Experiment for dna replication

DNA Replication

In the body, there are about 33 billion base pairs of DNA in the genome. " A genome is an organism's complete set of DNA, including all of its genes. Each genome contains all of the information needed to build and maintain that organism… contained in all cells that have a nucleus (U. S. National Library of Medicine)." The 33 billion base pairs in the genome must be copied as accurately as possible when any specific one of the cells in the body divide triggering the start of DNA replication. During the DNA replication process, copies of cell's DNA are being produced. A DNA molecule consists of the inborn components in all living cells.

At specific locations on the DNA strand, the replication process will begin. These specific locations are known as the " origins of replication" and can be depicted by their sequence. Specialized proteins such as DNA Polymerase recognize these origins of replications, latch onto the site, and start to open up the DNA. After the DNA Polymerase binds to the DNA, two structures in the shape of a " Y" begin to form. In other words, Replication Forks are created at this time, as well as a replication bubble which grows from both ends.

The first enzyme that is created at the origin of replication is called Helicase. Helicase works to push the replication forks forward, " unwinding" and cutting the DNA almost in half. In this part of the process, Helicase has done its job of fully breaking the weak hydrogen bonds between the nitrogenous base pairs of the DNA strand. Proteins called single-stranded binding proteins make their way around the replication bubble, submerging the separated strands of DNA located close to the replication fork, preventing them from spiraling back up into a double helix as well as stabilizes the DNA strand itself.

After the single-stranded binding proteins do their job, the enzyme known as Primase is introduced adding a few ribonucleotides (R-nucleotides) to the strands of the original DNA. “ These RNA nucleotides are *primers* allowing *DNA Polymerase III* to attach…The RNA primer allows DNA Polymerase III to attach and provides a hydroxyl (OH) group so the first D-nucleotide can be matched up with the parental strand (The Biology Primer).” Being that DNA can only make DNA in the 5’ to 3’ direction, this stirs up a problem in the replication process. The double helix of a DNA strand always moves “ anti-parallel”. One of the DNA strands 5’ to 3’ direction, while the other runs opposite. This allows for the two new strands, to be created in slightly different sequences. Subsequently, the gaps between the DNA fragments, made when helicase first unwound the double helix, are sealed by DNA ligase thus replicating a DNA strand.

Throughout our 2-3-minute movement study, my group and I decided to portray the process of DNA Replication. At the beginning of the piece, you can depict that as each of my group members slowly make their way to a standing position, they begin to gather and find their partners through the motion of any action and twist (general) until they are standing in front of their partners. Then each member slowly raises their arms to touch figure tip to finger-tip with the person across from them representing the weak hydrogen bonds of the DNA strand coming together to find their base pairs.

For example, as seen in the process of DNA synthesis when the base pairs A links to the base pair T, and the base pairs G links to the base pair C.

Once the DNA strand is created at the beginning of the movement, I myself represent the Helicase enzyme fully breaking the weak hydrogen bonds between the nitrogenous base pairs. Using flexion, as well as any straight pathway, I make movements through the DNA molecule. We as a group chose to have the movement of the Helicase as it makes its way through the DNA strand as a circular pathway (general) to represent the helicase " unraveling" the DNA's double helix. As we scatter once the Helicase has done its job of breaking the weak hydrogen bonds, the positions in which each member of the group re locate to illustrates the replication bubble expanding and being created. Once the DNA replication bubble is created, we all gather in a circular pathway to form two single stranded DNA strands in a flexed position becoming as small as possible. After a brief pregnant pause is taken by the group, the group begins to sway sequentially depicting the DNA single strand binding proteins in motion towards their goal of protecting the single strands, keeping them from re-binding back together. In circular pathways, the group form one big single strand where one of the members of the group is forced out of line by another representing the process of DNA primase being turned into RNA primer.

After this process has been portrayed, the group then scatters in another circular motion back into their spots of the DNA replication bubble. At this time, the member who had broken off and became the " RNA primer" makes their way down the middle of the DNA replication bubble in a straight path, distributing balloons. In our movement piece the balloons used are to illustrate the leading and lagging stands in the DNA replication process. The red balloon as seen stands for the leading strand which is passed in a more fluent flow compared to the green balloon used to represent the lagging strand that is passed in a more slowly abrupt, stagnant way. At this point in the DNA replication process, a new strand is on its way towards being created.

References:

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