**Genetic Technologies**

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| **Technology Name** | **Technology Description** | **Use of the Technology** |
| *Genetic Counseling* | Analysis of risk for genetic disorders in a family. Family histories are used to construct pedigrees that aid in calculating probabilities | Used to present options available to avoid or reduce possible risks; also used to inform individuals of likelihood of developing late-onset genetic disorders based on family histories |
| *Genetic Screening* | Can involve biochemical tests that identify proteins indicative of certain genotypes.  Can also involve complementary DNA probes if the sequences of normal and mutant genes are known.  DNA probes of a sequence complimentary to both the normal and mutant alleles are exposed to a person’s DNA sample. If both probes bind then the person is a carrier. | Used to detect genes in people and advise them of their genotype. May aid in decision making. |
| *Gene Bank* | Storage site for the genetic material of a plant or animal species. The storage method varies according to the characteristics of the animal or plant: sometimes cryopreservation is used. | Used to preserve genetic diversity by ensuring a source of genes for a endangered species and particular crop plants. |
| *Gene Therapy (generally this term applies to humans only)* | The transfer of genes into the genome of cells. Often uses a “disarmed” viral vector to carry the gene into the targeted host cell. | Used to treat heritable disorders caused by single-gene mutation, such as hypercholesterolemia, adenosine deaminase deficiency (ADA), and cystic fibrosis. |
| *Restriction Enzyme/ endonuclease* | An enzyme derived from bacteria that recognizes a specific DNA sequence and cuts the DNA at that sequence. | Used to cut DNA for the purposes of recombination or for DNA analysis during chromosome mapping or DNA recombination. |
| *DNA ligase* | An enzyme that can rejoin a broken bond in DNA. | Used to “seal” ends of DNA that have been cut by a restriction enzyme: often used during the process of DNA recombination. |
| *Recombinant DNA* | The process of cutting out DNA from one genome and placing the DNA into another genome. | Used to transform bacteria. For example, so that the bacteria carry a gene from a different species. |
| *Gel Electrophoresis* | DNA fragments are applied to a gel (often made of agarose). Electricity is used to allow them to penetrate and move through the gel. Smaller DNA fragments move more easily and thus migrate farther than larger DNA fragments.  A sample of proteins are applied to a gel. Proteins can be positively or negatively charged, hence an electric current can be used to allow proteins to be separated by charge and subsequently by size. | When combined with staining or X-ray film techniques, the patterns observed are used to determine the presence or absence of particular DNA segments or proteins. Specific bands of DNA or protein can also be retrieved from the gel. |
| *DNA Fingerprinting* | A sample of DNA is cut with restriction enzymes – this produces a number of DNA segments of different lengths. Because each individual has a unique DNA sequence (genome), each individual will have a different number of sites where the enzyme will cut. This results in a unique number and length of DNA segments for each individual. These DNA segments produce a unique banding pattern (“fingerprint”) when analyzed using gel electrophoresis. | Used to determine paternity and to provide evidence in court cases. Used in many species to help establish kinship. |
| *Genetic Engineering* | A general term that refers to the alteration of an organism’s genome by selectively removing, adding or modifying DNA. | Used to produce genetically altered organisms that possess desired traits or that lack undesired traits. |
| *Biotechnology* | A very general term that refers to the use of organisms or biological products for commercial and/or industrial processes. | Since this is such a general term, the specific use of organisms or biological products would have to be described. |
| *Chromosome Mapping (also called linkage or genetic mapping)* | Recombination frequencies between genes are used to construct a map of a chromosome that places the genes found on that chromosome in linear order. | Knowledge of genetic distances between genes allow one to calculate the probability of appearance of recombinant genotypes and phenotypes in offspring. |
| *Gene map* | Usually refers to the sequence of bases of a single gene and the linear location of mutant gene sites that exist for that gene. | Knowledge of the different mutant sites of a gene can be recorded efficiently. |
| *Cloning* | The artificial production of genetically identical copies of segments of DNA, genes or cells.  (note: cloning is natural process as well. Many organisms, such as fungi, Aspen, and sea anemones, produce identical copies of themselves) | DNA or gene clones are used to provide ample amounts of DNA or genes to work with in the laboratory.  Cell lines are generally cell clones that are used to study the effect of drugs, etc., on those cells, and to study gene mutations in particular cells. |