

## 1- Forensic Paternity

Criminal situations can often call for forensic paternity testing, especially in cases where there are products of conception, such as rape or incest. In addition, forensic paternity tests as well as other family relationship tests could be used to identify missing victims or suspects through their family members who are available for testing.

### Unmatched Quality and Efficiency

DDC is the world's largest private paternity testing laboratory, and because of this, our forensic paternity tests are unmatched in quality and efficiency. Our laboratory's numerous accreditations include certifications by AABB (formerly the American Association of Blood Banks), the American Society of Crime Laboratory Directors/Laboratory Accreditation Board, and ACLASS Accreditation Services for ISO 17025 compliance.

### Strict Sample Processing


Our laboratory is able and well-equipped to process different sample types, including blood and fetal tissue samples and DNA samples collected by buccal swabs. Our staff handles every sample with a strict chain of custody, and every piece of DNA evidence is tested twice for complete accuracy. DDC's proprietary [Dual Process™](#) allows us to check each DNA sample against its source records at each step of the DNA test.

### Definitive Results

Forensic paternity test results from DDC exceed most courts' requirements, particularly in terms of the power of discrimination. For difficult cases, we can perform extended testing and statistical analysis in addition to the 13 core CODIS loci required by the FBI. We can also use specialized tests such as mtDNA and Y-STR typing to supplement paternity test results as well. Our in-depth experience in family relationship and paternity testing helps us to address unique genetic situations such as mutations and uncommon familial relationships.

## 2- DNA Fingerprinting

DNA fingerprinting is a test to identify and evaluate the genetic information—called [DNA](#) (deoxyribonucleic acid)—in a person's cells. It is called a "fingerprint" because it is very unlikely that any two people would have exactly the same DNA information, in the same way that it is very unlikely that any two people would have exactly the same physical fingerprint. The test is used to determine whether a family relationship exists between two people, to identify organisms causing a disease, and to solve crimes.

Only a small sample of cells is needed for DNA fingerprinting. A drop of blood or the root of a hair contains enough DNA for testing. Semen, hair, or skin scrapings are often used in criminal investigations. See a picture of [DNA testing in a criminal investigation](#) .

A person who has DNA fingerprinting done voluntarily usually provides a sample of blood taken from a vein. DNA testing also can be done on cells obtained by a simple mouthwash or a swab of the cheeks inside the mouth, but these methods are not recommended.

## Why It Is Done

DNA fingerprinting is done to:

- Find out who a person's parents or siblings are. This test also may be used to identify the parents of babies who were switched at birth.
- Solve crimes (forensic science). Blood, semen, skin, or other tissue left at the scene of a crime can be analyzed to help prove whether the suspect was or was not present at the crime scene.
- Identify a body. This is useful if the body is badly decomposed or if only body parts are available, such as following a natural disaster or a battle.

## How To Prepare

Tell your doctor if you have

had a blood transfusion within the past 3 months. You do not need to do anything else before you have this test.

Talk to your doctor about any concerns you have about the need for the test, its risks, how it will be done, or what the results will mean. To help you understand the importance of this test, fill out the [medical test information form](#)(What is a [PDF](#) document?).

## How It Is Done

### *Blood sample from a vein*

DNA that is used to establish paternity is collected from a blood sample. The health professional drawing blood will:

- Wrap an elastic band around your upper arm to stop the flow of blood. This makes the veins below the band larger so it is easier to put a needle into the vein.
- Clean the needle site with alcohol.
- Put the needle into the vein. More than one needle stick may be needed.
- Attach a tube to the needle
- to fill it with blood.
- Remove the band from your arm when enough blood is collected.
- Put a gauze pad or cotton ball over the needle site as the needle is removed.
- Put pressure on the site and then put on a bandage.

### *Blood sample from a heel stick*

3- How does DNA testing work?

DNA testing is a powerful tool for identification and has many practical applications.

Common uses include:

- Parental testing - to establish if someone is the biological parent of a child
- Forensic testing - to help identify suspects or victims in a criminal investigation

- Gene therapy - to test parents or fetuses for genetic conditions or birth defects
- [Genetic genealogy](#) - to find out more about someone's ancestry

## **What is DNA?**

At the heart of DNA testing is the molecule DNA. It carries our genetic code and determines traits from eye colour to aspects of our personalities.

