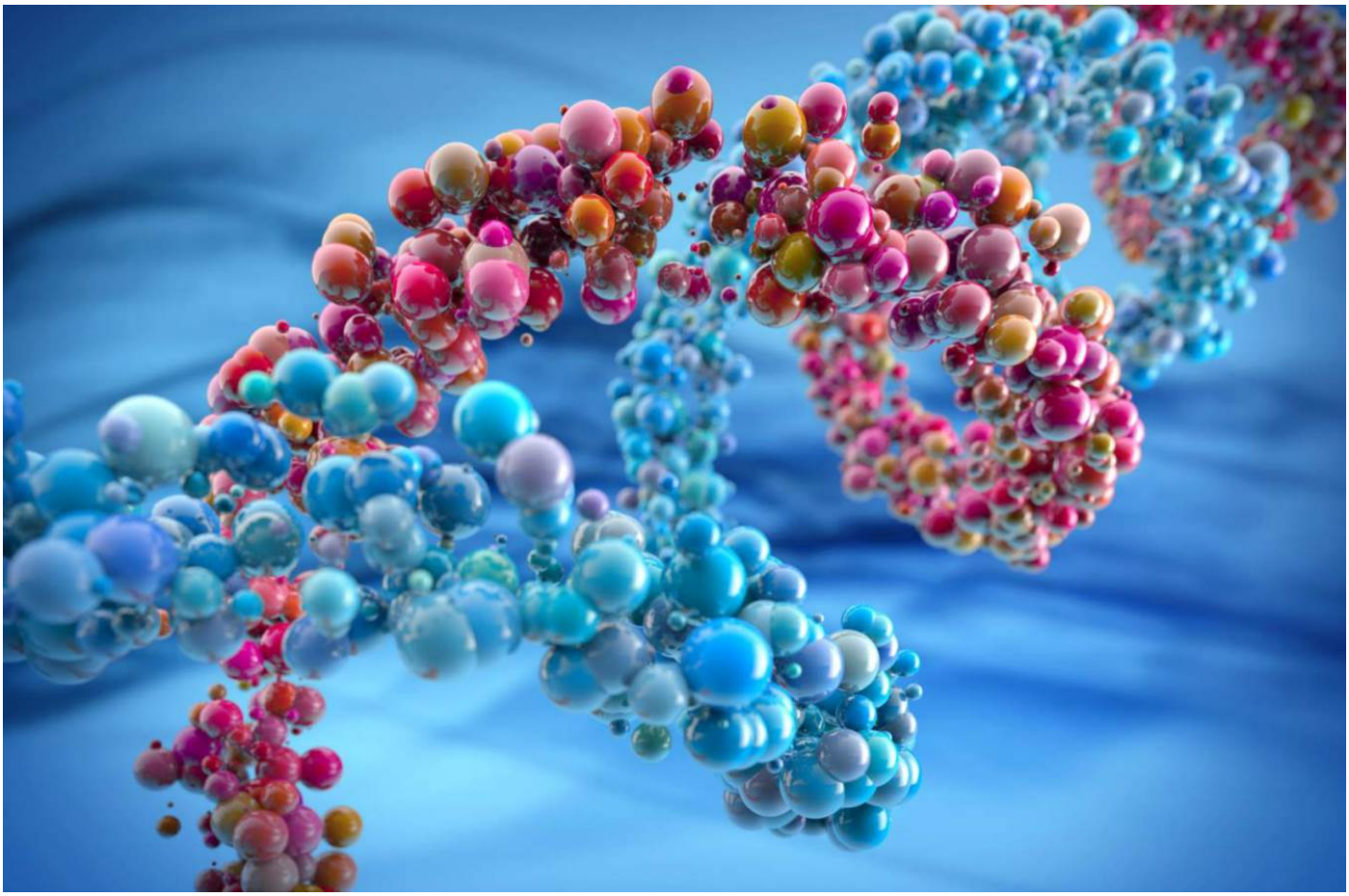
DNA Testing: Changing Lives With Billion-In-One Precision

University of Glasgow



Using the latest technology, Crucial Genetics provides the DNA testing that can make or break a case in the courtroom.

Identity has become a powerful driver in today's world, especially as identity theft breaks new records every year. Verifying identities through DNA testing has become a part of daily life as well, leading to richly rewarding experiences that include reuniting family members and bringing people closer together. Identification through DNA testing can also bring long-needed closure to traumatic events and start the process of healing. In short, identity can be the one thing that matters most when lives are being rebuilt.

This is exactly what Crucial Genetics, a Scotland-based DNA testing company, does for clients around the world. Using the most modern technology available, Crucial Genetics delivers the genetic data that is often the difference in "making or breaking" a case in the courtroom.

"The work we do could be the deciding factor in a murder trial, or it could help someone confirm the identity of his or her biological father," says Jacqueline Perry, Crucial Genetics' laboratory manager.

