

# The effects of B-9 derivatives on Retinoid X receptors and Peroxisome Proliferator Activated Receptors



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## Introduction

- Vitamin B-9 plays an important role in red blood cell formation and healthy cell growth (1).
  - There are many different forms of B-9 such as folate (found in whole foods), L-Methylfolate (the active form of folate), folic acid (synthetic form of folate) and folinic acid (natural form of B-9).
  - Studies have shown that L-Methylfolate can increase DNA methylation in certain tumor promoting genes and decrease tumor progression (2).
- Interested in using the Yeast Two Hybrid (3) assay to test RXR and PPAR and see how well these receptors bind to the various B-9 derivatives.
  - RXR is a receptor that homodimerizes with itself or other receptors and plays an important role in cell growth, differentiation and development.
  - PPARs are another group of receptors that regulate energy production, lipid metabolism and inflammation.

## Methods

- Two-day assays were performed and calculated as per manufacturer's directions (Thermo Yeast Beta-galactosidase Assay).
- Trials performed included:
  - 3 200 mcg RXR trials & 3 200 mcg PPAR trials
  - 3 400 mcg RXR trials & 3 400 mcg PPAR trials
  - 3 800 mcg RXR trials & 5 800 mcg PPAR trials
  - 5 trials using broccoli using amounts from 200 mcg-1600 mcg
- The B-9 derivatives tested were liquid L-Methylfolate and a capsule L-Methylfolate to compare the two against each other, folate, folic acid, and folinic acid.
  - The liquid l-Methylfolate capsules and liquid solution were purchased from the brand Triquetra.
  - The folate, folic acid and folinic acid were purchased from Solgar, Nutricost and Kirkman, respectively.
- The recommended daily dose for folate is 400 mcg for men and women, 600 mcg for pregnant women and 500 mcg for lactating women (4).

## Acknowledgements

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## Measurement of RXR and PPAR Activity

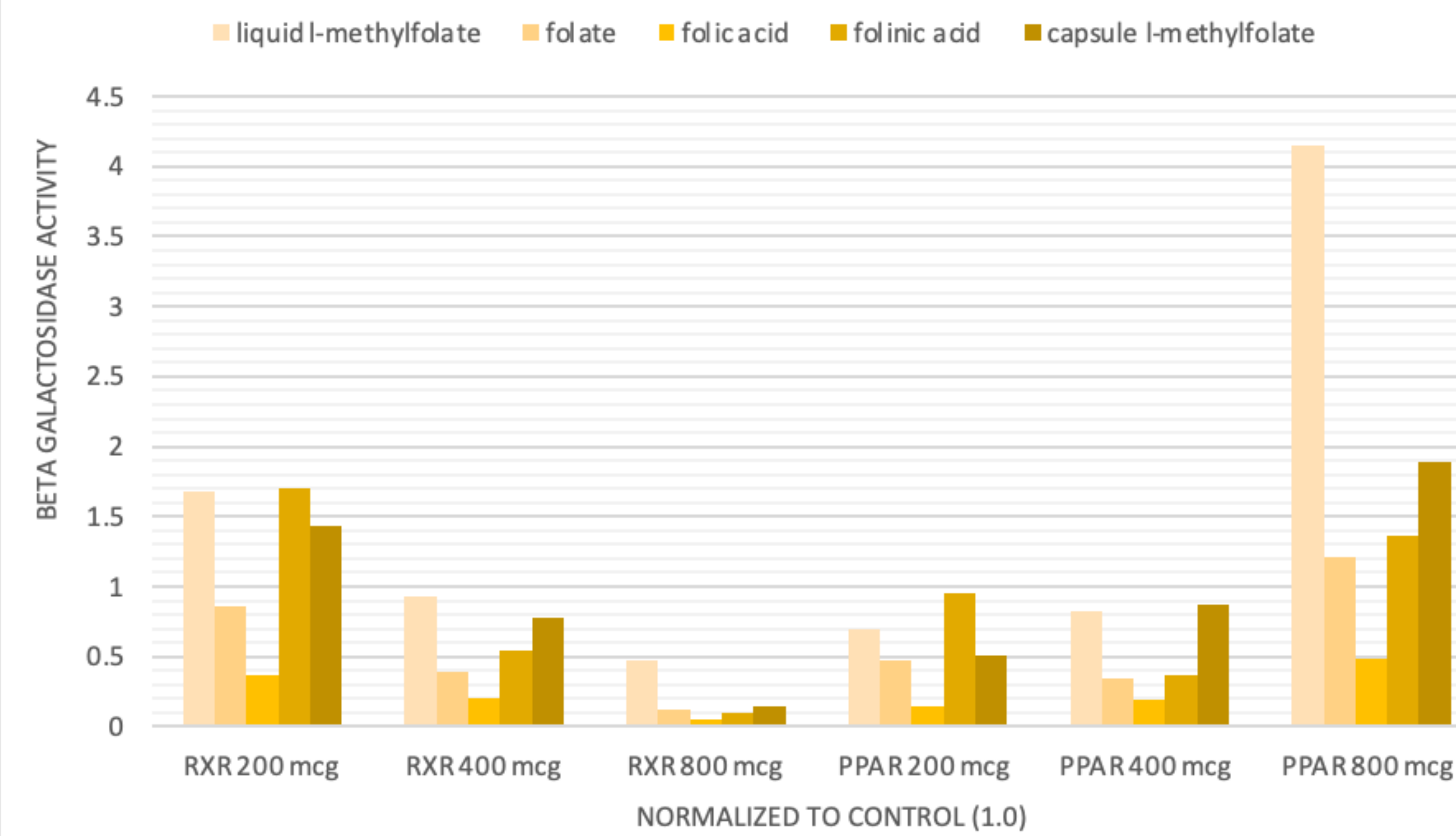


Fig. 1 Comparison of RXR and PPAR Beta-galactosidase activity for each supplement and dose combination.