Every cell in our bodies - from heart to skin, blood to bone - contains a complete set of our DNA.

## **What is the DNA test looking for?**

99.9% of the DNA from two people will be identical. The 0.1% of DNA code sequences that vary from person to person are what make us unique.

These sequences are called genetic markers, and are the part of the code that forensic scientists use when doing a DNA test.

Identical twins are the only people who have identical genetic markers.

However, the more closely related two people are, the more likely it is that some of their genetic markers will be similar.

The key to DNA testing is knowing where to look in the billions of letters of genetic code to find the genetic markers that will identify the important similarities or differences between people.

## **How does the DNA test work?**

Parental, forensic and genetic testing look for similarities in the genetic markers between two biological samples.

Because all cells in the body contain exactly the same DNA, samples can be taken from almost anywhere in the body, including skin, hair follicles, blood and other bodily fluids.

A forensic scientist might be asked to compare DNA from skin cells found underneath the fingernails of an attack victim, with the DNA from a blood sample taken from

a potential suspect.

First of all, the DNA is isolated from the cells and millions of copies are made, using a method called 'polymerase chain reaction', or PCR.

PCR uses a naturally occurring enzyme to copy a specific stretch of DNA over and over again

Having lots of DNA makes the genetic code easier to analyse.

The DNA molecules are then split at particular locations to separate them into known 'chunks' and the code at those specific points is analysed to create a DNA fingerprint. The fingerprints from the two different samples are then compared to see if they match.

### **How accurate are DNA tests?**

The accuracy of DNA tests has big implications. DNA tests are sometimes the only evidence to prove that a suspect was involved in a crime, or free someone who has been wrongly convicted.

It is easy to tell if DNA from two biological samples does not match. But a match doesn't make you totally certain that the two samples come from the same person.

There is always a small chance that two different people's genetic markers could be the same, especially if they are related.

To reduce the chance of error, scientists test more than one genetic marker. The more identical markers there are in two samples, the more accurate the test.

However, testing more markers takes more time and is more expensive. Forensic DNA tests usually examine six to ten markers. The chances that two unrelated people have identical profiles is less than [one in one billion](#).

#### **4- New genetic tools for differentiating "identical" twins: Eurofins develops first DNA test for forensic and paternity testing of twins**

<http://online.wsj.com/article/PR-CO-20131210-900237.html>

Eurofins Scientific (EUFILPA), one of the global leaders in Genomics Services, announces a research breakthrough in genetic discrimination between identical monozygotic twins.

Until now science has accepted the fact that monozygotic twins - also called "identical" twins from one fertilized ovum - could not be genetically discriminated. Even though there were theoretical considerations that monozygotic twins are not fully identical in their genome, no tools existed for forensic DNA fingerprinting in crime or paternity cases.

This has changed now. Eurofins, the European leader in genomic services, forensics and paternity tests, has successfully completed a genetic and forensic research project on twins. Based on the results Eurofins has developed the world's first test to identify genetic differences between identical twins. These tests can now be used by authorities, courts and medicine to solve cases involving monozygotic twins as originator of DNA traces in crime, or as alleged parents.

Building on the long forensics and genomics expertise of Eurofins, the scientists used the unique combination of leading labs available at Eurofins to look at the differences in the genome of identical twins. For this purpose they applied Eurofins' advanced sequencing and bioinformatics technologies. Genome sequencing

is a technique that allows researchers to read and decipher the genetic information found in the DNA of anything from bacteria to plants to animals. The vast amounts of data collected in this process are then analysed by means of intelligent proprietary information technology, called bioinformatics.

The scientists investigated the genetic material taken from sperm samples of two twins and from the blood sample of the child of one twin. Bioinformatics analysis revealed five mutations, so called Single Nucleotide Polymorphisms (SNPs) present in the twin father and the child, but not in the twin uncle. These findings proved the hypothesis that rare mutations will occur early after or before the ovum has split into two, and that such mutations will be carried on into body and sperm cells.

