Comparison Between Different Locations And Sampling Methods On The Assessment Of Bacteriological Quality Of Broiler Carcasses

Amani Lotfy F. Hema*, Mohamed Abdallah M. Abd El –Moneam and Wafaa M. M. Eissa***

Animal Health Research Institute Food Hygiene Department*, Central Laboratory Of Residue Analysis And Pesticides In Food**

Abstract

There are three principal methods for sampling poultry carcasses, skin excision, swabbing and whole carcass rinse .

Each of the methods of sampling poultry carcasses to determine bacterial counts and the location of the carcass sampled appears to affect results. Therefore, the objective of this study was to determine if the three different sampling methods, or two different areas of carcasses sampled (thigh and breast), affected significantly the numbers of aerobes , psychrotrophes , coliforms or E. coli and Salmonella recovered from pre-chill broilers. Fifty pre-chill broiler carcasses were collected to carry out the experiments from a commercial processing plant.

Obtained results revealed that There are significant differences ($P<0.01$) between the 3 methods for all bacterial counts where the recovered aerobes for each of rinsing, swabbing and excision methods were $1.43X10^9 \pm 2.48X10^8$cfu/g, $2.10X10^7 \pm 5.61X10^6$cfu/g and $1.15X10^4 \pm 3.84X10^2$cfu/g respectively. While the recovery number of psychrotrophes for the three methods were $1.36X10^7 \pm 2.55X10^6$cfu/g , $1.02X10^5 \pm 1.90X10^4$cfu/g and $4.10X10^3 \pm 1.77X10^2$cfu/g respectively and were $6.93X10^6 \pm 1.91X10^6$cfu/g, $9.45X10^3 \pm 2.45X10^3$cfu/g and $5.60X10 \pm 0.11$ cfu/g for coliforms respectively.

It was proven that the recovered aerobes, psychrotophes, and coliforms were significantly different for both of the two sampled locations (breast and thigh) for each of the swabbing and excision methods.

Results from the experiments also showed that only rinsing method could recover *Salmonella*(2%) while *E.coli* could be recovered from both Rinsing and excision methods (6%).

Key words:

Rinsing, swabbing, excision, sampling methods ,poultry bacteriological quality, Salmonella, Aerobes, psychrotrophes, E.coli, coliforms

Introduction

Poultry products are in demand around the world and chickens and other poultry can be reared in almost any part of the world. Chicken meat can make many positive contributions to the diet of human, where not all meat is seen as healthy, chicken meat is frequently more affordable than other meat.

Microbiological criteria have become an important source of information in developing hazard analysis critical control point (HACCP) and quality management systems of poultry slaughter plants **(Brown *et al.*, 2000).**

Sampling methods are necessary for critical

control point determination and overall improvements in the microbiological quality of commercially processed broiler carcasses.

Numbers and types of bacteria on processed poultry carcasses vary due to many factors, including recovery methods and carcass location sampled. Previous researchers have used methods such as skin swabbing, skin scraping, or skin excision and rinsing **(Patterson and Stewart, 1962)**.

Various sampling methods are available to determine microbiological quality of carcasses. There are three principal methods for sampling poultry carcasses, skin excision, swabbing and whole carcass rinse **(Palumbo *et al.,* 1999; Gill and Badoni 2005).**

Rinse sampling is used in the U.S.A. within the United States Department of Agriculture Food Safety and Inspection Service pathogen reduction program, whereas sampling of skin is preferred in the European Union. **(Zhang *et al.,* 2012).**

Fromm (1959) found that direct plating was not effective for sampling broilers or hens, but swabbing or excision and homogenizing skin was effective for recovering bacteria. The study also reported that swabbing was more effective than rinsing for recovering aerobic bacteria.

Avens and Miller (1970) stated that excision and blending of tissue recovered higher numbers of aerobic bacteria from turkey carcasses than did swabs. A series of experiments reported by **(McEvoy *et al.,* 2005)**, using 4 sampling methods for *Escherichia coli* in turkey carcasses, generally showed a modified carcass rinse procedure and a 2-swab method was superior than whole-carcass swab or a 1-swab method.

