

## ASSESSMENT OF THE KNOWLEDGE, ATTITUDE AND PRACTICES AMONG THE WORKERS IN POULTRY MEAT PORTIONING OPERATIONS IN KHARTOUM STATE, SUDAN

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### ABSTRACT

This study in Khartoum State from February 2018 to August 2020. Twelve operations were selected out of a total of 33 (36.4%) operations. A number of 6 POs were chosen randomly from the traditional and 6 from modern systems to cover the three localities of Khartoum State. The study aimed to assess the knowledge, attitudes and practices (KAP) related to food safety among the workers in poultry portioning operations. The data was collected through structured questionnaire. The study found that vast majority (83.3%) of participants were trained to do their responsibilities, while only 16.7% were not trained. More than one third (35%) of the participants had high secondary school education, 28.3% had primary education, 20% had university education and 13.3% were illiterates, while only 3.3% had intermediate education. More than half of the participants (55%) had 1-5 years working period, 31.7% had less than 1 year, 8.3% have 6-10 years and 5% had more than 10 years working. Over three quarters (78.3%) of participants usually wear protective clothes, while only 21.7% were not wearing. The study revealed no significant differences between the two systems in terms of Knowledge of workers about meat safety was considered high (ranged from 95-100%). This study indicated that poultry POs in different processes in Khartoum State need to apply Hazard Analysis and Critical Control Point (HACCP) programs. The study concluded that the majority of workers were trained to do their job responsibilities and were able to conduct good hygiene measures while performing their job.

**KEYWORDS:** Poultry meat portioning operations; knowledge, attitudes and practices; HACCP.

### I. INTRODUCTION

Poultry slaughterhouses in Khartoum state were distributed in the three localities of the State designed to produce more than 31,400 bird/ hr. From these, 10 modern companies have additional halls for cutting chicken, tallying or classifying to wings, breast, drumstick, legs and fillet then packing and freezing. Compared to the traditional operations, the halls in these modern operations, so far, comply with the regulations in terms of cleanliness and hygiene.<sup>[1]</sup>

Meat is supposed as an important source of protein to people and is the most mortal of all important foods because of its rich nutrients that encourage microbial growth. Food borne infections and illnesses are a serious worldwide health problem associated with economic losses. Economic losses due to food borne diseases are also important worldwide problem. However, the consumption of poultry meat has increased worldwide within the last decades.<sup>[2]</sup>

Epidemiological reports suggested that poultry meat is still the primary cause of human food poisoning. Poultry

meat is more favorable in the consumer market due to easy digestibility and acceptance by the majority of people.<sup>[3]</sup>

Pathogenic bacteria such as Salmonella spp., *Staphylococcus aureus* (S.aureus), *Listeria monocytogens*, *Campylobacter* spp. and *Escherichia coli* (E. coli 0157:H7), have been involved in a number of food borne illnesses.<sup>[4]</sup> These bacteria arise from contamination in the slaughterhouse during processing of live poultry into meat. Veterinary inspection procedures cannot detect presence of bacteria on meat.<sup>[4]</sup> The main sources of contamination include the slaughtered poultry themselves, personnel and the slaughterhouses facilities.

It seems to be very difficult to implement an HACCP based system in traditional poultry meat portioning operations, when a high proportion of employees is not familiar with the science behind having an appropriate PRPs in place.<sup>[1]</sup> Mortimore and Smith<sup>[5]</sup> have shown that many trainers had been willing to provide HACCP training without considering the scope (what has to be taught and what need not) and the depth of coverage.

## II. MATERIAL AND METHODS

### • Study area and population

This study was conducted in both traditional and modern (companies) poultry POs in the three localities of Khartoum State (Khartoum, Omdurman and Bahri).

### • Study design

This cross-sectional research study was conducted using questionnaire.

### • Questionnaire

A face-to-face questionnaire was used to collect information about knowledge, attitudes and practices of workers regarding food safety. Levels of workers' knowledge about food safety selected according to the

five keys to safer food as mentioned by WHO.<sup>[6]</sup> Sixty questionnaires were used to collect information about knowledge, attitudes and practices of the target population regarding food safety. The questionnaire was designed to obtain information on food safety perceptions, personal information, and knowledge of workers about meat safety, awareness of food-borne illnesses, meat handling and hygienic safety practices. The target populations for filling the questionnaire were the workers of the poultry POs.

