

2008 TAIWAN INTERNATIONAL SCIENCE FAIR

CATEGORY : Medicine and Health

PROJECT : Blood Brain Barrier Breached!

AWARDS : Medicine and Health Third Award

SCHOOL : Kelly Road Secondary School

FINALISTS : Brian Le

COUNTRY : Canada

Blood Brain Barrier Breached!

Name: Brian Le

Category: Medicine and Health

Country: Canada

An innovative approach to breaking through barriers to effective brain cancer treatments with minimal side effects

The purpose of this project is to determine if it is possible to use Ascorbic Acid Sodium-Dependent Vitamin C Transporter Type II, SVCT2, as an effective and safe protein to attach to certain brain tumor treatments to bypass the Blood Brain Barrier (BBB).

Stemming from this problem, a procedure was created to use *in vitro* engineering with the aid of a professor at the University of Calgary to combine SVCT2 and three specific tumor treatments; Imatinib Mesylate (STI-571), Temsirolimus (CCI-779), and Suberoylanilide Hydroxamic Acid (SAHA). Following this, a metabolic barrier had to be created to simulate the BBB. To do this, the use of three enzymes were mixed and held together using specific bonds.

Finally, a special bio-tracer was placed within the barrier to detect any toxic effects that may be produced. Then two trials were made with each treatment on the barrier at 34°C, 37°C, and 39°C. Once this was done observations could be made.

When the newly isolated SVCT2 attaches to the three cancer treatments, they would all be able to connect and form bonds with each other. Once the incubation period is over for the first trial at 34°C, 37°C and 39°C, several things would be observed within the data. When counting the number of cells that were able to get into the engineered metabolic barrier, it could be seen that there was a dramatic increase in the number of cells in the 37°C range.

SVCT2 can be a powerful tool in combating cancer. Because of its specificity, it may prove to be more advantageous over the currently used drugs which may have unwanted toxic side effects on the CNS. In the near future, SVCT2 could have the potential to be adopted as a promising therapy against cancer and certain tumors.

Furthermore, SVCT2 has the potential to be applied to many situations and can be modified to fit a number of situations that deal with getting past the Blood Brain Barrier. Initially, SVCT2 was only modified with three forms of treatment for Glioblastoma Multiforme, STI-571, CCI-779, and SAHA, however there are countless other treatments that have been developed, but that are not in use due to the BBB.

This project was successful in determining an appropriate temperature of 37°C for the procedure to be used. The limitations of this experiment include the fact that this experiment was performed *in vitro* and so complexity among individuals cannot be analyzed. However, this is an early step for the future of SVCT2 as a treatment, and clinical trials to test SVCT2 *in vivo* may not be too far off.

評語

- 1) The idea is good.
- 2) Mr.Le(the another) should pay more attention to “basics”, e.g. the sign of game/protein under investigation.