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ORIGINAL ARTICLE

Some Physical and Microbiological Characteristics of Muzekah and Dead Chicken

Adam, A. B[1]. Sulieman, A. E[2], Elssfah[1]M. E. and Vajid NettoorVeettil *[2]
[1]Department of Physics, Faculty of Scienc, University of Hail, Hail, Kingdom of Saudi Arabia
[2]Department of Biology, Faculty of Science, University of Hail, Hail, Kingdom of Saudi Arabia
Corresponding author. E-mail: vajidnv@gmail.com

ABSTRACT
This paper is anattempt to determine the characterization properties of chickens sacrificed through three different methods: i) Muzekah (slaughtered within the fulfillment of Islamic requirements); Slaughtered without pronouncing the name of Allah(SWP), and Dead (died without slaughtering). In addition, readyfish, goat, sheep, cow and camel meats were collected from local markets. The densities, water holding capacity (WHC)and microbiological characteristics of chicken meats weremeasured and analyzed. The results indicate that the average densities of Muzekah meats havehighest densities which ranged (1068 -1041 kg/m^3) followed by SWP chicken and Dead chicken that have densities 1036 and1021 kg/m^3, respectively. It is also found that, Muzekah meat has low WHC compared to other types of meat with significant values. The microbiological analysis indicated that Muzekahmethods resulted in reducing the various microbial characteristics of chicken meat. The total viable count of Muzekah, SWP and Dead chicken meat was 3.4 x 10^{3}c.f.u./g, 7.2 x 10^3 c.f.u./g and 10.5 x 10^{3}c.f.u./g, respectively. While the yeast and mould count of Muzekah, SWP and Dead chicken meat was 4.2x10^{2}c.f.u./g , 4.8x10^{2}c.f.u./g, and 8.0x10^{2}c.f.u./g, respectively. Moreover, SWP and Dead chicken meat were devoid of any harmful bacteria such as E. coli and Salmonella. Integrated results of the Muzkah meat showed high density, low WHC and APC that indicated it cleaned, healthy and have sinking abilities in water and seawater and permitted (Halal) to eat.
Key words: *Muzekah, Dead, Density, Microbial,yeast,harmful bacteria*

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INTRODUCTION

Islamic communities significantly distrust the safety and validity of imported meat in the markets, whether it has been slaughtered within the fulfillment of Islamic requirements (Muzekah) or not. The demand for Muzekah meat is very high and yet, there is no simple scientific method to help consumers to differentiate between Muzekah and non-slaughtered (Dead) meat in the market [12, 13, 16-18]. Muzekah means cutting the carotid andthe jugular blood vein by cutting the neck up to the spinal cord and then leaving the animal to die. This method is used for birds, cattle, sheep and goats, whereby the animal is laid down on its right side and the blood carrying arteries and veins are cut. The practice of Muzekah in Islam has always been to apply a sharp blade to the neck of the animal. There are many conditions for Halal Slaughtering (Muzekah) as mentioned in [14, 15, 17, 11, 23]. The perceptions of risk towards animal meat vary with time and depend on the consumers groups [7, 11, 23]. It is prohibited for Muslim to eat any of the followings: any animal that died before performing the Muzekah slaughtering, the blood and flesh of swine, meat which has been invoked other than the name of Allah, in addition to any meat contaminated or mixed with non-Halal meat. On the other hand, Muslims are allowed to eat seafood without slaughtering and the Muzekah meat of lawful animals. Studies have shown that Halal slaughtered meat (Muzekah), but not other conventional methods used in many countries, protects consumers from many food-borne diseases [11, 7]. It is well recognized as one of the main reasons for the popularity of Halal products even among non-Muslim consumers. Moreover, the way of Muzekah slaughtering process is of significant importance for human health, safety and quality of the meat. Globally, the Halal market that

spans from food to finance and tourism is worth USD 3 trillion. According to the latest estimated report, Halal products have two billion consumers worldwide, and which are growing annually by more than 20%. However, there is no intelligence device or a specific mechanism available for consumers to check whether the meat is Muzekah or not? In addition to that there are few scientific published reports on this important area [16, 17, 20].Al-Qurashi [1] stated that "if a municipal employee has doubts over the meat whether it is Halal or not, he should test it in water; Halal meat (Muzekah) sinks in water whereas non-halal meat (meat of deceased animal) floats over water. He should also cast a piece of the meat on hot coal, and if it sticks to the coal then it is Halal (Muzekah), and if it did not stick then it is from a deceased animal. This is similar to eggs, which sink in water if they are good, whereas float if they are spoiled [1]. The density, water holding capacity (WHC) and aerobic plate counts (APC) were measured.

