Drug Discovery: Primary screening of Traditional Chinese Medicines for anti-cancer activity using high-throughput screening

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Abstract

Primary screening of leads in drug development using a high-throughput screening technique is an effective way to quickly identify promising candidate for a specific type of drug from an extremely large amount of compounds. Currently, Tradition Chinese Medicines (TCMs) are of high interest in drug discovery because they have been used in the East for over two thousand years and little is known about their specific bioactivity. High through-put cytoxicity screening of crude TCM extracts will allow for the identification of potential for cancer treatments, and it will also help determine which concentrations of each extract are most useful to get the desired results. Identifying which extracts hold the most promise for further research towards a possible new treatment for cancer as quickly and accurately as possible is an important part of the drug discovery process because it can save time and money in the long and expensive journey of the development of a new drug.
There are thousands of TCMs that have been recorded over the past two millennia and since little research has been completed on these ancient remedies, the handful of modern drugs that have been discovered from the TCM vault are likely to be just the “tip of the iceberg.”

Image Source: http://chinavine.org/2011/08/12/barney-loye-folk-medicine/

Background

Traditional Chinese Medicine (TCM) has been practiced in Asia for over two thousand years, however it has been mostly overlooked in drug discovery studies. Cancer is one the deadliest and most complicated diseases on the planet. Effective treatment usually involves highly toxic chemotherapies that reduce the patient’s quality of life, and many cancers can develop resistance to currently available therapies. New drugs that eliminate these challenges are a must in order to treat cancer effectively. A handful of new drugs for cancer treatment such as Paclitaxil, Arsenic Trioxide and Camptothecin derivatives have come from the TCM vault, but there are thousands more remedies that have yet to be thoroughly studied as potential drugs for cancer treatment.

Image Source: http://www.acs.org/content/acs/en/education/whatischemistry/landmarks/camptothecintaxol.html

Objective

The Tennessee Center for Botanical Medicine Research (TCBMR) has taken on the task of studying TCMs for their potential in the western drug market, and one of its goals is to find new drugs to fight cancer.

Methods

Primary screening involves *in vitro* testing of TCM extracts for cytotoxicity on lung and breast cancer cells and very low toxicity on healthy cells. Using a high-throughput screening technique and fluorescence indicator AlarmarBlue, the effectiveness of each extract sample can be characterized. High throughput screening will allow a large number of extracts and concentrations to be tested simultaneously. AlarmarBlue, which is initially blue in color will be converted to a highly fluorescent pink compound in the presence of viable cells. Using a microplate reader to measure fluorescence, extracts with anti-tumor activity will be identified and their IC_{50} values will be determined.

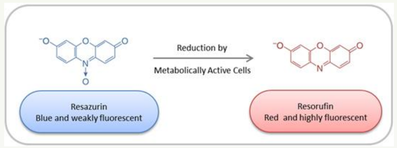
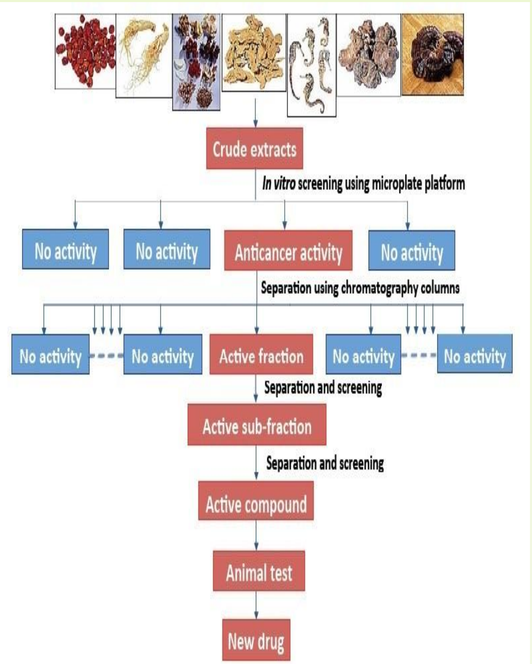


Image Source: http://www.abdserotec.com/alamarblue-assay-cell-proliferation-cytotoxicity.html

Image Source: http://www.abdserotec.com/alamarblue-accessory-reagent-buf012b.html



Conclusion

Completion of primary screening provides information needed for further study of promising extracts and advances them to the next step in the long process of drug discovery.

Summary

-TCMs are a large and promising source for discovering new drug candidates.

-Cancer cells and normal cells will be treated with crude TCM extracts in order to measure the cytotoxicity of the extract in each type of cell.

-High throughput screening using the AlarmarBlue reagent will help determine the best candidates and their IC_{50} values to allow for the next step in the drug discovery process.