### Statistical Analysis

The collected data was analyzed using SPSS version 20.0. Descriptive statistics, frequency and mean were used.

## III. RESULTS

### • Personal information

Figure (1) indicated that almost three quarters of participants were males (73.3%) and 26.7% were females.

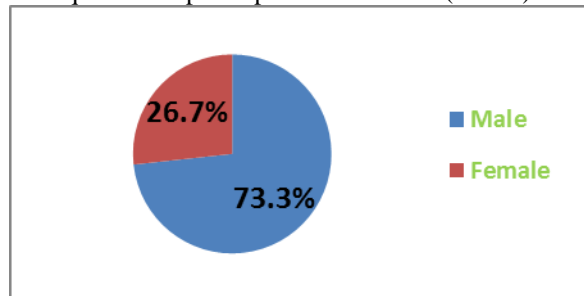


Fig. 1: Distribution of participants by gender (n=60)

Figure (2) displayed that (78.3%) of participants were aged between 15-30 years, 18.3% aged between 31-45 years and only 3.3% aged between 46-60 years.

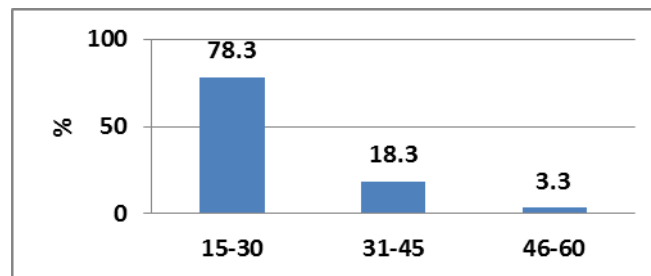


Fig. 2: Distribution of participants by age group (n=60)

Concerning education levels, more than one third (35%) of the participants had high secondary school education, 28.3% had primary education, 20% had university education and 13.3% were illiterates, while only 3.3% had intermediate education as shown in figure (3).

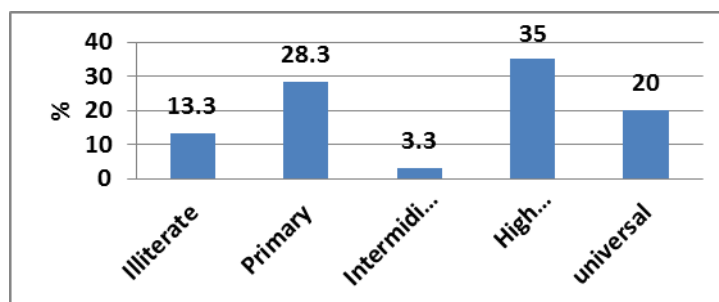


Fig. 3: Distribution of participants according to level of education (n=60)

More than half of the participants (55%) had 1-5 years working period, 31.7% had less than 1 year, 8.3% have 6-10 years and 5% had more than 10 years working, figure (4).

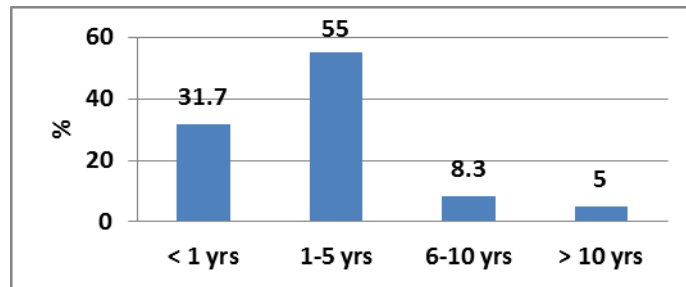


Fig. 4: Distribution of participants according to working period (n=60)

As shown in figure 4.5, the vast majority (83.3%) of participants were trained to do their responsibilities, while only 16.7% were not trained.