Headquartered at Southern General Hospital in Glasgow, Crucial Genetics is part-owned by the University of Glasgow, an institution with an international reputation for genetic and forensic research. This close association provides Crucial

Genetics scientists with access to top university researchers who have a remarkable range of knowledge and expertise in the biosciences.

In the early 1990s, Dr. John Gow, a molecular geneticist who is also director of the Centre for Forensic Investigation at Glasgow Caledonian University and a leader in field of DNA research, recognized the commercial need for DNA testing in Scotland.

“The world was showing an ever-increasing need for, and greater reliance on, DNA testing,” says Gow. “The technology was also rapidly evolving, which made commercial applications more feasible and affordable.”

In 2003 Gow and his team pioneered several new techniques that enabled the university to distinguish between family members in disputed paternity cases. Encouraged by these results, Crucial Genetics was formed in 2004 as a spin-off company.

“University of Glasgow supported the venture through business model development, full marketing support, and securing funding from investors such as Fifty-Six Ltd., a venture capital firm,” says Kevin Cullen, Ph.D., director of research and enterprise for the University of Glasgow.

Over the last two years Crucial Genetics has grown rapidly, tripling in size and quickly becoming the laboratory of choice in Scotland for DNA testing.

A Unique Technology

Crucial Genetics uses the most advanced automated fluorescent DNA laser scanning equipment available for STR/PCR DNA profiling — that is, the short tandem repeat (STR) polymerase chain reaction (PCR) method. This procedure compares 16 genes and is so sensitive that it can identify someone’s entire DNA profile from one individual cell. Results are available within 48 hours of testing. The accuracy is astounding — results are 99.9999 percent reliable, meaning the odds of two people having the same DNA are more than one-billion-to-one.

Most of Crucial Genetics’ work is directed toward paternity testing, forensic testing, genetically modified foodstuff testing and the pedigree analysis for animals. The procedure of preparation and analysis is actually a three-laboratory process.

A swab sample is taken from inside the subject’s cheek. The head of the swab is injected into a test tube, where the cheek cells are immersed in a concentrated alkaline salt solution. This solution rapidly enters the cells, expanding the cell and rupturing the cell walls. The freed DNA molecules, which carry a negative charge, collect on positively charged magnetic beads within the test tube.

The beads are washed and the pure DNA is released from the beads. The DNA is then prepared for analysis in a second laboratory, where each of the 16 genes that will be identified during testing is tagged with a chemical dye.

In the third laboratory the pieces of DNA are separated by size in a genetic analyzer. An argon laser excites the dyes, which then fluoresce. The fluorescence data is collected and analyzed by a computer, which converts the numbers into a DNA profile.

Results that Matter

Whether it’s the somber identification of human remains, or the joyous reunion of long-lost family members, Crucial Genetics makes it possible using state-of-the-art laboratory techniques. The company works closely with police

departments, immigration offices, insurance companies and health care organizations, often providing critical evidence for police cases and courtroom trials. Crucial Genetics scientists have helped identify casualties from natural disasters and the war in Iraq. This type of closure allows grieving families to hold funeral services and begin the long process of healing.

In 2005 Crucial Genetics became the only private DNA profiling firm in Scotland to be approved by the United Kingdom Accreditation Service to carry out human genetic profiling.

"This is a business where you simply cannot afford to make mistakes," says Gow. "Having this accreditation illustrates that we operate at the highest level, both in terms of scientific expertise and capability, as well as professional and ethical standards."

Crucial Genetics has also launched the United Kingdom's first secure DNA storage and profiling facility — 80 meters underground. Individuals can have samples of their DNA stored for future use in this highly secure facility, especially those working in high-risk fields such as construction, security, transportation and the military. Knowing a loved one can be identified in the event of a tragedy creates peace of mind for the entire family.

"Storing DNA can be very useful to individuals, as well as organizations," says Gow. "Genetic pre-disposition testing will allow families to trace a range of diseases to which they are susceptible. But if one piece of the family's DNA is unavailable, no preventative action can be taken."

Crucial Genetics also provides markers for genealogical studies and confirming paternal lineage and common ancestry along the male line. The company is creating an expansive database of DNA profiles that can connect Scottish individuals to their ancestral clans.

Thousands of children were orphaned after the devastating tsunami that struck Sri Lanka, Indonesia and Thailand in December 2005. A baby found alive floating in the ocean — later named Baby 81 — was claimed by over ten distraught women who had lost infants during the flood. With assistance from Crucial Genetics, the baby was reunited with its true biological mother.

"We've helped put criminals behind bars and, in some cases, have saved people who were innocent," says Max Hamilton, business development manager for Crucial Genetics. "Our paternity work stabilizes the lives of mothers and children by proving who the natural fathers are, who often then provide support. Ultimately we impact people's lives on a daily basis by simply helping them find the truth."

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