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The Role of Capsaicin and [6]-Gingerol in preventing cancer through altering immunity



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Course: BIOL 404 Immunology – Instructor: Dr. Amorette Barber

Introduction

- Phytoestrogens play a role in enhancing cell proliferation by binding to estrogen receptors in the human body, they also play a role in anti-cancer treatments (Sharma and Kumar, 2004).
- Research has found that elevated levels of estrogen may increase one's risk of cancer (Liang and Shang, 2013).
- Capsaicin, otherwise known as the chili pepper, inhibits the growth of cancer cells ((Clark et al. 2016).
- [6]-Gingerol is an ingredient in ginger, has been found to have cancer-preventive properties such as anti-inflammatory and anti-tumor promoting activities (Kim et al. 2005).
- MDSC have been found to facilitate tumor growth, in return causing chronic inflammation (Rosenberg and Sinha, 2009).

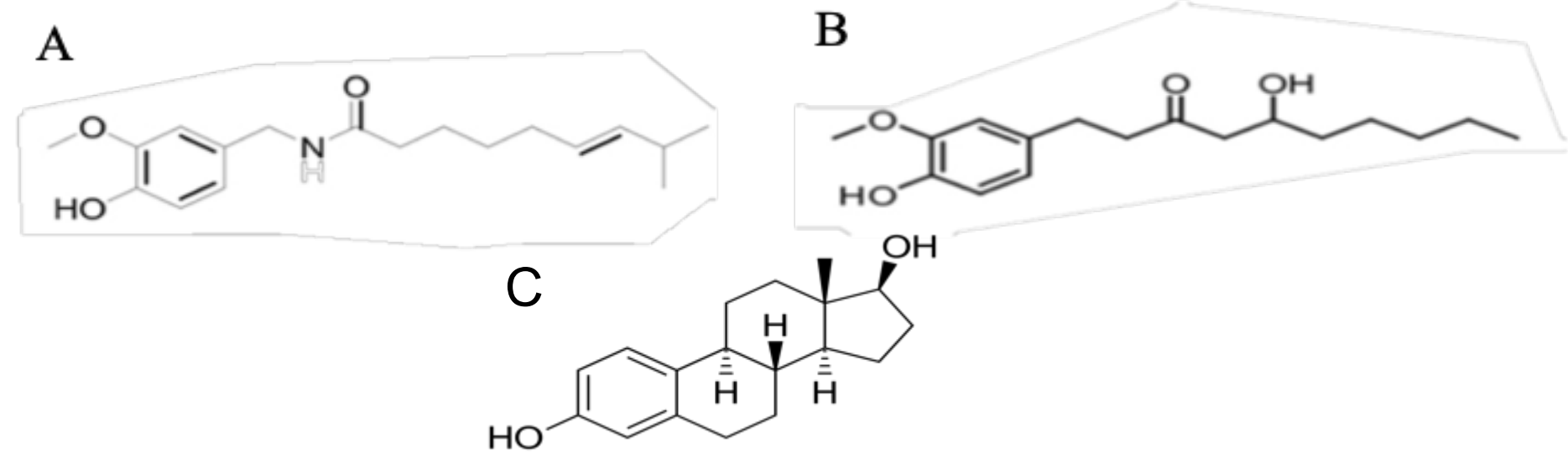


Figure 1. Phytoestrogen and Compound Structures. (A) shows the structure of Capsaicin. (B) shows the structure of 6-gingerol. (C) shows the structure of Estrogen.

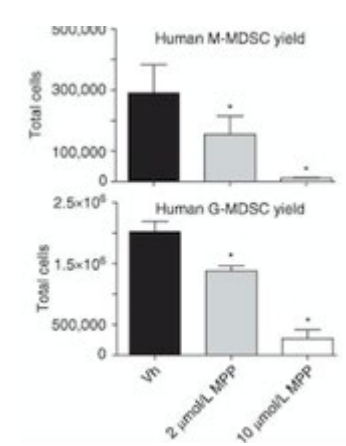


Figure 2. Response to inflammatory signals into MHC-II + myeloid cells. myeloid cells promote malignant progression through MDSC-mediated immune-suppression (Svoronoes et al. 2017).

Specific Aim

- In this study, we aim to see whether or not these phytoestrogens mimic estrogen and cause suppression of the immune response. This is important in the understanding the role of estrogen and phytoestrogens in cancer prevention.

