Identification of Small Molecule Cancer Stem Cells Inhibitors

Methodology

- **Culturing of cancer stem cells**
  - Culturing cells for testing
  - Added to 96 well plates when confluent
  - Each well is seeded with 10 000 cells
- **Addition of compounds**
  - Addition of 1 µl of diluted compounds into the 96 well plates
- **Resazurin fluorescence test**
  - Test for the remaining cells in the wells of the 96 well plates
- **Data analysis**
  - Analysis using evaluated data to determine the cytotoxic levels of added compound

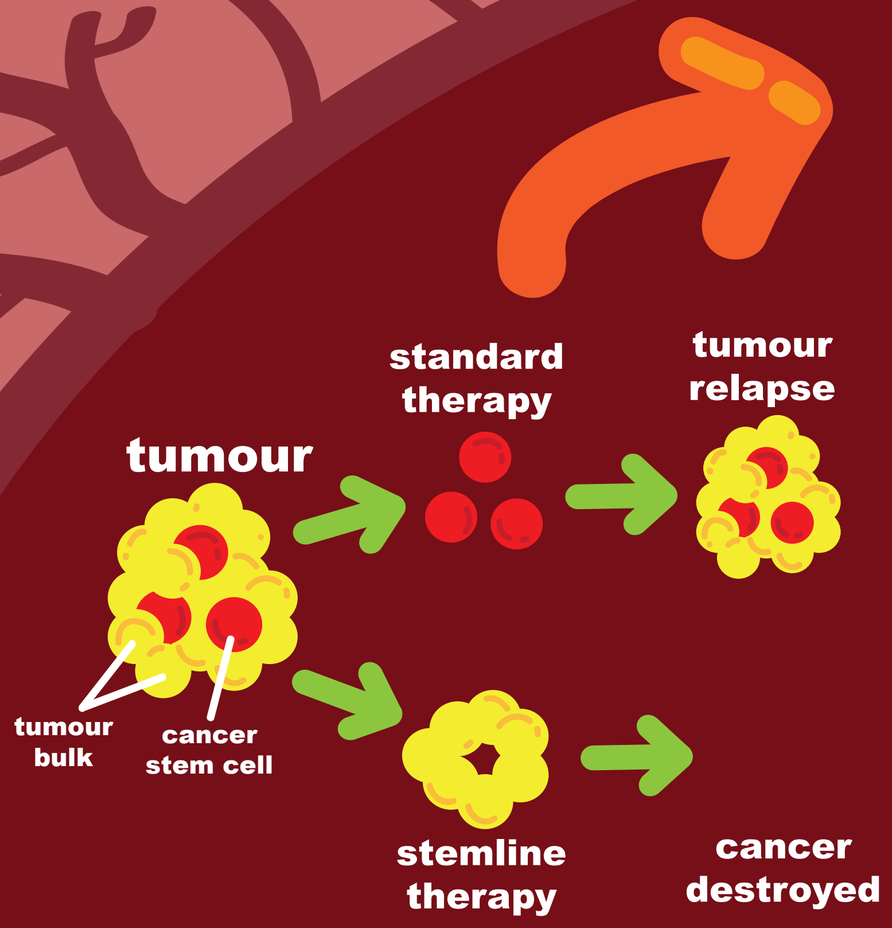

Fig 1: Difference in standard therapy and stemline therapy.

Introduction

Colorectal cancer is the most common cancer among males in Singapore and the second most common among females. Breast cancer is the most common cancer among females in Singapore. The current cancer stem cell model is whereby tumours arise from a minority of tumour cells termed cancer stem cells that have properties of normal stem cells. This is due to a disruption in the regulatory mechanism in stem cell renewal, which leads to uncontrolled cell growth. Cancer stem cells have become an important target during cancer treatment and there have been many attempts to search for small molecules that are cytotoxic to cancer stem cells and also specific in action.

Abstract

Cancer Stem Cells (CSCs) are rare stem cells within tumours that have the ability to self-renew and give rise to the phenotypically diverse tumor cell population to drive tumorigenesis. Due to the nature of CSCs, they are important targets when treating cancer. Traditional cancer therapies kill rapidly dividing tumor cells but may spare stem cells that can give rise to a new tumour. Eliminating CSCs, however, should halt a tumour's growth and prevent a relapse. Salinomycin (P16), P20 and P23 and paclitaxel have been identified to be highly cytotoxic to both Breast CSC and Colon CSC.

