

A Microbiological Survey of Protein Shaker Bottles Cleaning Practices.

James Blaxland¹, Simon Dawson¹, Ellen W. Evans² and Elizabeth C. Redmond*²

¹Cardiff School of Sport and Health Sciences, Cardiff Metropolitan University, Cardiff, United Kingdom.

²ZERO2FIVE Food Industry Centre, Cardiff Metropolitan University, Cardiff, United Kingdom.

*Corresponding author: eredmond@cardiffmet.ac.uk

Introduction

Food safety is essential for athletes as they are reported to be susceptible to infection after acute exercise¹. Foodborne infections can cause athletes to lose a few days' training, or can have a significant effect on performance in competitions.

Use of protein shakes, requiring the reconstitution of protein powder in a specifically designed 'shaker bottle, has increased in recent years². Recent research regarding the use of protein powder supplements has established that a third of reconstituted protein shake drinks are stored at ambient temperature and the majority of among gym-users fail to frequently and adequately clean their reusable drink containers, reporting to "rinse with cold water"³. Due to inadequate cleaning, reusable bottles used for protein drinks can become reservoirs for bacterial contamination. Microorganisms present could form biofilms allowing for the transfer of foodborne pathogens or resistant genes. Although the risks associated with inadequate cleaning and unsafe storage of reconstituted powdered infant formula has been investigated⁴, there is a lack of data detailing the microbial contamination of reusable drink containers used for reconstituted protein powder and the associated food safety risks for athletes.

Aim

The aim of this study was to determine microbiological contamination of shaker bottles and self-reported cleaning practices.

Methods

Recreational athlete intercept survey (n=18)

- A short, paper based survey (including 12 questions) was distributed to recreational gym users using shaker bottles when leaving a gym.
- Questions included self-reported preparation, storage, cleaning and replacement of reusable sports drink containers.
- The survey was either self-completed by participants or conducted with the assistance of a researcher whilst reusable sports drink bottles were sampled.

Microbiological analysis of in-use shaker bottles (n=30)

- Used, reusable sports bottles were sampled as part of this study.
- Bottles belonging to gym users leaving a gym, carrying a shaker bottle, were rinsed using 15ml Buffered Peptone Water using a standard method.
- The post-rinse solution was transported to the laboratory used to calculate the total colony forming units present.
- The total number of microorganisms was determined on nutrient agar using the Miles and Misra enumeration method.
- Presence/absence testing occurred to identify pathogens of interest such as *Staphylococcus aureus* and *Enterobacteriaceae* as indicators of hygiene.

This research has received ethical approval from the Cardiff Metropolitan University Healthcare and Food Ethics Panel (Reference STA-1122)

Results and Discussion

Recreational athlete intercept survey (n=18)

- The reported usage of shaker bottles ranged <1 month to >36 months.
- Reported replacement varied from "every few months" to "two to four years," this was normally as a result of damage or loss.
- All participants reported that shaker bottles were cleaned before use; however, details regarding the adequacy of cleaning practices were lacking.
- The majority of participants reported protein powder was reconstituted after training and drank immediately; however, 28% reported advanced preparation (<12 hours).

Microbiological analysis of in-use shaker bottles (n=30)

- Microbiological analysis determined **94% of bottles were contaminated with microbiological colonies** (average 5.0×10^7 recovered CFU/mL) (see Figure 1).
- *Enterobacteriaceae* were not isolated in any shaker bottles.
- **Methicillin-resistant *Staphylococcus aureus* was detected** in a 'clean, in-use' shaker bottle that had reportedly been "left in a car for a couple of days."

