

Role of telomerase in cancer and aging

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For hundreds of years, people have been trying to find the legendary fountain of youth, which was supposed to give aging people the ability to age backwards. Recently, modern scientists have discovered a special protein to do just that.

People age because cells have a biological restriction on how many times they can divide; this is called the Hayflick limit. In order to break the Hayflick limit, telomerase renews the protective DNA at the ends of the chromosomes, so that the cell can continue dividing. However, the issue with this is that telomerase activity can also cause an increase in cancer.

However, through recent experiments, scientists have been able to successfully implement telomerase in mice without an occurrence of cancer. Furthermore, since 70% of all cancer cells display an excess amount of telomerase, treatment and diagnostic tools could target telomerase in order to slow down cancer, as well as use the traditional treatment of radiation and chemotherapy.

These findings mean a great deal to people who are still looking for that fountain of youth, as well as the people who are fearful for themselves and their loved ones getting cancer. As this special protein brings the two fields of aging and cancer together, there are several ground breaking applications for this protein. Thus, this research experiment uses the meta-analysis of research papers to explain how telomerase could play a major role in cancer and aging. Introduction For several years, scientists have been approaching new and radical ideas on how to slow down aging. Although immortality is nearly impossible to accomplish, scientists have discovered a special protein, telomerase, which has potential capabilities to renew the cells biological

clock. Telomerase renews telomeres, special strands of unused DNA at the end of chromosomes, in order to allow the cell to continue replicating.

Although this may seem like the fountain of youth has been found, there is still another issue when it comes to telomerase; cancer. Carcinogenesis, the spreading of cancer cells, happens when normal cells mutate into a cell that cannot function properly, and then continues to spread (Hwang, Blocking Telomerase Kills Cancer Cells but Provokes Resistance, Progression). The purpose of this paper is to evaluate the properties of telomerase, find out the role telomerase plays in aging and cancer, and the potential uses for telomerase in the medical field. Differentiating healthy cells and cancer cells when targeting cells for telomerase treatment would significantly improve cell health by slowing down cancer cells and increasing telomere length in healthy cells. Cancer Normal human cells go through various stages of a cell cycle during their lifetime, but when a gene such as oncogenes and tumor suppressor genes mutate, a cell's DNA will start to code for proteins that enhance the cells ability to continue to divide, as well as repress a cells ability to stop itself from dividing, or undergo apoptosis.

A gene specific for the creation of telomerase proteins are called hTERT genes. These genes mutate during cancer, and their starts to be an abundance of telomerase in the cancer cells, which is one of the main reasons for why the cells continues to divide. Because these genes coding for telomerase turn off after birth, normal cells do not have this abundance of telomerase in them. This makes it easier for radioactive micro complexes to be used for diagnosing purposes, since these biomarkers will attach to where there is an abundance of telomerase, which is also the likely site of <https://assignbuster.com/role-of-telomerase-in-cancer-and-aging/>

the cancer cells. 70%-90% of all cancers have lengthened telomeres, as well as an abundance of telomerase. Aging The role of telomerase in aging has been debated for several years since the discovery of telomerase.

However, due to trials being done on mice, scientists have gotten significant results. Aging occurs due to the Hayflick limit, which is the limit on the number of divisions a cell go through before it enters a suspended state, or senescence. The Hayflick limit is what causes cells to degrade and eventually die, thus limiting a human's lifespan. However, when the telomerase gene hTERT is activated, the telomerase acts as a reverse transcriptase, and it adds on base pairs to the RNA strand of the cell's telomeres. This would then allow the cells to surpass its Hayflick limit and increase a human's lifespan. In a recent study by Harvard graduates, mice were given telomerase in order to lengthen their telomeres. After several years, the mice that had the longer telomeres showed a significant reversal of aging in the very old mice. However, since the telomeres were lengthened, the chances of its cells going through carcinogenesis increased rapidly, since the long telomeres allowed benign cells to continue growing. Further Application Through several studies, it is shown that telomerase certainly plays a role in cancer and aging, and because the role telomerase plays into the two diseases is so contradicting, it has become difficult to estimate a balance between the two subjects. However, the results that have been found are promising. For cancer, radioactive biomarkers could be used for detecting overexpression of telomerase in malignant tumors.

Also, sensitive techniques such as telomeric repeat amplification protocol assay would measure the concentration of the telomerase subunits and relay <https://assignbuster.com/role-of-telomerase-in-cancer-and-aging/>

the information, which could then be scanned and visualized by an expert. In addition to diagnostics, because telomerase is mainly present in cancer cells due to the activation of the hTERT gene, telomerase inhibitors would work well on cancers that have just begun to metastasize, controlling the telomere length of the cell. However, because of the lag of telomeres gradually shortening, other common treatments such as radiation and chemotherapy would have to be used in addition to telomerase therapeutics. In addition to telomerase helping out cancer patients, telomerase can also be used to help people who are trying to fight aging. In a recent study, scientist gave mice a controlled gene therapy strategy, which is controlling the expression of the telomerase gene, in addition to over expressed telomerase. This method greatly increased the mice's health, and no cancer was present in the mice.

Although further tests need to be done on humans to see whether people can continuously consume telomerase supplements, elderly people who feel like a slight increase in the risk of getting cancer is nothing to worry about, moderation in the supplement should significantly increase the quality of their life. Because of the continued studies being done on aging, it is not recommended for individuals who are not facing immediate age related complications to take the telomerase supplement, as this could very well increase their risk for cancer. Conclusion There have been significant advances in the field of cancer and aging, and the human lifespan is increasing significantly. In this study, telomeres were studied in order to bring insight into another field of aging and cancer. After observing the data from several academic journals, the results shown were that telomerase is present in 70 to 90 percent of all cancer cells, and because of this, taking

telomerase inducing supplements will increase a person's risk of cancer. However, because of this study, scientists can use biomarkers to target telomerase enzymes in cancer cells.

Furthermore, telomere shortening cancer therapeutics could be combined with the current treatment such as radiation and chemotherapy, since the telomerase inhibition would cause a lag phase to occur, and it would only be beneficial to patients at an early stage of cancer. Since only few people have been tested with telomerase, the murky nature of this subject is imminent, and further research would have to be done to determine precise safety restrictions on telomerase drugs, as well as telomerase inducing drugs. If you want to learn more about telomerase and its role in cancer and aging, go to [www. telomerase. weebly. com](http://www.telomerase.weebly.com)