



Monitoring of food handlers and their influence on the preparation of ready-to-eat foods

Seguimiento a manipuladores de alimentos y su influencia en la preparación de alimentos listos para el consumo

Acompanhamento de manipuladores de alimentos e sua influência no preparo de alimentos prontos para consumo

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Abstract

Introduction: Transmission of foodborne pathogens is related to inadequate sanitary conditions, which are derived from either the food preparation process or the person who prepares it. Food handlers are essential to preserve food innocuousness and protect consumer's health. **Objective:** To evaluate demographic characteristics, hygiene practices, knowledge, work conditions and the presence of pathogenic microorganisms in food handlers at public school restaurants in Antioquia, Colombia. **Materials and methods:** The study evaluated 104 food handlers in a municipality in Antioquia. Demographic data and stool samples were collected to identify intestinal parasites, *Salmonella* spp., and *Staphylococcus aureus*. **Results:** The presence of intestinal parasites (e.g. *Entamoeba Complex* and *Trichuris trichiura*) was identified in 61% of female participants. *Staphylococcus aureus* was isolated from 49% of food handlers. **Conclusion:** Infection of food handler was confirmed, making them potential sources of food contamination. They are committed to their work and have the knowledge to preserve basic hygiene conditions. It is highlighted their importance and influence in adequate hygienic practices to minimize the risks of transmission, as well as the need for medical treatment and regular checkups of food handlers to counteract the risk to consumers.

Keywords: Food supply; *Salmonella*; *Staphylococcus aureus*; parasites; foodborne diseases. (Source: DeCS, Bireme).

Resumen

Introducción: La transmisión de patógenos a través de alimentos está relacionada con condiciones sanitarias inadecuadas, las cuales se derivan del proceso de elaboración de los alimentos o de quien los procesa. Los manipuladores de alimentos son esenciales para preservar la inocuidad de los alimentos y proteger la salud del consumidor. **Objetivo:** Evaluar las características demográficas, prácticas de higiene, conocimiento, condiciones laborales y la presencia de microorganismos patógenos en manipuladores de alimentos en restaurantes de escuelas públicas de Antioquia, Colombia. **Materiales y métodos:** El estudio evaluó 104 manipuladores de alimentos de un municipio de Antioquia. Se recolectaron datos demográficos y muestras fecales para identificar parásitos intestinales, *Salmonella* spp. y *Staphylococcus aureus*. **Resultados:** Se identificó la presencia de parásitos intestinales (*Entamoeba Complex* y *Trichuris trichiura*) en 61% de mujeres. *Staphylococcus aureus* fue aislada del 49% de participantes. **Conclusión:** Se confirmó la infección de los manipuladores, lo que los convierte en fuentes potenciales de contaminación. Ellos están comprometidos con su labor y tienen el conocimiento para preservar condiciones higiénicas básicas. Se resalta su importancia e influencia en prácticas higiénicas adecuadas para minimizar riesgos de contaminación y la necesidad de tratamiento médico y chequeos periódicos para contrarrestar riesgos para el consumidor.

Palabras clave: Abastecimiento de alimentos; *Salmonella*; *Staphylococcus aureus*; parásitos; enfermedades transmitidas por los alimentos. (Fuente: DeCS, Bireme).

Resumo

Introdução: A transmissão de patógenos através dos alimentos está relacionada às condições sanitárias inadequadas, que decorrem do processo de preparo dos mesmos ou de quem os processa. Os manipuladores de alimentos são essenciais para preservar a segurança alimentar e proteger a saúde do consumidor. **Objetivo:** Avaliar as características demográficas, as práticas de higiene, o conhecimento, as condições de trabalho e a presença de microrganismos patogênicos em manipuladores de alimentos de restaurantes de escolas públicas de Antioquia, Colômbia. **Materiais e métodos:** O estudo avaliou 104 manipuladores de alimentos de um município de Antioquia. Dados demográficos e amostras fecais foram coletados para identificação de parasitas intestinais, *Salmonella* spp. e *Staphylococcus aureus*. **Resultados:** A presença de parasitas intestinais (*Entamoeba Complex* e *Trichuris trichiura*) foi identificada em 61% das mulheres, *Staphylococcus aureus* foi isolado de 49% dos participantes. **Conclusão:** Foi confirmada a infecção dos manipuladores, o que os torna potenciais fontes de contaminação. Eles estão comprometidos com seu trabalho e possuem conhecimento para preservar as condições básicas de higiene. Destaca-se que é importante incentivar a práticas higiênicas adequadas para minimizar os riscos de contaminação para o consumidor, a necessidade de tratamento médico e custo de revisões periódicas.

Palavras chave: Abastecimento de alimentos; *salmonella*; *staphylococcus aureus*; parasitos; doenças transmitidas por alimentos. (Fonte: DeCS, Bireme).