Density is a measure of the "compactness" of matter within a substance and is defined as the mass per unit volume [1]. Its standard metric unit is (kg/m^3). The volume of any solid object, irregular or regularly shaped, can be measured by liquid displacement method. The solid is submerged in a liquid in which it is not soluble, and the volume of the displaced liquid is measured. The bulk density averages of chicken's bone, skins and breasts were reported as 881, 1113 and 1121 kg/m^3, respectively [14]. While the densities of fresh fish 1045 kg/m^3, seawater 1025 kg/m^3, pure water 1000 kg/m^3, pork 970 kg/m^3 and for blood 620 kg/m^3 [13]. The specific heat of water c_{water}= 4186 J/(kg K) is the largest among all common materials. It means that water can give off or take in large quantity of heat with little change in temperature [28, 29].

Water holding capacity (WHC) of raw and cooked meat has been related to some important organoleptic properties such as juiciness and tenderness [3]. Change in WHC of muscle homogenates has been shown to be closely related to the pH, and to be a sensitive indicator of variations in the charges and structure of muscle proteins. An efficacious way of preventing food-borne human diseases is to monitor the microbiological quality of poultry meat and meat products during production, storage and distribution. Epidemiological reports suggest that poultry meat is still the primary cause of human food poisoning [21]. The microflora of poultry might be transferred from the primary production sites to production lines, and further, by subsequent contamination [9]. Microflora of crude chicken meat is heterogeneous and originates from slaughtering premises, operators' hands, equipment and outfit, in addition to water and air [2, 4, 10].

MATERIALS AND METHODS

COLLECTION OF SAMPLES

To achieve the aim of this paper, one-month-old chickens (n = 9) were obtained from a commercial hatchery. The chickens were hydroid strains and their weights ranged between 1.5-1.75 kg. Each chicken was kept immediately after slaughtering in a sterilized container, and transported under aseptic conditions to the Laboratory at the Faculty of Science, University of Hail. Ready fish, goat, sheep, cow and camel meats were also collected from local markets in Hail.

Methods of slaughtering

Muzekah method

The chicken was put in a chicken killing cone. The head was pulled out through the end of the cone, and then the artery was cut just below the jaw line. The chicken was left to bleed out until the reflexes stopped, and then washed off to remove dirt. While the ready day fresh of fish, goat, sheep, cow and camel meats were collected from local markets and tested.

Slaughtering without pronouncing (SWP) the name of Allah method:

Without performing in the name of Allah, and without adhering to the conditions of the Muzekah method, the chicken was put in the jaw line. The chicken was left to bleed out until the reflexes stopped, and then washed off to remove feathers and dirt.

Dead method:

In order to keep all the amount of blood within the meat, the chicken neck was dislocated immediately and died out.

Preparation of meat samples for analysis

Poultry meat samples were prepared for analysis, which included: Muzekah, Slaughtered (SWP) and dead chicken meat and chicken meat from local company. All the chicken meats were chilled immediately within two hours of slaughtering to 5 °C to insure the prompt removal of the animal heat and preserve the wholesomeness of the products. Each meat sample was divided in two parts, one part was packed, sealed, chilled, and kept as a reference. The other part was chilled for 24 hours and then used for analysis.

Measurement the specimen's density:
Theoretically, to measure the density of an object we can use the Archimedes principle which can be express as:

$$\rho = \left[\frac{W}{W-W_a}\right]\rho_F \quad (1)$$

Where F_B is the buoyant force on the object, ρ_F is the density of the fluid, W is the actual weight of the object measured in air (W = mg), and W_a is the apparent weight while the object is immersed in a fluid.

