UNIVERSITY OF EDUCATION, WINNEBA

COLLEGE OF TECHNOLOGY EDUCATION-KUMASI

FACULTY OF VOCATIONAL EDUCATION

DEPARTMENT OF HOSPITALITY AND TOURISM EDUCATION

FOOD SAFETY KNOWLEDGE AND FOOD SAFETY PRACTICS OF MEAT HANDLERS IN ABATTOIRS AND BUTCHERIES IN ACCRA METROPOLIS OF GHANA

RICHARD ASIAM

2014

UNIVERSITY OF EDUCATION, WINNEBA

COLLEGE OF TECHNOLOGY EDUCATION-KUMASI

FACULTY OF VOCATIONAL EDUCATION

DEPARTMENT OF HOSPITALITY AND TOURISM EDUCATION

FOOD SAFETY KNOWLEDGE AND FOOD SAFETY PRACTICES OF MEAT HANDLERS IN ABATTOIRS AND BUTCHERIES IN ACCRA METROPOLIS OF GHANA

RICHARD ASIAM

A Dissertation in the Department of Hospitality and Tourism Education, Faculty of Technology Education, Submitted to the School of Graduate Studies, University of Education, Winneba In Partial Fulfillment of the Requirements for the award of the Master of Technology Education (Catering And Hospitality) degree.

DECEMBER, 2014

DECLARATION

Student's Declaration

I, **RICHARD ASIAM**, declare that this thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE: …… DATE: ……

Supervisor's Declaration

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Thesis laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: **MR. MICHEAL TSORGALI**

SIGNATURE ……

DATE ……

ACKNOWLEDGEMENT

I want to give thanks to the Almighty God for his protection and guidance in life and in undertaking this study. My heartfelt gratitude also goes to my supervisor, Mr. M. Tsorgali, whose suggestions, criticisms and recommendations have made this work a huge success. I will also like to say a big thank you to the butchers at the abattoirs in the Accra Metropolis who agreed to participates in this study.

Finally, to everyone who in one way or the other helps in this study to be a successful one. I thank you all for your sacrifice and prayers.

DEDICATION

This long essay is dedicated to God Almighty for seeing me through numerous hurdles, May His name be praise forever.

TABLE OF CONTENTS

CHAPTER TWO: LITERATURE REVIEW

CHAPTER THREE: METHODOLOGY

CHAPTER FOUR: RESULTS AND DISCUSSION

LIST OF TABLES

LIST OF FIGURES

FIGURES **PAGE**

LIST OF ACRONYMS

AMA	Accra Metropolitan Assembly
GSA	Ghana Standards Authority
FDA	Food and Drug Authority
EPA	Environmental Protection Agency
ESID	Environmental and Sanitation Inspectorate Division
MOFA	Ministry of Food and Agriculture

ABSTRACT

The safety of meat on the Ghanaian market, particularly those slaughtered locally, has been a source of concern over the years. Butchers slaughter animals on the bare ground and singe the fur with lorry tyres which is an unpleasant scene observed in James Town and other areas in Accra and its surrounding communities. The research design was mainly a mixture of both quantitative and qualitative descriptive study which covered a sample of 170 respondents. Multistage sampling was used to arrive at the final sample size and in depth interviews and questionnaires were used for the primary data collection. The findings of the study indicated that animal wastes were openly disposed of near the abattoirs attracting carnivorous animals such as vultures and dog. Improper cleaning of equipments and butchering platforms; the use of car tyres to burn and roast animals; ineffective supervision by law enforcement agencies; poor sanitation within the abattoir and illiteracy on the part of the butchers are threats to the safety of meats from these abattoirs It was concluded that there are several laws enacted to ensure food safety. However these laws are not effectively enforced in the abattoirs hence butchers engage in practices which could lead to microbial contamination of meat. The study recommended that public education on the various laws governing food safety should be intensified to enlightened butchers and the general public on the roles of these food laws.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter introduces the study. It presents the background information of the study, followed by the problem statement. Other issues discussed are the objectives of the study and the research questions as well as the scope of the study.

1.2 Background of the Study

Each year, millions of people worldwide suffer from food-borne diseases and illnesses resulting from the consumption of contaminated food which has become one of the most widespread public health concerns in the contemporary world (Sanlier, 2009; Smith, 2013; APEC, 2009). Analyses of food-borne disease notifications throughout the world have shown that the majority of outbreaks result from practices during food processing and preparation in small food businesses, in residential homes and other places where food is process and prepared for human consumption (Seaman, & Eves, 2006).

