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Methyl and Butyl-Parabens Initiate Myeloid Derived Suppressor Cell (MDSC) Activity

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BIOL 404:Immunology

Department of Biological and Environmental Sciences



Background

- Xenoestrogens are man-made chemicals used as antimicrobial agents in cosmetics, personal hygiene products, plastics, and pesticides. They mimic the effects of estrogen and are linked to tumor growth.
- Studies show that Parabens have been linked to the development of breast cancer¹.
- Researchers found that MCF-7 breast cancer cells treated with methylparabens induced tumor proliferation through tumor-initiating cell activity².
- Low doses of butylparabens have been known to increase estradiol secretion in MCF-7 cancer cells resulting in an increase in cell proliferation⁴.
- Methyl and Butyl-parabens have endocrine disrupting effects.
- This activity can lead to the activation of Myeloid-derived suppressor cells (MDSCs) which directly contribute to the proliferation of tumor cells³.

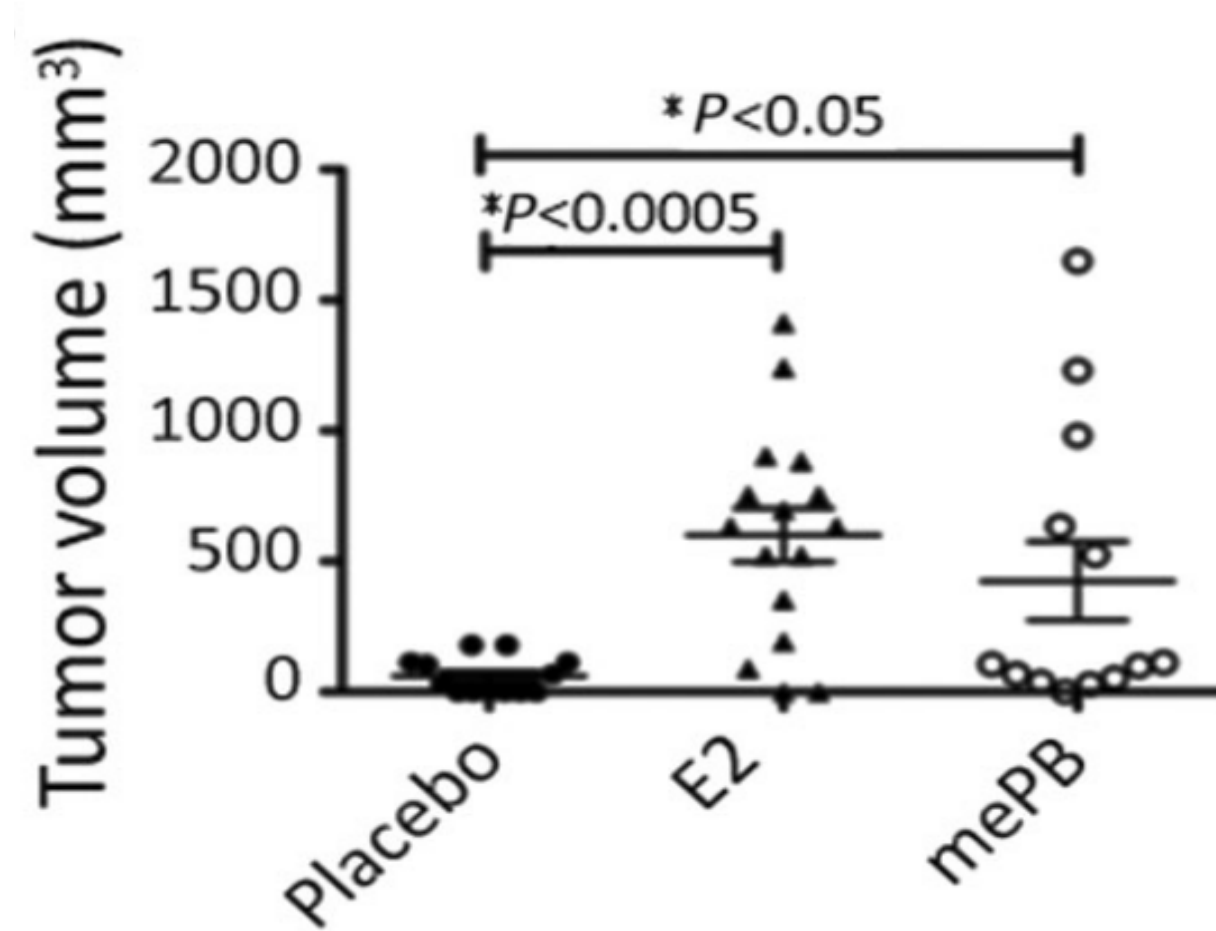


Figure 1. Proliferation of MCF-7 Breast Cancer Cell². Mice exposed to methylparabens resulted in a significant increase in tumor formation compared to placebo.

