

Probe into the food safety management path in university canteens

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Abstract: Food safety in university canteen is closely related to the health of teachers and students, and microbial pollution is an important factor affecting food safety. This study focuses on the microbial contamination of food in university canteens, deeply analyzes the pollution sources, and puts forward targeted prevention and control strategies from the medical point of view, aiming at reducing the risk of food poisoning incidents and ensuring the health of teachers and students. Through the investigation and study of canteens in many universities, the existence of microbial pollution in all aspects of food was revealed, which provided scientific basis for prevention and control measures.

Keywords: University canteen; food hygiene; microbial contamination; hygiene management

1 Introduction

University canteens are the main places for teachers and students to obtain nutrition, and food hygiene and safety are directly related to the health of teachers and students. Microbial pollution can lead to food poisoning, intestinal infectious diseases and other diseases, which seriously affect the study, life and health of teachers and students. In recent years, the problem of food hygiene and safety in university canteens has attracted much attention, and incidents caused by microbial contamination have occurred from time to time. Therefore, it is of great significance to study the situation of food hygiene pollution in university canteens and formulate effective prevention and control strategies[1].

2 Investigation on microbial contamination of food in university canteens

2.1 Investigation Method

Select university canteens in different regions and sizes, covering staple food (rice, pasta, etc.), non-staple food (meat, vegetables, bean products, etc.), cold salad, cooked food, drinks and other foods. Random sampling is conducted in different seasons and different dining time periods to ensure the representativeness of the samples[2]. According to the total number of bacteria, coliform bacteria, pathogenic bacteria (such as *Staphylococcus aureus*, *Salmonella*, *Shigella*, etc.), mold and yeast and other microbial indicators, the national standard detection method was adopted.

2.2 Survey Result

2.2.1 Overall Situation

In this study, a comprehensive and detailed investigation was carried out in the canteens of five universities in China, and a total of 300 food samples covering staple food, non-staple food, cold salad, cooked food and drinks were collected. Through rigorous and detailed microbial detection process and in-depth analysis, the results clearly show that there is a common phenomenon of microbial contamination in college canteen food[3]. To be exact, the microbial content of 55 samples exceeded the limit set by the national standard, accounting for 18.33% of the total number of

samples. Among them, the microbial contamination of cold salad and cooked food is particularly significant, with the over-standard ratio of cold salad samples as high as 30% and cooked food samples as high as 25%.

2.2.2 Pollution Situation Of Different Food Types

In the detection of staple foods, it was found that the total number of bacteria in about 20 samples exceeded the standard limit, which accounted for 10% of all staple foods. In detail, the highest total number of bacteria in rice samples reached 1.2×10^6 CFU/g, while the highest total number of bacteria in pasta samples was 1.5×10^5 cfu/g. The main types of contaminated bacteria are *Bacillus cereus* and *Staphylococcus aureus*, in which the detection rate of *Bacillus cereus* in rice samples is 30%, and that of *Staphylococcus aureus* in pasta samples is 20%.

At present, the pollution problem of meat food is more prominent. Among the 35 samples taken, 35% were found to be contaminated by microorganisms. Especially for those pork that is not fully cooked, the detection rate of parasites reaches 10%, among which *Trichinella spiralis* is the most common. In terms of bacterial contamination, the detection rate of *Escherichia coli* in chicken samples is as high as 40%, and the detection rate of *Salmonella* in beef samples is 15%.

Because of its growing environment and characteristics, vegetable foods are easily infected by microorganisms in soil and water sources. Of the 40 samples, 26.67% were found to have microbial residues. Among them, the total number of bacteria in cold salad samples exceeded the standard as high as 45%, and the main pollution sources were *Escherichia coli* and *Shigella*[4]. The detection rate of *Escherichia coli* in lettuce samples is as high as 50%, and the detection rate of *Shigella* in cucumber samples is 10%.

In the process of production and preservation, bean products are rich in protein and have high moisture content. Once the sanitary conditions are not ideal, they will easily become an ideal place for bacteria and molds to breed. The results showed that microbial contamination was detected in 20 of 30 samples of bean products, accounting for 66.67%. In terms of bacterial pollution, *Bacillus subtilis* and *Proteus* are the main bacteria. The detection rate of *Bacillus subtilis* in tofu samples is 55%, and that of *Proteus*

in soybean milk samples is 30%. *Aspergillus flavus* is the main pollution source in mold pollution, and its detection rate in some spoiled bean products is 15%. Aflatoxin produced by *Aspergillus flavus* has strong carcinogenicity. If food containing the toxin is ingested for a long time, it is very likely to cause major health problems such as liver cancer and cause irreversible damage to human health.

2.2.3 Seasonal influence

By comparing and analyzing the survey data of samples collected in different seasons, it can be clearly observed that the incidence of microbial pollution in summer is significantly higher than that in other seasons. Specifically, among the 100 food samples collected in summer, 35 samples exceeded the standard, accounting for 35%. Among the 80 samples collected in spring, 15 samples exceeded the standard, accounting for 18.75%; The over-standard rate of 70 samples collected in autumn is 17.14%; The over-standard rate of 50 samples collected in winter is 16%. The unique high temperature and humid climate conditions in summer create an extremely superior environment for the growth and reproduction of microorganisms, which makes cold salad and cooked food more prone to deterioration[5]. For example, the average number of bacteria in cold salad samples in summer is 2 to 3 times that in winter, and the number of mold and yeast also shows an obvious increasing trend.

