SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Highly Commended

Science Writing

Year 9-10

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The Mystery of Brain Cancer (Glioblastoma)

Glioblastoma is the most aggressive form of brain cancer. It kills 95% of patients within 5 years of their diagnosis. It is a brain tumour that grows rapidly and can affect the tissue surrounding the tumour. It is also one of the biggest medical mysteries in the world today.

There is currently no cure for Glioblastoma, but there are ways to slow the growth. Professor Shudong Wang and her team at UniSA are currently testing a new experimental drug called Auceliciclib that could be a cure.

Auceliciclib targets the Cyclin-Dependent Kinases enzymes, which are largely responsible for most human tumours. The drug is currently undergoing clinical trials and if proven successful, this drug could save many lives and give hope to those diagnosed.

The most common tumours in glioblastoma are gliomas and related brain tumours such as astrocytoma and ependymoma. These tumours surround the nerve cells.

Because of their location when the tumours grow it puts pressure on the surrounding nerves. This can cause seizures, language difficulty, muscle weakness, sensory loss, and visual changes because of the pressure. On top of these symptoms, as the tumours grow they can cause the brain to swell, this can cause nausea and headaches.

When these tumours develop, in the early stages, removal may be possible however, it is extremely difficult because as the glioma cells grow tentacles form and begin to affect the surrounding tissue.

Glioblastomas can develop from forms of astrocytoma, another type of brain cancer. These tumours develop from astrocyte cells which play an important role. These cells are only found in the central nervous system (CNS). These cells have a starlike appearance, and their major function is to maintain an appropriate chemical environment for neuronal signalling.

Other things we know about Glioblastoma is that the cyclin-dependent enzymes play a large role in the growth of these tumours. The new drug Auceliciclib targets these enzymes and manages to pass the blood brain barrier to successfully reach and treat the tumour.

Auceliciclib is an experimental drug that is being tested both independently and in combination with Temozolomide (TMZ). A company called Aucentra is doing clinical trials of this drug. They are testing it in 28-day cycles, testing different doses on patients with different grade gliomas.

As of current time this cancer cannot be completely cured, but the growth can be slowed, and symptoms can be reduced. The current treatments involves surgery to remove the tumours, radiation therapy (both targeted and general) and chemotherapy.

Temozolomide (which is being used in combination with Auceliciclib) in selected trials, is actually a drug used in chemotherapy. Temozolomide works by preventing the cancer cells from making Deoxyribonucleic Acid (DNA). Which is the genetic material of the cancer cells. Without being able to produce this the cells can't grow.

Auceliciclib targets the cyclin-dependent enzymes, specifically type 4 and 6 which affects tumour growth and manages to reduce side effects meaning that it is able to stop the cancer from growing and multiplying so that a surgery, such as a craniotomy, can be performed and hopefully majority of the tumour can be removed.

This means that patients can develop a better quality of life and possibly prolonged life too.

This new drug could have a great positive impact to people dealing with cancer and has potential to replace radiation therapy. This is because chemotherapy both destroys the cancer cells and stops them from multiplying and spreading, with the added Auceliciclib it means that specific cells (that play a large role in tumours) can be targeted, and when used in joint with Temozolomide can be destroyed.

This would solve many issues to do with radiation therapy, such as damage to other non-infected cells and parts of the brain meaning that the patient's brain would be detrimentally affected if they were to fully recover from the cancer.

Eventually with more development this drug could even completely replace the use of Temozolomide too, while providing the same relief but with reduced side effects.

This improves the quality of life in patients even if they are not cancer free, as it can provide a treatment to prolong their life while preventing more damage to the brain.

As previously mentioned this drug is currently in the testing stage and there is no guarantee that it will work as expected. On top of this the drug is not yet a complete replacement for all other treatments that can have large side effects, meaning that although this is a ground-breaking discovery it cannot replace all current treatments that can cause issues such as surgery and chemotherapy.

As well as this there are issues and limitations that can come up during the testing phase or future. These issues include morals and ethics, (on whether it is really safe to test this), The issue of funding, (both the University of South Australia and Aucentra need funding to complete clinical trials), and patients, (in order for these clinical trials to be performed there needs to be patients that meet the criteria who are willing to participate).

All of these are limitations, while most are minor they can still slow down the development of this new drug immensely.

In summary, while this drug is still in the testing and development stage it is showing very promising signs of providing a new cure to glioblastoma.

Currently this drug is being tested in clinical trials both independently and in combination with Temozolomide (TMZ). If these tests prove successful hopefully a cure for this vicious cancer can be created with reduced side effects and risks that can be associated with other treatments. After further development this drug might even be able to replace other treatments.

This would then be able to both elongate the patient's life and improve their quality of life too. Providing a better outcome then current treatment.

I believe that Auceliciclib should continue to be developed.

While others may believe that testing these drugs is morally or ethically wrong, when looking at the outcome of this drug if successful I believe it is worth it.

When comparing the cost to the outcome it is definitely worth testing. If it has any chance of saving the 10,000+ patients diagnosed every year, 95% of which die within 5 years of diagnosis, I believe it is worth it.

If successful, this drug means that people with this aggressive cancer can now live less-impacted and longer lives, even if they still have cancer, and to me that is most important. If all goes well we may be one step closer to solving the mystery of glioblastoma.

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Resources

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