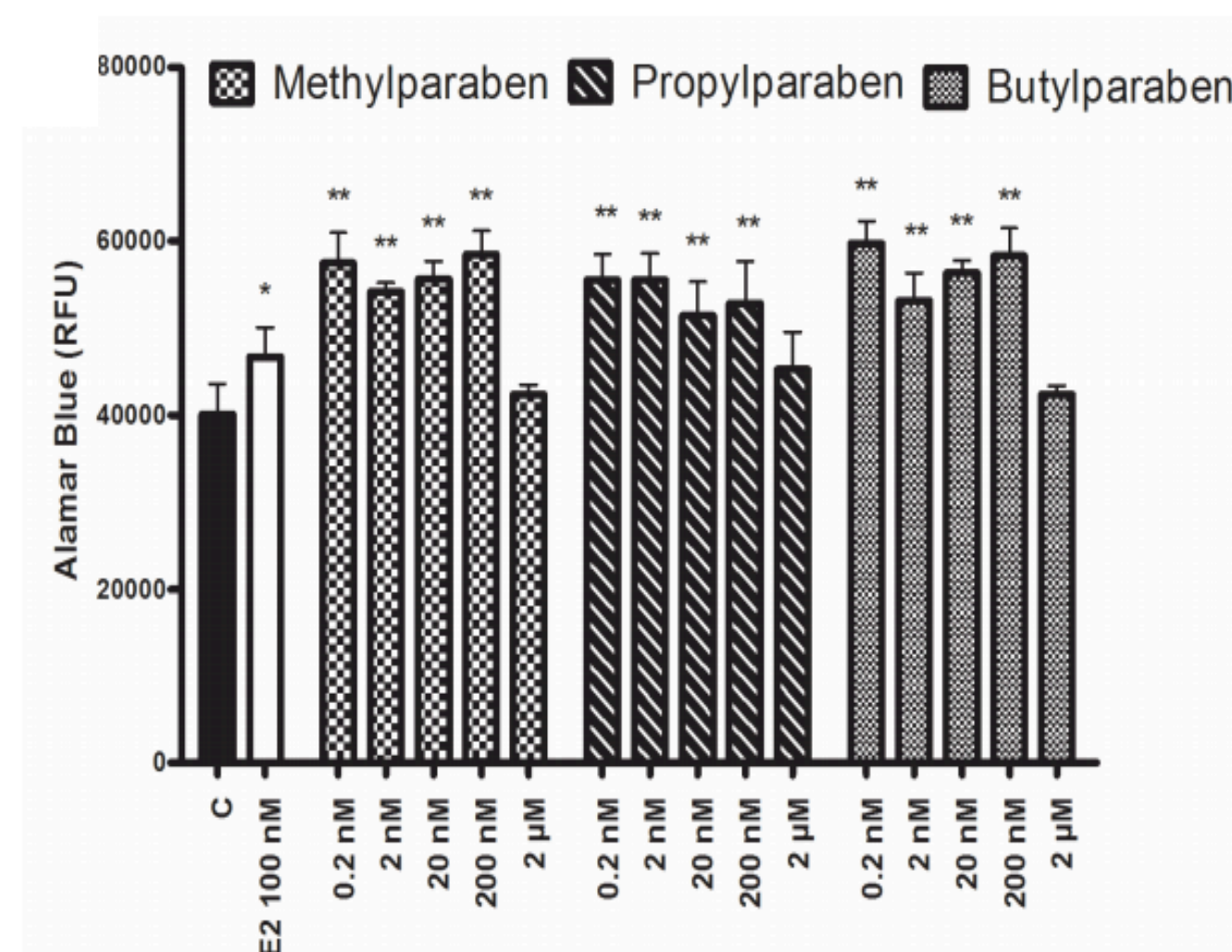