Fortunately, in this study: to measure the densities of the specimens we used an instrument called the Quarrrz-AU-300S. The quarrrz-AU-300S was primary calibrated in our laboratory before following the coming steps: Firstly, after starting up the machine we pressed on the machine to display [0.000] on the screen as shown in Fig 1a. The specimen was placed onto the measuring table when M_1flicking on, and then pressing [ENTER] to display stable symbol "O" on the screen. Mass (M_1) now changes to mass(M_2) which indicate that the weight of the specimen in air was saved. Next step the specimen was placed into the nacelle with fully water and carefully press [ENTER] to display the symbol "O" again. Finally mass (M_2) was disappeared and the screen displayed the density value of the specimen as shown in Fig 1b.

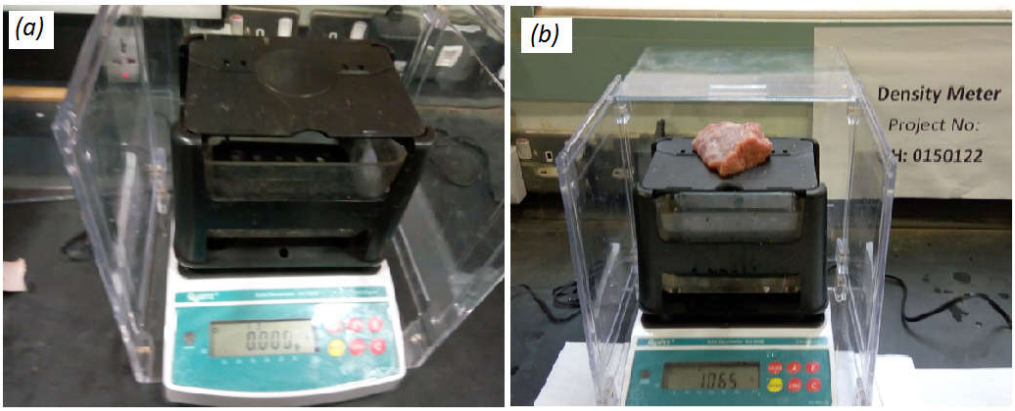

Figure 1: (a)Quarrrz-AU-300Sinstrument,and (b) display a density value of one of the specimen.

Water holding capacity (WHC)
The samples were wrapped with a nylon net and 3-pieces of filter paper. The wrapped samples were centrifuged at 3000Xg for 20 min. The percentage ratio of sample weight difference between, before, and after centrifugation, to sample weight before centrifugation provided free water content. The difference between moisture content and free water content was described as the water holding capacity index.

Microbiological analysis of chicken meat samples

Preparation of Serial Dilution
For preparation of serial dilution, 10 grams meat sample was shaken thoroughly with 90 ml sterile distilled water to give 10-1 dilution. Asset of 6 tubes containing 9ml sterile distilled water was prepared and 1ml of the suspension was transferred to the first tube of the dilution series. This was repeated up to the dilution 10-7 and 1 ml of the suspension was transferred to the first tube of the dilution series. This was repeated up to the dilution 10^7 .

Determination of total viable count
The different microbiological characteristics of different meat samples were carried out according to Harrigan and McCane [12] methods. These methods included:
Total Viable Count One ml aliquots from suitable dilution were transferred aseptically into sterile Petri dishes. To each dilution, 10–15 ml of melted and cooled (42°C) plate count agar were added. Inoculums was mixed well with the medium and allowed to solidify. The plates were then incubated at 37°C for 24 hours.
The total viable count was calculated by the standard formula
(S /S +D) × P C = TCFU

Yeast and Mould Count
From suitable dilution 0.1 ml samples was aseptically surface plated on to Potato Dextrose Agar medium (PDA) with 40 ppm Chloramphenicol added to inhabit bacterial growth .The plates were incubated at 25°C - 28°C for 48 hour as described by Harrigan and Mac Can [12]]. The counts were presented as colony forming units per gram (cfu /g).

