CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
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Project Number
J2131

Project Title
Are the Dosing Devices for Pediatric Over-the-Counter Liquid Medicines Accurate?

Abstract

Objectives/Goals
My objective was to test the accuracy of dosing devices for pediatric OTC liquid medicines. I hypothesized (1) that the mean error rates for devices included with the medicines would be negatively correlated with their degree of compliance with 2009 FDA guidelines and (2) that the mean error rates for each medicine, across all tested devices, would be positively correlated with relative viscosity.

Methods/Materials
For 11 pediatric OTC liquid medicines, I gave each medication's included dosing device a score of 0-5 for compliance with 2009 FDA guidelines and measured the relative viscosity of each medication. I tested included devices and alternate dosing devices for accuracy over 5 different sample dosages, using a graduated cylinder. I calculated the error of each device for each medicine. To determine correlations, I plotted the mean errors against (1) the FDA compliance score and (2) the relative viscosity.

Results
Mean errors for the 11 included dosing devices ranged from 0% to 15%. The mean error for all included dosing devices was 12%, the same as the oral syringe. Among alternative dosing devices, the flatware spoon had a 27% mean error, but dropper, medicine spoon, and measuring spoons all scored better, with only an 8% mean error for each. Mean errors for individual dosing devices were negatively correlated with FDA compliance scores and mean errors for each medicine, across all dosing devices, were positively correlated with relative viscosity.

Conclusions/Discussion
Most parents' substitute for the included dosing device is a flatware teaspoon, according to Madlon-Kay and Mosch (2000). In my observations, this was the least accurate choice, with an error more than double that of included dosing devices, on average. However, included dosing devices were less accurate than several alternative dosing devices, including kitchen measuring spoons, and all of the included devices I tested met 3 or fewer of the 5 FDA guidelines. Since the CDC reported in 2010 that 70,000 ER visits (1/3 of all ER visits for children under 12) were a result of overdoses of OTC medicine, parents should reach for a kitchen measuring spoon or pick up a medicine spoon or dropper at the pharmacy, rather than using the dosing cup included in most OTC medicines.

Summary Statement
My project tests the accuracy of dosing devices for pediatric OTC liquid medicines and correlates errors with lack of FDA compliance and higher viscosity.

Help Received
Mother bought supplies and helped edit and type report; brothers washed equipment between tests.