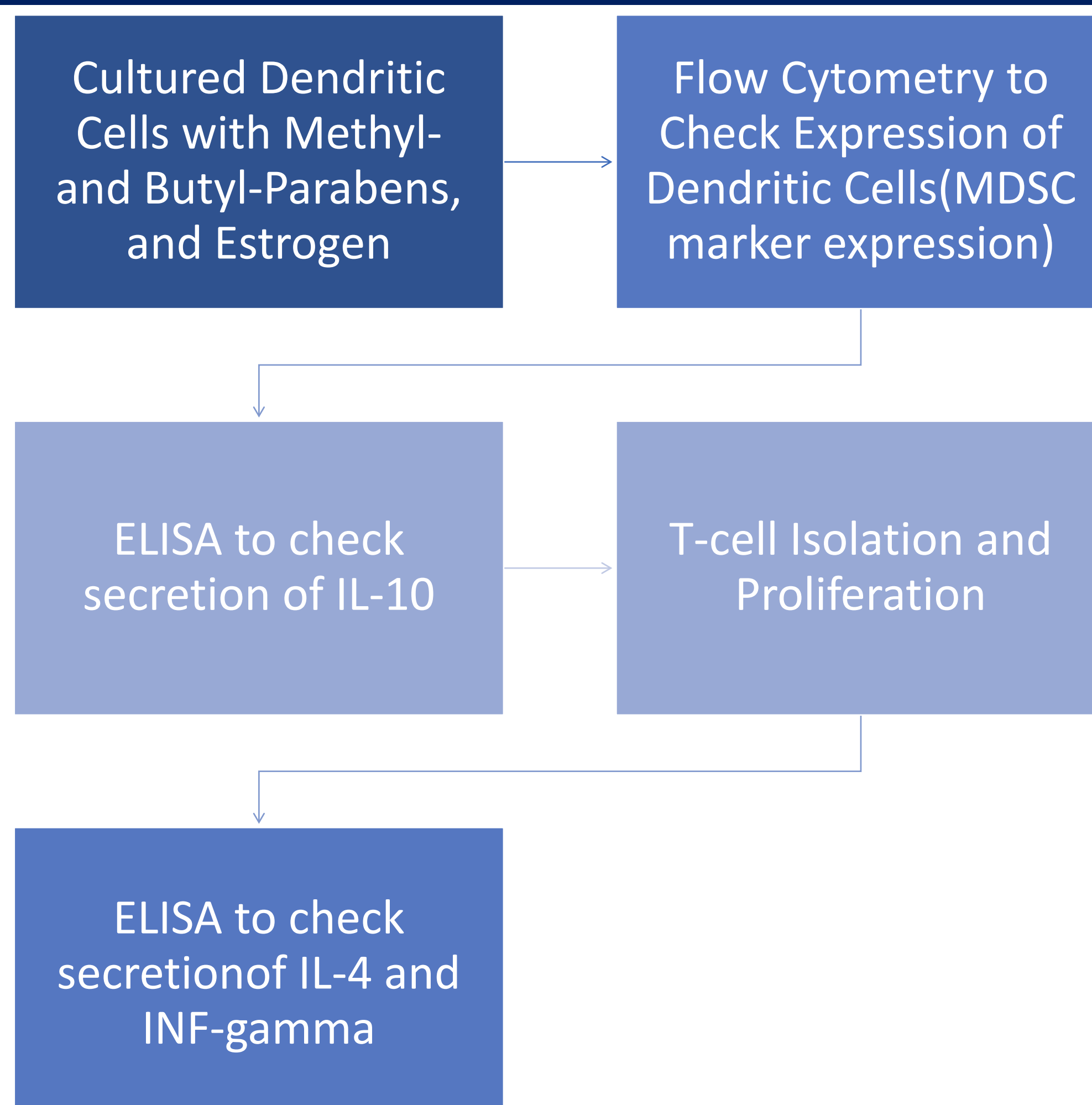