Coliform test

One ml of sample was plated onto (MacConky Agar) media. The plates were incubated at 37ºC for 48 hours and the counts were presented as colony forming unites per gram (cfu/g).

***E.coli* detection**

Plates showing positive coliforms were subjected to the confirmed test using Brilliant green bile lactose broth in test tubes with Durham tubes. The test tubes were then incubated at 44ºC for 48 hours. Each confirmed positive tube was sub cultured into E.C. broth medium and then incubated at 44.5ºC for 24 hours. Tubes showing any amount of gas production were considered to be positive.

Salmonella detection

Ten grams of sample were weighted aseptically and mixed well with 100 ml sterile nutrient broth. This was incubated at 37ºC for 24 hours. Then 10 ml were drawn aseptically and added to 100 ml selenite broth. The broth was incubated at 37ºC for 24 hours. Then with a loopful streaking was done on dried Bismuth sulphite agar plates. The plates were then incubated at 37ºC for 72 hours. Black metallic sheen discrete colonies indicated the presence of salmonella. A confirmatory test was carried out by taking a discrete black sheen colony and sub culturing it in a Triple sugar iron agar tubes. Production of black colour at the bottom of the tube confirms the presence of salmonella.

RESULTS AND DISCUSSION

Average Densities of Chickens and other Animal Meats

Figure (2) shows the densities of Muzekah chicken (Chi),fish, cow, sheep, camel, goat, SWP (Chi), Sweater, Dead Chicken,(D. Chi), pure water, pork and blood. The average densities are extended from 1068kg/m^3 the density of Muzekah chicken to 1041 kg/m^3 the density of goat meat, with standard deviation in the range 5.3-15.6 of 1000 kg/m^3.That means the first five meats in the graph would sink deeply in both seawater as well as pure water.This finding is in full agreement with Ziauddin's statement [5, 12]. He stated that the Muzekah meat sink in water. But he couldn't mentioned the SWP meat that has a density of 1036kg/m^3 which greater than the seawater also. While the meat of the dead chicken shows less average density of 1022 kg/m^3 which isless thanthe density of seawater and greater than that of pure water followed by the density of pork and blood. It was reported that the densities of pork and blood were 970 and 620 kg/m^3, respectively [13-14] which areless than the density of pure water (1000 kg/m^3). Interestingly, it is well known that, all Muslims are forbidden to eat the meat of dead animals, the flesh of swine and blood. These three types of meats have densities less than the density of seawater and float on it. This is a simple method for Muslims to differentiate between the allowed and the forbidden fresh meats by immersing them in seawater, where if they sink means they are fresh and allowable to eat, whereas if they float, they are not permitted for him to eat. The result also gives sign that helps the consumer to determine the quality of meat.

WHC of Muzekah-Chi, SWP, dead chickens are shown in Fig. 3. It is clearly shown that the Muzekah meat has low WHC compared to the other types of meat. While higher WHC was observed in the meat of dead chicken. The low WHC of Muzekah meat decreases the volume and increases the density. Thus the Muzekah meat sinks in both sea and pure water and support the Ziauddin's statement [12]. Thus the sinking ability of Muzekah meat seems to be a suitable and simple detecting mechanism that can differentiate between it and other methods of slaughtering.

Microbiological characteristics of chicken meat

The study has taken into consideration all the samples of chicken meat that reached the Microbiology laboratory during the period from 01/11/2016 to 10/12/2016. These samples were consisted of Muzekah, Slaughtered and Dead chicken meat. The microbiological safety and quality of poultry meat are similarly vital to producers, retailers and customers, and both involve microbial contaminants on the prepared item. Two quite different groups of microorganisms are applicable: foodborne pathogens and the harmless organisms to human health, but, being psychrotrophic, are able to multiply on the product during chill storage. Spoilage results mainly from off'- smell advancement, and product shelf-life is determined both by the number of spoilage organisms present initially and the temperature history of the product at all stages of production and subsequent storage and handling [22, 17]. The microbiological characteristics of the various meat samples are presented in Table (1).Most of the tested samples of chicken show a low contamination and only a few samples had high microbial contamination. The total viable count of Muzekah, Slaughtered and Dead chicken meat was 3.4 x 10^3c.f.u./g, 7.2 x 10^3 c.f.u./g and 10.5 x 10^3c.f.u./g, respectively. While the yeast and mould count of Muzekah, Slaughtered and Dead chicken meat was 4.2x10^2c.f.u./g , 4.8x10^2c.f.u./g, and 8.0x10^2c.f.u./g, respectively. It is clearly seen that the total viable counts of bacteria and fungi (yeasts and moulds) of the dead chicken meat exceeded those