Food borne diseases occur commonly in developing countries particularly in Africa because of the prevailing poor food handling and sanitation practices, inadequate food safety laws, weak regulatory systems, lack of financial resources to invest in safer equipment and lack of education for food-handlers (WHO, 2004). Of the foods intended for humans, those of animal origin tend to be most hazardous unless the principles of food hygiene are employed. Animal products such as meats, fish and their products are generally regarded as high-risk commodity in respect of pathogen contents, natural toxins and other possible contaminants and adulterants (Yousuf, Ahmed, Yeasmin, Ahsan, Rahman, 2008).

Bacterial contamination of meat products is an unavoidable consequence of meat processing in Accra, the capital city of Ghana which is presently experiencing rapid growth. As a result, the number of commercial food establishments in the city has been visibly increasing. The source of meat for all these commercial food establishments is the Accra metro abattoirs. Additionally, these abattoirs provide meat requirements for higher institutions. However, the qualities of the available abattoirs in the city are below standard and had no basic facilities like stunning, bleeding, evisceration and cooling rooms.

Food safety and sanitation are very important issues for the success of the food industry. Customers expect to be served or supplied with safe and wholesome food, and a food borne disease outbreak can ruin the food industry. According to the Food Law in Ghana (PNDC L305B), it is an offence to offer for sale food that is not of nature, substance and or quality. Meat can be contaminated at several points along the flow of meat processing to consumption. It can be contaminated where the animals are slaughtered or during the processing in the plants. It can also be contaminated while being transported and during final preparation at the establishment. Worthington, Roberts, Williams, (1996) acknowledged that the knowledge about food safety and good hygiene practices of people within a community influences the quality of life of the people. Thus, gaining understanding about food safety and hygiene gives individuals and the society the opportunity to cut down their risk from many food borne diseases.

According to Adzitey (2010), the isolation of various bacterial in chevon and mutton sold in Tamale metropolis indicated the lower standard of hygiene operating in the slaughtering, processing and sale of meat. The abattoirs are normally controlled by local bodies, which should follow the standards prescribed, but due to non-

existence of modernized abattoirs, environmental pollution is arising out of the slaughtering activities. The waste and wastewater from the abattoirs and butcheries are not being treated in an integrated waste treatment solution which therefore could not end up being used as compost, biogas and clean water. From Ashanti Region, routine reports from Kumasi Slaughter houses include cases of zoonetic disease as asserted by Otupiri, Adam, Laing, Akonomori (2000). This behavior of butchers not observing high standard of hygiene and not complying with the basic food laws in the country will do more harm to the people in Accra Metropolis and to the health of the entire nation.

Also, residents around the Sunyani Abattoir at the Nana Bosoma Central Market on Tuesday, April 30, 2013 expressed concern about its unsanitary conditions and feared an outbreak of a contagious disease Ghana News Agency (GNA,2013).The GNA in an interview at Sunyani stated that they could not accommodate the bad odour which emanated from the abattoir. The workers had to slaughter and prepare the carcass on the bare floor because there were no hooks to hang them on. One butcher who spoke on condition of anonymity explained that it was built in 1972 since then the abattoir had not seen any major rehabilitation. This is due to the fact that the butchers do not wear any protective gear; some of them get sick regularly since they are forced to breathe the bad odour at the facility.

1.3 Statement of the Problem

The safety of meat on the Ghanaian market, particularly those slaughtered locally, has been a source of concern over the years. Butchers slaughter animals on the bare ground and singe the fur with lorry tyres which is an unpleasant scene observed in James Town and other areas in Accra and its surrounding communities. A visit to

Ashiedu Keteke a Sub-metro of Ododoidio Constituency in Accra Metropolis shows that, butchers in 'London' market abattoir do not adhere to strict hygienic rules and regulations thereby breaching the food laws of the country. The butchers know little about food safety; food rules and personal hygiene. This make butchers slaughter and sell meat to their customers in an unclean environment and under uncontrolled temperature. Harmful materials such as lorry tyres are used to singe the smaller animals such as Goats, Sheep and the skin of cattle. This practice poses casinogenic diseases to the health of consumers. Thus, the safety of meat sold in the Ghanaian market cannot be guaranteed because it appears there are unsanitary practices in the abattoirs and butcheries. A lot of questions are being raised by consumers about the safety of meat from the various abattoirs. There is little scholarly works on the area of meat safety in the abattoirs and butcheries in Ghana. In view of these problems, this study sought to assess the existing food safety knowledge and practices of food safety of meat handlers in abattoirs and butcheries in Ghana using the Accra Metropolis as a case study.