Previous reports have also focused on the portion of the carcass sampled, including a review by **(Patterson and Gibbs, 1975)**. Early reports indicated that some areas of the carcass contained larger numbers of bacteria than other portions **(Walker and Ayres, 1959; May, 1962). Kotula (1966)** found that numbers of aerobic bacteria on pre-chill broiler carcasses were highest on thighs, followed by fewer bacteria on legs and then breasts.

Patterson (1972) reported that skin from the neck contained higher numbers of aerobic bacteria than the back; other sites including inside leg, outside leg, vent area, and under the wing were mostly equal. **Smith *et al.,* (2007)** observed higher numbers of coliforms and E. coli recovered from the back of pre-chill broilers than from the breast. A few reports have not observed differences within carcasses sampled. **Cox *et al.,* (1976)** found no difference between thigh and breast areas sampled for aerobic bacteria and Enterobacteriaceae. Similarly, **Klinger *et al.,* (1981)** found no difference in numbers of aerobic bacteria or Enterobacteriaceae from 5 sites sampled on kosher-processed broilers.

Both the method of sampling poultry carcasses to determine bacterial counts and the location of the carcass sampled appears to affect results. Therefore, the objective of this study was to determine if the 3 different sampling methods, or different areas of carcasses sampled, affected numbers of coliforms or E. coli recovered from pre-chill broilers.

Materials and Methods

Experiment 1: Evaluation of Different 3 sampling methods .

Preparation of samples:

Fifty pre-chill broiler carcasses were collected from 2different local commercial processing markets (n = 50).The live weights of birds range from 1.9 to 2.4 kg, and the weights of dressed carcasses range from 1.2 to 1.7 kg. The carcasses are scalded by immersion in water of about 50C^{o}for2.5 min before de-feathering. After dressing and evisceration, carcasses collected at the plant were each placed in a separate plastic bag and were stored on ice during transport to a laboratory where they were weighed and measured and sampled within 3 h of being collected.

After transferring carcasses to a clean bag, were removed from the bags and placed on a clean surface. A sterile blunt-edged stainless-steel blade was used to split each carcass along the breast bone and opened to expose the

body cavity manually into two equal halves one of them was used for rinsing sampling while the other was used for both swabbing and excision sampling

a) Rinsing: was conducted with 200 ml SPW, containing 0.85% NaCl and 0.1% peptone)
in sterile stomacher bags with manual agitation for 1 min , the recovered bacterial count was multiplied by 2to compensate for the carcass division.

b) Swabbing: Using a sterile cotton swab moistened with SPW and template, a total area of 25 $cm^2$from both the thigh and the breast from nearly the same places at each carcass, five sites that were equivalent to those sampled by excision: leg, breast, neck, around the visceral cavity and under the wings) were added to 225ml of SPW.

c) Excision: using sterile forceps and scissors, a total area of 25 cm 2 of skin is cut from both the thigh and the breast from nearly the same place in each carcass were added to 225 ml of SPW.

Experiment 2: Evaluation of different sampling sites

Fifty pre-chill broiler carcasses were collected as mentioned previously

Preparation:

- Swabbing::Using a sterile cotton swab and template, a total area of 25 cm^2 was swabbed from each of the thighs as well as breasts separately and added to 225 ml of of 0.1% peptone solution.
- Excision: using sterile forceps and scissors total area of 25 cm^2 of skin is cut from each of the thighs and the breasts separately225 ml of of 0.1% peptone solution.
  Homogenization of the solutions is carried out.

Serial dilutions ,plating,and incubation are carried out to perform different counts:

- Aerobes count, Psychrotophes count, Coliforms count according to : **APHA:2001**

Detection of:

- *E.coli* according to: **FDA:2002**
- Salmonella according to: **ISO 6579:2002**

Results and Discussion

Results from the experiments showed Significant differences in all counts; aerobes, psychrotrophes and coliforms between the three sampling methods table (1) and fig.(1).

