



**CALIFORNIA STATE SCIENCE FAIR  
2015 PROJECT SUMMARY**

<b>Name(s)</b> <b>Mihoko Kubo</b>	<b>Project Number</b> <b>S0610</b>
<b>Project Title</b> <b>Detection and Comparison of Heavy Metals in Dog Foods Using Flame Atomic Absorption Spectroscopy</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective of this research was to detect and quantify three heavy metals (cadmium, lead, and chromium) in dry dog foods in order to investigate if a heavy metal was present in the foods. Dogs are important members in many families across the U.S., and their health is significantly linked to their food consumption. Because pet illnesses are often assumed to be caused by food intake, it is possible that chemicals exposed from pet food manufacturers are mixed into the products. The goal in this research is to accurately measure the amount of heavy metals in different brands of dog food through the flame atomic absorption spectroscopy.</p> <p><b>Methods/Materials</b> Sixteen different samples from various brands of dry dog food were obtained. Approximately 0.5 g samples of dog food were placed in a 100 mL Teflon reactor, followed by 5 mL of ultra-pure nitric acid and 2 mL of 30% hydrogen peroxide. Three replicates of each dog food were prepared simultaneously. Using a Mars6 microwave sample preparation, the samples were heated up to 180° for 10 minutes. The solutions were diluted to 50 mL. A Shimadzu AA-7000A atomic absorption spectrometer equipped with a 10 cm air-acetylene flame head was used for flame atomic absorption spectroscopic measurements. A small amount of each standard or sample was transferred to a 5 mL auto-sampler vial and placed in the auto-sampler rack. Determinations were performed in triplicate on each sample.</p> <p><b>Results</b> Neither cadmium nor lead were detected in any of the sixteen samples tested. The flame atomic absorption spectrometer detected traces of chromium in the range of 5.0 ~ 21.5 µg/g in each of the dog food samples.</p> <p><b>Conclusions/Discussion</b> Three of the samples tested exceeded the FDA approved maximum tolerable limit of 10.0 µg/g (ppm), and three other samples were close to this 10.0 µg/g chromium concentration limit. Although there were no specific patterns regarding the concentration of chromium to the price of the sample, there was a small correlation as the cheapest sample contained the most chromium amount. Exceeding the maximum tolerable limit of chromium in foods can affect the kidneys in most canines.</p>	
<b>Summary Statement</b> This research investigated the presence and amounts of heavy metals (cadmium, lead, and chromium) in several brands of dry dog foods using the flame atomic absorption spectroscopy.	
<b>Help Received</b> Dr. David Green, professor of chemistry at Pepperdine University, provided a lab facility and supervised the use of the flame atomic absorption spectrometer and the microwave-assisted acid digestion system.	