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The Effects of Roundup on *Tetrahymena thermophila* Growth and *DES7* Gene Expression

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Introduction

- The unicellular, eukaryotic ciliate *Tetrahymena thermophila* is a popular model organism in molecular biology.
- Cytochrome p450 is a protein family that is vital in synthesizing estrogen in humans.
- One study found that Roundup significantly decreased human embryological cell's abilities to produce NADPH--a protein from the Cytochrome P450 protein family.
- Roundup is a commonly used herbicide on major food crops in the United States.
- **Hypothesis:** If *Tetrahymena thermophila* are exposed to a biologically relevant dose of Roundup there will be a change in their growth rate and expression of Cytochrome p450.

Methods

- **Primer synthesis:** Primers for the *DES7* gene were designed using Oligoanalyzer software.
- **Culturing:** *T. thermophila* cultures were maintained in NEFF media throughout the experiment. For experimentation, the cultures were transferred into SPP media and the experimental culture's SPP media was supplemented with a 0.6% RoundUp solution.
- **RNA extraction:** RNA was extracted using Qiagen's RNeasy Mini Kit.
- **Reverse transcription:** cDNA was synthesized using RevertAid.
- **qPCR** was performed using PowerUp SYBR MasterMix. *BTU1* gene expression was used as positive control.
- **Cell Counts** were performed with hemocytometers.