Methods

Culture Dendritic Cells with Estrogen, Capsaicin, and [6]-Gingerol

Flow Cytometry - MDSC

ELISA - MDSC

Isolate T-Cells and Culture with MDSC

T-Cell Proliferation

T-Cell Skewing

Results

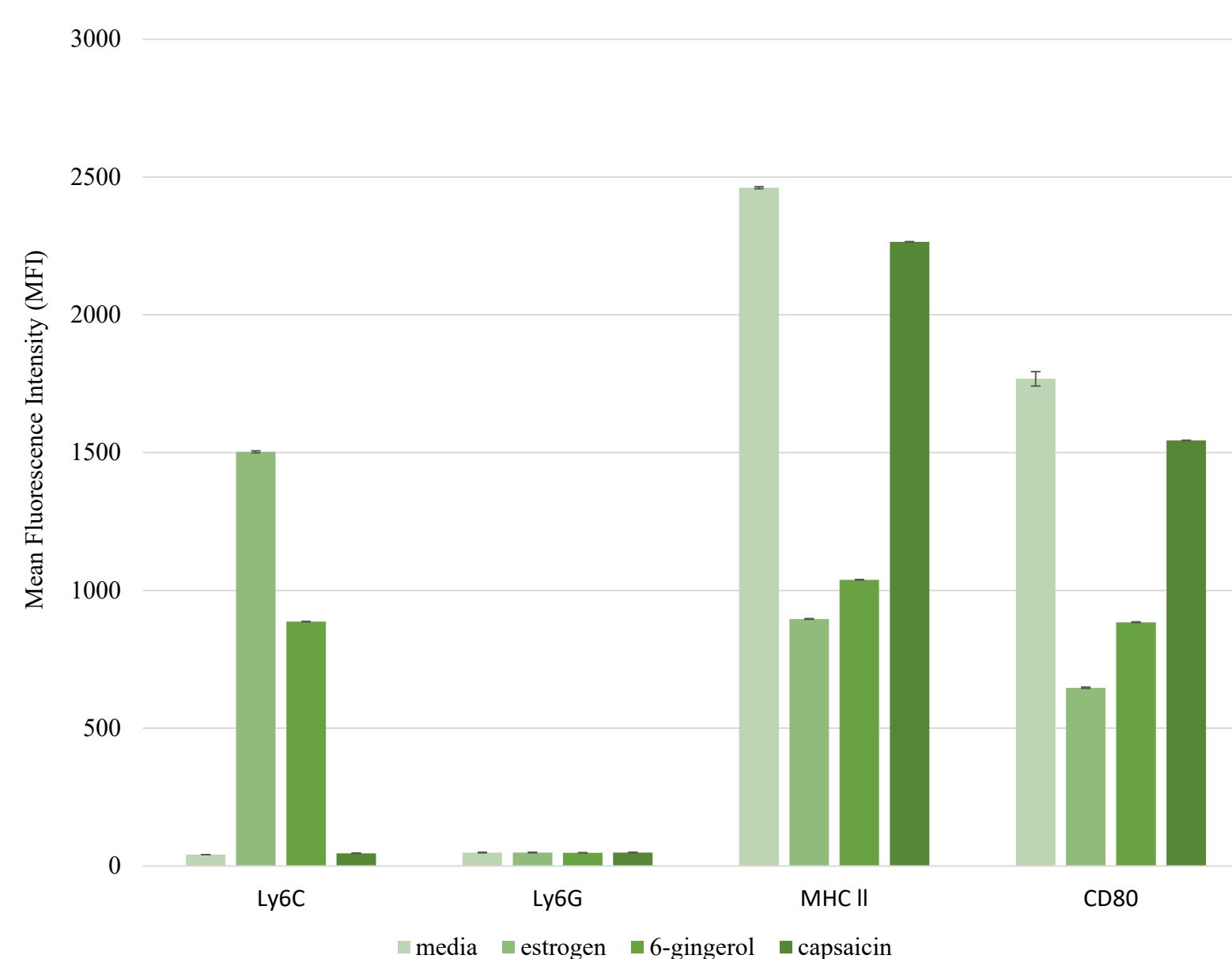


Figure 1. Differing cytokine levels due to media, estrogen, and phytoestrogens. Flow cytometry data with the comparison of cytokines made between different media, estrogen, and phytoestrogens.