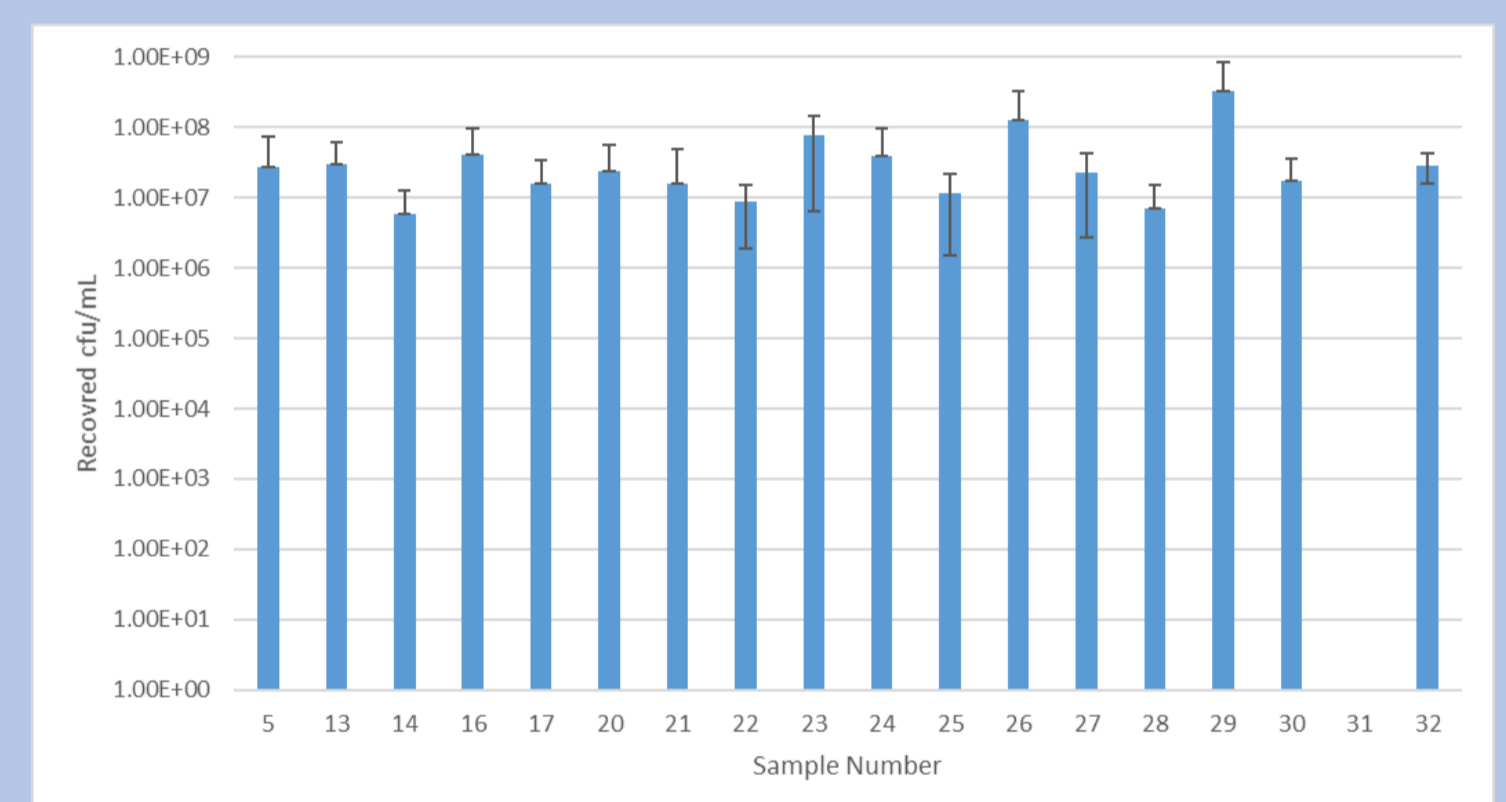


Figure 1. Sports bottles recovered total viable counts (results shown are represent three separate repeats, error bars represent standard error).

Significance

- Self-reported practices may indicate inadequate cleaning, preparation and storage of protein drink shaker bottles, which may have contributed to high level of microbiological contamination.
- Observed behavioral data regarding the cleaning of shaker bottles is required to complement findings from this study; there is a need to explore perceived risks associated with shaker bottles use among professional / recreational athletes.

References

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Cardiff
Metropolitan
University

Prifysgol
Metropolitan
Caerdydd

Food Industry Centre
Cardiff Metropolitan University

ZERO2FIVE
Canolfan Diwydiant Bwyd
Prifysgol Metropolitan Caerdydd

Food & Drink Research Unit
Uned Ymchwil Bwyd a Diod



@Lfoodsafety
@Research_Ellen
@ZERO2FIVE_