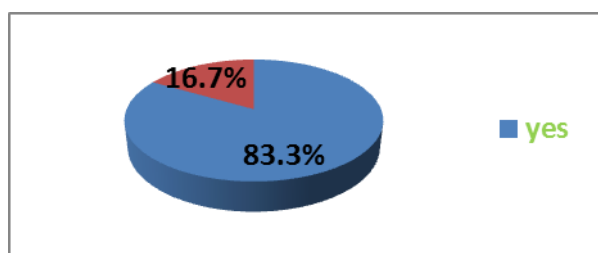


Fig. (5): Distribution of participants according to whether they were well trained and trained to do their responsibilities or not (n=60)

Figure (6) indicated that, over three quarters (78.3%) of participants usually wear protective clothes, while only 21.7% were not wearing.

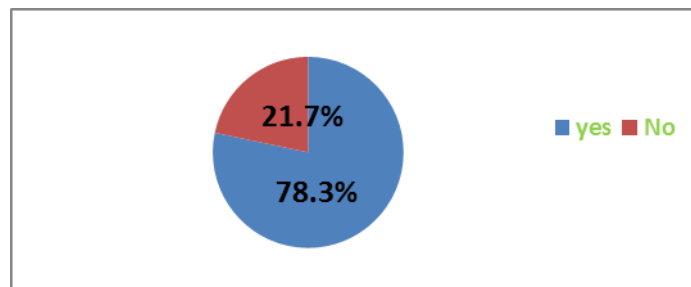


Fig. (6): Distribution of participants according to wearing of protective clothes (n=60)

Nearly 70% of the participants were not wearing protective clothes because it was not available and 30.8% mentioned that it was not comfortable as shown in figure (7).

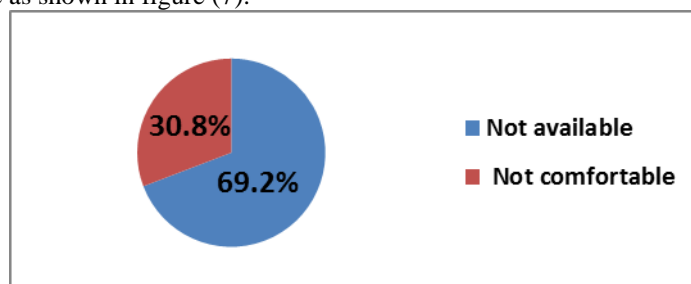


Fig. 7: Reasons behind why workers did not wear the protective clothes (n=13)

• **Hygiene practice among participants**

Table (1) illustrated the distribution of hygiene practice among workers. The vast majority 51(85%) of workers

cleaned their hands before starting, during work and when the work needs that. A number of 45 (75%) of the workers used soap.

**Table 1: Distribution of hygienic practice among workers.**

Hygienic practice	Response	No.	%
Do you clean your hands before starting, during work and when the work needs that?	Yes	51	85.0
	No	9	15.0
	<b>Total</b>	<b>60</b>	<b>100.0</b>
Do you use soap when washing your hands?	Yes	45	75.0
	No	15	25.0
	<b>Total</b>	<b>60</b>	<b>100.0</b>
For how long do you clean your hands?	10 seconds	15	33.3
	15 seconds	20	44.5
	20 seconds	10	22.2
	<b>Total</b>	<b>45</b>	<b>100.0</b>
Do you dry your hands after cleaning?	Yes	39	65.0
	No	21	35.0
	<b>Total</b>	<b>60</b>	<b>100.0</b>
If YES, how do you do that?	Paper towel	5	8.3
	Cotton towel	23	38.3
	My apron	9	15.0
	Nothing	2	3.3
	<b>Total</b>	<b>60</b>	<b>100.0</b>
When you go to lunch or toilet do you repeat washing your hands?	Yes	57	95.0
	No	3	5.0
	<b>Total</b>	<b>60</b>	<b>100.0</b>
Do you smoke or use snuff during the work?	Yes	6	10.0
	No	54	90.0
	<b>Total</b>	<b>60</b>	<b>100.0</b>
Identify your work place?	Defrosting area	8	13.3
	Portioning area	21	35.0
	Packaging area	23	38.3
	Refrigerators area	8	13.3
	<b>Total</b>	<b>60</b>	<b>100.0</b>
Do you move from your place of work to another during the shift time?	Yes	45	75.0
	No	15	25.0
	<b>Total</b>	<b>60</b>	<b>100.0</b>

- **Knowledge of participants for meat safety**

Table (2) showed the knowledge of workers of meat safety. The vast majority of workers (88.3%) knew the meaning of meat contamination. More than two thirds (66.7%) of those who knew the meaning of meat

contamination mentioned meat color change, 13.3% said purification, 10% said dirty and only 1.7% said fracture. The most common diseases affect poultry mentioned by workers were bird influenza (51.7%), Newcastle (18.3%), Salmonella (3.3%) while 26.7% did not know.