Figure 2. The Effects of Low doses of Parabens on Tumor Proliferation⁴.

Specific Aim

- Our specific aim is to see if Methyl and Butyl Parabens induces the proliferation of tumor cells

Methods



Results

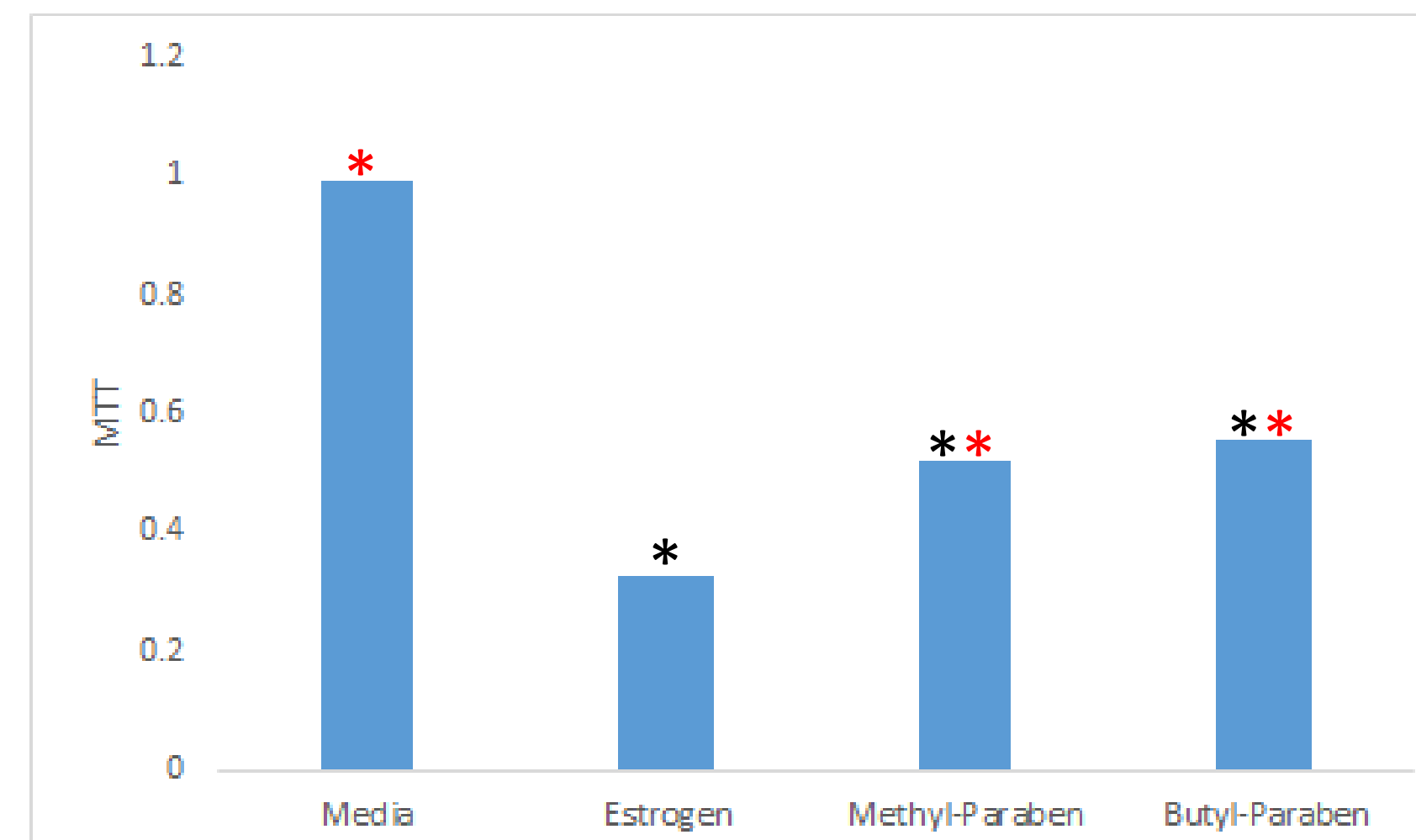


Figure 3. MTT assay for Cell Proliferation. Cells proliferated slower than when untreated. * = Significant at p=0.05 level in comparison to media * = Significant at p=0.05 level in comparison to estrogen

Figure 4. Flow Cytometry Analysis of MDSC Markers and Cell Surface Receptors. Ly6C and Ly6G are markers for MDSC identification MHCII and CD80 are cellular proteins responsible for activation of CD4 T-cells. * = Significant at p=0.05 level in comparison to media * = Significant at p=0.05 level in comparison to estrogen

