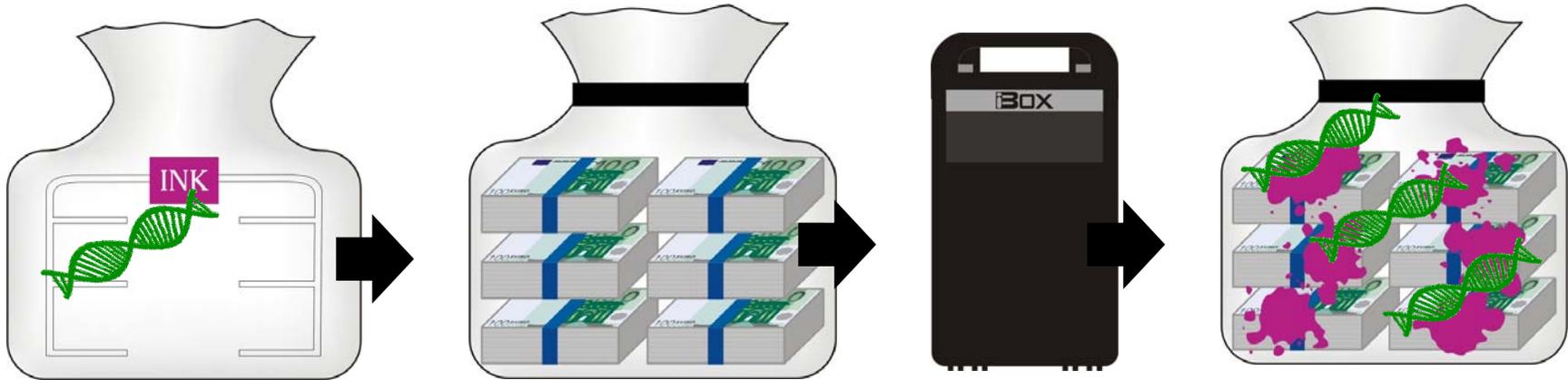


Cash-in-Transit DNA Ink



- DNA adds deterrent value to address growing CIT crime rate. Incidence of CIT crime has increased over 260% in London since 2007 according to Scotland Yard.
- SigNature® DNA used in Loomis UK cash boxes. DNA providing forensic evidence to assist UK Police in linking criminals to stolen notes.

Degradation Ink with DNA Marking



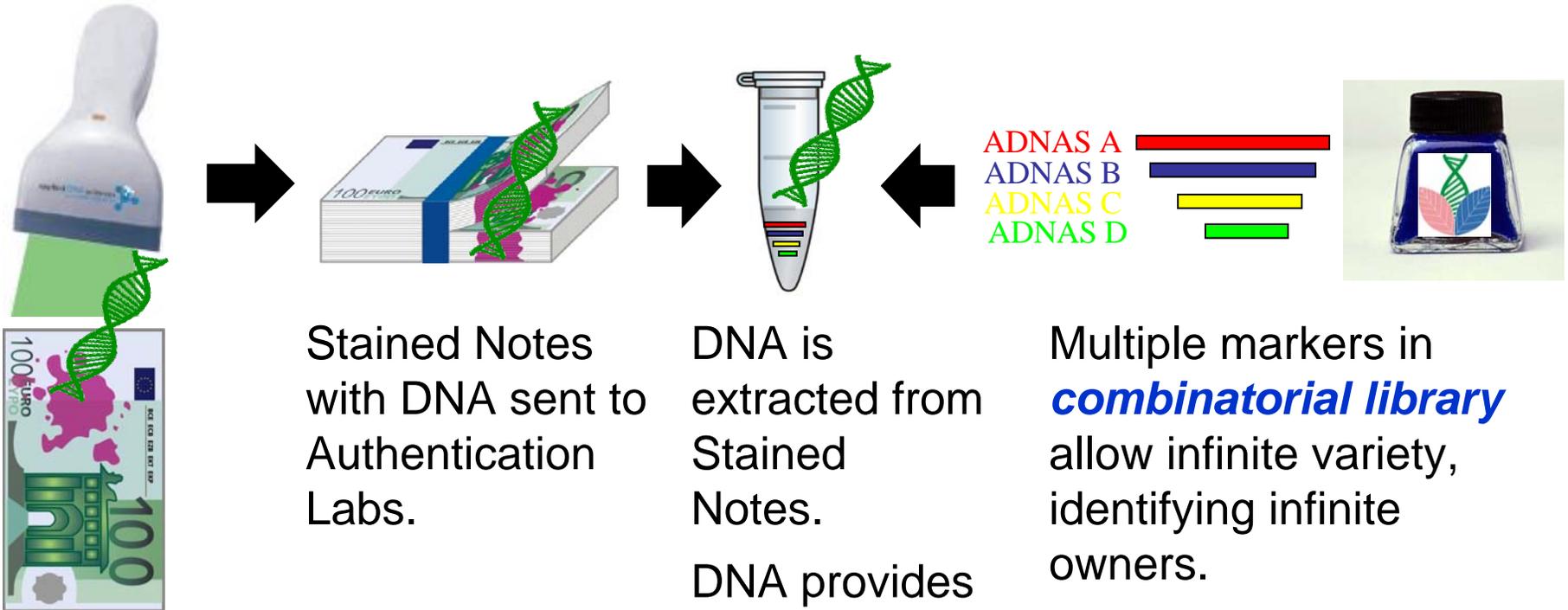
DNA is blended with degradation ink and installed in each iBox which contains a unique DNA sequence.