The recovered aerobes from the rinsing, swabbing and excision were approximated to be$1.43X10^9 \pm 2.48X10^8$cfu/g, $2.1X10^7 \pm 5.61X10^6$cfu/g and $1.15X10^4 \pm 3.84X10^2$cfu/g respectively. While the recovered number of psychrotrophes for the three methods were $1.36X10^7 \pm 2.55X10^6$cfu/g , $1.02X10^5 \pm 1.9X10^4$cfu/g and $4.1X10^3 \pm 1.77X10^2$cfu/g respectively and were $6.93X10^6 \pm 1.91X10^6$cfu/g, $9.45X10^3 \pm 2.45X10^3$cfu/g and $5.6X10 \pm 0.11$ cfu/g for coliforms.

The obtained results also showed that only rinsing method could recover Salmonella from one rinsed sample(2%) while E.coli could be recovered from both Rinsing and excision methods from three samples each (6%).

Through the achieved results in this work of recovered bacteria (aerobes, psychrotrophes and coliforms) It was observed that the rinsing method was significantly superior than the other two methods followed by excision and finally swabbing. Whole-carcass rinse (WCR) is considered one of the most widely used sampling methods. This method is favourabled by the USDA's Food Safety Inspection Service to enumerate Escherichia coli and determine the incidence of Salmonella **(USDA, 1996).**

Similar results were recorded by **(Blankenship *et al.,* 1975),** in a Comparison experiment for rinse and swab sampling methods applied to broiler visceral cavities for total aerobic plate count (TPC) and recovery of artificially inoculated S. typhimurium , there were significant differences($p<0.05$) between the mean log of recovered (TPC), 7.81 compared to 6.93 respectively and 6.8 5 compared to 5.87 of recovered salmonella for the rinse and swab methods respectively.

The obtained results were almost agreed with that achieved by **(Zhang *et al.,* 2012**) who reported that the ability of three sampling methods to recover bacteria (TVC), Pseudomonas spp., B. thermosphacta and Lactic acid bacte-

ria, indicated that the highest counts were recovered using the rinsing method followed by excision, and the lowest counts by the swabbing method.

However, The findings of this current study are more or less in agreement with **(Gill and Badoni, 2005; Smith, *et al,* 2007)** who reported that whole carcass rinse (WCR) method appears to yield an overall estimate of the number of bacteria on the carcass and that excision and rinsing could recover similar numbers, while swabbing recovered lower. The researchers added that although rinse technique was sensitive in the ability to detect micro organisms, it is somewhat expensive with regard to time, materials, and labor, and carcasses may have to be discarded when rinsed with diluents other than water so it was considered inconvenient for sampling carcasses

In this concern, **(Kotula, 1966)** mentioned that, only Rinsing method-among swabbing, excision, rinsing of specific areas or rinsing by spraying-provides representative microbiological assessment meanwhile other sampling methods provide limited area sampled and lack of variations of contamination due to different parts of the carcass.

On the other hand, The studies performed by both **(Fromm, 1959 and Bolton, 2003)** revealded that swabbing method was more effective and more reliable than used rinsing for recovering aerobic bacteria and monitoring microorganisms when it covers larger carcass areas than excision. Contrarily, **(Avens and Miller, 1970)** stated that excision and blending of tissue recovered higher numbers of aerobic bacteria from turkey carcasses than did swabs. Also, a series of experiments reported by **(McEvoy *et al.,* 2005)**, using 4 sampling methods for recovery of Escherichia coli from turkey carcasses, generally showed a modified carcass rinse procedure was superior than whole-carcass swab. Furthermore, **(Simonsen, 1989)** stated that larger numbers of bacteria were recovered by rinsing, those numbers were sometimes <10% as compared with that recovered by excision of skin, but with a larger fraction of the flora being recovered from warm than from chilled carcasses)

In this study, the large recovered number of bacteria using excision method, may be attributed to that the skin can attain larger numbers of contamination as the de-feathering process generates negative pressure inside the feather follicle giving it the ability to absorb liquids containing different types of contaminant from the surrounding medium (scalding and washing stagnant fluids).

In this regard, **(Berrang *et al.,* 2001)**explained the cause of the higher bacterial recovery from excision method as the skin contained more bacteria than meat surfaces of thigh and breast parts taken from pre-chill broiler carcasses and the muscle below the surface is essentially sterile **(Avens and Miller, 1970**).