The Eurofins "Twin Test" is available in all laboratories of the Eurofins Genomics Business Line. The test will be performed at the Eurofins DNA Campus in Ebersberg, at the laboratories of Eurofins MWG Operon and Eurofins Medigenomix Forensik GmbH.

## **5- The danger of unreliable paternity tests**

<http://www.newscientist.com/article/mg20827893.200-the-danger-of-unreliable-paternity-tests.html#.UyL93stWFOw>

*Can prenatal blood tests identify a fetus's father? The result could sway a decision to abort but our investigation suggests it isn't always accurate*

KATHRYN\* was on the brink of booking an appointment at the abortion clinic. In October 2008, she received an email she'd been dreading: the results of a prenatal paternity test suggesting she was pregnant by a man other than her boyfriend.

She was delighted at the prospect of having her boyfriend's baby, but couldn't bear to have the other man's child. "I said to my counsellor that there's absolutely no way I can go through with this pregnancy if it's that guy's," Kathryn recalls.

Fortunately, she decided to have a second test. Conducted by one of the UK's leading forensic genetics labs, this this showed conclusively that the other man could not be the father. Today, Kathryn dotes on her daughter and looks back on the incident with horror.

Kathryn is not the only person to have received flawed results from the Canadian laboratory that ran the initial test she purchased. In an investigation covering similar cases, plus samples we submitted ourselves, *New Scientist* has discovered errors made by the lab, including DNA profiles for fetuses and possible fathers that are inconsistent with the known ancestry of the human genome. It even generated a DNA profile for a "fetus" when the woman tested was not actually pregnant.

The test is run on a sample of the woman's blood and cheek swabs from possible fathers. Our investigation suggests that the

results are unreliable - with potentially devastating consequences. "Paternity testing can have profound effects on people's lives and, when there is an unborn child involved, may lead to a termination," says [Denise Syndercombe Court](#) of Barts and The London School of Medicine and Dentistry, who ran the follow-up test for Kathryn.

Selling genetic tests direct to the public is a burgeoning industry, with people turning to their DNA to explore their health and probe their ancestry

as well as to resolve contested paternity.

Our findings highlight the potential dangers of allowing companies to operate without regulation and quality control. Paternity testing labs are free to operate without accreditation unless they offer results for use in court. "This has been

able to fly under the radar," observes [Gail Javitt](#), a lawyer with the Washington DC firm Sidley Austin, who has studied the regulation of genetic testing.

Kathryn and other pregnant women who ordered the blood test were keen to avoid a procedure called an amniocentesis. This is normally used to detect fetal abnormalities such as Down's syndrome, and involves inserting a needle into a pregnant woman's belly to take a sample of amniotic fluid containing cells from her fetus. The procedure carries a small risk of miscarriage, so genetic testing labs have been working on methods

of isolating fetal DNA from a pregnant woman's blood.

Geneticists have had some success in developing tests on maternal blood to detect fetal genes that are not also carried by the mother. For instance, it's possible to [determine fetal sex](#) by detecting sequences from the male Y chromosome. But these methods have not easily translated to paternity testing.

Despite this, several websites offer prenatal paternity tests based on a woman's blood. Quoted prices start at about \$960 and while the technical descriptions differ a little from site to site, for those *New Scientist* found, the

tests are run by a lab in Toronto, Canada, operated by a company called the [Health Genetic Center](#). The lab's director is Yuri Melekhovets, who trained as a geneticist in Moscow, Russia.

The lab began to develop a blood test for paternity in 2000. By 2002, some customers who sought a second opinion from labs running standard paternity tests had received contradictory results, suggesting that the blood test was prone to error. And the following year, an Arizona court ordered that one of Melekhovets's companies, and a firm

called Genetest, which had sold his prenatal blood test, should pay substantial damages to one couple who were given an incorrect result ([see "Four lives changed forever"](#)). The action brought against these firms was not defended and a representative of the Toronto lab said that Melekhovets had never been made aware of the ruling.