1.4 Purpose of the Study

The purpose of the study was to improve food safety knowledge and practices in abattoirs and butcheries that lead to microbial contamination in Accra Metropolis.

1.5 Objective of the Study

The objectives of the study were to:

1. examine the food safety situation in the abattoirs and butcheries
2. explore the food safety regulatory systems operating in the abattoirs and butcheries.

3. identify the practices of meat handlers in abattoirs and butcheries that contribute to microbial contamination and to recommend effective safety practices for meat handlers and butchers.

1.6 Research Questions

In pursuant of the above objectives the following research question were formulated to guide the study.

1. What is the food safety situation in the abattoirs and butcheries?
2. What is the food safety regulatory system that operates in the abattoirs and butcheries?
3. What are the practices of meat handlers in abattoirs and butcheries that contribute to microbial contamination in the Accra Metropolis?

1. 7 Significance of the Study

- The research findings will assist authorities (AMA) concerned in the Metropolis and policy makers to regulate and streamline the activities of butchers and abattoirs to minimize contamination. It will also help health inspectorate of the Metropolis to enforce laws regarding the operation and management of abattoirs. This will bring about standardization of abattoir and butcheries.
- The research findings will also bring to light the level of food safety knowledge among the butchers and the hygienic practices adopted in the handling of meat. The realization of the short fall in food safety knowledge by butchers and its impact on microbial contamination will serve as a catalyst to update their knowledge and also to acquire modern skills and knowledge

regarding abattoir practices through education and training programs which will help bridge knowledge gap in their work, bringing about efficiency in the abattoir and butcheries, thereby minimizing microbial contamination.

- Again, the research will help bring about standardization and regulation of activities of abattoir which eventually will aid in eliminating health hazards posed to the butchers due to the working conditions prevailing prior to the research. This will therefore create a congenial and health hazards free environment for the butchers, thereby averting any health risk associated to their working environment.
- Finally, the study will also serve as related literature to future researchers embarking on similar work and help build on the researcher's knowledge and understanding of the study variable. It will also help the researcher to appreciate food safety knowledge and practices of abattoirs and butcheries.

1.8 Scope of the Study

This study is limited in scope to the food safety knowledge and food safety practices of meat handlers in the abattoirs as well as the awareness foods safety laws or regulations in abattoirs in the Accra Metropolis of Ghana. The study is limited to the abattoirs where the animals are slaughtered and dressed for the markets (butcheries). This is because the activities of the butchers in the abattoirs are not in the glare of the public and for that matter the consumer as compared to the activities of butchers in the butcheries in the various markets where they try to observe hygienic practices in order to attract more clients. Geographically the study was limited in scope to the Accra Metropolis. This study area was chosen because the area is densely populated and as such any blemish in meat safety practices could hand a serious blow to public.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviewed related literature. The literature outlines what is known or works done by others in the research area. It also identifies some of the gaps in existing knowledge in the area of food safety. The literature was organized into variables as per the specific objectives of the study as captured below.

- Concept of food and food safety
- Food safety rules and regulation(Foods Laws)
- Practices of Meat Handlers in Abattoirs and Butcheries
- Microbial contamination of meat
- Hygienic Practices in abattoirs and butcheries

2.1 Concept of Food and Food Safety

Scientifically, food is any substance consumed to provide nutritional support for the body (Adigbo and Madah, 2008). It is usually of plant and animal origin and contains essential nutrients such as carbohydrates, fats, protein, minerals and vitamins. The substance is assimilated to provide energy, maintain life or stimulate growth.Food and DrugsAct (PNDC Law 305B, 1992), define food as any article manufactured, sold or represented for the use as food or drink for human consumption, chewing gum, water and any ingredient of such food, drink, chewing gum or matter. Codex (1997) stated that food is any substance whether processed, semi-processed or raw which is intended for human consumption and includes drinks, chewing gum and any substances which has being used in the manufacture,

preparation or treatment of 'food' but does not include cosmetics or tobacco or substances used only as drugs.

From the above definitions, one can say that food is such an important part of an occasion that people cannot do without, therefore, it should be handled well to ensure its safety.

According to United Nations Population Division (UNPD) (1998), the nutritional status, health, physical and mental faculties depend on the food we eat and how we eat it. UNPD (1998), pointed out that access to good quality food has been man's endeavour from the earliest days of human existence; hence safety is a basic requirement of food quality.

The American Society of Safety Engineers (2009) defined safety as the state for which the risks are at an acceptable level, and tolerable in the setting being considered. Knechteges (2012) is also of the view that safety is a relative freedom from danger, risk or threat of harm whether caused deliberately or by accident.