of the Muzekah, and Slaughtered chicken meat. On the other hand, coliforms were not detected in both Muzekah, and Slaughtered chicken meat, while the dead meat contained 3 x 10^2c.f.u./g. Moreover, the *E. coli* were found in relatively higher counts (2.5x10^2c.f.u./g) in contrast to the chicken meat slaughtered according to halal methods which did not contain any *E.coli* cells. *Salmonella spp.* were not detected in Muzekah, and Slaughtered chicken meat while it was found in large numbers in dead chicken meat (1.4x10^2c.f.u./g). Little *et. al*., [18] detected Salmonella spp. and *E.coli* in 7% and 0.6%) of the 183 raw meat products he tested, respectively.

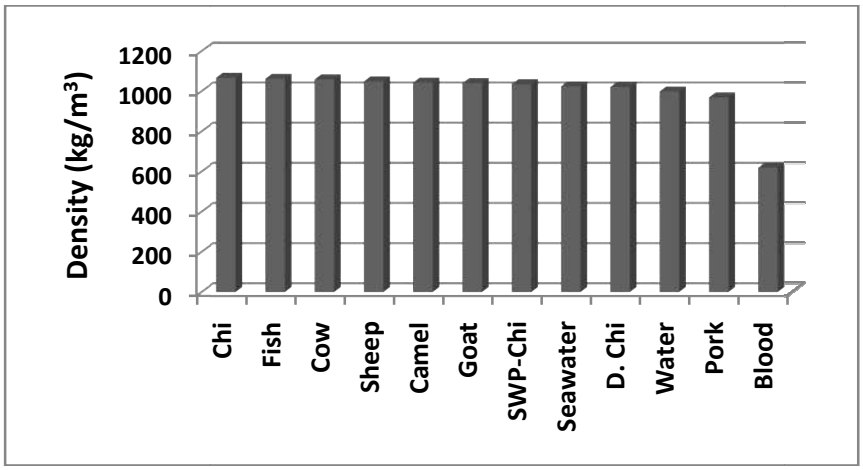

Figure 2: Densities of different types of meats

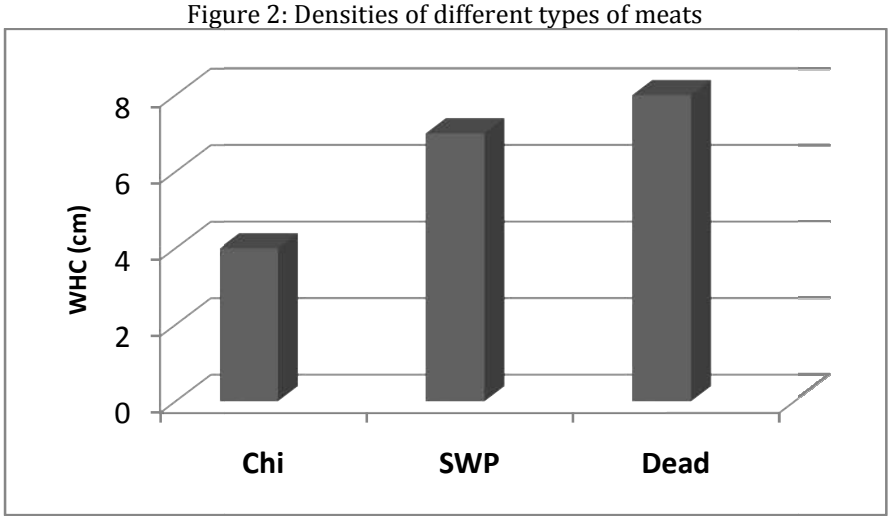

Figure 3: Water holding capacity (WHC) of different meat types .