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Additionally, in this study, the manipulators' knowledge about the implementation of a system of Hazard Analysis Critical Control Points (HACCP) was evaluated, and if they were capable of identifying the most critical control points within the process, as a crucial point to develop a safe environment for food preparation. Dzwolak⁽³⁵⁾ has explored the importance of implementing this type of preventive systems in small establishments like restaurants, and he concludes how relevant this program is in the improvement of food handler and hygienic surface as possible vehicles of pathogenic microorganisms that could reach the food. As such, manipulators have the ability to identify the main dangers in two processes: protein and salad preparation, in the menu. For meats, the critical control point is associated with the control of the cooking temperature that guarantees the elimination of pathogenic microorganisms that could be there. Contrastingly, for the salad process and depending on the type of process it has undergone, fresh or cooked. In the case of fresh salad, its critical control point is the concentration of disinfectant and the time of contact needed for its sanitization. In the other hand, cooked salad, it is a similar process for meat, the critical control point is associated with the cooking temperature that guarantees the elimination of pathogenic microorganisms⁽³²⁾.

Our study reported findings for parasites in stool, such as *B. hominis*, *Entamoeba Complex* and *Trichuris trichiura*, it is contrasted with those by Barros *et al.*⁽³⁹⁾ and Bastidas *et al.*⁽⁴⁰⁾. *B. hominis* is considered to be an opportunistic and emerging parasite with a high prevalence in developing countries⁽³³⁾, and its infection has been associated with low nutritional status in school-age children, and that affectation is synergistic when associated with *E. nana*, *I. bustchlii*, and *E. coli*⁽³⁸⁾. These species have been reported in other studies performed in manipulators in food services^(33,42,43), reflecting that parasite species found in our study frequently affect the population of food manipulators and their control is a worldwide concern. Yimam *et al.*⁽⁴⁷⁾, reported in their systematic research, the presence of parasites in foodhandlers from Ethiopia restaurants, they explain that healthy and hygienic conditions play an important role in their control, and establish what the colonization of foodhandlers, with parasites, represent a risk for the contamination of beverages and prepared foods. The presence of commensal parasites are reported, including opportunistic parasites such as *B. hominis* and *Entamoeba complex*, a fact that suggests greater attention to colonized food handlers. *Trichuris trichiura* is a geohelminth, and requires part of its life cycle being developed in soil to be an infectious agent. However, for all cases in which the presence of at least one parasite was identified, a deworming activity was suggested in food handlers.

On the other hand, the absence of *Salmonella* sp. in manipulators coincides with other studies⁽³⁰⁾, and it can be inferred that it could indicate efficient control by regulating entities, and that is it thanks to the implementation of the systems of good manufacturing practices within school restaurants. Nevertheless, even though in this study manipulators are not the direct source of this pathogen, other studies keep reporting its prevalence in food,

especially ready-to-consume products^(29,44). Additionally, Smith *et al.*⁽⁴⁶⁾, in their study were reported an analysis of whole genome sequence of *Salmonella enteritidis*, sample that came from a patient, and they suggested the possibility of a common contaminated food source, which could be contaminated with eggs strongly implicated, this type of finding allows us to infer that food continues to be the greatest source of contamination for this type of pathogen.

Regarding the presence of coagulase positive *S. aureus* reported in this study, similar data was found in studies by Dorotiková *et al.*⁽⁷⁾, who showed 27% of *S. aureus* in food handlers. These data highlight the importance of searching asymptomatic carriers of *S. aureus* in food services, as evidenced in this study since there was no correlation with the respiratory symptoms, nor with the personal who consulted the doctor in the last six months, since they are a direct source of food contamination, and could even generate outbreaks of food poisoning in the population they serve^(9,10,34,44). However, the correlation analysis showed that good and adequate hygiene practices directly impact this parameter, and as such, they should be emphasized in terms of cross contamination control through manipulators. For all cases in which the coagulase positive *S. aureus* was reported, an antibiotic treatment was suggested in food handlers, and an increase in hand washing.

Conclusions

The results of this study reveal risk factors related to the presence of microorganisms linked to foodborne diseases in manipulators. This study found intestinal parasites and the presence of coagulase positive *S. aureus* in healthy population. The presence of these microorganisms indicates the need for permanent clinical control and surveillance, along with training programs focused on the perception of the risk, which could lead to a positive impact on preventive practices. In addition, it is clear that hygiene practices are care and control activities in which each food handler has to be aware of performing them adequately to minimize the risk of transmission any pathogen. For future studies, sensitive and specific analysis techniques could be proposed to compare the negative results, for example, as it was for *Salmonella* spp. In the case of *S. aureus* healthy carriers, it is relevant to confirm positive results through molecular techniques, if these isolates belong to strain that produce important exotoxins, that can contribute to increase risk factors of transmission foodborne illness.

Conflicts of interest: The authors declare no conflicts of interest.

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