The World Health Organisation (2008) defines food safety as the assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use. Food safety according to McSwane, Rue, Lintion & Williams (2012) is the state of acceptable and tolerable risks of illness, disease or injury and harm from the consumption of food. Food safety encompasses actions aimed at ensuring that all foods are as safe as possible.

Food safety implies absence or acceptable and safe level of content adulterants, naturally according to toxins or any other substance that may cause food injuries to health on an acute or chronic basis (UNPD, 1998). Food safety and sanitation are the very issues for the success of the food industry and good health (Robinson, 1998). Food establishments provide the last line of defence in controlling

or eliminating the hazards that cause food borne illness (McSwane, Ruc, Lincon and Graf, 2003). For people to be well nourished and healthy, the food they eat must be safe and of good quality (Robinson, 1998).

Effective food safety programmes requires managers, supervisors and people in charge who are knowledgeable about hazards associated with contaminated food (McSwame et al, 2003). According to Otupuri, Adam, Laing and Akonomori (2000) the butchers in Kumasi never receive any form of training, the knowledge, attitude, belief and practices are largely inadequate for their profession in view of the important role the butchers play. Food safety also requires that the person in charge must be committed to implementing safe food handling practices and workers trained to understand proper hygiene and food hygiene practices (Wardlow, 2000).

From the above, food safety policies and actions covers the entire food chain from production to consumption. A lot of things affect food before they are consumed, some of these things are environmental and artificial contaminants from hazardous water, industrial pollution, pesticides that are chemically added to crops to restrict and regulate insects, weeds and plant growth, micro-organism such as bacteria, mould, viruses and parasites and enzymes which aid maturity make food unwholesome.

Therefore, it is very important to ensure safety throughout the chain of food production, the practices of abattoirs and butcheries in ensuring food safety cannot be down played.

2.2 Foods Safety Rules and Regulation (Foods Law)

According to Mensah, Goodman, Zaza, Moultori, Kocher, Dietz and Pechack (2007) Law is a fundamental element of effective public health policy and practice that played a crucial role in many of public health's greatest achievements of the 20th century.

The focus of food laws in all countries is to:

- Protect public health
- Convey information to consumers
- Protect against fraud (food safety, health claims, food labelling, GMPs, sanitation requirements etc).
- Assure fair trade practices

-Issues of hormone residue in beef between the EU and the USA

-Issues on fruit juice, drink and nectar in Ghana.

- Application of pesticides

2.2.1 Food and Drugs Act (PNDCL) 305B 1992)

An act to provide standards for the sale of food and drugs and/or related matters

Prohibition against the sale of unwholesome food

1. A person commits an offence if that person sells or offers for sale a food:
   a. that has in or on it a poisonous or harmful substance.
   b. that is unwholesome of unfit for human or animal consumption.
   c. that consists in whole or in part of a filthy, putrid, rotten, decomposed or diseased substance.

      that is adulterated

d. that is injurious to health or

e. that is not of nature, substance or quality prescribed by standards.

2. In determining whether an article of food is injurious to health, regard shall not only be to the probable effect of that article on the health of a person consuming it, but also to the probable cumulative effect of articles of substantially similar composition on the health of a person consuming the article in ordinary quantities.

Section 2

Standards of Food

Where a standard is prescribed under an enactment for food, a person who manufacturers, labels, packages, sells, or advertises food in a manner that is likely to be mistaking for food or the prescribed standard commits an offence.

Section 3

Prohibition against Sale of Poor Quality Food

A person who sells to the prejudice of a purchaser a food which is not of the nature, substance or quality of the article demanded by the purchaser commits an offence. It is not a defence to an offence under subsection (1) to plead that the purchase was not prejudiced because the food was bought for analysis or for the purpose other than consumption.

Section 5

Manufacture of Food

A person shall not manufacture a food for sale unless the food is manufactured under the supervision of a person with appropriate knowledge and qualification who can ensure the purity and wholesomeness of the food.

Section 6

Sale of Food under Insanitary Conditions

1. A person who sells, prepares, packages, conveys, stores, or display for sale a food under insanitary conditions commits an offence.
2. Food shall be stored and conveyed in a manner that preserves its composition, quality and purity and minimizes the dissipation of its nutritive properties from climatic and any other deterioration conditions.

Section 7

Food Unfit for Human Consumption

1. A person who
    a. sells or offers or exposes for sale or has in possession for sale, or
    b. deposits or consigns to any other person for the purpose of sale,
    c. Food intended for, but unfit for, human or animal consumption commits an offence.
    d. Where a food in respect of which an offence with paragraph (a) of subsection (1) has been committed was sold to the person charged by any other person, that other person commits an offence.