Results

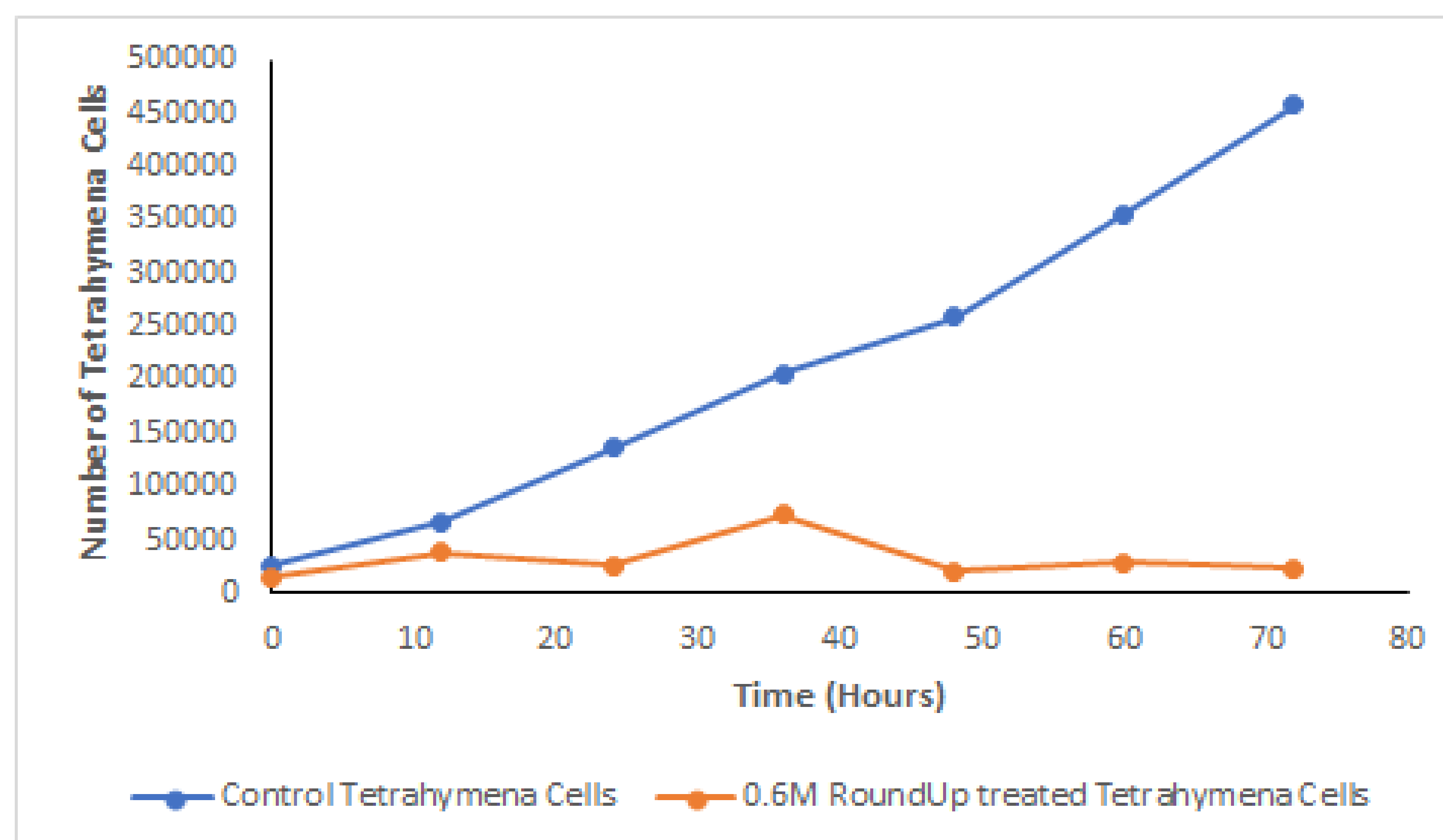


Figure 1: Growth curve for control and Roundup-exposed *T. thermophila*. P values: 12 hours = 0.018, 24 hours = 0.025, 36 hours = 0.095, 48 hours = 0.15, 60 hours = 0.089, 72 hours = 0.026.

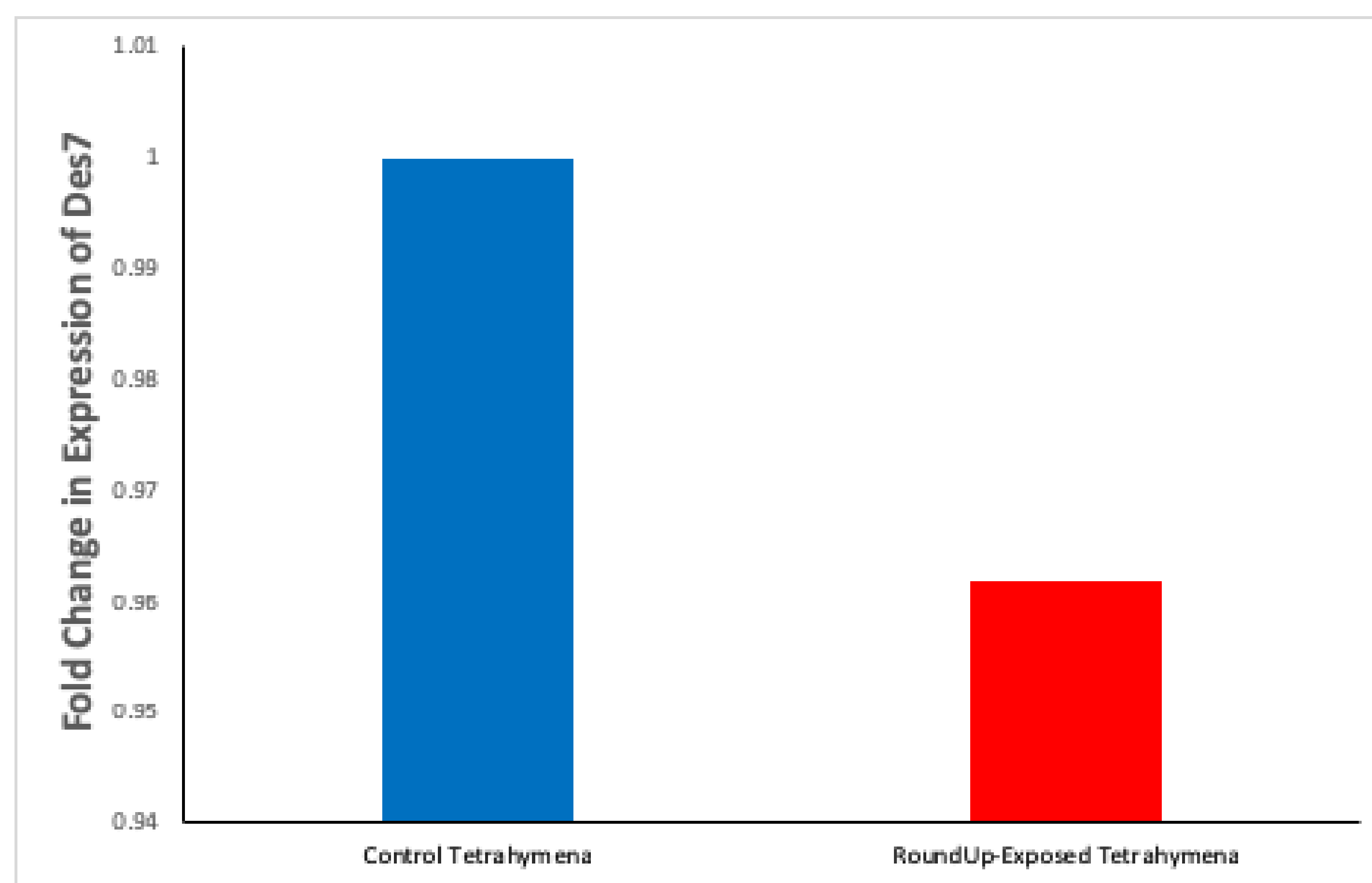


Figure 2: Fold change in expression of *DES7* from both control and Roundup-exposed *Tetrahymena*. ($p = 0.9384$ for control and experimental).

