COLLEGE OF SCIENCE
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

**Research and Creative Experience for Undergraduates (RCEU)**
**Summer 2017**

# The Cytotoxicity of Essential Oils on MCF-7 Breast Cancer Cells

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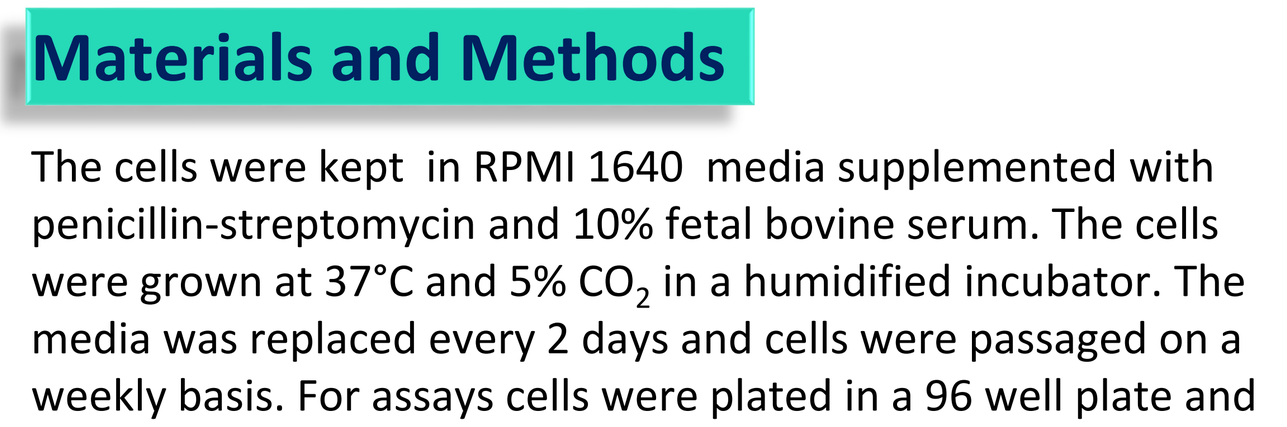
## Introduction

Since ancient times, plants and herbs have played a large role in curing and treating various ailments. Breast cancer is not exempt from the benefit of plant based treatment . By understanding the cancer cells' reactions to various essential oils-hydrophobic liquids extracted from plants through evaporation, distillation, and fractionation-new cancer treatments can be discovered. There are various forms of breast cancer that grow and function in various ways. In order to narrow the focus and widen understanding, this study was confined to a specific breast cancer line-MCF-7. MCF-7s are a mammalian epithelial breast cancer cell line. The growth and division of the cell is regulated by estrogen (estrogen receptor positive). Various essential oils were examined to determine their ability to kill MCF-7 cells.

## Materials and Methods

The cells were kept in RPMI 1640 media supplemented with penicillin-streptomycin and 10% fetal bovine serum. The cells were grown at 37°C and 5% $CO_2$ in a humidified incubator. The media was replaced every 2 days and cells were passaged on a weekly basis. For assays cells were plated in a 96 well plate and essential oils were added. After 48 hours of incubation, a MTT assay was done to determine the percent kill by the essential oils. In living cells, the oxidoreductase enzyme in the mitochondria converts the MTT into a colored crystal-formazan. After 3-4 hours of incubation, the formazan was dissolved and the 96 well plate was read by a plate reader at 570nm to determine the wells' absorbance. Higher absorbance correlates to a higher amount of cell viability.




3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide **(MTT)**

(*E*,*Z*)-5-(4,5-dimethylthiazol-2-yl)-1,3-diphenylformazan **(Formazan)**

Image 1. MTT reduced to Formazan

## Key Findings/Results

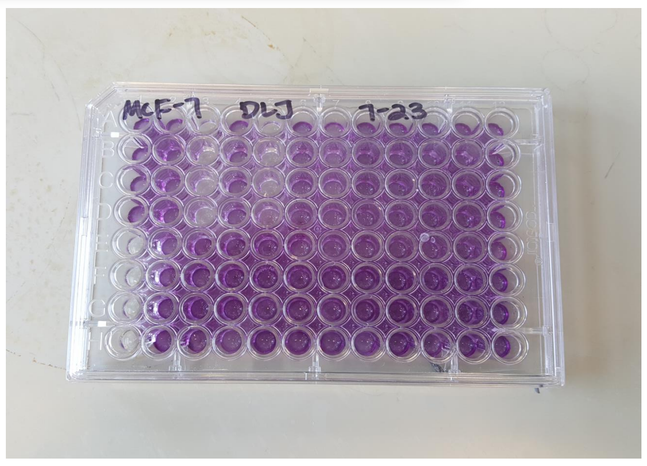



Image 2. Dissolved formazan crystals

Cytotoxic Oils

| Essential Oil | % Kill |
|---|---|
| *Helichrysum italicum* (0.005%) | 92.08 |
| *Juniperus communis* (0.01%) | 85.57 |
| *Picea mariana* (0.01%) | 92.64 |

## Impact/Conclusions

The oils that succeeded in killing the breast cancer cells can be further fractioned into purer components. In the future, each constituent can be tested separately against the MCF-7 cell line. By doing so, the exact portion of the oil that is responsible for the cytotoxicity can be determined. The fractioned portion can then be used in new cancer therapy.

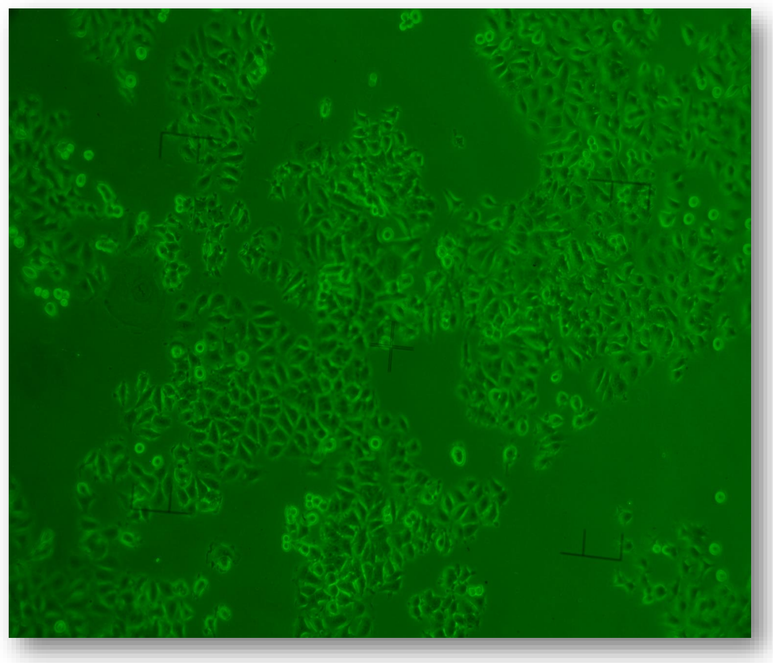


Image 3. MCF-7 cells in culture

## Acknowledgements

I would like to thank Dr. Bernard Vogler, David Cook, UAH Office of the Provost, UAH Office of the Vice President for Research and Economic Development, Dr. Sundar Christopher, Dr. Emanuel Waddell, Robert & Pearl Johnson, Helen Kelly, and God. I greatly appreciate all you have done.

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