Table (1): Microbiological characteristics of chicken meat (c.f.u./g**).**

Meat samples	Total viable count Count (c.f.u./g)	Total yeast and mould Count (c.f.u./g)	Coliform Count (c.f.u./g)	*E. coli* Count (c.f.u./g)	*Salmonella* Count (c.f.u./g)
Muzekah	3.4 x 10^3	4.2x10^2	Nil	Nil	Nil
Slaughtered	7.2 x 10^3	4.8x10^2	Nil	Nil	Nil
Dead	10.5 x 10^3	8.0x10^2	3.0 x 10^2	2.5x10^2	1.4x10^2

In general, the microbiological analysis indicated that halal slaughtering methods resulted in reducing the various microbial characteristics of chicken meat. These findings, however, coincide with those reported in the literature [23, 24] whereas they are shown to be much higher with respect to that recently found by Teldeschi [24] in samples of meat from chicken and products derived from chicken.

It has been demonstrated that virtually all the odorous substances found at spoilage could be attributed to microbial growth and metabolism [27]. Friedhoff *et al*. [8] have described the use of simple microbiological criteria, including aerobic mesophilic colony counts, *Enterobacteriaceae* counts and in some instances, enumeration of yeast to verify good manufacturing practices. Contamination of poultry

meat with food borne pathogens remains an imperative public health issue can prompt to sickness if there are misbehaviors in handling, cooking or post-cooking storage of the product. In developed countries, food borne illness causes human suffering and loss of productivity, and adds significantly to the costs of food production and healthcare. It is additionally a conceivable reason for mortality, which is even more of a problem in developing regions, where the health status of many individuals is already compromised.

CONCLUSION

It is well known that, there is no intelligence device or a specific mechanism available for consumers to check whether the meat is Muzekah or not? This paper is an attempt to determine the densities, WHC and microbial properties of chickens sacrificed through three different methods Muzekah, SWP and Dead chickens and ready animal's meat that were collected from local batchers shops. In order to identify a suitable detecting mechanism that can differentiate between the Muzekah and other methods of slaughtering. It was found that the average densities of Muzekah meats (Chicken, Fish, Camel, Cow, Sheep and Goat, SWP) are greater than the density of seawater and sink in both seawater and pure water. It is also found that, Muzekah meat has low WHC compared to other types of meat with significant values. While higher WHC is observed in the meat of dead chickens. Integrated results of the Muzkah meat showed high density, low WHC and APC that indicated it cleaned, healthy and have sinking abilities in water and seawater and permitted (*Halal*) to eat. The higher APC of the dead chicken indicates highly contaminated meat, with growth of bacteria and synthesis of gasses that increased the volume and reduced the density and enhanced the floating. The obtained results have validated, confirmed and supported Ziauddin's statement and the sinking ability of Muzekah meat.