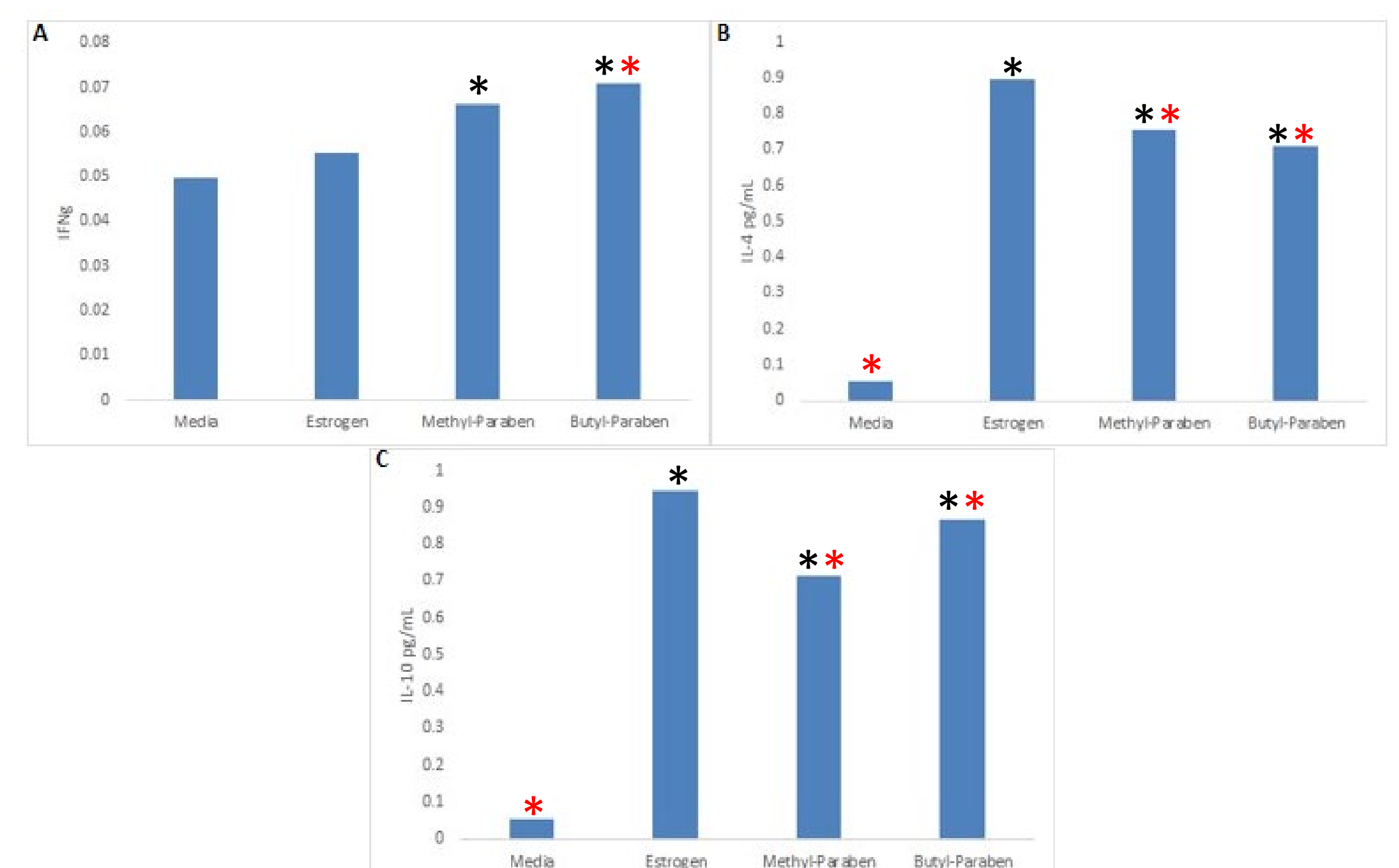
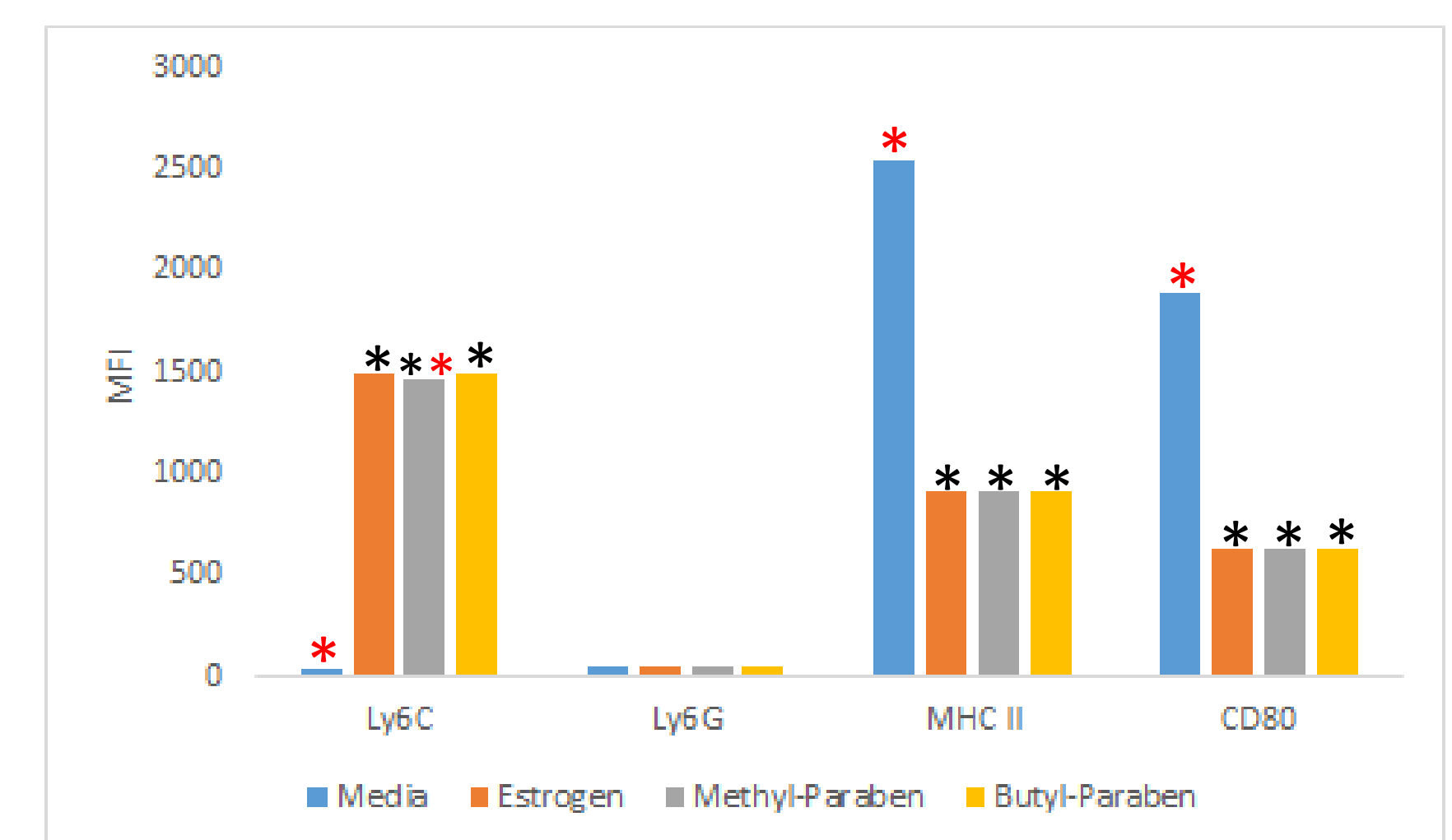


Figure 5. Cytokine Secretion. (A) IFN-gamma secretion was significantly different for Butyl-Parabens. (B) IL-4 secretion was significantly different between media and the various treatment groups. (C) IL-10 secretion was significantly different between the control and treatment variables. * = Significant at p=0.05 level in comparison to media * = Significant at p=0.05 level in comparison to estrogen

Conclusion

- There were no significant differences between the parabens and estrogen assays which indicate that they mimic oestrogenic activity
- Methyl and butyl-parabens both increased myeloid derived suppressor cell activity

Future Directions

- Is there a relationship between parabens in cosmetics/personal hygiene products and tumor growth?
- Does the amount of plastic in our daily lives, lead to tumor growth?
- Tumor growth/issues compared between farmers who work with pesticides and those who do not
- Do the pesticides used on the food we eat cause proliferation of tumor cells?

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