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Short communication

Assessment of the personal hygiene and the bacteriological quality of butchers' hands in some abattoirs in Alexandria, Egypt

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ABSTRACT

Poor personal hygiene of food handlers has been associated with food borne-disease outbreaks. Unsatisfactory personal hygiene may cross-contaminate foodstuffs with pathogenic organisms contributing to the spread of disease. We aimed to evaluate the butchers regarding their bacterial hand contamination and hygienic practices from some abattoirs in Alexandria. A cross-sectional study was conducted on 50 butchers randomly selected from the abattoirs of 10 districts in Alexandria, Egypt, to assess their hygienic practices using a predesigned questionnaire sheet. Bacterial contamination of butchers' hands was evaluated by direct finger-print and modified glove juice methods. Out of 50 butchers, 23 (46%) had health certificates, 9 (39.13%) of which were valid. Protective clothes were used by 15 (30%) butchers and daily hand wash at the beginning of the day was performed by 40 (80%). Paper towels were used by 16 (40.0%) butchers for hand drying. The butchers' hands showed colony count ranged between $\geq 10^7$(12.0%) and $\geq 10^{12}$(12.0%) CFU/hand. *Escherichia coli, Staphylococcus aureus* and non typhoidal Salmonella were isolated from 15.32%, 14.52% and 1.61% of butchers' hands, respectively. In conclusion, there is an immediate need for health education of butchers about the proper hygienic practices they should follow.

1. Introduction

The abattoir is a labor-intensive working environment, the knowledge and level of training of the meat handlers regarding personal and general hygiene is of particular importance to ensure the health and safety of the consumer. Meat handlers play a major role in ensuring food safety throughout the chain of production, processing, storage and preparation. Mishandling and disregard for hygiene measures by handlers frequently contributes to outbreaks of foodborne illnesses caused by *Staphylococcus aureus* (*S. aureus*) and Gram negative bacilli such as *Escherichia coli (E. coli)* and Salmonella spp. The importance of hand hygiene in the control of foodborne infections cannot be under-emphasized (Fawzi, Gomaa, & Bakr, 2009).

Although hand-washing may seem trivial to the food staff, failing to do it can have tragic consequences. It is generally acknowledged that one important vehicle for cross-contamination of food is attributed to food handlers' hands. Accordingly, improved personal hygiene and meticulous hand washing would lead to the basic control of faeces-to-hand to-mouth spread of potentially pathogenic transient microorganisms (Jumaa, 2005; Soriano, Prieto, Moltó, & Mañes, 2005).

To prevent the spread of infection, people in the food production and food service industries should be well trained and motivated to follow good personal hygiene practices, to use correct hand washing procedures and to follow these procedures while working (Soriano et al., 2005). The aim of the current study was to evaluate the butchers from some abattoirs in Alexandria regarding their bacterial hand contamination and hygienic practices.

2. Material and methods

A cross-sectional study was conducted in Alexandria, Egypt. It involved 50 butchers randomly selected from the abattoirs of 10 different districts in the study area. A questionnaire sheet was filled for every butcher included all relevant information about, health certificate (presence and validity), protective clothing (gloves, gumboots, and aprons), frequency of aprons cleaning, hand washing frequency, and means of hand cleaning and drying. Moreover, determination of the bacteriological profile of butchers'

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hands was evaluated by two methods; direct finger-print samples and modified glove juice methods

2.1. Direct finger-print samples

The fingers of the working hand of butchers were printed onto the surfaces of 5% sheep blood agar and MacConkey's agar plates by gentle pressure for 5 s. Plates were aerobically incubated at 37 °C for 18–24 h for evidence of microbial growth. (Karabay et al., 2005)

2.2. Modified glove juice method

Butchers were asked to thoroughly wash their working hand in a sterile plastic bag containing 100-ml sterile peptone saline (0.1%). Each sample was labeled and transferred to the laboratory within 1–2 h in an ice-box. Ten folds serial dilutions from each peptone sample were made by serial transfers of 1 ml of the glove juice into 9 ml of sterile peptone saline. Then 100 μl from each dilution using an automatic pipette were streaked onto the surfaces of 5% blood agar and MacConkey's agar plates. Plates were aerobically incubated at 37 °C for 18–24 h for evidence of microbial growth. Total number of colony forming units (CFU) was determined from countable plates which were defined as plates having from 30 to 300 CFU. The total number of colonies/hand was counted using the formula number of colonies from each blood plate × the reciprocal of the dilution factor (Baldini, Gutman, & Keefe, 2001; Fawzi et al., 2009; Larson et al., 2001).

Isolates were identified to species level by Gram stain and conventional biochemical tests according to methods described by (Forbes, Sahm, & Weissfeld, 2007).