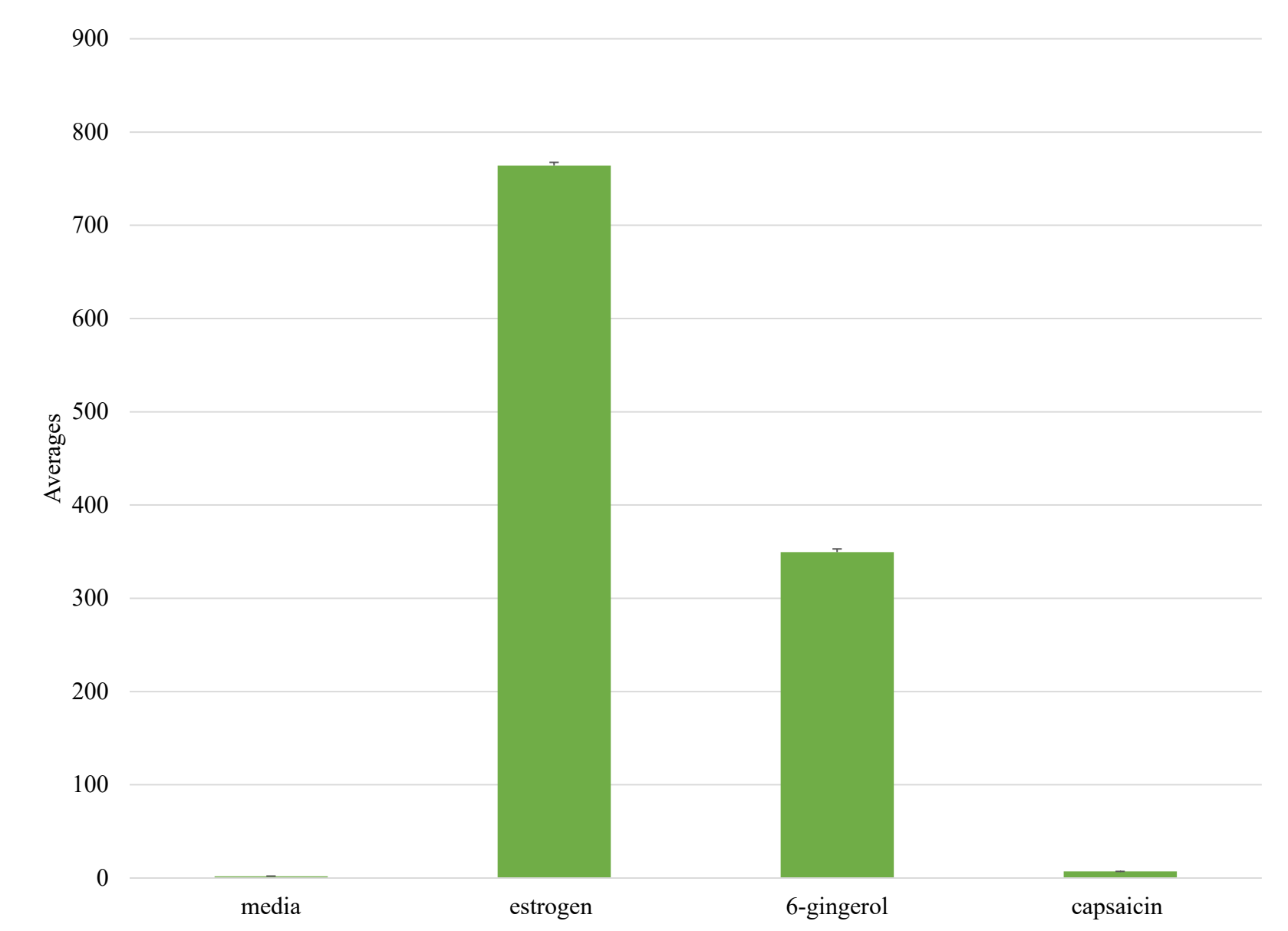


Figure 2. Exposure to [6]-Gingerol induced differentiation of MDSC. ELISA data with the comparison of cytokines made between different phytoestrogens.

