

Definition done in
1869. advancement
of mendel's works



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Definition of DNA

DNA denotes deoxyribonucleic acid and is the hereditary material in living organisms and plants. It governs some characteristics such as bone density, hair color, and eye color among others. It is characterized by long narrow string (Rand & Catalano, 2006). The location for most DNA is the nucleus though some may be found in the mitochondria and is called mitochondrial DNA. Entirely all parts of the body are composed of DNA except the red blood cells. The DNA information is usually in a coded format based on the four chemical bases present in it. Adenine (A), guanine (G), cytosine (C), and thymine (T) pair with each other to form base pairs (Riley, 2005).

The combination of base pair, sugar molecule and a phosphate molecule forms nucleotides. The fact that DNA can replicate is vital especially when cells divide to give new cells identical features from the old cells.

History of DNA

The discovery and implementation of DNA-related projects has indeed come a long way. The onset of DNA related tests date back to 1865 when Gregor Mendel examined the genetic profiles of pea plants. Isolation of DNA initiated by Friedrich Miescher was done in 1869.

Advancement of Mendel's works was never cemented until 1890 when three scientists namely; Hugo DeVries, Erich Von Tschermak, and Carl Correns embarked on them. Each of the three was involved in a detailed research of DNA for different works (Butler, 2000). It was Andrei Nikolaevitch Belozersky who first isolated a pure DNA culture in 1935. James Watson and Francis Crick were influential in proposing the double-stranded, helical,
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complementary, anti-parallel model for DNA and had their work published in a magazine. The discovery and isolation of DNA polymerase was successfully done by Coenbergen in 1958. The polymerase was later to become useful in making test tube DNA. The cracking of the genetic code came in 1966 thanks to Marshall Nirenberg, Heinrich Mathaei, and Severo Ochoa who indeed demonstrated that each of the 20 amino acids is determined by a sequence of three nucleotide base (codon). The first DNA cloning experiments were done in 1972 in California (Jobling & Gill, 2004).

The first recombinant organism was produced in 1973 when Stanley Cohen, Annie Chang and Herbert Boyer successfully transferred DNA from one life form into another. 1976 saw the release of the first recombinant guidelines by the NIH. Studies by David Botstein and others indeed proved that when a restrictive enzyme is applied to DNA from two genetically different individuals, restriction fragment length Polymorphisms (RFLPs) arises. The invention of the polymerase chain reaction (PCR) by Kary Mullis and others at Cetus Corporation in Berkeley, California, was considered the most revolutionary new technique in molecular biology in the 1980s. A technique for DNA fingerprinting to identify individuals was discovered by English geneticist Dr. Alec Jeffrey in 1984 (Butler, 2000). National Center for Human Genome Research by James Watson, and the Human Genome Project were launched in 1989 and 1990 respectively.

The USA Army started collecting blood and tissue samples in 1992 with an aim of identifying soldiers who died in combat. Daniel Cohen produced sketch of all the 23 pairs of human chromosomes. The cloning of a sheep called Dolly from an adult ewe were efforts by researchers at Scotland's <https://assignbuster.com/definition-done-in-1869-advancement-of-mendels-works/>

Roslin Institute in 1997. The cracking of the human genetic code came in 2000 when scientists agreed that the invention would be of vital usefulness in addressing incurable diseases.

DNA and their use by the US Police

Bode Technology's forensic casework, data banking and mass disaster teams has played a crucial role in ensuring that law enforcement identify thousands of criminals. The freedom of those who are found to be innocent is also ensured after a DNA test is carried out (Connors, Lundregan & McEwen, 1996). Identification missions by the police have been successful for the last 12 years courtesy of testing DNA profiles in blood, semen, sweat and skin tissue evident at crime scenes.

Comparisons are then made with those already present in government databases. According to Rand and Catalano (2006), police who were trailing the killers of a four year old girl in Kansas City had a big secret that was unknown to the public. Whereas local residents known to the girl said she was black, DNA tests carried out showed that she had a white grandparent. Advances in DNA testing are making work easier for investigators who need not rely on the profiles which are not captured in the databases.