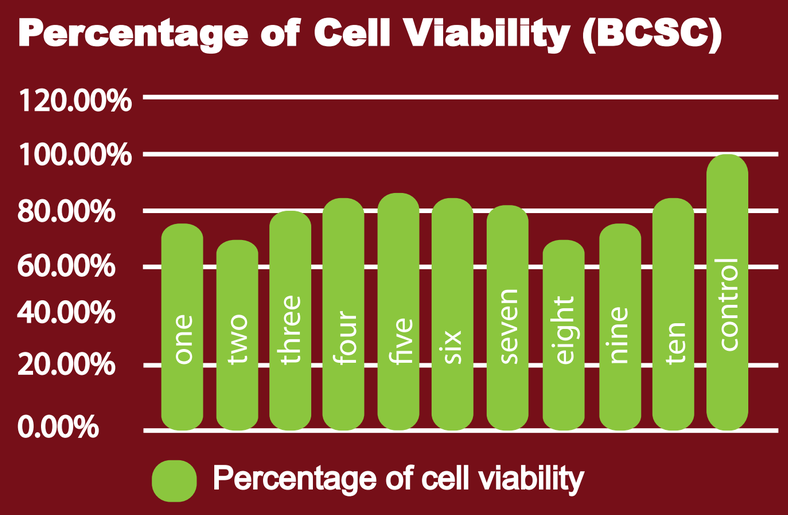

Fig 3: Top 10 compounds with highest killing rates for breast cancer stem cells.

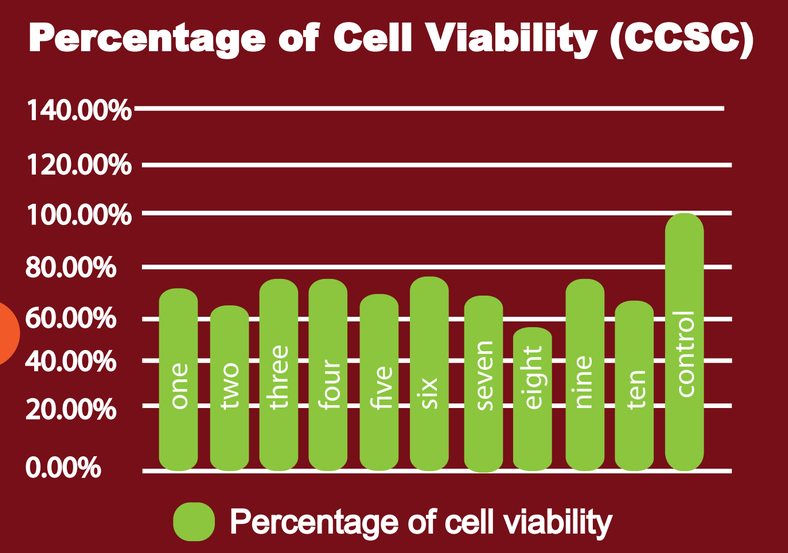

Fig 4: Top 10 compounds with highest killing rates for colon cancer stem cells.

Discussion

According to the number of breast cancer stem cells that remain alive from Fig 3, it is clear that the percentages of cancer stem cells killed by the compounds are very similar. Deriving from the percentages calculated, the compound with the highest killing rate is the 8th compound, which is the compound coded C7 from plate HF09151. The percentage of cells that remain alive is the least among the compounds which we had tested, whereby 69.00% of cells were still alive at the end of the test. According to the number of colon cancer stem cells that remain alive from Fig 4, we can also see that the compounds tested on the cancer stem cells display killing rates similar to one another. As we can see, the compound with the highest killing rate is the 8th compound, which is compound C6 from the plate HF09152 and the percentage of live cells in the well is 57.57%, which means that it had almost killed half of the cells in the well.

Conclusion

We conclude that the compounds of the Maybridge Ro3 library display similar cytotoxic levels when tested on both colon and breast cancer stem cells. The research would have been better if we had better understood the theory behind each test first before carrying them out. Future research should encompass the testing of the compounds which have displayed a higher cytotoxic level towards the cancer stem cells for their side effects on the human body and how the compounds can be formulated into a cure for human cancer.

Acknowledgements

We would like to thank the following people for guiding us in the course of this project:
Supervisor Dr. Mark Richards,
Lab Technicians Gwen Goh and Kay Wee,
Teacher Mentor Mr Goh Tze Mian

Presented by :
Goh Li Herng, Shirlin Koh Ming Yi, David Lee Wei & Shawn Chick

Designed by:
Sarah Kelly Ng, Woong Jia Yi & Joshua Tan

SCIENCE AND TECHNOLOGY SYMPOSIUM 2013
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