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REFERENCES

1. Al-Qurashi. M.M. (2001). Parameters of the bagpipes in the provisions arithmetic " Page 106, first edition. Scientific library, Beirut, Lebanon (in Arabic).
2. Bell, G. (1997). "Distribution and sources of microbial contamination on beef carcasses". J Appl. Microbiol. 82 (3): 292-300.
3. Bouton, P. E. Harris P.V., and Shorthose, W.R. J. (1971). Food Science. V. 36; 435-439.
4. Bremner A. and M. JohnstonM.(1996). "Control of microbial hazards in poultry processing. In: Poultry meat hygiene and inspection.Cambridge University Press,125-148.
5. Dawson, Cragg Ross, (2000). "Qualitative Research to Explore Public Attitude to Food Safety".Food Standard Agency. Diss., Università di Milano, Italy.
6. Fernandez-Gines,J.M. Fernandez-Lopez J, Sayas-Barbera E., Perez-Alvarez J. A. (2005).Meat products as functional foods: A review. J Food Sci. 70: R37–R43.
7. Friedhoff, R.A, A.P.M. Houben, J.M.J. Leblanc, J.M.W.M. Beelen, J.T. Jansen and D.A.A. Mossel, (2005).Elaboration of microbiological guidelines as an element of codes of hygienic practices for small and/or less developed businesses to verify compliance with hazard analysis critical control point. J. Food Prot., 68: 139-145.
8. Fries, R. (2002). "Reducing *Salmonella* transfer during industrial poultry meat production".World Poultry Sci. J. 58, 527-540.
9. Gerrard D. E. and A. L. Grant A. L. (2003).Principles of animal growth and development, Kendall/Hunt Publishing.
10. Gregory. N. G.(2008)."Animal Welfare at markets and during transportation and slaughter", Meat science, Vol. 80, 2-11.
11. Harrigan, W. F. and MacCance, M.E, (1998).Laboratory Methods in Food and Dairy Microbiology.Academic press-London, UK.
12. http://go.key.net/rs/key/images/Bulk%20Density%20Averages%20100630.pdf.
13. http://www.fao.org/docrep/003/X6909E/x6909e09.htm#b5Religious%20or%20ritual%20slaughter%20(Halal%20and%20Kosher)
14. http://www.thepoultrysite.com/articles/2515/global-poultry-trends-2012-poultry-increases-its-share-of-global-meat-production.
15. Ibrahim R. , T., Begam, T. and Adam, A. B. (2010). Capacitive Discrimination of Slaughtered and Non-slaughtered Sheep and Goat Meat. Intelligent and Advanced Systems (ICIAS), ISBN 1424466237, 1–5.
16. Ibrahim, S. M., Abdelgadir, M. A. and Sulieman, A. E. (2014).Impact of *Halal* and Non-halal Slaughtering on the Microbiological Characteristics of Broiler Chicken Meat and Sausages. Food and Public Health, 4(5): 223-228

17. Ibrahim, S. M., Abdelgadir, M. A. Sulieman, A. E. and Adam.A. B. (2014).Influence of Halal and Non-Halal Slaughtering on the Quality Characteristics of Broiler Chicken Burger. International J. of Food Science and Nutrition Engineering, 4(5): 113-119.
18. Little, C., Gillespie, I., Louvois, J. and Mitchell, R. (1999).Microbiological investigation of halal butchery products and butchers.Premises. Communicable Diseases and Public Health 1999: 2: 114-8.
19. Menafn.com (2013). (Middle East North Africa Financial Network. Halal Slaughtering: A cut above the test has Great role in preventing infection diseases, says expert. MENAFN (Press) Sharjah.
20. Mulder, R.W. (1999). "Hygiene during transport, slaughter and processing". In: Poultry Meat Science. Poultry Science Symposium Series Volume Twenty-five.Eds. Richardson and Mead.CABI Publishing, 277-285.
21. Pooni GS, Mead GC. (1984). Prospective use of temperature function integration for predicting the shelf-life of nonfrozen poultry-meat products. Food Microbiology 1984; 1:67 78.
22. Ruth. R. Yeung W. and Yee M.S. "Multi-dimensional analysis of consumer-perceived risk in chicken meat". Nutrition & Food Science, Vol.32, No. 6, 219-226, 2002.
23. Tedeschi, E., (2002). Evaluation of some qualitative parametric parameters.IJFD, 24-30.
24. Tompkin, R.B., (1983). Indicator organisms in meat and poultry products. Food Technol.-Chicago 37(6):107-110.
25. Viehweg SH, Schmitt RE, Schmidt-Lorenz W. (1989).Microbial spoilage of refrigerated fresh broilers. VII. Production of off odours from poultry skin by bacterial isolates. Lebensmittel-Wissenschaft und-Technologie 1989; 22:356367.
26. Walker J., (2009)."Physics Fourth Edition" , John Wiley & Sons, Inc.
27. Walker, R.H. (2008)."Fundamentals of Physics, Eighth Edition, John Wiley & Sons.