9. **Penalty and Defence**

1. A person who is found guilty of an offence under section 1, 2, 3, 4, 5, 6, 7, or 8 is liable on conviction to a fine not exceeding five hundred penalty units or a term of imprisonment, not exceeding two years or to both the fine and the imprisonment and is liable, in the case of continuing offence to a further 25 penalty units for each day during which it continues.

Defence

2. In proceeding for an offence under the sections referred to in subsection (1),in respect of a food containing an extraneous matter, unless the presence of the extraneous matter has rendered the food injurious to health, it is a defence for the accused to prove that the presence of threat matter was an unavoidable consequence and form parts of the process of preparation or collection of that food (2), In proceedings for an offence consisting of the advertisement for sale of a food, it is a defence for the accused to prove that the publication was received and made in the ordinary course of business of the accused as a publisher.

Closure of the Premises

The minister shall, on the advice of the board, order the closure of any premises where food is manufactured, prepared or sold, if the board has reason to believe that the food is exposed to the risk of contamination and the appropriate in the circumstance.

2.2.2 European Food Act (1984)

Section 1

It is illegal either to do anything to food to make it harmful to health or to offer sale any food which has been made harmful to health.

Section 2

It is an offence to offer for sale food which is not of nature, substance or quality demanded by a purchaser.

Section 8

It is an offence to offer for sale food which is unfit for human consumption.

2.2.3 1990 Food Act UK Offence Summary

7. Rendering food injurious to health can be temporal, permanent or cumulative.

8. Selling or processing food

Unfitness as food, injurious to health or contaminated such that it will be unreasonable to expect to be eaten e.g. Maggots in ice cream, hair/metal in food.

14. Selling to purchasers prejudice (under self pretence i.e. fraud) if the purchaser knows it is not an offence.

2.2.4 Animal Slaughterhouse and Meat Inspection Act, 2055 (1999)

Act No.26 of the Year 2055 B.S (1999) Nepal

According to Sefa-Dede (2009) there is lack of legal structure on meat inspection procedure in Ghana. It is yet to be pass by parliament. Animal Slaughterhouse and Meat inspection Act 2055 (1999), B. S. Nepal has been used for the study since all food laws as described by World Health Organization(WHO)

(2008), have a common focus of ensuring the safety of the consumer; meet the demands of quality and safety of both internal and external market and to make profit.

Section 2

No Establishment of a Slaughterhouse or Selling of Meat be Made Without Authorization:

Nobody shall establish a slaughterhouse or become a meat seller without obtaining license under this Act.

Section 3

Establishment of Slaughterhouse:

1) The Government of Nepal may establish slaughterhouse in any area of Nepal by a notification published in the Nepal Gazette.
2) Notwithstanding anything contained in sub-section (1), the Government of Nepal may give permission as prescribed to the non-governmental (Private) sector also to establish a slaughterhouse.
3) The terms and conditions to be followed and the specification to be met at the time of establishment and operation of a slaughterhouse under sub section (1) or (2) shall be prescribed.

Section 4

License:

(1) A person or an organization interested in establishment of a slaughterhouse or selling of meat shall have to apply for a license in the prescribed format to the prescribed officer.

(2) If an application is received under Sub-section (1) the prescribed officer shall make necessary inquiries on such application and may issue a license in the prescribed format for the establishment of a slaughterhouse or for selling meat.

(3) The terms and conditions to be followed by a meat seller shall be as prescribed.

Section 5

Examination of Animals before Slaughtering (Ante-mortem Examination)

1) Any animal to be slaughtered shall be produced for ante-mortem examination at the slaughterhouse where such place is established and where slaughterhouse has not yet been established at the site as specified by the Meat Supervisor. The procedure for examination of animal shall be prescribed.
2) If an animal is found fit for slaughtering, the Meat inspector shall give permission of slaughtering of such animal with some marking.
3) If an animal is found diseased upon inspection under Sub-section (1) the Meat inspector may prohibit slaughtering of such animal.

Section 6

Slaughtering of an Animal to be carried out in the Slaughterhouse:

(1) An animal fit for slaughtering under Section 8 shall have to be slaughtered in the slaughterhouse.

(2) Notwithstanding anything contained in Sub-section (1),if there is no slaughterhouse in any area animals shall have to be slaughtered at such place and time as specified by the Meat Supervisor.

