



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

<b>Name(s)</b>  <b>Elizabeth Zhang</b>	<b>Project Number</b>  <b>S1526</b>
<b>Project Title</b>  <b>The Effect of Metal Ions on Lactobacillus acidophilus Growth and Beta-galactosidase Activity</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives</b> This project aims to assess Lactobacillus acidophilus growth and beta-galactosidase activity in response to the following divalent metal ions: magnesium, manganese, and iron.</p> <p><b>Methods</b> To test bacteria growth, reactivated L. acidophilus (Carolina Biological) was inoculated into 4 groups of culture medium, with 3 groups containing additional Mg, Mn, and Fe ions, respectively. After incubation, the relative growth intensities were obtained through spectrophotometric measurements of turbidity at 610 nm. To test beta-gal activity, bacterial cell pellet samples were treated with an O-Nitrophenyl-beta-galactopyranoside assay (Hardy Diagnostics). Spectrophotometric analysis at 440 nm measured the development of yellow color, which represented relative beta-gal activity.</p> <p><b>Results</b> The positive control, Mg, Mn, and Fe growth samples (N=9) displayed bacteria growth intensities of 0.194, 1.335, 0.182, and 0.268, respectively. The positive control, Mg, Mn, and Fe samples (N=5, 4, 5, and 5, respectively) had beta-gal activities of 0.280, 0.593, 0.205, and 0.305, respectively. The addition of Mg exhibited statistically significant increases of 598% and 112% in bacteria growth and beta-gal activity, respectively, in comparison with the control group. The effects of the Fe and Mn samples on bacteria and beta-gal activity were statistically insignificant.</p> <p><b>Conclusions</b> L. acidophilus is a strain of gram-positive bacteria used commonly in commercial probiotics; this bacterium is often ingested for lactose fermentation, which is facilitated by the enzyme beta-gal. Mg appeared to significantly promote bacteria growth and enzyme activity, which are quantifiable indicators of metabolic activity. The data suggests that, of the three ions, the adjunct consumption of Mg with L. acidophilus probiotics may significantly improve conferred benefits.</p>	
<b>Summary Statement</b>  This project suggests that magnesium ions lead to the most significant increase in Lactobacillus acidophilus growth and beta-galactosidase activity.	
<b>Help Received</b>  I designed and completed the experiment by myself. I received guidance from my school's science research advisor, Ms. Melissa Klose, through our designated research program.	