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|  | Throughout history man has attempted to learn where he is from and who he really is. Much of the time, a person can trace their relations back a couple of generations. But is there a way where we can go farther back than that? Can we determine where the entire race of humans evolved? Did humans originally migrate out of Africa, when the entire landmass in the world was known as Pangea, or did they evolve in several areas and then migrate? Only in recent times have we been able to analyze possible evolutionary patterns by examining human DNA.  Our first idea for this project was to check relationships between tadpoles and bullfrogs in the Arroyo Del Valle creek. Unfortunately there were not enough tadpoles and bullfrogs to proceed with an adequate experiment size. Also, we realized that it would be very difficult to obtain the required reagents needed for this tadpole experiment. This is when Mr. Thiel, our teacher, went to a DNA workshop and came back with the idea to use the Alu fragment to check heredity in humans and analyze their relationships to parts of the world and not just to their siblings or parents. Through research, we have found a correlation between certain ethnic ancestral trees. The populations of Africa, Europe, Asia/Americas and Australia all have the same frequencies for the Alu insertions. For example if somebody was homozygous positive for the Alu fragment then we could say from looking at the Cold Springs Harbor Laboratory1 database that this person has some ancestors from Asia or South America.  **What is the basis of this project?**  What we are looking for is an Alu insertion in a specific location on DNA. By amplifying the DNA through a PCR based essay and gel electrophoresis, sharp bands should be seen in the gels through the use of ethidium bromide staining which would indicate whether the Alu insertion is present on both sets of DNA or not.  **History**  Biotechnology has been described as "Janus-faced." This implies that there are two sides. On one, techniques allow DNA to be manipulated to move genes from one organism to another. On the other, it involves relatively new technologies whose consequences are untested and should be met with caution. The term "Biotechnology" was coined in 1919 by Karl Ereky, a Hungarian engineer. At that time, the term meant all the lines of work by which products are produced from raw materials with the aid of living organisms.  Biotechnology is NOT new. Man has been manipulating living things to solve problems and improve his way of life for millennia. Although the ability to study segments of DNA or even the idea of DNA hasn�t been around that long the idea of "Bioengineering" has been around for centuries. Early Agriculture concentrated on producing food. Plants and animals were selectively bred, and microorganisms were used to make food items such as beverages, cheese, and bread.  The late eighteenth century and the beginning of the nineteenth century saw the advent of vaccinations, crop rotation involving organic crops, and animal drawn machinery. The end of the nineteenth century was a milestone of biology. Microorganisms were discovered and Mendel�s work on genetics was accomplished.  Biotechnology at the beginning of the twentieth century began to bring industry and agriculture together. During World War I, fermentation processes were developed that produced acetone from starch and paint solvents for the rapidly growing automobile industry. Work in the 1930s was geared toward using surplus agricultural products to supply industry instead of imports or petrochemicals. The advent of World War II brought the manufacture of penicillin. And the biotechnology focus moved to pharmaceuticals. The "cold war" years were dominated by work with microorganisms in preparation for biological warfare, as well as antibiotics and fermentation processes.  Biotechnology is currently being used in many areas. DNA Fingerprinting is becoming a common practice in forensics, although still not widely accepted in the court system. Similar techniques were used recently to identify the bones of the last Czar of Russia and several members of his family. Production of insulin and other medicines is accomplished through cloning of vectors that now carry the chosen gene, originally by scientists from Genetech, the first genetic engineering company. Immunoassays are used not only in medicine for drug level and pregnancy testing, but also by farmers to aid in detection of unsafe levels of pesticides, herbicides, and toxins on crops and in animal products. These assays also provide rapid field tests for industrial chemicals in ground water, sediment, and soil. In agriculture, genetic engineering is being used to produce plants that are resistant to insects, weeds, and plant diseases.  A current agricultural controversy involves the tomato. A recent article in the New Yorker magazine compared the discovery of the edible tomato that came about by early biotechnology with the new "Flavr-Savr" tomato brought about through modern techniques. In the very near future, you will be given the opportunity to bite into the Flavr-Savr tomato, the first food created by the use of Recombinant DNA technology ever to go on sale. New biotechnological techniques have permitted scientists to manipulate desired traits. Prior to the advancement of the methods of recombinant DNA, scientists were limited to the techniques of their time: cross-pollination, selective breeding, pesticides, and herbicides. And although some say this raises new and profound ethical issues concerning humans "playing God", can it really raise any new issues, especially when biotechnology in the form of selective breeding has been going on for decades?  In the mid-1800s, a monk named Gregor Mendel, working in Brunn, Austria, observed that the offspring of certain plants had physical characteristics similar to the physical characteristics of the plants' parents or ancestors. Mendel wondered why related organisms, both plant and animal, tended to resemble one another and how familial resemblances might be explained. Gregor Mendel reasoned that close observation of inheritance might provide him with the answer for which he searched. He therefore set out to examine the physical traits in pea plants (because of their quick reproductive cycles) in an attempt to predict the traits that would occur in future generations.  During years of painstaking effort, Mendel counted thousands of plants for seven different traits, including plant height, flower color and position, seed color and shape, and pod color and shape. Mendel concluded that certain "factors" were being transmitted from parent to offspring and so on, thus providing a connection from one generation to the next. Mendel suggested that these factors were directly responsible for physical traits. His interpretation of the experimental data further suggested that each individual had not one, but two factors for each trait, and that these factors interacted to produce the final physical characteristics of the individual.  Back then, Mendel had no knowledge of DNA or genes or molecular biology, but his findings were later realized as effects of the DNA in the pea plants. Once DNA was discovered, scientists looked back at Mendel�s experiments and put two and two together. They realized that DNA is the house of information in cells and have used this as an advantage. Now that present information can be known, is there history within DNA?  **What are Alu fragments?**  Alu fragments are found in regions of DNA known as "junk DNA," DNA that does not transpose genes which produce proteins and other known characteristics of cells. Along with being "junk DNA," Alu fragments are known as transposons, or jumping genes, genes that can be taken out of one part of a DNA strand and attached into another. What makes these genes "jump" is unknown, but it is known that this Alu fragment rarely jumps, if at all, in several hundreds of generations.  All this boils down to what our experiment is about. Have these Alu fragments been passed down from generation to generation, and will we be able to examine back through time the inheritance patterns of these three different genotypes to a particular part of the world? Thus supporting one theory of evolution or another: did humans originally migrate out of Africa, when the entire landmass in the world was known as Pangea, or did they evolve in several areas and then migrate? | |
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