One company, the Paternity Testing Corporation (PTC) of Columbia, Missouri, has run tests for several customers of the Toronto lab, and found that its conclusions about paternity were inaccurate. "We have identified a series of errors over the course of the past eight years," says Joe Gorman, PTC's general counsel. After learning of these cases, and other errors identified by Syndercombe Court's lab at Barts, *New Scientist* decided to investigate further, focusing on recent tests.

The Toronto lab's testing procedures have evolved over time. Initially, it claimed to concentrate small numbers of fetal cells from the woman's blood. Today, the lab's prenatal testing website [stresses the use of "cell-free" fetal DNA](#), which passes across the placenta from fetal cells that have broken down.

## **6-Forensic Paternity**

<http://www.forensicdnacenter.com/criminal-paternity.html>

Forensic DNA paternity testing is often used in criminal situations such as rape or incest where there are products of conception. In addition, forensic paternity tests as well as other family relationship tests could be used to identify missing victims or suspects through their family members who are available for testing.

### **Unmatched Quality and Efficiency**

As the world's largest private DNA testing laboratory, DDC's forensic DNA paternity tests are unmatched in quality and efficiency. DDC's laboratory has a number of accreditations for both paternity testing and forensics, including the AABB (American Association of Blood Banks), ASCLD/LAB – *International* (American Society of Crime Laboratory Directors/Laboratory Accreditation Board) and NFSTC/ISO17025 (National Forensic Science Technology Center). DDC is also one of the first two private DNA laboratories to achieve ASCLD/LAB–*International* accreditation.

### **Strict Sampling Process**

Our laboratory is equipped to process different sample types, such as blood, fetal tissue, bone, hair, and the regularly used buccal swab. All samples are handled with a strict chain of custody documentation process. Each DNA sample is checked against its source records.

## **7-GenQuest DNA Services: Paternity Testing**

<http://www.genquestdnalab.com/paternity.html>

Paternity testing to determine a child's parentage is necessary to a child's wellbeing and legal rights.

The accuracy of paternity tests results have a probability of paternity greater than 99.0% with an average of 99.5%. If after a standard test the probability is less than 99.0% \*additional alleles are used to achieve a greater probability of paternity.



Parentage testing can be performed before the birth of the child in conjunction with other medical or genetic screening, such as Chorionic Villus Sampling or Amniocentesis. Please visit [Prenatal Testing](#) for more information.

## **Maternity Testing**

The procedure for maternity testing follows the same principles as a paternity test (See paternity testing for further details). This test is most often performed to complete case requirements for the United States Embassy and the United States Citizenship and Immigration Services, but is also helpful if a child has been adopted or if there is a concern that the child was switched at birth.

## **Twin Study**

A Twin Study is useful for determining whether twins are identical or fraternal. If the twins that are tested are identical, they will have identical DNA profiles. If the twins are fraternal, their DNA will be similar to each other (as in sibling cases), but not identical.

## **Sibling Testing**

Sibling Testing is ideal for individuals hoping to find out if they are **Full Siblings** (sharing both a common mother and a common father), **Half Siblings** (sharing only one common parent, either mother or father), or if they are unrelated. If the mother or mothers of the children are available for testing, it is highly recommended that they be tested at the time of the possible siblings in order to increase the genetic evidence, however the mothers are not required to participate.

This test is based on a kinship ratio where the Combined Kinship Index of 1 reveals no genetic evidence for or against kinship; therefore the weight of the genetic evidence is stronger the further away the Combined Kinship Index is from 1.

## **Grandpaternity Testing**

Testing for Grandparents of a child in order to prove the paternity is the second best option besides testing the alleged father. If an alleged father is unavailable for testing, such as cases of adoption, or in the event that the father is deceased, a sample can be taken from both of the alleged father's parents. The ideal situation for this test is to have the mother, child, and BOTH of the alleged grandparents. With both of the alleged father's parents included, his DNA profile can be reconstructed and compared to the child's DNA profile. In nearly every case, these results can yield a high enough probability of paternity.

If only one of the grandparents is available for testing, it is highly recommended that the mother provide a sample as well. Each time a person is removed from the test (i.e. grandparent or mother), the genetic evidence for or against kinship decreases, and can yield a



low kinship index. This test (one grandparent only) is based on a kinship ratio where the Combined Kinship Index of 1 reveals no genetic evidence for or against kinship; therefore the weight of the genetic evidence is stronger the further away the Combined Kinship Index is from 1.