Section 7

Examination of Meat of the Slaughtered Animal:

(1) The Meat Inspector shall have to inspect the meat of the slaughtered animal under section 9 as prescribed.

(2) If any defect or disease is found in the meat of the slaughtered animal upon examination under Sub-section (1), the meat Inspector may partially or completely prohibit the sale or distribution of such meat.

(3) For the purpose of this Section the Government of Nepal may specify a laboratory for examination of meat.

Section 8

Prohibition on the Sale of Meat:

(1) No sale of meat of the animal other than as mentioned in Sub-section (1) of Section

2 shall be allowed.

(2) No sale of meat of dead animal due to disease or any other cause shall be allowed.

(3) No sale of meat with skin shall be allowed.

Provided that, this Section shall not prevent for sale the meat of birds, pigs, wild pigs or boars and the meat of species identifying organs or portions of head or legs of the animal with skin.

Section 9

Stamp of Marking of Meat:

(1) The Meat Inspector shall have to affix clearly visible stamp or mark as prescribed at the time of giving permission for the sale of meat after examination of meat of the animal.

(2) No meat seller shall sell any meat without having stamped or marked under Subsection (1)

Section 10

Penalties:

(1) A person who violates Sub-section (1) or (3) of Section 8 Section 9, Sub – section (2) of Section 10, Sub-section (3) of Section 11 or Sub –section (2) of section 12 shall be liable to a fine up to Five Thousand Rupees for the first time and Ten Thousand Rupees or an imprisonment up to one month or both from the second time and onwards for each offence.

2.2.5. Due Diligence Defence

Every food handler, whether they prepare, manufacture, serve or transport the food, has a responsibility to make sure that it is safe to eat. If the food is found to be unfit to eat, person responsible can be prosecuted unless he or she can prove they took every reasonable precaution or she exercised due diligence to avoid causing the offence. This defence can be established if a food handler can proof that it was the fault of another person, or someone that they trusted carried out all necessary checks, that he or she had no reason to believe that their omission or action that they had taken would result in an offence (Caserani, 2005).

Due diligence can be claimed if a person in the food industry was supplied with ready- prepared meals that, after consumption, caused food poisoning. The food handler would have to prove that he or she had taken all reasonable precautions to avoid situation occurring by carrying out all the necessary checks on the method of production and by obtaining details of storage and transportation temperatures of the food before delivery. Written records that show dates and the types of checks made are very important and would form a crucial part of the evidence. (Ceserani, Kinton & Fosket, 2005).

There are many federal laws and programmes in place to attempt to lower the rates of food borne infection. They cover a wide variety of issues, including regulation of meat production (with specific quality standards) and programmes to help educate the public about food safety. One such programme, The National Food Safety Initiative (FSI) was launched in 1997 and focused on "improving data on pathogens, coordinating regulatory responses, consumer educational efforts and behavioral surveillance." Industry efforts to lessen the spread of disease include milk pasteurization, "sanitary control" on farms, and the development of the Hazard Analysis and Critical Control Point (HACCP). The Critical Control Point(CCP), according to a study published in the Journal of Food Safety in 2004, is "a point, step, or procedure in a food process at which control can be applied, and as a result, a food safety hazard can be prevented, eliminated, or reduced to acceptable levels. Food "processors must use CCP critical limits that have been scientifically validated" to prevent the growth of pathogens. Specifically for meat, since pathogens grow in warmer temperatures, the CCP is related to time and temperatures meat is allowed to remain. As of 2004, the maximum "regulatory limit" for poultry during production was 13 degrees Celsius (13oC).

2.2.6 Current U.S Meat Regulations/Programmes

There are many federal level programmes in place to attempt to lower the rates of food borne infection. They cover a wide variety of issues, including regulation of meat production (with specific quality standards) and programmes to help educate the public about food safety. One such programmes, the National Food safety Initiative (FSI) was launched in 1997 and focused on "improving data on pathogens, coordinating regulatory responses, consumer educational efforts and behavioral surveillance". Industry efforts to lessen the spread of disease include pasteurization of milk, "sanitary controls" on farms, and the development of the Hazard Analysis and Critical Control Point (HACCP). The CCP, according to a study published in the Journal of Food Safety in 2004, is "a point, step, or procedure in a food process at which control can be applied, and as a result, a food safety hazard can be prevented, eliminated, or reduced to acceptable level. Food processors must use CCP critical limits that have been scientifically validated" to prevent the growth of pathogens in warmer temperatures, the CCP is related to the time and temperature meat is allowed to remain. As of 2004, the maximum "regulatory limit" for poultry during production was 13 degree Celsius (Halebak & Schdosse, 2008).

