



**CALIFORNIA STATE SCIENCE FAIR  
2016 PROJECT SUMMARY**

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<b>Project Title</b> <p align="center"><b>The Discovery and Test of a New Biologically Produced Acne Cream: Lacnend</b></p>	
<p align="center"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective of this project is to ferment lactic acid, purify it, and create an effective acne cream.</p> <p><b>Methods/Materials</b> The first study was to ferment the lactic acid using <i>L. rhamnosus</i> bacteria over the course of 7-10 days in MRS Broth. Then, the second study, was to purify the lactate using a liquid-liquid extraction with butanol as the single solvent. After purifying, the lactic acid was mixed with coconut oil to produce a 10% cream. This cream was tested on Tryptic Soy Broth agar plates with lawns of <i>E. coli</i>.</p> <p><b>Results</b> The fermentation results showed a moderate fluctuation in the amount of lactic acid produced. The yield of lactic acid from glucose for each culture, respectively, was 71.78%, 69.78%, 65.08%, 67.34%, 64.11%, 75.76%, 77.18%. This fluctuation was not significant according to the Kolmogorov-Smirnov test (<math>p &gt; 0.05</math>). The three purifications# overall yields were respectively: 81.5%, 61.8%, 47.6%. The results for testing the cream underwent a statistical analysis. There were 30 Lacnend, 48 control and 18 coconut samples. Bacterial growth was coded as -1 (no growth) to 1 (growth). Therefore, scores closer to 1 show that there is stronger growth. A one-way ANOVA (levels: control, coconut, Lacnend) indicated that the growth in Lacnend condition (mean= -0.4) was significantly lower than the growth in coconut (mean= 0.67) and control (mean= 1) conditions <math>F(2, 75) = 48.61, p = 0.00</math>. The Lacnend condition was different than the other two conditions (<math>p = 0.00</math>), but the control and coconut conditions did not differ significantly (<math>p &gt; 0.1</math>).</p> <p><b>Conclusions/Discussion</b> The results showed that the cream worked in inhibiting the growth of <i>E. coli</i>. Lacnend provides hydration to the skin because of the lactic acid and the coconut oil, and it has antimicrobial properties from the lactic acid. It is important to note that this cream is the first acne cream to have an ingredient which is biologically produced through bacteria. Also, it is the first acne cream to utilize only lactic acid and coconut oil in a cream which is effective against bacteria causing acne.</p>	
<b>Summary Statement</b> <p>The biological production of lactic acid through fermentation, purification, and creation of a cream using coconut oil proved to make an effective acne cream that is the first of its time.</p>	
<b>Help Received</b> <p>My teacher Ms. Bechtel, my advisor Semsi Ensari, Genentech, &amp; SMCHS</p>	