## 8-■ Forensic Paternity Test

[http://www.dnaplus.com/forsensic\\_paternity\\_test.htm](http://www.dnaplus.com/forsensic_paternity_test.htm)

While we recommend using swab, hair, or even blood samples for paternity testing, we understand it is not always possible to obtain these types of samples for logistical or confidentiality reasons.

That's why we offer a complete forensic paternity testing service. Submitting a forensic sample allows you to test a person's DNA without them knowing - making this test 100% discreet. You can choose to send a forensic sample for every tested person or just one. It's your choice.

Examples of forensic samples include, but are not limited to:

- Dried blood stains on bandages, tissue, cotton, paper, swabs
- Dried stains on underwear, sheets, pads, tampons
- Dried semen stains on tissue, underwear, clothing
- Dried saliva from toothbrushes, bottles, cans, cigarette butts, stamps, used tissue
- Razors shavings from electric razor
- Bone, teeth, tissue (from deceased individual)

## 9-Forensic DNA Testing Services

<http://www.dnacenter.com/forensic/forensic-services.html>

Linking unsolved crimes. Finding a suspect. Identifying victims of violent crimes or natural disasters. Although traditional forensic methods may help to achieve these goals, DNA technologies are the most advanced and definitive tool to solve the toughest cases.

A wide range of testing services

DNA Diagnostics Center (DDC) assists law enforcement agencies, private investigators, and legal professionals in finding answers, administering justice, and ensuring a safe, secure environment for everyone. DDC's forensics team provides a comprehensive range of services including [STR, Y-STR and mini-STR casework](#), and [forensic paternity](#). We also offer case review and consultation services to defense attorneys who may seek a second opinion on cases previously tested by other laboratories.

A team of forensics experts

The DDC forensic laboratory is operated by highly qualified scientists in their field. DDC's laboratory director, Dr. Michael Baird, is the first DNA expert to testify in a court case that used DNA as evidence (the Castro case) and has appeared on NBC as a TV consultant on the

OJ Simpson case. The forensic operation is led by Dr. Julie Heinig, who worked with the Cuyahoga County Coroner's office on the Sam Sheppard (*The Fugitive*) case. The rest of the forensics team has undergone rigorous training in specimen handling, chain of custody, and DNA analysis.

#### State-of-the-art DNA testing

DDC's state-of-the-art laboratory ensures highly stringent testing procedures and fast turnaround time. We use a variety of PCR-based amplification kits for STR analysis (including the 13 core CODIS loci used by the FBI) and Y-STR profiling. Our protocols are routinely checked against the strict standards of the forensic community, including those issued by the Director of FBI. Our rich experience in paternity and family relationship testing expands our analytical capabilities in complicated forensic investigations. Our [accreditations](#) attest to the high quality of the laboratory services we provide.

#### Complimentary training and resources

In its commitment to assisting our clients and other legal professionals, DDC offers complimentary continuing education seminars on Forensic DNA and Legal Applications. DDC also has developed an extensive mock crime scene on-site at our Fairfield, Ohio, facility to help investigators, lawyers, and law enforcement agencies ensure the integrity of their DNA evidence collection procedures. We strive to provide our clients with the tools and resources to assist their understanding of quality DNA collection and testing procedures.

## 10- Case Study in Forensic Paternity Testing

<http://www.nature.com/scitable/forums/genetics-generation/case-study-in-forensic-paternity-testing-105243629>

In Mississippi, a new law unlike any other in the nation went into effect on July 1<sup>st</sup>. The new law stems from a [bill](#) that was passed by the Mississippi legislature earlier this year with the stated purpose of protecting teens from sexual abuse and subsequently lowering the teen pregnancy rate. According to the [CDC](#), Mississippi has the highest teen birth rate in the country, with 55 out of 1000 babies in the state born to teenagers aged 15-19; the teen pregnancy rate is 60% above the national average. So how is this new law relevant to a blog about genetics and ethics? One provision stipulates that cord blood be retrieved from babies born to teenagers that are less than 16 years old at the time of conception "if it would be reasonable to suspect that the minor's pregnancy resulted from a sex crime against a minor". The cord blood is to be stored so that it will be available for testing if a statutory rape or other sex crime investigation is pursued. According to the bill, it is "reasonable" to suspect a sex crime has occurred if one or more of the following apply:

- The mother of the infant will not identify the father of the infant;
- The mother of the infant lists the father of the infant as unknown;
- The person the mother identifies as the father of the infant disputes his fatherhood;
- The person the mother identifies as the father of the infant is twenty-one (21) years of age or older; or
- The person the mother identifies as the father is deceased.

- Supporters of the bill believe this new law will deter older men from victimizing young women, even if the relationship is consensual. Detractors point out that a minority of teenage births in the state are to girls under the age of sixteen, and there is no evidence that a significant number of these births are the result of statutory rape or other sex crimes.
- The bill mandates cord blood collection solely for the purpose of paternity identification, although nothing in the bill explicitly prohibits using the DNA for another purpose.
- Do you believe that Mississippi has crossed any ethical boundaries? Take our poll! If you do not agree with either choice we have offered below, or you have a different rationale for your decision, please leave a comment providing another option.

## **11- DNA testing firm building a name for itself**

### [DNA-testing-firm-building-a-name-for-itself-5122390](#)

SAN ANTONIO — DNA Reference Laboratory Inc., founded in 1997, was on a strong growth curve and enjoying solid profits until two freak accidents stalled the business for a time.

President M. Al Salih and Vice President Asia Gaily had to move their business twice: once in 2004 after their first-floor lab was flooded, and again in 2011 when pipes burst in their second location.

Each move led to costly delays, but didn't put the company on its back. Now, DNA Reference Laboratory has a stable location at 5819 NW Loop 410, and it's poised to grow again.

When the couple started their business, the goal was to offer comprehensive DNA testing, Salih said.

“We built up the lab by building three departments for DNA testing,” Salih said. “It was difficult,” he said, because each type of testing requires accreditation from a different regulatory agency. The three key areas are in relationship testing, forensic testing and as a guide to medical treatment.

The certifications are expensive and time-consuming, said Tom Hansis, a senior business adviser at the Small Business Development Center at the University of Texas at San Antonio. But DNA Reference is getting back on track. Hansis has worked with Salih and Gaily since they founded their business.

Salih, 65, and Gaily, 56, a married couple who are natives of Sudan, have complementary talents. He has a doctorate in microbiology from Oregon State University and is a former research assistant professor at the University of Texas Health Science Center. She is a finance and accounting graduate of the University of Texas at San Antonio.

Relationship testing is one of the lab's key sources of revenue, and DNA Reference is only one of 33 laboratories in the country — and the sole lab in town — that is accredited by the AABB, formerly the American Association of Blood Banks.

DNA relationship testing is used in certain paternity, maternity and child custody cases, and in divorce cases when, for example, a lawyer seeks to show that a child is the biological offspring of a parent.

The company uses 24 genetic markers that will indicate a 99.96 percent probability of paternity, Gaily said, while many competitors accept 99 percent probability for establishing paternity. That means one in 100 random unrelated males could be the father, she said.

Laredo-based lawyer Leticia Garcia uses various labs for paternity tests. She said DNA Reference “really does stand out” because of turnaround that's often a week or two shorter than competitors'. Its prices are favorable, too, she said.

DNA testing also is often used in immigration cases.

“We've been using them — and different labs — for many years,” San Antonio lawyer J.A. Garcia said, adding that the company “is especially helpful” when people in different countries need to be tested to apply to be a U.S. resident or citizen.

“We need a good lab that can take a scientific sample and give us an analysis that provides a likelihood of paternity,” Garcia said. “You can claim to be a citizen if you can show that your parent is a citizen and lived in the U.S. for a time before your birth. If there isn't a record to prove the birth, maybe you can provide it through DNA.”

This aspect of the company's business needs better marketing, Salih said, to let prospective customers know that governmental agencies won't accept the results of a test from a nonaccredited lab.

