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S2DTimes

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News

ANTISENSE TECHNOLOGY TO CORRECT MUSCULAR DYSTROPHY

Source: ScienceNow

Using antisense technology, scientists at the Medical Research Council Clinical Sciences Centre in London, U.K. were able to make mice with a muscular dystrophy-like disease to produce dystrophin, a muscle protein that is important for normal muscle function, which is missing in these animals.

Muscular dystrophy, a sex-linked disease caused by a mutation on the X chromosome, primarily affects boys. Patients of one of the most severe types of the disease-Duchenne muscular dystrophy-are unable to make dystrophin protein.

Like most genes, the RNA for the dystrophin protein undergoes splicing, in which pieces of RNA are clipped out. Researchers introduce a short stretch of RNA that is the mirror image of the Duchenne mutation. This "antisense" RNA binds to the faulty region of the RNA and is eliminated by splicing enzymes that detect the region as junk. An almost normal RNA is produced. This method hasn't worked well in animal models.

Drs. Qi Long Lu and Terence Partridge and their colleagues combined the antisense strategy with a chemical that is usually used in gene therapy to improve delivery of DNA into cells. After injecting the combination in the diseased mice, dystrophin levels were 20% of normal, compared to none in controls. The effect of one injection continued for 3 months. The experiments are published in the 6 July online issue of *Nature Medicine*.

According to neuroscientist Thomas Rando of Stanford University, the challenge is to deliver the antisense RNA through blood, so it becomes integrated into several muscles at once and alter it to last longer.

Biographies of the Notables in Science

In this newsletter, we will feature the notable **Rosalind Elsie Franklin**

Adapted from http://library.thinkquest.org

Rosalind Franklin, a British physical chemist whose groundbreaking work led to the discovery of the double-helix structure of DNA, was born on July 25, 1920 in London, England. Since early age she wanted to become a scientist. Franklin entered Newnham College in Cambridge in 1938 and graduated in 1941. She had a graduate fellowship for one year but quit in 1942 to work at the British Coal Utilization Research Association. While there she did research on the physical structure of carbon and coal. In 1945 she obtained her Ph. D. in physical chemistry from Cambridge University. Franklin went to Paris at the Laboratoire Central des Services Chimiques de L'Etat from 1947 to 1950. During her stay in Paris she learned x-ray diffraction methods, studying the structure of carbon.

In 1951, Franklin went back to England as a research associate for John Randall's laboratory at King's College, Cambridge. At Randall's lab, she met Maurice Wilkins who was working on other projects. While Wilkins was away, she was given responsibility over the DNA project. When he returned, he mistakenly treated her as a lowly technical assistant. Despite some friction with Wilkins, Franklin continued her DNA research. She developed a technique in which she was able to take photographs of the DNA molecule, which showed a helical structure. During that time no one else was able to take such photographs. She also identified the location of phosphate sugars in DNA.

In 1951 through 1953, Franklin came extremely close to finding the structure of DNA but was beaten in publication by American biochemist James Watson and British biochemist Francis Crick. Without her knowledge or permission, Wilkins showed Watson one of Franklin's crystallographic photos of DNA. Once seeing the photos, Watson and Crick easily figured the structure out and published their article in the science journal Nature. An article by Franklin appeared in the same issue on her work. She later published several other articles relating to DNA structure.

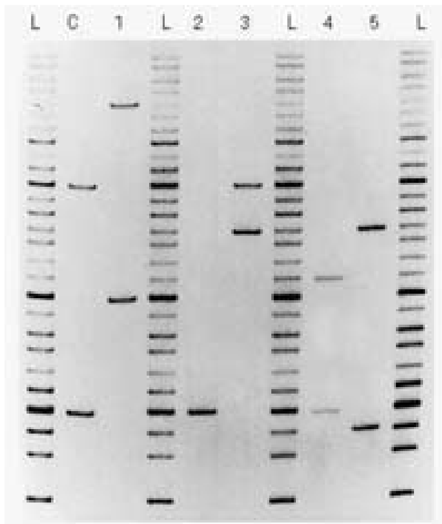
In the spring of 1953, Franklin moved to J. D. Bernal's laboratory at Birkbeck College where she worked on the tobacco mosaic virus and the polio virus. Rosalind Franklin died in 1958 in London, England from ovarian cancer at the age of thirty-seven. Four years after her death, James Watson, Francis Crick, and Maurice Wilkins were awarded the Nobel Prize for the double-helix model of DNA in 1962.

Hands-on Activities

A Technique used in Forensic Science

D1S80 is a DNA locus that consists of a series of tandem repeats of 16 base pairs (bp) in length and alleles range from approximately 350 to 1,000 bp. The variation at this locus resides in the length of a defined DNA fragment determined by the number of tandem repeats. Because the fragment is small, PCR reaction is performed. Students can extract their own DNA (swabs taken from their cheeks) and perform a PCR reaction to find out what their D1S80 locus is. (http://www.appliedbiosystems.com/products/productdetail.cfm?prod_id=103. The kit is AmpliFLP™ D1S80 PCR Amplification Kit)

In the Figure below, lanes marked as L contain the allelic ladder with various alleles separated on a polyacrylamide gel. All unknown samples are compared to the allelic ladder. Allelic ladders range from 14 to 41 repeats (14 is the lowest band you see in the gel below). 15 is not present since it is very rare among U.S. population. Lane C contains a DNA sample that has D1S80 alleles 18, 31 which is heterozygous since two bands are present (inherited one allele from each parent). The genotype for C at the D1S80 is 18, 31.