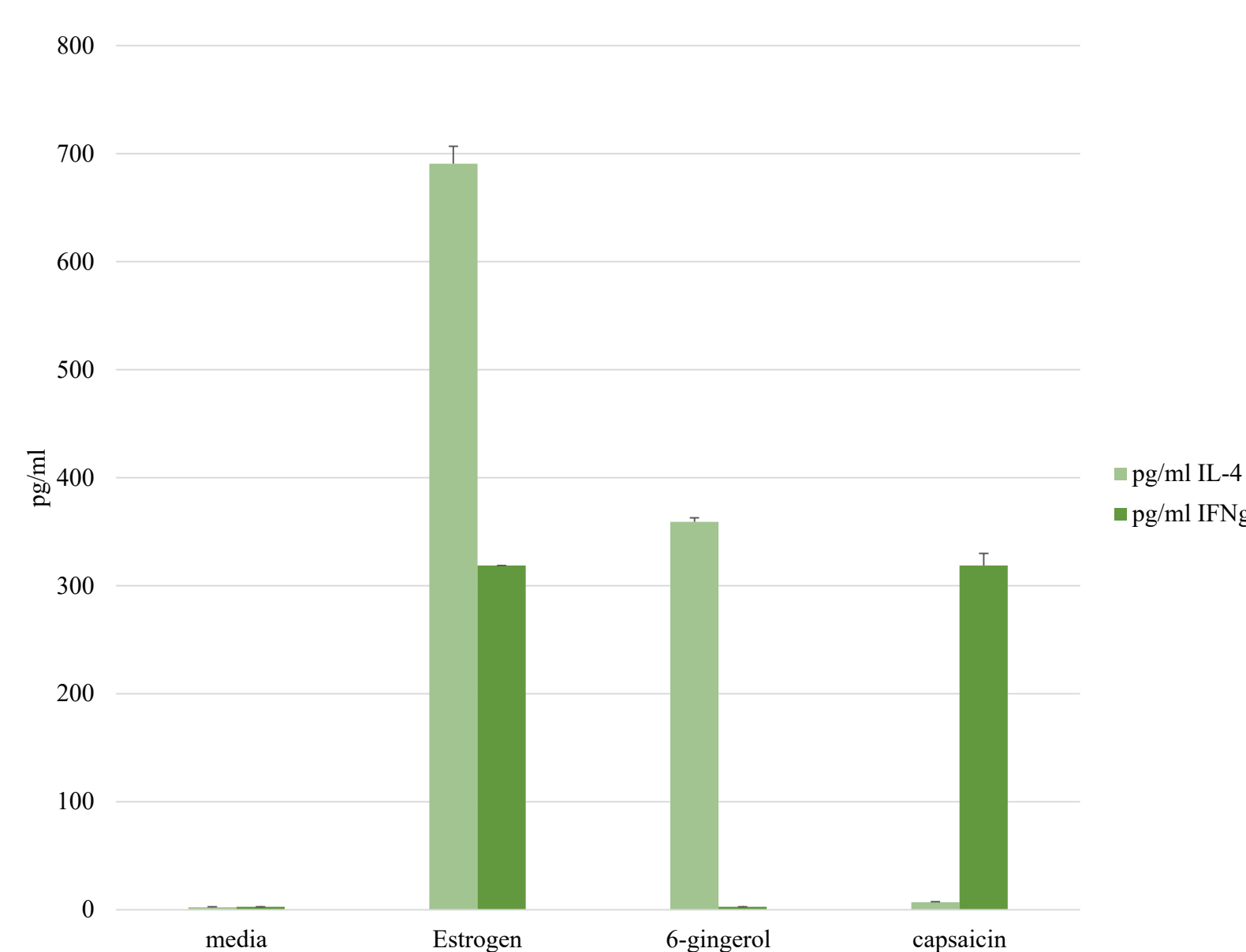


Figure 3. Similar effects of phytoestrogens with estrogen and the cytokines. ELISA data with T Cell skewing cytokines while comparing two different cytokines between the different phytoestrogens.