Declaring the lower recovery levels of swabbing method, **(Ghafir and Daube, 2008)** attributed that to the topography of the skin or the attachment of bacteria to the skin. In addition, many factors, including swabbing materials and carcass type, may have a significant effect on bacterial recovery by swabbing (However, swabbing is considered advantageous for the meat industry because it is less laborious than excision and does not compromise meat quality **(Lindblad, 2007**). In general, excision is superior to swabbing, based on the fact that higher numbers are recovered and low variation is achieved.

Concerning the disadvantages of rinse method versus to the advantages of the other methods ,swabbing and excision offer practical advantages over the traditional whole carcass rinse, because of the ease and rapidity of collection, reduced enrichment medium required and the possibility of sampling prior to complete evisceration **(Sarlin *et al.,* 1998; Mead *et al.,* 2010)**. Second, measurement of the surface areas of carcasses is necessary for rinse methods, but it is hardly possible to determine **(Jorgensen *et al.,* 2002; Gill and Badoni 2005).**

For determining whether different areas of the same carcass harbor more bacteria than other areas the second experiment of this study was performed.

Sampling methods allowing distinct areas of the carcass to be sampled have produced evidence that bacterial numbers from various areas on the same carcass may differ.. obtained results through recovering aerobes, psychrotrophes and coliforms by sampling two different sites using two different sampling methods, proved that the recovered aerobes, psychrotophes, and coliforms table(2) and fig.(2) were significantly different ($P<0.01$) for both of the two sampled locations (breast and thigh) for each of the swabbing and excision methods.

The recovered bacteria were higher from thigh than from breast for both methods and were higher from excised than swabbed areas for the two sampled sites.

Similarly, Prior researches have shown that different sampling locations on a carcass produce different numbers of recovered bacteria. Broiler carcasses have more bacteria on the back than on the front and more bacteria on the thigh than the breast, **(Kotula, 1966 and Smith *et al.*, 2007)** observed higher numbers of coliforms and E. coli recovered from the back of pre-chill broilers than from the breast.

The current results were in agreement also with **(Bodnaruk *et al.*, 1998)** who reported that E. coli numbers on the breast skin of turkey carcasses were significantly lower than the numbers found on thigh skin.

Vaidya *et al.*, (2005) also reported more bacteria on the legs of poultry carcasses than on other areas sampled. Therefore, results from the present study are in general agreement with previous reports.

On the other hands. **(Cox *et al.*, 1976)** found no difference between thigh and breast areas sampled for aerobic bacteria and Enterobacteriaceae. Similarly, **(Klinger *et al.*, 1981)** found no difference in numbers of aerobic bacteria or Enterobacteriaceae from 5 sites sampled on kosher-processed broilers.

Table (1). Comparison between Bacterial counts with different methods.

	Rinse	Excision	Swab
Count	Mean ± SE	Mean ± SE	Mean ± SE
Aerobes	$1.43X10^{9}\pm 2.48X10^{8}$	$2.10X10^{7}\pm 5.61X10^{6}$	$1.15X10^{4}\pm 3.84X10^{2}$
Psychrotrophes	$1.36X10^{7}\pm 2.55X10^{6}$	$1.02X10^{5}\pm 1.90X10^{4}$	$4.10X10^{3}\pm 1.77X10^{2}$
Coliforms	$6.93X10^{6}\pm 1.91X10^{6}$	$9.45X10^{3}\pm 2.45X10^{3}$	$5.60X10 \pm 0.11$

There are significance differences ($P<0.01$) between the 3 methods for all counts.

Table (2). Comparison between Bacterial counts recovered from different sites.

	Swab		Excision	
	Breast	Thigh	Breast	Thigh
count	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
Aerobes	$5.90X10^{3}\pm 3.03X10^{2}$	$1.70X10^{4}\pm 6.55X10^{2}$	$4.52X10^{6}\pm 7.78X10^{5}$	$3.75X10^{7}\pm 1.05X10^{7}$
Psychrotrophes	$1.59X10^{3}\pm 1.43X10^{2}$	$6.60X10^{3}\pm 3.14X10^{2}$	$8.70X10^{3}\pm 1.25X10^{3}$	$1.96X10^{5}\pm 3.69X10^{4}$
Coliforms	$3.90X10 \pm 0.335$	$7.30X10 \pm 0.389$	$3.57X10^{3}\pm 4.28X10^{2}$	$1.70X10^{4}\pm 4.73X10^{3}$