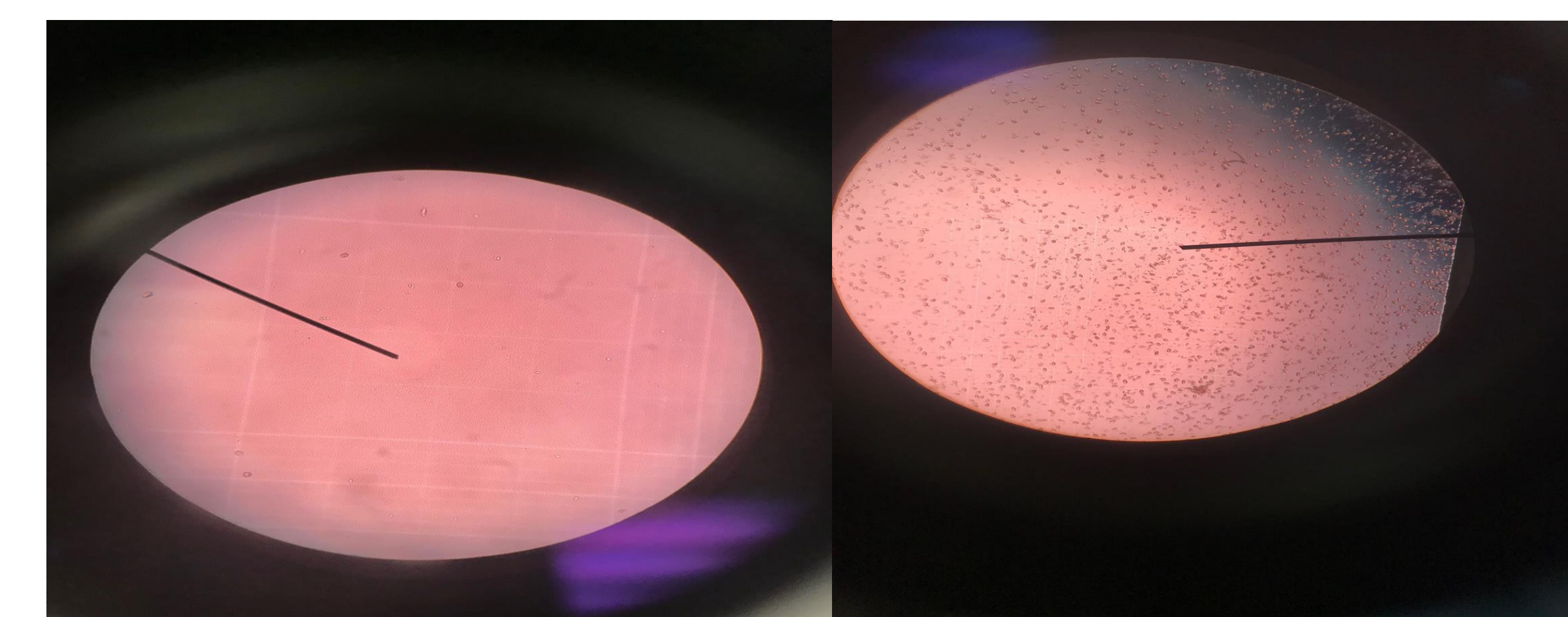


Figure 3: Pictures taken through microscope (X4 magnification) of both control and Roundup-treated *Tetrahymena*.

Conclusion

- There was a slight decrease in the expression of *DES7* (Figure 2), but it was not statistically significant ($p=0.94$).
- Roundup exposure decreased cell growth in Roundup-exposed cultures as seen in Figure 1.
- Overall, growth curve assays showed a significant difference in cell growth of Roundup-exposed *T. thermomophila*.
- The results disagreed with our hypothesis on gene expression, but agreed with our hypothesis for cell growth.

References

- Richard S, Moslemi S, Sipahutar H, Benachour N, Seralini GE. doi:10.1289/ehp.7728.
- Tomas J. Poklepovich, Nicolás Urtasun, María V. Miranda, Alejandro D. Nusblat, Clara B. Nudel <https://doi.org/10.1016/j.steroids.2015.02.001>.

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