

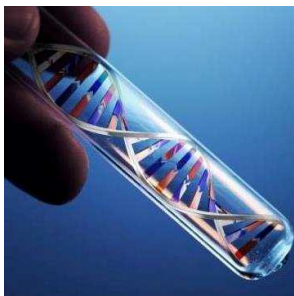
Next Generation DNA Led Analysis - Challenges and Threats

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DNA is the source of life and has been studied since a generation, but very little is known about as yet. Several sophisticated technologies of the current era have laid their foundations on the principle of DNA based mechanisms. DNA based technologies are revolutionizing Forensic Investigation, Medical Diagnosis, Paternity Disputes, Individual Identity, Health insurance, Motor Insurance sectors.



Recent years have witnessed an explosive growth in biological data and gave birth to the pacemaker of biology called Bioinformatics. More than 350 fully sequenced genomes are publicly available, and more than 780 are in the pipeline. We can expect automation; it is already happening. There will be more integration of computerized analysis with laboratory tests. Capillary electrophoresis will require less material and produce faster results; DNA chips are in the pipeline too. We can also expect miniaturization with attendant portability. Recently into action of a hand-held chip that can analyze 8 STRs in a few minutes. We can foresee the time when forensic analysis can take place at the crime scene. If immediate results are produced, it can offer prompt clearance of erroneously identified suspects, avoiding much needless apprehension. I would emphasize, however, that what can be done in pilot

experiments will usually not be good enough for forensic use, for which a system must be thoroughly tested and validated. Primitive DNA Analysis methods required higher cell count in order to develop profiles. Current DNA Fingerprinting from swabs is particularly fast, results may be expected in hours, yielding accurate results.



While the appropriate use of DNA can be helpful in reducing and reversing wrongful convictions, inappropriate use of it and the sway of it, over other evidence on juries and judges can create a system of wrongful convictions. The expansion of publicly available information resulting from the Human Genome Project has justified the role for bioinformatics capabilities worldwide. With the regular increase in the Biological data scientists started focusing on challenges like-where to store the data?, how to analyze them? Do we have enough expertise and manpower to secure and manage the massive data coming out of different genome projects across the globe? If Computers are being hacked Biological data stored in computers and databases can also be hacked. Cells are compared to the

hardware and DNA as the Biological software. What next??? Will bad biologists start developing bad synthetic biomolecules for disturbing the human race and making them unhealthy? DNA testing which is used to free innocents and convict the criminals may start working other way round? Can Biology be hacked? If yes, what is the way forward? We are in 1980s era; if you talk of Biological hacking – a very early stage. There have been only a few Biological attacks, which were sponsored by Governments as of now (Including the white powder, Anthrax attack), but genomics is changing with jet speed and the silence of Biological hacking may last soon in absence of corrective measures and ignorance. We may need to be prepared for listening and handling DNA Spams, DNA Spoofing and bio identify theft sometimes soon. The current era of incredible innovations toward the zeal to chase the heights of development has made science and technology one of the most powerful tools to accomplish the tasks of incremental prosperity for human welfare and sustainable development. It has been rightly said that science, technology, and innovation work together for growth and development. With the multifarious aspects of science there is a need for thought-provoking ideas and cumulative efforts that can strengthen the scientific capacity to produce successful innovation systems.



About the author: Dr. Amit Kumar is passionate Forensic Scientist, Entrepreneur, Engineer, Bioinformatician and an IEEE Volunteer. In 2005 he founded first Private DNA Testing Company BioAxis DNA Research Centre (P) Ltd in Hyderabad, India with an US Collaborator. He has vast experience of training 1000+ Crime investigation officers and helped 750+ Criminal and non-criminal cases to reach justice by offering analytical services in his laboratory. His group also works extensively on Genetic Predisposition risk studies of cancers and has been helping many cancer patients from 2012 to fight and win the battle against cancer. Amit is member of IEEE Strategy Development and

Environmental Assessment committee (SDEA) of IEEEEMGA. He is senior member of IEEE and has been a very active IEEE Volunteer. With experience at Section, Council, Region and IEEE MGA levels in several capacities he has driven number of IEEE Conferences, Conference leadership programs, Entrepreneurship development workshops, Innovation and Internship related trainings.