Smoking: How Genetic Mutations Affect Your Susceptibility to Cancer

An article from the Genetic Literacy Project states that our genes may play a part in whether we may develop cancer from smoking cigarettes. Over 30% of cancer-related deaths each year are caused by smoking. These are not just cancers of organs that are exposed to cigarette smoke, such as lung, throat, and larynx cancers. Smoking can also be responsible for several cancers in other parts of the body, including the kidney, cervix, and colon. A study published in Science on November 4th stated that “for each year a person smoked a pack a day there were 150 new genetic mutations in each of his or her lung cells”. However, other recent studies also prove that genetic mutations occur in organs that have no direct contact with tobacco smoke. The LA Times reported that for every “pack year”, a smoker will have about 18 new bladder cell mutations and 6 new liver cell mutations (per cell).

Several studies performed on cancerous tissues have resulted in the identification of several consistent DNA mutations. Scientists have identified 20 genomic signatures that are caused by tobacco carcinogens, including mutations such as base-pair swaps and other more complicated issues. These signatures have been proven to effect the person’s susceptibility to various different cancers. One of these issues that is currently being researched is called signature 5, which so far seems to accelerate the amount of mutations depending on how heavily the person smokes. While signature 5 has proven to be related to age in non-smokers, it has only shown to be caused by tobacco intake for smokers. Signature 5 is also much more common in smokers, ranging from 30 to 500 percent more likely.

These genetic mutations caused by smoking have surprisingly only been found within actual genomes, as opposed to the out packaging of the genome that alters gene expression. However, cancer research has shown that environmental exposures to the carcinogens found in tobacco can alter the expression of cancer-causing genes without resulting in a mutation of the gene’s sequence. This research also supports why smoking during pregnancy has devastating effects on the development of the fetus.

While smoking is a dying trend in the United States, there are still 1 billion people in the world who frequently smoke cigarettes. This topic and the continuation of this research are important to me because of the amount of people in developing nations who smoke. They are much less likely to have access to the healthcare, information, or necessary tools that they need to quit smoking. Therefore, continued research on how tobacco carcinogens cause genetic mutations may help us to better understand smoking-related cancer and how to prevent it from taking so many lives.