



Detecting Heavy Metals in Nutritional Supplements

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Introduction

- Nutritional supplements are increasingly being used by athletes, military personnel, and in healthcare.
- The Food and Drug Administration (FDA) does not require third party testing to ensure quality and safety.¹
- Three nutritional supplements were analyzed and compared to the FDA regulations for bottled water to determine the effectiveness of current regulations for these supplements.
- If heavy metal concentrations found are above accepted levels for bottled water,² then the testing practices of the companies may be inadequate.



Figure 1: Nutritional Supplements used

Methods

- Three 200 µL aliquots of each supplement and three digestion blanks were digested and analyzed.
- The digestion samples were then diluted by a factor of 1:250, and standards were prepared for analysis.
- The samples, standards, and blanks were analyzed through ICP-MS.
- ANOVA tests were conducted for variability between supplements and between supplements and the FDA regulations for bottled water.²

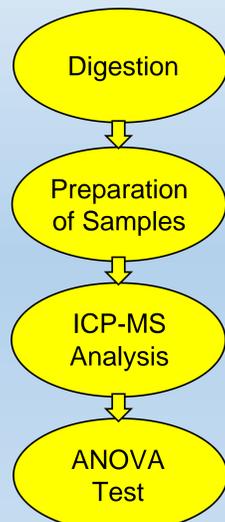


Figure 2: Agilent 7800 ICP-MS and SPS4 autosampler

Results

- Unjury was significantly lower in lead ($p=0.0400$) than Ensure and Boost. Boost was significantly higher in cadmium ($p=0.0028$) than Unjury and Boost.
- Unjury was significantly lower than the FDA regulation for lead ($p=0.0258$).
- Boost was significantly higher than FDA regulation for cadmium ($p=0.0009$). Ensure and Unjury were significantly lower than the FDA limit.
- All the Nutritional Supplements were significantly lower than the FDA regulation for mercury ($p=0.0002$).
- Variability in Arsenic detection makes determining the difference between Boost, Ensure, and the FDA limit unreliable. Unjury was significantly below the FDA limit.

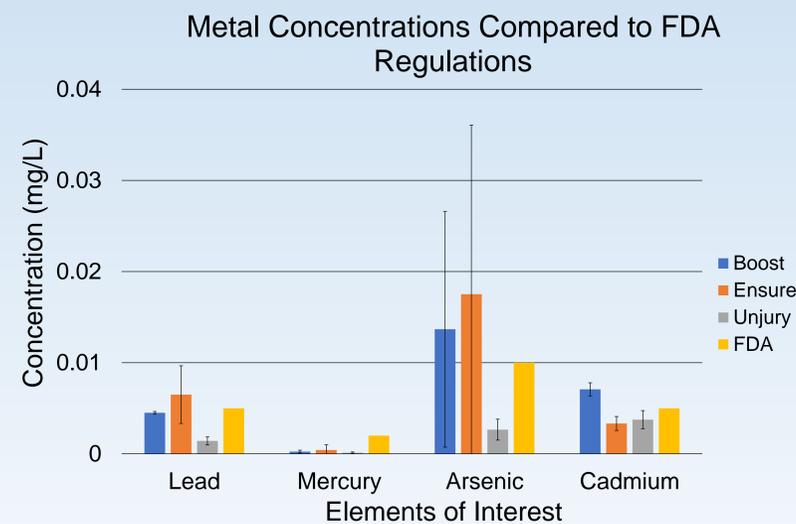


Figure 3: Average concentrations of elements of interest in Nutritional Supplements Compared to the FDA standard for Bottled Water

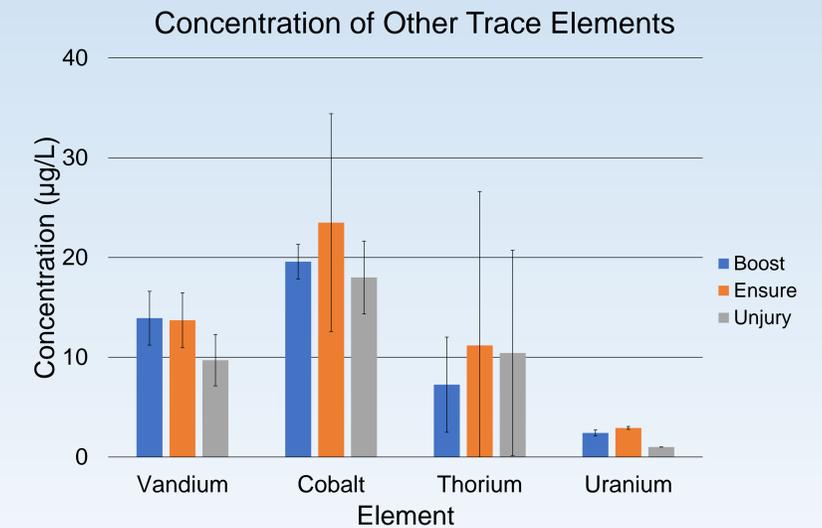


Figure 4: Average Concentrations of Other Elements detected

Discussion

- Variability between samples indicates the supplements were possibly not homogenate.
- Unjury seems the best choice for consumers and patients.
- Ensure seems to have the highest levels of heavy metals, however there is also large variability.
- Ensure was over the FDA regulation for both lead and arsenic.
- Boost was over FDA regulations for arsenic and cadmium.
- Comparison to FDA regulation of bottled water is not ideal
- 5.5 bottles would need to be ingested a day to reach the suggested limit of lead.
- 10 bottles a day would reach the suggested limit of cadmium and arsenic.
- Only one or two are generally consumed in a day.

Conclusion

- Some heavy metal contamination is present in the supplements.
- The results possibly support the hypothesis that testing, and quality assurance by these companies is potentially inadequate due to some of the average concentrations of these metals being above guidelines for bottled water.
- Results support the need for further investigation possibly with a wider range of samples and increased repetitions of the ICP-MS analysis.

Acknowledgement

Thank you to Dr. Wight, Dr. Caudill, and Dr. Nguyen

References

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