The uses of dna technology in forensic science

Science, Biology

Timothy Banas has a master's degree in biophysics and was a high school science teacher in Chicago for seven years. He has since been working as a trading systems analyst, standardized test item developer, and freelance writer. As a freelancer, he has written articles on everything from personal finances to computer technology. Forensic science involves the use of scientific procedures to gather evidence related to matters of the law. The cells of all organisms contain deoxyribonucleic acid (DNA), and the DNA of any one organism is unique. Forensic scientists have learned to collect and analyze DNA to help determine which organisms--humans as well as other kinds--were present at the scene of a crime or catastrophe. DNA can be used to accomplish a number of specific goals in forensic investigations. Identifying Individual Persons * Because each person's DNA sequence is unique, it can be matched to him like a fingerprint. According to the U. S. government's Oak Ridge National Laboratory, forensic scientists use DNA evidence to identify persons in criminal and paternity cases. DNA evidence does not always identify a suspect or a man as being the father of a child; sometimes the forensic evidence exonerates a suspect or determines that a man is not the father of a child. DNA evidence can also be used to identify victims of catastrophes, such as natural disasters or terrorist attacks. Identifying Species of Animals * There are laws governing the conservation and hunting of endangered species. If someone is suspected of illegally capturing and transporting an endangered species, forensic scientists can use DNA analysis to confirm or rule out whether the animal specimen in question in fact belongs to the protected species. A few hair or skin cells from the animal will suffice to yield accurate test results, so a suspected

animal transporter or hunter does not need to be caught with the actual animal. Other Applications * DNA evidence can be used to identify a type of bacteria or parasite that may have caused the death of a person. This information can be useful in cases of medical or parental negligence. The origins of expensive consumables like liquors and caviars can be verified using DNA analysis. Lastly, DNA samples can help medical professionals find good donor organ matches for people who require organ transplantations to survive. ---------- Bioremediation The use of living organisms for the recovery/ cleaning up of a contaminated medium (soil, sediment, air, water). The process of bioremediation might involve introduction of new organisms to a site, or adjustment of environmental conditions to enhance degradation rates of indigenous fauna. Bioremediation can be applied to recover brownfields for development and for preparing contaminated industrial effluents prior to discharge into waterways. Bioremediation technologies are also applied to contaminated wastewater, ground or surface waters, soils, sediments and air where there has been either accidental or intentional release of pollutants or chemicals that pose a risk to human, animal or ecosystem health. Different approaches to bioremediation take advantage of the metabolic processes of different organisms for degradation, or sequestering and concentration, of different contaminants. For example, soil bioremediation might be performed under either aerobic or anaerobic conditions, and involve optimization of the metabolic pathways of bacteria or fungi for degradation of hydrocarbons, aromatic compounds or chlorinated pesticides. Phytoremediation is bioremediation using plants and is often proposed for bioaccumulation of

metals, although there are many other different types of phytoremediation. Bioremediation using genetically engineered microorganisms (GEMs, or GMOs), carrying recombinant proteins, is still relatively uncommon due to regulatory constraints related to their release and control. Other methods of enzyme optimization that do not include gene cloning technqiues, might be applied to indigenous microorganisms in order to enhance their pre-existing traits. Examples: Nutrients were added to the soil to enhance bacterial degradation of contaminants and increase the rate of bioremediation on the brownfield site.