**Table 2: Knowledge of workers of meat safety.**

Meat safety	Response	No.	%
Do you know the meaning of meat contamination?	Yes	53	88.3
	No	7	11.7
	<b>Total</b>	<b>60</b>	<b>100.0</b>
If yes, explain the meaning of contamination?	Dirty	6	10.0
	Meat color change	40	66.7
	Fracture	1	1.7
	Purification	8	13.3
	<b>Total</b>	<b>60</b>	<b>100.0</b>
What are the most common diseases affect poultry?	Newcastle	11	18.3
	Bird influenza	31	51.7
	Salmonella	2	3.3
	don't know	16	26.7
	<b>Total</b>	<b>60</b>	<b>100.0</b>
Do these diseases infect humans too?	Yes	33	55
	No	27	45

	<b>Total</b>	<b>60</b>	<b>100.0</b>
If you have a disease accompanied by colic and diarrhea, do you leave the slaughterhouse and go to hospital?	Yes	47	78.3
	No	13	21.7
	<b>Total</b>	<b>60</b>	<b>100.0</b>
Do you go back to your work before finishing treatment duration?	come back to my workplace	6	10.0
	Wait until complete my treatment at home	41	68.3
	<b>Total</b>	<b>60</b>	<b>100.0</b>
Do you do regular medical test and have health certificate?	Yes	44	73.3
	No	16	26.7
	<b>Total</b>	<b>60</b>	<b>100.0</b>
Do you sterilize the knife with which you work by hot water?	Yes	15	25.0
	No	45	75.0
	<b>Total</b>	<b>60</b>	<b>100.0</b>
If your answer yes, how many times a day you sterilize it?	Once during work	9	60.0
	Twice	5	33.3
	More than once	1	0.7
	<b>Total</b>	<b>15</b>	<b>100.0</b>

As displayed in table (3), the majority of respondents (98.3%) thought that washing floors, walls and different surfaces with detergents and disinfectant was important for meat safety. However, 95% of the respondents mentioned that there were places or equipment that will

not affect meat safety if not cleaned and disinfected. All the respondents (100%) stated that it is necessary to store the meat in the refrigerators, while 98.3% thought that if transport vehicles are not cleaned and disinfected, this will affect meat safety.

**Table 3: Knowledge of workers by meat safety.**

<b>Meat safety</b>	<b>Response</b>	<b>No.</b>	<b>%</b>
In your opinion, is washing floors, walls and different surfaces with detergents and disinfectant important for meat safety?	Yes	59	98.3
	No	1	1.7
	<b>Total</b>	<b>60</b>	<b>100.0</b>
Is there any places or equipment that will not affect meat safety if not cleaned and disinfected?	Yes	57	95.0
	No	3	5.0
	<b>Total</b>	<b>60</b>	<b>100.0</b>
Is it necessary to store the meat in the refrigerators?	Yes	60	100.0
	No	0	0.0
	<b>Total</b>	<b>60</b>	<b>100.0</b>
If the meat is not refrigerated, will this affect the safety of meat?	Yes	60	100.0
	No	0	0.0
	<b>Total</b>	<b>60</b>	<b>100.0</b>
Is it necessary to clean and disinfect vehicles used to transport meat?	Yes	60	100.0
	No	0	0.0
	<b>Total</b>	<b>60</b>	<b>100.0</b>
In your opinion, if transport vehicles are not cleaned and disinfected, will this affect meat safety?	Yes	59	98.3
	No	1	1.7
	<b>Total</b>	<b>60</b>	<b>100.0</b>

#### IV. DISCUSSION

This study was conducted to assess the current situation for level of knowledge, attitudes and practices related to food safety in portioning poultry operations in Khartoum State, Sudan.

The study showed that the majority of workers in this sector were males. This may be because the locations of these operations are far from residential areas.