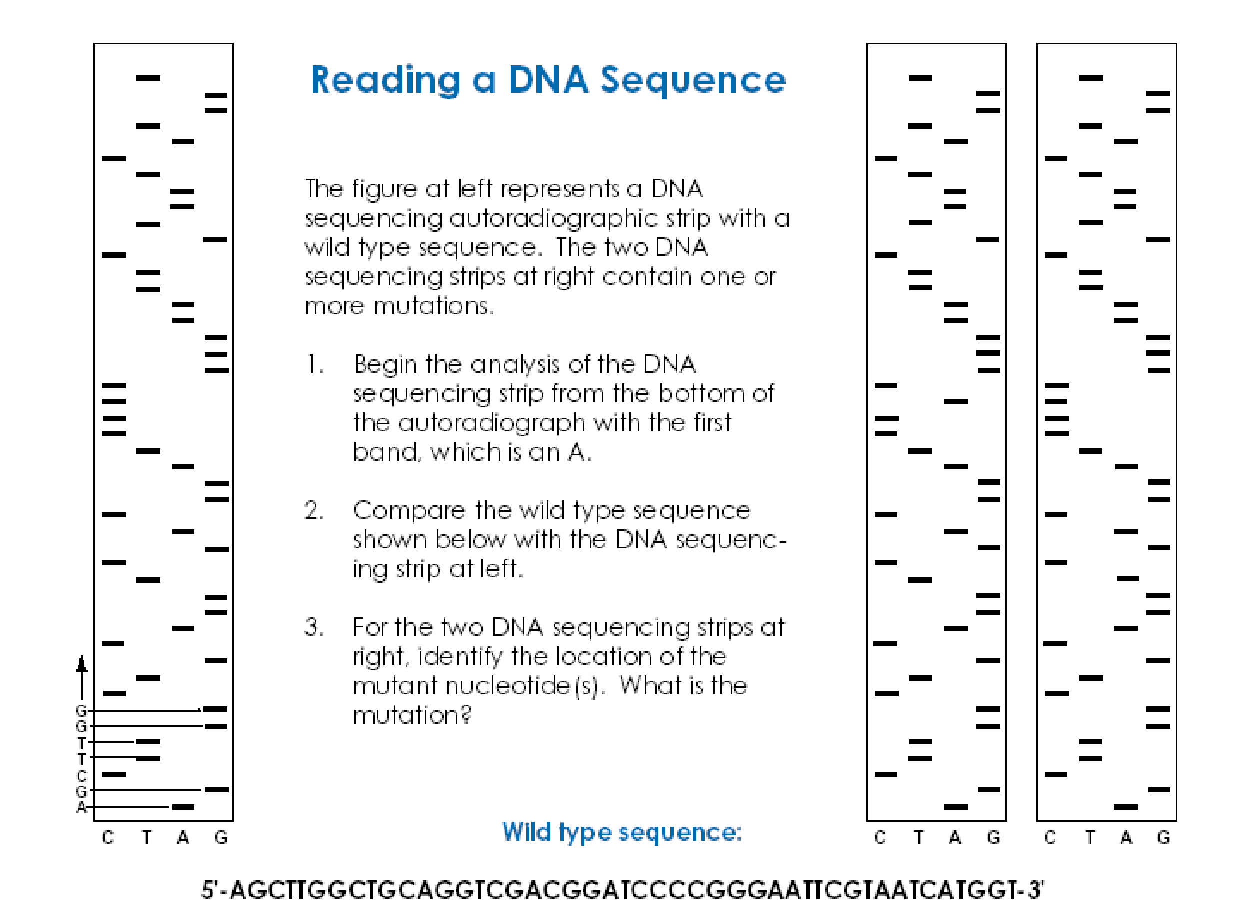
1. What is the genotype of D1S80 for sample 1?
2. What is the genotype of D1S80 for sample 2?
3. What is the genotype of D1S80 for sample 3?
4. What is the genotype of D1S80 for sample 4?
5. What is the genotype of D1S80 for sample 5?
6. Which sample is homozygous?

Answers: 1: 24, 37; 2: 18, 18; 3: 28, 31; 4: 18, 25; 5: 17, 28; 6: sample 2 (only 1 band- both parents share the same allele).

Transcription and Translation

An interactive site for your students to understand transcription and translation: http://gslc.genetics.utah.edu/teachers/tindex/overview.cfm?id=transcribe

Learning how to read a DNA sequence



Humor

A biologist was interested in studying how far bullfrogs can jump. He brought a bullfrog into his laboratory, set it down, and commanded, "Jump, frog, jump!"

The frog jumped across the room. The biologist measured the distance and then noted in his journal, "Frog with four legs jumped eight feet."

Then he cut the frog's front legs off. Again he ordered, "Jump, frog, jump!"
The frog struggled a moment, then jumped a few feet. After measuring the distance, the biologist noted in his journal, "Frog with two legs jumped three feet."
Next, the biologist cut off the frog's back legs. Once more, he shouted, "Jump, frog, jump!"

The frog did not jump. It just lay there. "Jump, frog, jump!" the biologist repeated.
Nothing happened and then the biologist noted in his journal, "Frog with no legs lost its hearing."

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