The cost of DNA Reference's tests range from \$175 for a home paternity kit to as much as \$700 if several people must be tested, Salih said.

For a forensic test, the price ranges from \$750 to \$1,000 for each item that must be tested, he said.

The lab also has done forensic testing to obtain evidence in criminal cases, and Salih has testified in court cases involving slayings, sexual assaults and rape.

In one high-profile case, the lab's tests helped the Innocence Project exonerate two incarcerated men, one on death row, who had been convicted of murder in Oklahoma. The case later became the subject of a 2006 nonfiction book by writer John Grisham. Now, the lab is reapplying to be accredited by the College of American Pathologists so its DNA tests can be used by the medical community.

Also, it's seeking recertification as an American Society of Crime Lab Directors/Laboratory Accreditation Board to provide DNA tests in forensic matters.

Salih expects the certifications to be in place by April.

Also, a growing part of the company's business is ancestry and ethnicity testing. DNA ancestry testing “deals with your line,” Salih said, which can be traced back through scores of generations. “That's useful, but it doesn't have anything to do with ethnicity.”

Ethnicity testing is more useful, Salih believes, because a person's genetic makeup can help determine the likelihood of the subject's susceptibility to diseases. The company sells its proprietary ethnicity test for \$395.

Once the company regains its certifications, "We can bring it back to where it was," Salih said. "We have the capacity and we're qualified to do the work, and that's what counts."

## 12- New genetic tools for differentiating "identical" twins:

Eurofins develops first DNA test for forensic and paternity testing of twins

<http://www.eurofins.com/en/media-centre/press-releases/2013-12-10.aspx>

Eurofins Scientific (EUFLPA), one of the global leaders in Genomics Services, announces a research breakthrough in genetic discrimination between identical monozygotic twins.

Until now science has accepted the fact that monozygotic twins - also called "identical" twins from one fertilized ovum - could not be genetically discriminated. Even though there were theoretical considerations that monozygotic twins are not fully identical in their genome, no tools existed for forensic DNA fingerprinting in crime or paternity cases.

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Building on the long forensics and genomics expertise of Eurofins, the scientists used the unique combination of leading labs available at Eurofins to look at the differences in the genome of identical twins. For this purpose they applied Eurofins' advanced sequencing and bioinformatics technologies. Genome sequencing is a technique that allows researchers to read and decipher the genetic information found in the DNA of anything from bacteria to plants to animals. The vast amounts of data collected in this process are then analysed by means of intelligent proprietary information technology, called bioinformatics.

The scientists investigated the genetic material taken from sperm samples of two twins and from the blood sample of the child of one twin. Bioinformatics analysis revealed five mutations, so called Single Nucleotide Polymorphisms (SNPs) present in the twin father and the child, but not in the twin uncle. These findings proved the hypothesis that rare mutations will occur early after or before the ovum has split into two, and that such mutations will be carried on into body and sperm cells.

The Eurofins "Twin Test" is available in all laboratories of the Eurofins Genomics Business Line. The test will be performed at the Eurofins DNA Campus in Ebersberg, at the laboratories of Eurofins MWG Operon and Eurofins Medigenomix Forensik GmbH.

## 13- Forensic Testing

The most popular and reliable method to collect samples for DNA testing is the buccal swab collection method. Buccal swab collection is quick and painless and is recommended as the best method for sample collection for all Genex clients.

However, in cases where a buccal swab sample cannot be obtained (e.g. individual is missing, deceased, or unable to participate) a forensic sample can be submitted to Genex for testing. The cost for testing a forensic sample is \$180 US for each forensic sample. However, because the quality of the DNA in a forensic sample cannot be guaranteed, there is a chance that if the DNA in the sample that you submit is degraded or insufficient, we may not be able to obtain useful information, but the charge will still apply.