2.3. Hygienic Practices in abattoirs and butcheries

In developed world, according to Giritlioglu, Batman and Tetik(2010) there exist strict legal regulations on the hygienic standards of handling and processing of meat. In most developing countries especially in rural communities, standard and hygienic methods of handling and processing meats are given less attention even though they are or form part of the countries rules and regulations on animal and meat production. For instance, in most rural areas of Ghana, perhaps due to certain constraints such as inadequate education, unavailability of portable water and reliable

power (electricity) supplier, meat processing is traditionally carried out in unhygienic conditions. Slaughter methods are sometimes dictated by religious beliefs and customs without inspection by qualified veterinary officers.

2.3.1 Hygiene

Ceserani,Kinton, and Foskette (2005) are of the view that hygiene is the science and practice of pre-saving health and is one of the most important subjects for all persons working in the food industry. Whiles Greek goddess year sees hygiene as a set of practices performed for the preservation of health. Hygiene in its fullest and original meaning goes much beyond that to include all circumstances and practices, lifestyle issues, premises and commodities that engender a safe and healthy environment. WHO (2008) refers to hygiene as conditions and practices that help to maintain health and prevent the spread of disease. Hygiene has been classified into three areas according to Ceseraniet (2005) and Adigbo and Madah (2010) Personal, Kitchen or Environment, and food hygiene.

Noss and Rady (1993), asserted that meat requires special handling because it contain bacteria and high moisture content and rich nutrient that favours microbial growth. This implies that meat left lying on butchers table from morning to evening is susceptible because it receives more handling and has more surface exposed to bacterial contamination. Kuta (2000) supported this view by saying that at time such carcasses are almost beginning to decompose but they are sold to the public. Therefore any individual who handle food must observe basic food Hygiene (FH), Personal Hygiene (PH), Good manufacturing practice (GMPs), Good Environmental Hygiene (GEH) and standard operational procedures (SOPs).

The practice of clean habits in food industry is the only way to achieve a standard of hygiene (Ceserani, 2005).Also Ofosu-Ampofo (2011)pointed out that ,the abattoirs and butcheries in Ghana are currently in a bad state therefore there is the need to maintain a certain level of hygiene. In poorly managed market environment particularly in Ghana, unhygienic practices are the major cause of food poisoning and contamination (Soyiri, Agogli and Dongdem, 2008) .In 1998, FDA, in cooperation with USDA, issued the guide.

The basic principles of the guide are to prevent microbial contamination of fresh produce through the use of good quality water, proper health and hygiene, and sanitation practices.

2.3.2 Clean Habit Practices

Ceserani et al (2005) pointed out that the practice of clean habit is the only way to achieve satisfactory standards of hygiene. Adigbo and Madah(2010), also spelt out the following clean habits practices:

- Bath regularly, at least twice a day.
- Keep fingernails clean and well groomed. Fingernails should be trimmed and clean. Long and ragged nails harbour bacteria and are difficult to keep sanitary.
- Keep hair away from face and avoid touching hair while you work. Cover hair with a cap, net or scarf.
- Wear clean clothes and apron when working around food. Bacteria can accumulate on dirty clothes. Avoid or roll long sleeves, which can dip into foods.

- If you have an open sore or cut, do not handle food (unless you wear plastic gloves). Open sores are the major source of bacteria.
- Jewellery, rings and watches should not be worn.
- Nose and mouth should not be touch with the hands when handling food.
- Cough and sneeze into a handkerchief, not over food. People with colds should not come into contact with food.
- Table should not be sat on.
- Only healthy people should handle food.

According to Pastage (2008) the normal flora for staphylococcus is the skin of humans and animals and this can be transmitted onto food. McSwame (2003), also stated that staphylococcus causes meningitis, foot bamble, arthritis, black pox, boils scalded skin and other causes of food poisoning resulting in severe vomiting, and diarrhoea, sore throat and fever.

2.3.3. Hand Washing

Jol, Kassianko, Kyat and Ggel (2010) mentioned that hand washing is the most single important procedure for preventing infection and illness .Hand washing is one of the most important hygiene principles in the prevention of infection .Employing good hand washing techniques, many disorders can be avoided such as food poisoning, wound infection and maintaining the general health of the hand and nails. Mensah, Yeboa, Owusu-Darko and Ablordy (2002) explained that many Ghanaians do not care how dirty their fingers are when handling money so the butcher with his bloody fingers, the artisan with dirty dusty hand, the street food vendor with the wetly and oily hand receive or pick Ghanaian currency notes with hand leading to contamination of the notes by micro organisms hence causing cross contamination to

food. Hands must be washed thoroughly and frequently, particularly after using the toilet, before commencing work and during the handling of food. This assertion is supported by Ceserani (2005) they said it is always useful to wash the hand after handling money, blowing the nose, disposing of rubbish and cleaning. It is necessary to wash both hands after arriving at work and taking break, handling raw meat, poultry or fish, touching dirty dishes, equipment and utensils and handling garbage and phone (Robinsons, 2000).