The present study revealed considerable proportion of illiterate participants of more than thirteen percent. This

low education level may indicate that the workers remained working in poultry industry due to the lack of opportunities in the job market. It can also be anticipated that low educational level may negatively affect productivity and safety. Oluwatayo<sup>[7]</sup> stated that the more the number of years of formal education of the poultry farmers, the higher the workers ability to take risks.

This study revealed that the majority of workers were trained to do their job responsibilities. This finding complies with that recorded by Nasr<sup>[8]</sup> who showed that 63.3% of the respondents in meat operations in Khartoum State were hygienically qualified for the job,

indicating that they were aware of the food hygiene program.

Furthermore, the majority of participants in this study were found to wear protective clothes and those who did not was because it was not available. This result was in line with that stated with Arcury *et al.*<sup>[9]</sup> who recorded that having PPE available and encouraging its used were important considerations. The importance of having PPE in place is because food workers can spread foodborne illness in the food service environment through hand contact with pathogens from their gastrointestinal tracts or objects or food contaminated with pathogens and subsequent passage of pathogens to food.<sup>[10]</sup>

In the present study the vast majority of workers were found to clean their hands for 10 to 20 seconds before starting, during work and when the work needs that. This finding is supported with that stated by FDA<sup>[11]</sup> food code which indicated that hand washing should take at least 20 seconds and shall include running warm water, soap, friction between hands for 10 to 15 seconds, rinsing, and drying with clean towels or hot air. The finding is also in line with a study conducted in Italia poultry sector which showed that most of the Italian (84.3%) poultry workers used soap to wash their hands. The result is also supported by a study conducted by Neupane *et al.*<sup>[12]</sup> where 71.7% of the respondents washed their hands regularly with soap and water. Contrary to this, Palumbo *et al.*<sup>[13]</sup> reported that depending upon the type of food facility, 33% to 73% of the facilities investigated were out of compliance with proper hand washing procedures.

It is stated that hand drying after washing is an essential component of effective hand hygiene procedures.<sup>[14]</sup> Although the means used in hand drying in this study were not appropriate, a considerable portion of respondents used to dry their hands after washing them. This finding is supported by that recorded by Guzewich and Ross<sup>[15]</sup> and Palumbo *et al.*<sup>[13]</sup> who stated that proper hand washing didn't occur as regularly or as thoroughly as needed.

Furthermore, only 10% of workers in this study were found to smoke or used snuff during work. Studies indicated that Staphylococcus bacteria can be transferred from the lips to the hands while smoking.<sup>[16]</sup> Moreover, smoking and consuming food at the slaughterhouse have been associated with increased risk of zoonotic diseases such as *leptospirosis*.<sup>[17]</sup>

Three quarters of workers (75%) in this study agreed that they used to move from their places of work to another during the shift time. Moving from dirty to clean area in food processing plants may pose great hazard to food safety as this practice spreads pathogenic microorganisms such as Salmonella, Shigella and *Escherichia coli* from dirty workers' hands to food.<sup>[18]</sup>

Also, the present study showed that knowledge of workers about the meaning of meat contamination was adequate. This finding is in agreement with the study of Jianu and Golet<sup>[19]</sup> where the highest level of knowledge was significantly associated with workers who had better education.

Carpenter *et al.*<sup>[20]</sup> recommended workers with symptoms of illness, especially food borne ones, should be excluded from work. This study showed high knowledge of poultry workers with regard to health exclusion policy that deals with sick workers. This may be attributed to the high proportion of educated workers.

## V. CONCLUSION AND RECOMMENDATIONS

This study concluded that the majority of workers were trained to do their job responsibilities and were able to conduct good hygiene measures while performing their job. It is recommended that to use of the HACCP (Hazard Analysis Critical Control point) approach by all food handlers.

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This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors Ethics declarations.

### Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

### Competing interests

The authors declared that they have no competing interests.