## Measurement of Activity in Broccoli

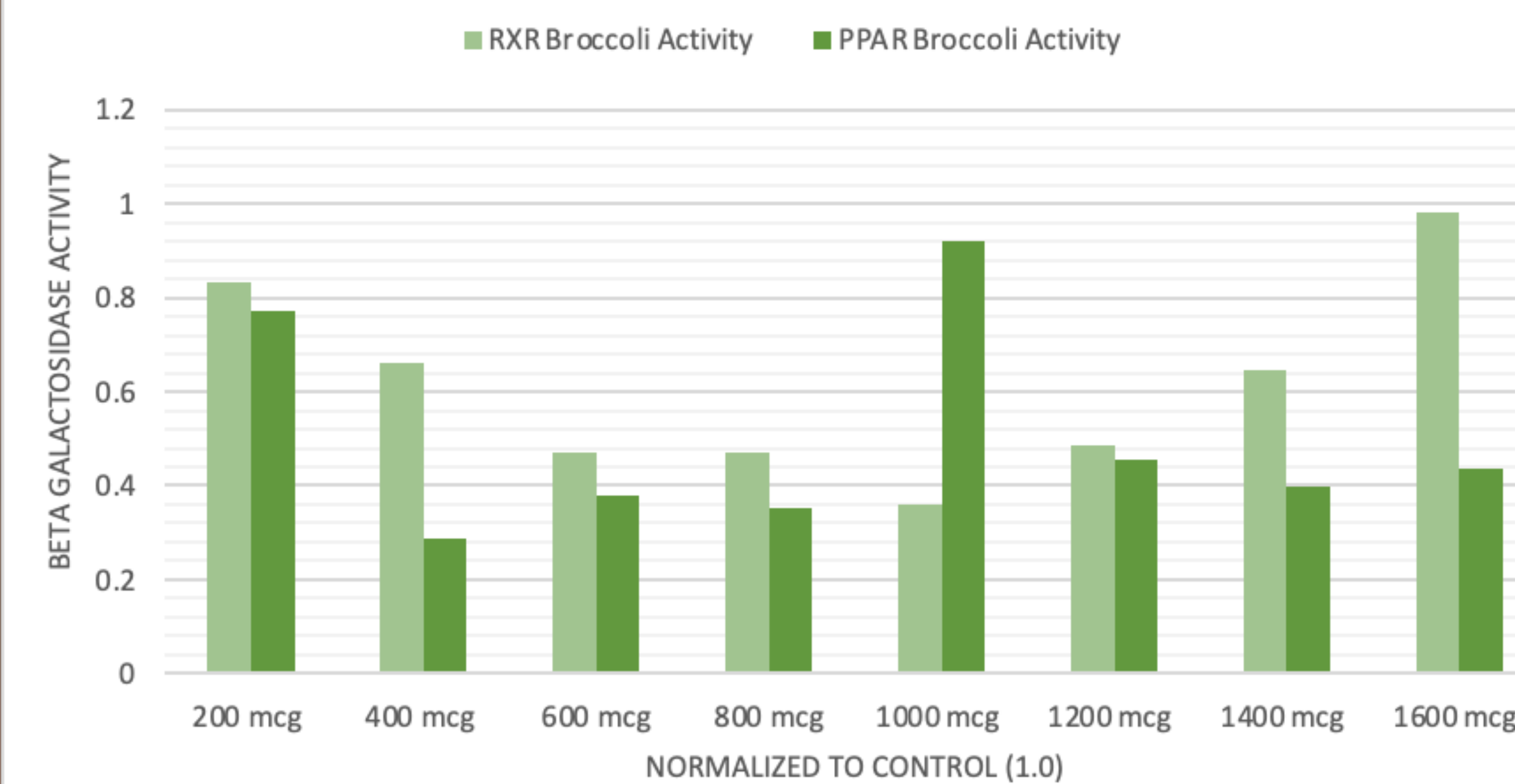


Fig. 2 Comparison of RXR and PPAR Beta-galactosidase activity for each quantity of broccoli.



Fig. 3 Supplements used in this research.

## Results

- Folic acid consistently showed the highest readings for the OD420 and OD600 for both RXR and PPAR.
  - T-tests results between normalized sample values for both RXR and PPAR at all doses and supplements were statistically significant for folic acid under all treatments.
- The liquid L-Methylfolate tested showed the lowest readings.
  - None of the doses or receptors with liquid L-Methylfolate had statistically significant t-test values.
- When comparing the capsule L-Methylfolate to the liquid L-Methylfolate, the capsule yielded more activity.
- The OD420 and OD600 readings increased as the concentration of broccoli increased.

## Discussion

- Folic acid can be used to promote the dimerization of PPAR and the supplement, but not between RXR and the supplement.
  - For three of the PPAR 800 mcg trials, all columns that included the derivative and working solution turned yellow which indicated binding between the supplement and the receptor.
    - The working solution used for OD600 analysis may have been contaminated during or after the trials using PPAR and 800 mcg supplement doses.
    - Along with the working solution, the glucose may have been contaminated during the trials.
    - The results from the OD600 may have been impacted by samples that were potentially contaminated.
  - None of the RXR trials turned yellow after incubation.
- Future work will involve more trials for each treatment with freshly cultured yeast.

## References

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