



**CALIFORNIA STATE SCIENCE FAIR  
2009 PROJECT SUMMARY**

<b>Name(s)</b> <b>Rima R. Deshpande</b>	<b>Project Number</b> <b>J0408</b>
<b>Project Title</b> <b>Got Milk? How Do Fat Content, Exposure to Air, and Movement Affect the Shelf Life of Milk?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> After returning from a 10 day vacation, I realized that milk from only one of the two containers with the same expiry date had gone bad. One container was opened for use many times, the other only once. This posed two questions, (1) does milk go bad faster when exposed to air and movement?, and (2) do different types of milk respond differently to storage and handling? My goal was to find out how air exposure, movement, and fat content affect the shelf life of milk. I hypothesized that milk that is exposed often to air and movement, and has the highest fat content will go bad the fastest.</p> <p><b>Methods/Materials</b> I tested the effects of these variables on fat free, low fat, whole, and soy milk for changes in pH and optical density (OD), indicative of bacterial growth and milk break-down. I took 2 containers of each type of milk with the same expiry date, kept one stationery and used the other daily for 10 days. I measured the pH and OD of milk from the daily-use-container every day, and that from the stationery container on day 10. I compared the pH and OD of milk from the exposed and moved containers to that from unexposed and stationary ones on day 10.</p> <p><b>Results</b> I found that milk of any type exposed to air and frequent movement showed greater decrease in pH and increase in OD. Also, when used daily, the fat free milk showed the largest and most rapid pH decrease by day 10. Soy milk (second highest fat content) showed the smallest and most gradual pH decrease. Similarly, milk types with low fat content showed larger increases in OD while those with high fat content showed smaller increased in OD by day 10.</p> <p><b>Conclusions/Discussion</b> The results showed that as hypothesized, greater air exposure and more frequent movement of milk do correlate with pH decrease and OD increase, suggestive of bacterial growth leading to milk-spoiling. However, contrary to my hypothesis, milk with the lowest fat content went bad the fastest, as measured by pH reduction and OD increase. Interestingly, plant-derived soy milk showed the least and slowest pH decrease and OD increase, when compared with animal-derived milk types. Better understanding of these factors affecting the shelf life of milk may allow consumers to improve the storage and handling conditions to maximize the usable life of drinking milk.</p>	
<b>Summary Statement</b> This project is a study of how air exposure, movement, and fat content affect the shelf life of drinking milk; future optimization of these factors may allow us to maximize the usable life of drinking milk.	
<b>Help Received</b> Parents provided guidance; Amgen provided laboratory supplies and equipment.	