There are significance differences between all breast and thigh counts ($P<0.01$)

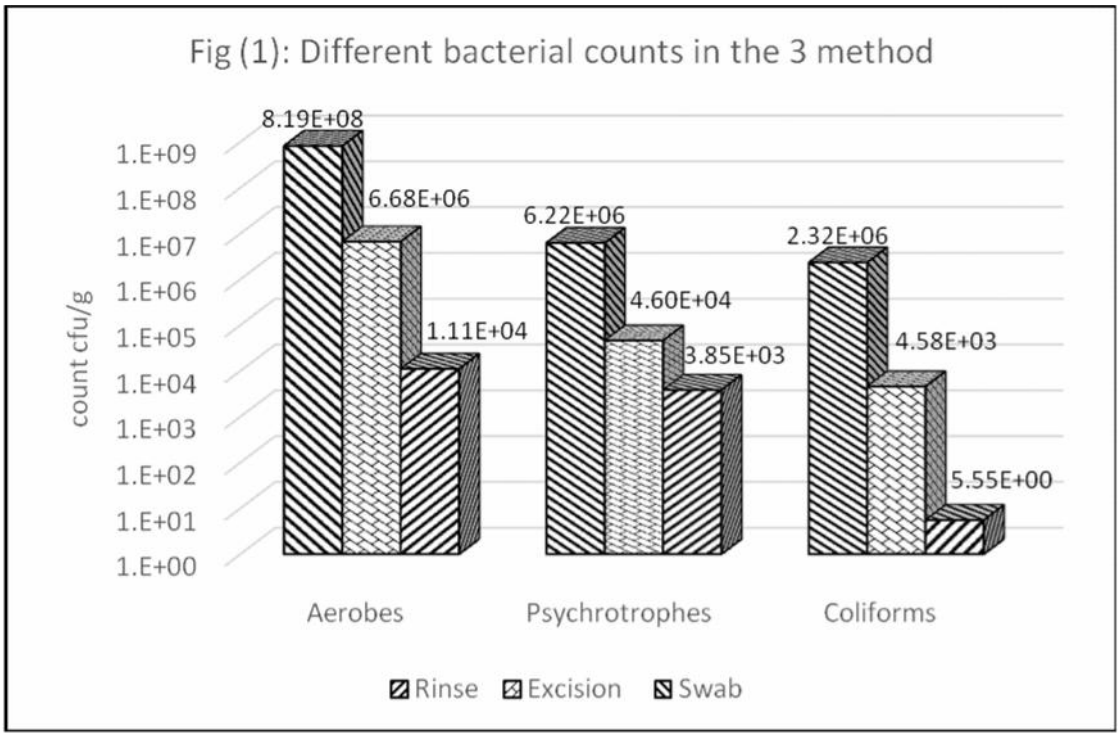
Fig (1): Different bacterial counts in the 3 method
count cfu/g
1.E+09
1.E+08
1.E+07
1.E+06
1.E+05
1.E+04
1.E+03
1.E+02
1.E+01
1.E+00
8.19E+08
6.68E+06
1.11E+04
6.22E+06
4.60E+04
3.85E+03
2.32E+06
4.58E+03
5.55E+00
Aerobes
Psychrotrophes
Coliforms
Rinse
Excision
Swab