Cash bundles are placed inside the iBox with the DNA ink.

iBox is locked and transported to the intended destination.

Following discharge, cash is marked with DNA-reporter adduct

Authenticating DNA from Marked Notes



DNA-UV adduct detected with handheld reader.

Stained Notes with DNA sent to Authentication Labs.

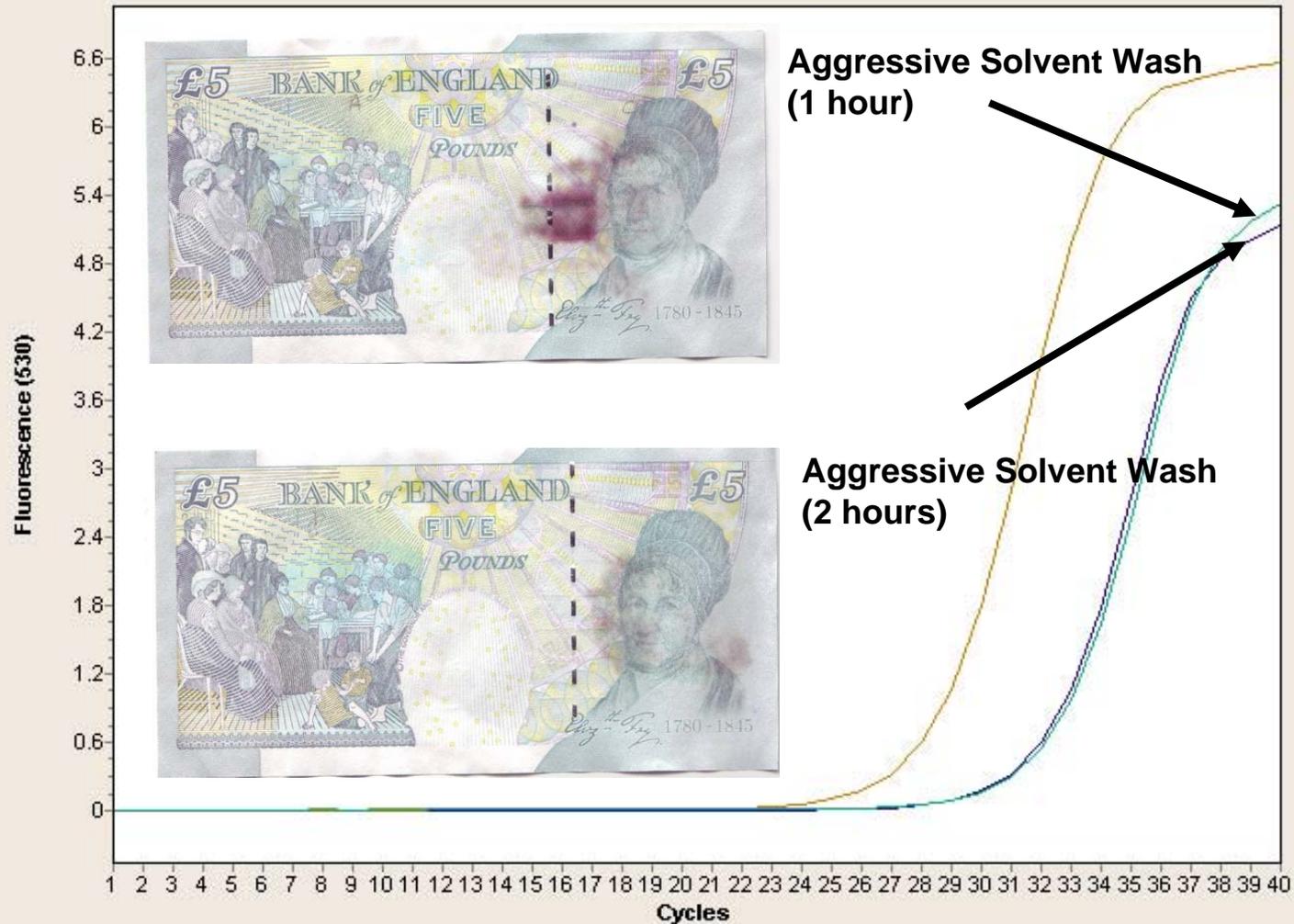
DNA is extracted from Stained Notes.

DNA provides ***absolute provenance.***

Multiple markers in ***combinatorial library*** allow infinite variety, identifying infinite owners.

DNA Persists After Exhaustive Washing with Aggressive Solvent - *DNA is more substantive than dyes*

Amplification Curves



No Wash

RT-PCR of Stained Notes Before and After Washing with Aggressive Solvent

Layered DNA Security Applications

- Thermal transfer ribbons can be marked with DNA and can be used with commercial Zebra or Sato printers.
- Laser Toner Ink and printed documents can be marked and authenticated with DNA.
- Fluorescing inks, 2D barcodes and holograms are all compatible partners with SigNature DNA.

Summary

- DNA is the ultimate security weapon because it **can not be copied.**
- DNA provides **forensic** evidence to prosecute counterfeiters.
- DNA is **absolute authentication** and can be used for audits, quality control and compliance.
- DNA is **affordable** and works within the existing manufacturing process.
- DNA is a **green** technology.

Thank You!