Examples of samples which are commonly submitted to our laboratory for testing include:

Dried blood stains (e.g. dried blood on bandages, on tissue, cotton, or paper)

Dried underwear stains (e.g. stains on underwear, pads, tampons, diapers)

Dried semen stains (e.g. stains on tissue, underwear)

Dried saliva stains (e.g. cigarette butts, stamps, stains on clothing or napkins) Hair (hair works very well if it is plucked directly from the head. Hair which has fallen off natural on hair brushes or pillows may work but is not as good as freshly plucked hair. Cut hair will not work. Hair must have root)

Razors shavings from electric razor (fingernail clippings will not work)

Bone, teeth, tissue (from deceased individual)

### Types of Tests

#### **Relationship Test**

In the event that one or more individuals cannot participate in a relationship test (e.g. paternity test), a forensic sample can be used in place of a buccal swab sample. The total cost for a relationship test will be the cost of the identity test plus \$180 US for each forensic sample (for example, to conduct a paternity test with a standard swab sample from the child, but a forensic sample from the alleged father, the cost would be \$180 US for the paternity test plus an extra \$180 US for one forensic sample).

#### **Sex Tests**

A DNA forensic test can be used to determine the sex and number of individuals in a stain. This type of testing is often used to check for infidelity. For example, this test can determine whether male DNA is present on a stain. This test can also determine whether a stain contains the DNA of only one person, or more than one person.

#### **Identity Tests**

Two samples can be tested and compared to see if they came from the same person.

#### **14- India's first private DNA Forensics Lab in Gurgaon**

<http://www.thehindu.com/todays-paper/tp-national/indias-first-private-dna-forensics-lab-in-gurgaon/article4972204.ece>

Global biotechnology company Life Technologies has launched India's first private DNA forensics laboratory here, which is expected to accelerate sampling process, thus reducing the burden on existing forensic laboratories.

"Life Technologies DNA Forensics Laboratory will reduce the burden on existing forensic system and address the requirements of DNA database generation for un-identified dead bodies or other crime investigations," said Devashish Ohri, Managing Director of Life Technologies South Asia.

Currently, there are 28 laboratories for forensic DNA investigation and testing in the country. But, many of them are overburdened with an increasing number of cases and have sample backlogs.

Till the beginning of 2013, there was a backlog of 862 crime cases in the DNA division of the Delhi State Forensic Science Laboratory alone, Ohri said, adding that for a country of the size and population of India, the number of labs ideally should be about 400.

The lab here is equipped with advanced DNA testing systems and will facilitate a broad range of DNA testing including paternity testing, kinship testing, DNA profiling for database generation, and forensic DNA analysis.

Nadia Altomare, Vice President and General Manager for Life Technologies Human Identification Business, said: "DNA technology has widely been accepted as the most effective crime fighting tool among law enforcement agencies for a variety of applications, including sexual assault, missing persons and disaster victim identification."

"It's also the primary technology used for performing paternity and kinship testing," Altomare added

The Life Forensics Laboratory will meet international standards for DNA testing.

"The opening of a laboratory shows strong commitment by Life Technologies to partner with Government agencies in this vital area. I am sure this lab would bring more efficiency and improve the available forensic capabilities." said Dr J R Gaur Principal Scientific Officer (Life Science) in the Ministry of Home Affairs, and former Director of State Forensic Science Laboratory.

#### **15-DNA Paternity Test**

<http://www.internationalpaternity.com/services/dna-paternity-test>



## **Discreet, Safe and Accurate Testing**

We use a non-invasive, pain-free DNA collection method for paternity testing and DNA analysis. Using the latest technology, a buccal cell sample taken from the inside of the mouth is now the newest and most recommended method for sample collection. A buccal cell sample can be collected quickly, painlessly and discreetly using the home collection kit.

## **How to Read a DNA Test Report**

**Conclusions:** There are two possible outcomes in a DNA paternity test:

**1. Paternity Exclusion.** A paternity exclusion indicates that the tested man is not the true biological father of the child. A report which states a paternity exclusion will show a minimum of two exclusions at two different genetic loci. When a paternity exclusion is indicated, the probability of paternity is 0%.

**2. Paternity Inclusion.** If the report states that the tested man is not excluded as the biological father of the tested child, a combined paternity index of greater than 1000 is indicated. A combined paternity index of greater than 100 is accepted to establish 99.0% probability of paternity. A CPI greater than 1000 indicates that the probability of paternity is greater than 99.9%.