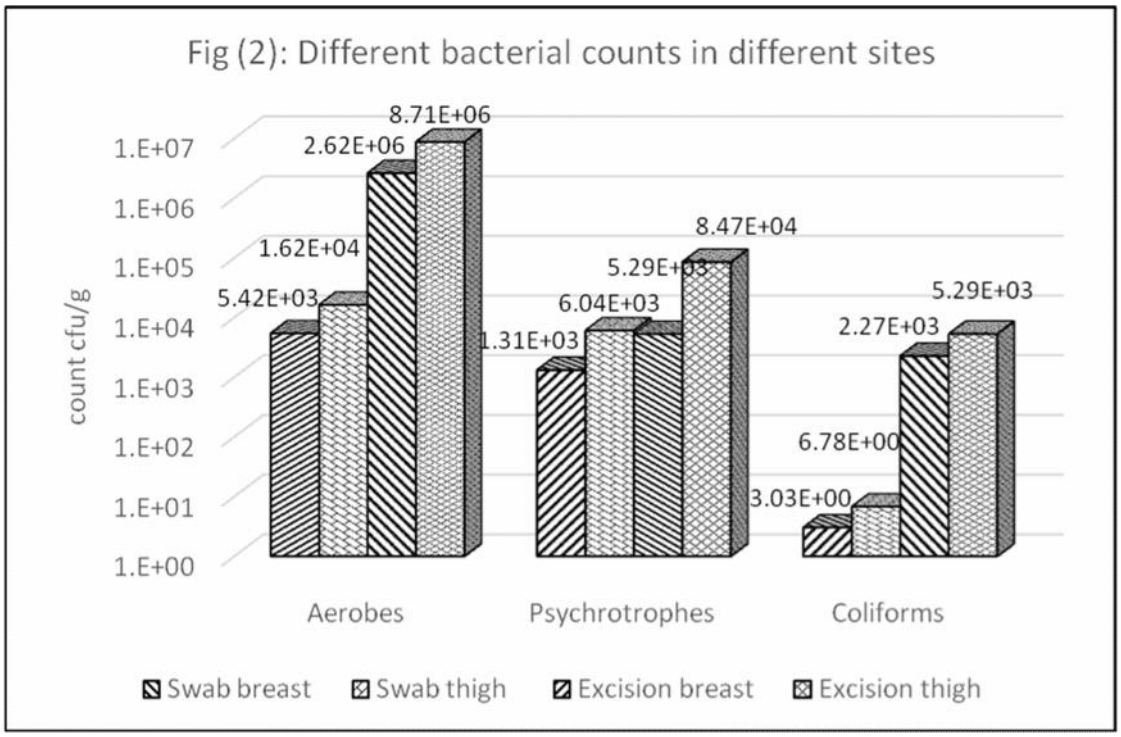
Fig (2): Different bacterial counts in different sites
count cfu/g
1.E+07
1.E+06
1.E+05
1.E+04
1.E+03
1.E+02
1.E+01
1.E+00
8.71E+06
2.62E+06
1.62E+04
5.42E+03
8.47E+04
5.29E+03
6.04E+03
1.31E+03
5.29E+03
2.27E+03
6.78E+00
3.03E+00
Aerobes
Psychrotrophes
Coliforms
Swab breast
Swab thigh
Excision breast
Excision thigh

References

APHA (2001). Compendium of Methods for the Microbiological Examination of Foods. Downes, F. P. and Ito, K. (eds.). 4th ed. American Public Health Association, Washington, DC. USA.

Avens, J.S. and B.F. Miller (1970). Quantifying bacteria on poultry carcass skin. Poult. Sci. 49:1309–1315.

Berrang, M.E., S.R. Ladely and R.J. Buhr (2001). Presence and level of Campylobacter, coliforms, Escherichia coli, and total aerobic bacteria recovered from broiler parts with and without skin. J. Food Prot., 64:184–188.

Blankenship, L.C., Cox, N.A., Craven, S.E. and. Richardson R.L., (1975). Total Rinse Method for Microbiological Sampling of the Internal Cavity of Eviscerated Broiler Carcasses. Applied Microbiology 30: 290-292.

Bodnaruk, P.W., J.L. Schmelder, P.J. Krakar, and R.B. Tompkin. (1998). A comparison of Escherichia coli levels at four sampling sites on turkey carcasses. Poult. Sci. 77:1531–1533.

Bolton, D.J. 2003. The E.C. decision of the 8th June 2001 (EC/471/2001). Excision versus swabbing. Food Control 14, 207–209.

Brown, M.H., Gill, C.O., Hollingsworth, J., Nickelson, R., Seward, S., Sheridan, J.J., Stevenson, T., Sumner, J.L., Theno, D.M., Usborne, W.R., Zink, D., (2000). The role of microbiological testing in systems for assuring the safety of beef. Int. J. Food Microbiol. 62: 7–16.