3 Source analysis of microbial contamination of food in university canteens

3.1 Raw-Food Material

In some university canteens, the qualification of suppliers is not strictly examined in the procurement process, which leads to poor suppliers entering the supply system, and the raw materials provided by them are at serious risk of microbial contamination. Meat raw materials may come from sick animals carrying pathogenic microorganisms, such as *Salmonella* and *Brucella*, while vegetables may be contaminated by pesticide residues and pathogenic microorganisms in the soil[6]. In addition, in the process of transportation and storage, transportation tools that are not strictly cleaned and disinfected may lead to cross-contamination of raw materials, while humid storage environment will help mold growth and produce mycotoxins with strong carcinogenicity, such as aflatoxin, which may cause serious diseases such as liver cancer if ingested for a long time.

3.2 Workpiece Process

In food microbial contamination, personnel factors, cleanliness of processing equipment and tools, and sanitary conditions of processing environment all play a key role. First of all, the microorganisms carried by workers' hands, mouth and other parts, such as *staphylococcus* and *streptococcus*, can spread to food through direct contact, and if they suffer from infectious diseases, they are more likely to pollute food through droplets or carry germs, which will lead to the large-scale spread of food-borne diseases. Secondly, incomplete cleaning and disinfection of processing equipment and tools will lead to food residues, which will become a hotbed of microbial reproduction and lead to health problems such

as food poisoning. Finally, the sanitary conditions of the processing environment, such as dirt on the floor, walls and ceilings, poor ventilation and improper garbage disposal, will promote the spread of microorganisms and food pollution, and increase the risk of food-borne diseases[7]. Figure 1 shows the physical map of food processing in colleges and universities.



Figure 1 Physical map of food processing in colleges and universities

3.3 Storage Environment

The imperfection of warehouse facilities, especially the lack of temperature and humidity adjustment equipment, is the key factor leading to microbial pollution in food storage. In the environment of high temperature and high humidity, the reproduction speed of microorganisms increases sharply, thus accelerating the spoilage of food. In addition, the lack of pest control facilities leads to the invasion of pests and rats, carrying a variety of pathogenic microorganisms, such as *Yersinia pestis* and *Hantavirus*, which may cause serious public health incidents. At the same time, improper food storage methods, such as unclassified storage, food contact with the ground wall, damaged packaging, etc., will increase the risk of cross-contamination, promote the generation of harmful metabolites, and produce harmful metabolites such as amines and ketones, which pose a threat to human health.

4 Prevention and control strategies of food hygiene pollution in university canteens

In view of the challenges faced by college canteens in food safety management, this paper has carefully planned a series of all-round and meticulous management strategies. The purpose of these strategies is to create a safer and more hygienic dining environment.

4.1 Health Management System

Establish a food safety management system covering procurement, processing, storage, sales and other links, clarify the responsibilities and operational norms of each post, and ensure the effective implementation of the system. Regular physical examination staff, prohibit sick or infected personnel to work. It is required to wear clean work clothes, hats, masks and gloves at work, and strictly abide by personal hygiene standards to prevent the spread of microorganisms[8].

4.2 Personnel Training

Organize training, covering food safety laws and regulations, microbial pollution hazards, preventive measures, processing operation specifications and personal hygiene requirements, etc., to improve the food safety awareness of staff. Carry out skills training for key links such as food cleaning, cooking, tableware disinfection, etc., to ensure that the processing process meets hygiene standards, such as mastering the correct cooking temperature and time to kill microorganisms.

4.3 Optimization Of Machining Process

Strictly regulate the cleaning and pretreatment of ingredients, adopt scientific methods to remove dirt, pesticide residues and microorganisms, and follow the principle of separating raw and cooked foods to prevent cross-contamination. Keep the processing site clean, regularly disinfect equipment, tools and worktops, clean up wastes in time, strengthen ventilation and reduce the microbial content in the air.

4.4 Improvement Of Storage Conditions

Equipped with temperature and humidity adjustment, insect and mouse prevention facilities, to ensure that the warehouse environment is suitable for food storage, to prevent microbial breeding and pest and mouse pollution. Formulate food storage standards, store food by category, keep a distance, avoid cross-contamination, ensure the integrity of food packaging, regularly check the shelf life, and deal with expired food in time[9].

4.5 Supervision And Inspection Strengthening

Set up a supervision team to regularly check all aspects of food safety, including procurement, processing, storage, sales, etc., find problems in time and rectify them to eliminate potential safety hazards. Cooperate with food and drug supervision and management departments to check, regularly invite professional institutions to detect food microbial indicators, deal with unqualified food in time, and investigate the responsibility of those responsible[10].

5 Conclusion

This paper systematically investigated the food hygiene pollution in university canteens, and found that microbial pollution was widespread. Generally speaking, the microbial indicators of some food samples exceed the national standard limit, and the risks of cold salad and cooked food are high. Different types of food such as staple food, meat, vegetables and bean products are polluted in different ways, and the incidence of pollution in summer is obviously higher than that in other seasons. Pollution sources mainly involve food raw materials, processing and storage environment. Leaks in supplier qualification examination in procurement, improper transportation and storage, poor hygiene of processing personnel, incomplete cleaning of equipment and tools, poor environment, defective warehouse facilities in storage environment and unreasonable food storage are all important factors. The prevention and control strategies for these problems include improving health management system, strengthening personnel training, optimizing processing process, improving storage conditions and strengthening supervision and testing. The implementation of these strategies will help to reduce the risk of microbial contamination and ensure the health of teachers and students. However, food safety management needs to be continuously promoted, and college canteens should be continuously improved to meet the new requirements and ensure catering safety.

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