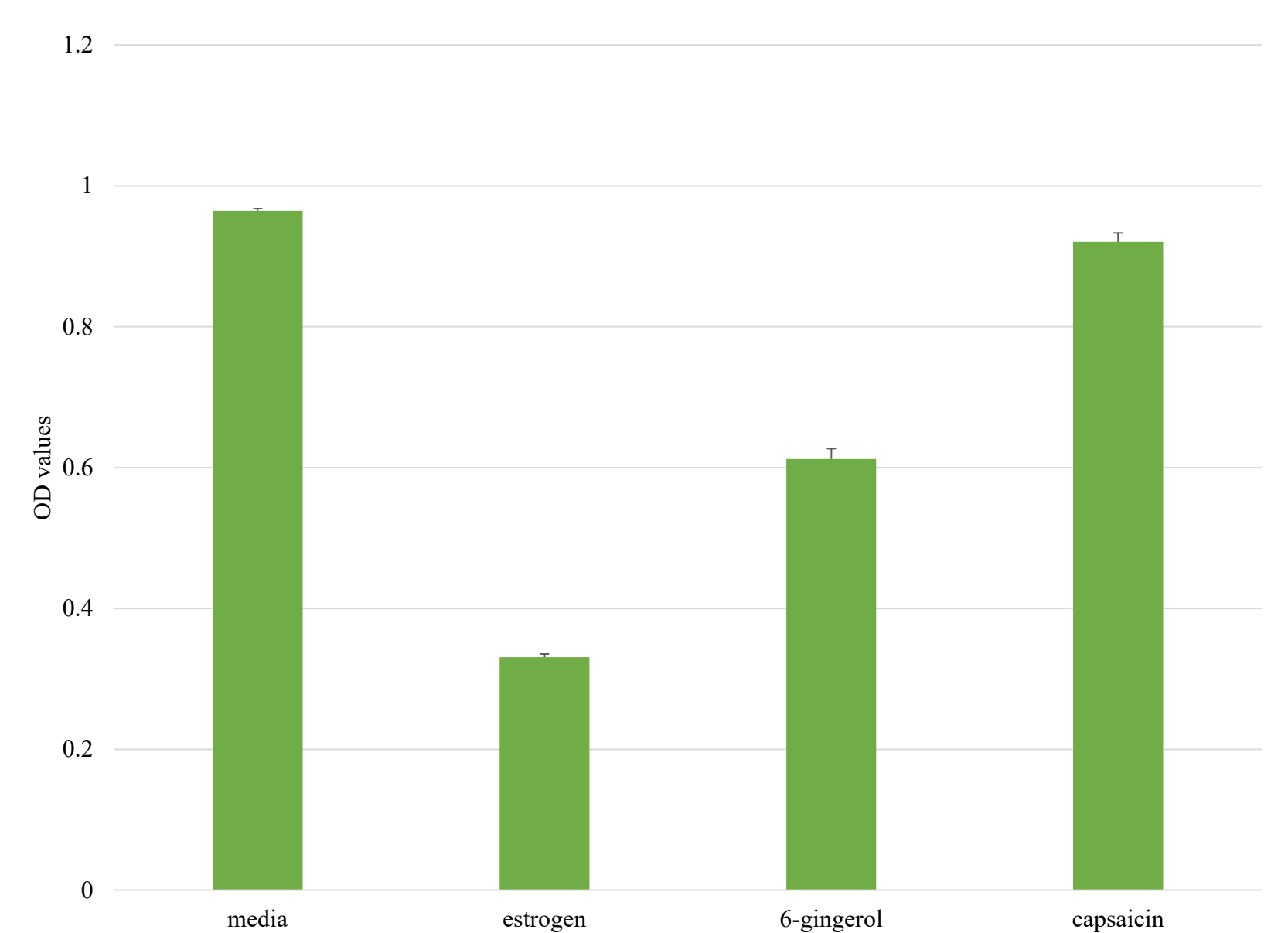


Figure 4. MTT assay to measure T cell proliferation. Comparison of the optical densities of the different phytoestrogens. Analysis shows that all data was statistically significant.

Conclusions

- Capsaicin altered MDSC differentiation while 6-gingerol did not, which indicates that this is needed to suppress the immune response and prevent cancer with estrogen.
- Estrogen looks very similar to [6]-Gingerol suggesting that it can suppress the immune response and prevent cancer.
- When comparing the two cytokines, IL-4 and IFN γ , with the phytoestrogens tested:
 - [6]-Gingerol had the greatest significance between the cytokines along with a greater reaction with cytokine IL-4
 - Capsaicin had a greater reaction with cytokine IFN γ
- T Cell activation did not alter capsaicin, which suggests that capsaicin can suppress the immune response and prevent cancer after T-cell proliferation.

Future Directions

- Using Capsaicin and [6]-Gingerol together to treat a variety of cancers.
- Using Capsaicin and [6]-Gingerol to inhibit the growth of cancer cells.
- Researching other phytoestrogens that may have anti-cancer or anti-tumor properties.

Citations

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