



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Swethasai Palakur	Project Number 36880
Project Title Were Micelles or Vesicles the First Protobionts? Measuring DNA Phase Extraction into Lipids	
Objectives/Goals The objective of the study is to investigate a specific stage in the process of abiogenesis. In the packaging stage, where DNA and other genetic material need to be packaged into some sort of compartment to form the basic prokaryotic cell, they need to be packaged into protobionts. Micelles and vesicles are two different forms of protobionts. Micelles are more lipid-based, being hydrophobic while vesicles are more complex and have an inner water based core. Therefore, a way to test this study is to prove whether or not DNA is soluble and is compatible with lipids (a micelle environment) or water (a vesicle environment). Abstract Methods/Materials I used falcon test tubes to set up a phase extraction between the lipids and DNA. I also used both saturated and unsaturated oil to perform the phase extraction. I increased ratios of oil to DNA with every phase extraction, simulating ratios of lipid to genetic material that may exist in prehistoric oceans. I extracted DNA from strawberries using a household method to provide DNA that was necessary for my experiment. By layering the DNA and oil on top of one another, shaking and centrifuging them both, I can allow the DNA to be accepted into the lipid layer or not. I tested samples for DNA extracted into the lipid layer using a spectrophotometer. Results The DNA did not seem compatible and comfortable around the lipids, for the DNA did not extract into the oil layer in a significant amount. Many of the results showed that more DNA was measured than the positive control. Therefore, most of the results had to be determined as 0 for it was impossible that DNA was to be found in the oil layer. A large portion of the DNA remained in the water layer during the phase extraction, signifying that DNA is more comfortable in water based areas. Conclusions/Discussion Results indicated that DNA was less likely to be extracted into the lipid layer due to the incompatibility of DNA with lipids. It was concluded that micelles are less likely to form in comparison with vesicles. DNA is known to be hydrophilic, and may not be comfortable in hydrophobic environment. Based on this study, micelles are less likely to package genetic material due to its hydrophobic environment. Therefore, it is concluded that vesicles were likely to arise as the first protobionts, and therefore were the first compartments to package genetic material. DNA could easily package into a vesicle-based structure.	
Summary Statement Through DNA and lipid phase extractions, it was shown that vesicles packaged DNA and were the first protobionts, leading to the basic prokaryotic cell, for, DNA did not extract in significant amount into lipids.	
Help Received Mr. Tom Caldwell, Pre-Doctoral Student, Chessler Lab, UC Irvine Health-School of Medicine assisted me by supplying the needs for equipment. Mr. Caldwell clarified any questions related to the research. He assisted with centrifuging the samples and measured the DNA with a spectrophotometer.	