Tests are enabling police get the idea of how a suspect looks like. Louisiana police used ancestry testing to find the suspect in seven rape/murders in 2003. According to Rand and Catalano (2006), the same approach has been employed by the police in other states such as Missouri, Virginia, Colorado and California to get to the bottom line of about 100 homicide, rape and missing-persons cases. Tests are being developed in order to allow for the

determination of a suspect's eye color as well as hair color. People who are also interested in knowing their roots are given the opportunity to buy the test. Due to the difficulty experienced in testing DNA from evidence gathered from scenes of crime, ancestry tests are usually very expensive.

Individuals are charged \$ 219 for the test (Jobling & Gill, 2004). Though most professionals are of the opinion that DNA tests should be inclined towards knowing the race of the suspects, most police detectives are so far contented with the progress made towards combating crime. Others are of the opinion that the reliability of the ancestry test is still unverified. Some defense lawyers are of the opinion that they have fears in using the ancestry testing to determine suspects' heritage.

They share the view that such findings may actually promote the notion that some races are more inclined to crimes than others and at the same time leading to genetic racial profiling (Connors et al., 1996). DNA tests are also used by the police in investigating human trafficking cases.

DNA Testing

The testing of DNA is usually carried out for different purposes ranging from wanting to know ones ancestry to crime scene investigations. The types of DNA tests available are named according to the results expected thereafter. Examples of these tests are forensic tests used by police to investigate crime suspects and paternity tests to understand ones ancestry. Several paternity tests exist namely; simple paternity test, legal paternity test, super paternity test, premium paternity test and secret paternity test (Riley, 2005). Forensic

tests are of two types, RFLP (restriction fragment length Polymorphisms) and PCR (polymerase chain reaction) based testing.

The former requires larger amounts of DNA. The DNA must be under graded. The rate of DNA degradation increases if the condition is warm as well as moist and hence difficult to for RFLP procedures.

Also, old and insufficient crime-scene evidence may not be useful in yielding results for a RFLP test. PCR-based testing on the other hand often requires less DNA than RFLP testing. Furthermore, a partially degraded DNA may still find its importance in PCR tests (Riley, 2005). PCR tests are affected by varying concentrations of contaminants at the crime scene or in the laboratory. Proper handling techniques are vital in PCR tests in order to reduce the extreme sensitivity to contaminants. The fact that PCR is less direct, faster and more sensitive has made it the most preferred option in forensic testing. However it should be noted that PCR is more prone to error than RFLP.

The founders of the chain reaction realized that the reaction could be contaminated. They came up with precautionary techniques. The technique involved in polymerase chain reaction (PCR) is not the same as a sterile one. This because sterilized solutions are capable of inhibiting DNA.

DNA has a characteristic feature of surviving heat sterilization. PCR technique is thus far from the sterile technique. Contamination of PCR is normally associated with earlier polymerase chain reactions. It should however be noted that genomic DNA is dangerous and poses more

contamination risks (Riley, 2005). Genomic DNA refers to that which is not <https://assignbuster.com/definition-done-in-1869-advancement-of-mendels-works/>

amplified. Contamination of PCR can be minimized by using several methods.

Both negative and background controls should be run during the whole procedure to facilitate detection of contamination. Although bleach may work effectively in cleaning surfaces and equipments, the use of gas flames is recommended to remove DNA on metal parts/surfaces. In most cases, the reaction takes place in thermal cyclers and should be kept free of contaminants all the time. Sample tubes may leak DNA due to temperature extremes. In order to avoid this, one may use hot soapy water, a soft wiper as well as a scrub brush which is round in shape when it comes to cleaning the thermal cyclers and their sample tubes. Samples should be stored in proper containers to avoid contamination. The separation of selected samples is usually recommended particularly those samples which are used as evidence and contain very limited DNA.

Overemphasis of the logical value of the proof ought not to be done. The margins of error in the stated probabilities should be within limits of acceptance. Technological advancement, though beneficial has faced criticisms due to the occasional unpopular probabilities.

DNA Policy Implications and Lab Survey

A financial commitment is vital for the support of the police, labs, and courts in making DNA the standard in all crime investigations.

The number of suspects will increase if DNA is collected in property crimes.

The number of prosecutions is set to rise also (Ritter, 2008). It is commonly

hypothesized by researchers that nurture has influence on the mental health
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through the alteration of the genome and its physical properties and hence expression (Scott & Hudson, 1998). Researchers have immensely carried out a study of how stress experienced in early life can have long-lasting modifications in physiology and behavior through epigenetics (Connors et al. 1996).

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