## VI. REFERENCES

1. Mustafa, E. A., Adil M.A. Salman and Iman M. Hamad (2016). Review on Food Safety System With Reference To Meat Operations in Khartoum State, Sudan. RAJAR Volume 2 Issue 07 July 2016.
2. Ukut IOE, Okonko IQ, Ikpoh IS, Nkang AO, Udeze AO, Babalola TA, Mejeha OK, Fajobi EA. (2010). Assessment of bacteriological quality of fresh meats sold in Calabar Metropolis, Nigeria. *Electron. J. Environ. Agric. Food Chem*, 9(1): 89-100.
3. Yashoda KP, Sachindra NM, Sakhare PZ and Rao DN (2001). Microbiological quality of broiler chicken carcasses processed hygienically in a small scale poultry processing unit. *J. Food Quality*, 24: 249-259.
4. Nouichi S, Hamdi TM. (2009). Superficial Bacterial Contamination of Ovine and Bovine Carcasses at ElHarrach Slaughterhouse (Algeria). *Europ. J. Scientific Res.*, 38(3): 474-485.
5. Mortimore, S., & Smith, R. A. (1998). Standardized HACCP training: assurance for food authorities. *Food Control*, 9(2): 141-145.
6. WHO (2010) World Health Organization,. Five keys to safer food manual.

7. Oluwatayo, I.B., (2004). Income risk and welfare status of rural households in Nigeria: Ekiti state as a test case. *WIDER Research Paper*, United Nations University (UNU), Katajanokanlaituri, Helsinki, Finland.
8. Nasr, S. B. A. (2013). Assessment of Food Safety Knowledge, Attitude and Practices among Poultry Slaughterhouses Plant Workers in Khartoum State-Sudan (Doctoral dissertation, Sudan University of Science and Technology).
9. Arcury, T.A.; Vallejos, Q.M.; Marn, A.J.; Feldman, S.R.; Smith, G.; Quandt, S.A. (2006). Latino farmworker perceptions of the risk factors for occupational skin disease. *Am. J. Ind. Med.*, 49: 434–442.
10. Paulson DS.(2000). Handwashing, gloving and disease transmission by the food preparer. *Dairy Food Environ Sanit*, 20(11): 838-45.
11. FAD.(2001). Bacteriological Analytical Manual Isolation of *Campylobacter* species from food and water. Washington: FDA.
12. Neupane, D., Khanal, V., Ghimire, K., Aro, A. R., and Leppin, A. (2012). Knowledge, attitudes and practices related to avian influenza among poultry workers in Nepal: a cross sectional study. *BMC infectious diseases*, 12(1): 1-7.
13. Palumbo, M.S., J.R. Gorny, D.E. Gombas, L.R. Beuchat, C.M. Bruhn, B. (2007). Cassens, P. Delaquis, J.M. Farber, L.J. Harris, K. Ito, M.T. Osterholm, M. Smith and K.M.J. Swanson. Recommendations for Handling Fresh-cut Leafy Green Salads by Consumers and Retail Foodservice Operators. *FoodProt Trends*, 27: 892-898.
14. Boyce, J. M., and Pittet, D. (2002). Guideline for hand hygiene in health-care settings: recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. *American journal of infection control*, 30(8): S1-S46.
15. Guzewick J, Ross MP.(1999). Evaluation of risks related to microbiological contamination of ready-to-eat foods by preparation workers and the effectiveness of intervention to minimize those risks. White Paper, Section II: Interventions to prevent or minimize risks associated with bare-hand contact with ready-to-eat foods.) Food and Drug Administration. *Center for Food Safety and Applied Nutrition*.
16. Ball, B., Wilcock, A., and Aung, M. (2009). Factors influencing workers to follow food safety management systems in meat plants in Ontario, Canada. *International journal of environmental health research*, 19(3): 201-218.
17. Campagnolo, E. R., Warwick, M. C., Marx Jr, H. L., Cowart, R. P., Donnell Jr, H. D., Bajani, M. D., ... and Bolin, C. A. (2000). Analysis of the 1998 outbreak of leptospirosis in Missouri in humans exposed to infected swine. *Journal of the American Veterinary Medical Association*, 216(5): 676-682.
18. Forsythe, S. J. (2002). The microbiological risk assessment of food. Oxford, England: Blackwell Science.
19. Jianu, C., and Goleț, I. (2014). Knowledge of food safety and hygiene and personal hygiene practices among meat handlers operating in western Romania. *Food Control*, 42: 214-219.
20. Carpenter L., Green A., Norton D., Frick R., TobinD'Angelo M., Reimann D., Blade H., Nicholas D., Egan J., Everstine K., Brown L. and Le B. (2013): Food worker experiences with and beliefs about working while ill. *J. Food Protect.*, 76: 2146-2154.