3. Results

Evaluation of the hygienic practices of the 50 butchers (Table 1) revealed that daily hand wash was performed by 40 (80%) butchers at the beginning of the day, where 15 (37.5%) out of those used soap and water, 16 (40%) used tap water only, while 9 (22%) used unclean basin water. Paper towels were used by 16 (40%) butchers for hand drying, while 11(27.5%) butchers dried their hands by their clothes and 13 (32.5%) butchers let their hands wet. Regarding protective clothes, 15 butchers (30%) put aprons while 8 butchers (16%) used gloves and gumboots, respectively. It was found that none of butchers cleaned aprons daily, while 12 (24%) butchers cleaned it once/week and 3 (6%) butchers cleaned it twice/week. By inspection of health certificates, out of 50 butchers, 23 (46%) had health certificates of which 9 (39.13%) were valid.

Evaluation of butchers' hand bacterial contamination showed that 124 different bacterial isolates were cultured from butchers' hands. Gram-negative bacilli represented 57 (45.97%) of isolates, Gram-positive cocci represented 53 (42.74%) of isolates while Gram-positive bacilli represented 14 (11.29%) of isolates. The most common isolate was *E. coli* 19 (15.32%) followed by *S. aureus* 18 (14.52%) then coagulase negative staphylococci (CNS) 16 (12.90%), *while* the least isolated pathogen was non typhoidal Salmonella (1.61%) of isolates (Table 2).

The bacterial count of butchers' hands ranged between $\geq 10^7$ CFU/hand and $\geq 10^{12}$ CFU/hand, and 48% of samples showed $\geq 10^{10}$ CFU/hand.

Table 1
Frequency of some hygienic practices and presence of health certificates of 50 butchers, Alexandria, Egypt.

Practices	No.	%
Hand-washing	40	80.0
Wearing protective clothes:	15	30.0
• Aprons	15	30.0
• Gloves	8	16.0
• Gumboots	8	16.0
Health certificate presence	23	46.0

Table 2
Bacterial profile of the butchers' hands, Alexandria, Egypt.

Type of organism	No. of isolates	%
G +ve cocci	(53)	(42.74)
Staphylococcus aureus	18	14.52
Coagulase negative staphylococci	16	12.90
Micrococcus	6	4.84
Non-hemolytic streptococci	13	10.48
G +ve bacilli	(14)	(11.29)
Diphtheroids	8	6.45
Bacillus spp.	6	4.84
G −ve bacilli	(57)	(45.97)
Escherichia coli	19	15.32
Klebsiella pneumoniae	13	10.48
Citrobacter freundii	8	6.45
Citrobacter diversus	5	4.03
Pseudomonas aeruginosa	7	5.64
Non typhoidal *Salmonella*	2	1.61
Proteus mirabilis	3	2.42
Total	124	100

4. Discussion

Meat handlers are an important vehicle for microorganisms and improper handling practices may cause meat contamination and consequently foodborne diseases, which pose a potential risk to public health (Campos et al., 2009).

The word hygiene usually refers to cleanliness and especially to any practice which leads to the removal or reduction of harmful infectious agents. A study in the USA suggested that improper food handling practices in food serving establishments contributed to 97% of foodborne illnesses, thus employees should pay attention to their personal hygiene (Fawzi et al., 2009; Jumaa, 2005).

Harker (2001) emphasised that pre-employment health assessments for food handlers must be performed. Feglo, Ferimpong, and Essel-Ahun (2004), concluded that food handlers constitute a significant risk in the spread of enteric fever and therefore suggest the inclusion of salmonellae screening in the regular health profile examination that is required of food handlers and to monitor those found to be infected. In the present study, 54% of butchers did not have a health certificate and 60.87% of the found health certificates were not valid.

The purpose of wearing overalls protective clothing is to protect both the food product and the meat handler from cross contamination. It is important that all possible measures should be taken to reduce or eliminate such contamination (Muinde & Kuria, 2005). Nel, Lues, Buys, and Venter (2004) stated that bacteria attached to fiber cloths may multiply vigorously due to the presence of food residues, humidity and also because they frequently remain for long periods at room temperature inside domestic kitchens and food services. Bartz, Ritter, and Tondo (2010) found that contaminated cloths when rubbed onto surfaces, microorganisms are invariably transferred to the surfaces or hands of the food handlers in sufficient numbers to cause food-borne infection. Thus, protective clothes should not only be on protection but also on cleanliness. Clothes should be adequately cleaned and disinfected to eliminate microorganisms (Bartz et al., 2010; Cogan, Bloomfield, & Humphrey, 1999).

Haileselassie, Taddele, Adhana, and Kalayou (2013) showed that 14.6% of the abattoir workers randomly selected from Mekelle city