Cox, N.A., A.J. Mercuri, J.E. Thomson and V. Chew (1976). Swab and excised tissue sampling for total and *Enterobacteriaceae* counts of fresh and surface-frozen broiler skin. Poult. Sci., 55:2405–2408.

FDA (2002). Food and drug administration, Bacteriological analytical manual, Enumeration of E.coli and coliform bacteria.

Fromm, D. (1959). An evaluation of techniques commonly used to quantitatively determine the bacterial population on chicken carcasses. Poult. Sci., 38:887–893.

Ghafir, Y. and Daube, G. (2008). Comparison of swabbing and destructive methods for microbiological pig carcass sampling. Lett. Appl. Microbiol. 47, 322–326.

Gill, C.O. and Badoni, M. (2005). Recovery of bacteria from poultry carcasses by rinsing, swabbing or excision of skin. Food Microbiol. 22, 101–107.

ISO (2002). ISO No. 6579 Microbiology of food and animal feeding stuffs -- Horizontal method for the detection of Salmonella spp. International Organization for Standardization, Geneva, Switzerland.

Jorgensen, F., Bailey, R., Williams, S., Henderson, P., Wareing, D.R.A., Bolton, F.J., Frost, J.A., Ward, L. and Humphrey, T.J. (2002). Prevalence and numbers of Salmonella and Campylobacter spp. on raw, whole chickens in relation to sampling methods. Int. J. Food Microbiol. 76, 151–164.

Klinger, I.,D. Basker and B.J. Juven (1981). Sampling for precise microbiological plate counts on broiler chicken carcasses. Poult. Sci. 60:575–578.

Kotula, A.W. (1966). Variability in microbiological samplings of chickens by the swab method. Poult. Sci. 45:233–236.

Lindblad, M. (2007). Microbiological sampling of swine carcasses: A comparison of data obtained by swabbing with medical gauze and data collected routinely by excision at Swedish abattoirs. Int. J. Food Microbiol. 118, 180–185.

May, K.N. (1962). Bacterial contamination during cutting and packaging chicken in processing plants and retail stores. Food Technol. 16:89–91.

McEvoy, J.M., C.W. Nde, J.S. Sherwood and C.M. Logue (2005). An evaluation of sampling methods for the detection of *Escherichia coli* and *Salmonella* on turkey carcasses. J. Food Prot. 68:34–39.

Mead, G., Lammerding, A.M., Cox, N., Doyle, M.P., Humbert, F., Kulikovskiy, A., Panin, A., Nascimento, V.P. And Wierup, M. (2010). Scientific and technical factors affecting the setting of Salmonella criteria for

raw poultry: A global perspective. J. Food Prot. 73, 1566–1590.

Palumbo, S.A., Klein, P., Capra, J., Eblen, S. and Miller, A.J. (1999). Comparison of excision and swabbing sampling methods to determine the microbiological quality of swine carcass surfaces. Food Microbiol. 16, 459–464.

Patterson, J.T. (1972). Microbiological sampling of poultry carcasses. J. Appl. Bacteriol. 35:569–575.

Patterson, J.T. and D.J. Stewart (1962). Bacteriology of processed broilers. I. Method of examination. Res. Exp. Rec. Minist. Agric. North Irel. 11:57–63.

Patterson, J.T., and P.A. Gibbs. (1975). Sampling methods for poultry meat. Proc. 2nd Eur. Symp. Poult. Meat Qual., Oosterbeek, the Netherlands. Spelderholt Inst., Beekbergen, the Netherlands.

Pearce, R. and Bolton, D. (2005). Excision vs. sponge swabbing – a comparison of methods for the microbiological sampling of beef, pork and lamb carcasses. J. Appl. Microbiol. 98, 896–900.

Sarlin, L., Barnhart, E., Caldwell, D., Moore, R., Byrd, J., Caldwell, D., Corrier, D., Deloach, J.R. and Hargis, B. (1998). Evaluation of alternative sampling methods.

Simonsen, B., (1989). Microbiological criteria for poultry products. In: Mead, G.C. (Ed.), Processing of Poultry. Elsevier Applied Science, London, pp. 221–250.

