A MICROBIOLOGICAL STUDY OF DIETARY SUPPLEMENTS AVAILABLE IN SAUDI ARABIAN MARKETS

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Abstract: *The objective of this study was to study the microbiological properties and quality of dietary supplements available in the local markets of Saudi Arabia. Total bacterial count, coliform, Escherichia coli, Salmonella, and Staphylococcus aureus were included in this analysis. Out of a total of 80 tested supplements, microbial contamination was present in only nine products. Microbial levels ranged from 1.69–8.43 Log CFU/mL. The higher levels of total count (8.43 Log CFU/mL) and S. aureus (8.39 Log CFU/mL) were found in glutamine supplements. Amino acids, dynamisan, glucosamine sulfate, glucosaiene, creatine monohydrate, whey protein, and folate acid also showed bacterial contamination. Thus, our findings suggested that improvements are needed in these supplements.*

Introduction

According to the United States' Dietary Supplement Health and Education Act (DSHEA) of 1994, dietary supplements are defined as any "product" (other than tobacco) intended to supplement a diet and which contain one or more dietary ingredients (DSHEA, 1994). Examples of dietary ingredients include vitamins, minerals, herbs or other botanicals, amino acids, concentrates, metabolites, constituents, extracts, or a combination of these ingredients. Supplements can be classified according to their function (muscle building, immune boosting, fuel providing), form (pills, powders, foods or drinks), availability (over-the counter, mail order, Internet, multi-level mar-

keting), and scientific merits of claims (well-supported, unsupported, undecided) (Burke et al., 2006). Dietary supplements are therefore products that are taken orally that contain one or more ingredients intended to supplement one's diet, and are not considered as food.

Recently, there has been an increasing awareness of the importance of supplement safety as consumers are becoming more aware of the importance of dietary supplements as part of a balanced diet to ensure good health (Brink et al., 2005). There is a large variety of supplement types and brands available. At the same time, there has been an increasing concern about the quality of dietary supplements as these products have been found to contain varying amounts of active ingredients in addition to contaminants and adulterants (Angell and Kassirer, 1998; Borins, 1998). Thus, the objective of this study was to determine the microbiological quality of dietary supplements sold in Saudi Arabian markets.

Materials and Methods

Microbiological quality test

From each commercial sample, three capsules or tablets were placed in 10 mL sterilized BHI broth and mixed thoroughly. Samples were then incubated at 37°C for 24 h to allow for microbial cell recovery if present. One milliliter from each sample was then withdrawn and diluted with 0.1% peptone water. The appropriate dilutions were plated onto duplicate non- selective and selective agar medium. To obtain the total bacterial count, samples were plated on Brain-heart infusion agar (BHI). To test for coliform and *E. coli*, samples were plated on Violet red glucose bile Agar (VRBGA) and MacConky agar, respectively. Similarly, samples were plated on Xylose lysine deoxycholate (XLD) agar for *Salmonella,* and Baird-Parker agar base (BPAB) for *Staphylococcus aureus* count (Aljaloud et al., 2009).

Results and Discussion

In our study, nine products out of eighty dietary supplement samples tested showed the presence of coliform, *E. coli*, *Salmonella* and *Staphylococcus aureus*. The microbiological quality of dietary supplements available in the markets in Saudi Arabia was investigated. Eighty different dietary supplements were collected from the city of Riyadh (sample list not reported) and tested for total bacterial count, total coliforms, *Staphylococcus aureus, Salmonella,* and *Escherichia coli.* Figure 1 shows that the population of bacteria ranged from 1.69 – 8.43 Log CFU/mL. The total bacterial count was 8.43 log and *S. aureus* count was 8.39 log in supplement glutamine L. Similarly, other samples including amino acids, dynamisan, glucosamine sulfate, glucosaiene, creatine monohydrate, whey protein, and

folate acid also showed the presence of bacterial contamination. There was a low total count population of 1.73 log and *S. aureus* of 1.69 log in supplement pharmaton respectively. A study conducted by Okunlola et al. (2007) reported the microbial quality of medical products from Nigeria and found that over 47% of products were contaminated with *E. coli*, 33% with *Salmonella*, and 71.4% with *S. aureus*. The presence of *Salmonella* and *E. coli* in herbal powder and tablets has been reported earlier (Ravindran and Duraisankar, 2012). Hamilton-Miller et al. (1999, 2002) reported that out of 30 probiotic suppelments tested, 18 contained species other than those indicated on the label, indicating poor standard of supplements and inaccurate marketing claims. Authors have also reported the presence of potentially pathogenic species such as *E. faecium*. These studies indicate that supplements are not always safe and there is a need to improve the quality of dietary supplements sold to consumers.

Conclusion

From this study we can conclude that there are some contaminants in supplements sold in Saudi Arabian markets. The presence of *E. coli, Salmonella,* and *S. aureus* could be potentially harmful for human health. As a result, such dietary supplements need to be formulated in clean, controlled laboratories by trained quality assurance personnel.

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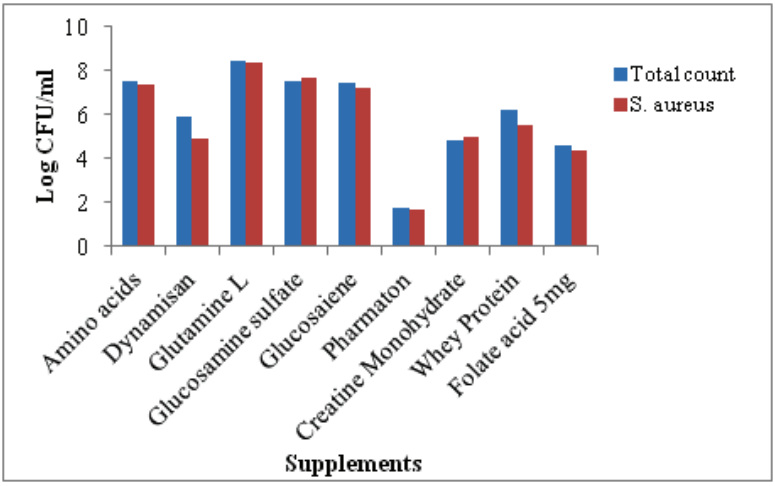

Figure 1. Bacterial population (Log CFU/mL) present in different supplements.