Smith, D.P., J.A. Cason, D.L. Fletcher, and J.F. Hannah (2007). Evaluation of Carcass Scraping to Enumerate Bacteria on Prechill Broiler Carcasses. Poultry Science, 86:1436–1439.

USDA, (1996). US Department of Agriculture, Food Safety and Inspection Service. Pathogen reduction: hazard analysis and critical control point (HACCP) system: final rule. Fed. Regist., 61: 38805–38989.

Vaidya, V., Paturkar, A., Waskar, V., Zende, R. and Rawool, D. (2005). Detection of indicator organisms on poultry carcass sites in an organized slaughterhouse. J. Muscle Foods, 16: 289–297.

Walker, H.W. and J.C. Ayres (1959). Microorganisms associated with commercially processed turkeys. Poult. Sci., 38:1351–1355.

Zhang, Ke Ping Ye, Xing Lian Xu, Guang Hong Zhou And Jin Xuan Cao (2012). Comparison Of Excision, Swabbing And Rinsing Sampling Methods To Determine The Microbiological Quality Of Broiler Carcasses) Journal of Food Safety, 32: 134–139.

مقارنة بين طرق واماكن سحب العينات المختلفة على تقييم الجودة البكتريولوجية لدواجن التسمين

[*]د. أمانى لطفى فرج حما ، [**]د. محمد عبد الله عبد المنعم ، [*]د. وفاء محمد محمد عيسى

[*]معهد بحوث صحة الحيوان - قسم صحة الأغذية

[**]المعمل المركزى لتحليل المتبقيات والمبيدات فى الأغذية

الملخص العربى

توجد ثلاث طرق رئيسية لسحب العينات من دجاج التسمين وهى : الشطف الكامل للدجاجة والمسحات من الجلد وسحب وزنات من الجلد.

وحيث أن كل من الطرق المختلفة للسحب وأماكن السحب المختلفة يبدو أنها تؤثر على النتائج. لذلك كان الهدف من هذا البحث تحديد إذا ماكانت ط السحب المختفلة أو أماكن السحب تؤثر على نتائج العد الكلى للميكروبات الهوائية أو المقاومة للبرودةأو الميكروبات القولونية أو عزل كل من ميكروبى السالمونيلا أو الميكروب القولونى النموذجى (إيشريشيا كولاى) من الدجاج قبل التبريد.

تم تجميع 50 عينة من دجاج التسمين لكل من التجربتين من أحد الأماكن المحلية التجارية لذبح وتنظيف الدجاج.وقد أثبتت النتائج وجود إختلافات معنوية بين طرق السحب المختلفة بالنسبة لكل أنواع العد البكتيرى حيث كان العد البكتيرى لكل من طرق

السحب المختلفة الشطف والمسحات والسحب من الجلد كالأتى :
$2.48X10^{8} \pm 1.43X10^{9}$, $2.10X10^{7} \pm 5.61X10^{6}$و $1.15X10^{4} \pm 3.84X10^{2}$خلية/جم على التوالى.بينما كان العد البكتيرى للميكروبات المقاومة للبرودة بالطرق الثلاث على الترتيب كالتالى : $4.10X10^{3} \pm 1.02X10^{5}$, $1.90X10^{4} \pm 1.77X10^{2}$
خلية/جم على التوالى وكان العد الكلى للميكروبات القولونية كالتالى:$1.91X10^{6} \pm 6.93X10^{6}$, $2.45X10^{3} \pm 9.45X10^{3}$ و$0.11 \pm 5.60X10$ خلية/جم على التوالى.
وكذلك فقد ثبت وجود إختلافات جوهرية بين الأعداد البكتيرية المعزولة من منطقتى الصدر والفخذ بالدواجن بين كل من طريقتى السحب(بالمسحات أوبسحب عينات من الجلد) .
وقد أظهرت النتائج أنه قد أمكن عزل السالمونيلا فقط بطريقة الشطف الكامل للدجاج بينما لم تفلح طرق السحب الأخرى فى عزل الميكروب ,فى الوقت الذى تم عزل ميكروب الإيشريشيا كولاى من خلال إستخدام طريقتى السحب بالشطف والسحب من الجلد.