An effective hand washing according to Jol *et al* (2010) needs nothing more than warm water, soap and a clean dry towel. This view was supported by Robinson (2000), he said that hand should be washed with hot water, with the aid of nail brush and anti-bacterial soap. After washing, hand should be rinsed and dried with towel, suitable paper or by hot-air drier. Hands should be washed with soap under warm running tap for at least 20 seconds, wash thoroughly paying special attention to germ that may be trapped under nails and in crevices and rinsed well to remove all traces of soap. Dry hands with paper towels; use a paper towel to turn off the faucet after washing hands. To ensure that hand wash is effective, the hand should firstly be moistened with warm water followed by the application of a general soap. Jol (2004), observed that using a repetitive motion, the palm, fingers, wrist and back of the hands and nail bed should be cleansed with special attention.

Robinson (2004) stated that areas most frequently missed during hand washing are the fingers, the crease between the fingers and the crease between the thumbs. Special attention should be made to the nail and nail beds as these are areas that frequently miss and harbor most germs due to the anatomical structure (Jol *et al*, 2004). According to FDA Codes, hands should be washed in separate sink specified as hand washing sink. Hand sanitizing lotions must never be used as a replacement for

hand washing (McSwane *et al*, 2003). Ansa et al (2006) revealed that butchers and meat sellers pay little attention to their personal hygiene and serve meat with dirty hands and clothing.

2.4 Practices of Meat Handlers in Abattoirs and Butcheries

2.4.1. Cleaning Techniques in Meat Plant

According to Bibec (2004) the first step in floor and equipment cleaning is to physically remove scrap that is coarse solid particles, with a dry brush or brush or broom and shovel. This is usually referred to as 'dry cleaning'. Baird (2005) revealed that using large amount of water to remove this material would be extremely wasteful and eventually cause drains to clog and waste water treatment facilities to become overloaded. Baird further explained that more profound clean-up procedures require water in sufficient quantities. Baird made it known that cleaning method commonly used in the meat industries is high pressure cleaning. The pressurized water is applied by high pressure units and special spraying lances. The pressure should be between 30-70 bars and the spraying nozzle 15cm from the surface to be cleaned. Using brushes or scrapers is widely applied in small-scale operation although labour and time-intensive.

Busta (2008) also explained that application can be by hand using brushes or scrapers for dismantled equipment or in general for smaller surface cleaning. Mechanical cleaning with high pressure equipment together with cleaning solutions is used for larger floor and wall areas as well as working tables, containers and equipment. Busta expressed that hot water should be used and the temperature should be 55^0C in order to achieve sufficiently high temperatures at the surface particularly for fat removal. High pressure water is efficient for surface cleaning after

dry-cleaning of scrap. It serves for removal of remaining small solid parts, blood and dirt from the entire floors and walls the processing sections as well as for the removal of meat and fat particles and layers of protein from tools and equipment. As hot water has a much better cleaning effect than cold water, hot water should be available for this purpose.

Bibec (2004) opined that the removal of loose dirt and meat fat residues by water does not mean that the cleaning was complete. Sticky or encrusted layers of fat or protein will still exist and must be removed. For this purpose chemical cleaning solutions can be very effective. Gould (2004) described the traditional cleaning substances for manual use as alkaline, such as sodium carbonates (Na_2CO_3 washing soda). Gould said these substances are efficient in dissolving protein and fats, but may cause corrosion in tools and equipment, if their pH is 11and above. Commercially available cleaning agents in modern cleaning practices are complex compositions of alkaline, acid or neutral chemical substances. In order to improve their dirt loosening properties, surface-active agents, also called surfactant or detergents are added. Ahmed (2010), said that detergents decrease the superficial tension of water. Water can then penetrate into the small spaces between dirt particles and surface, where those particles are attached, thus facilitating their removal. But for fat removal, Gould (2005) stated that pressurized hot water and cleaning Detergent are important as they keep the fat dissolved and prevent fats setting down after the water temperature has decreased. According to Ahmed (2010), detergents may have additional cleaning components such as chlorine, silicate or phosphate. It is important that manufacturers indicate the type of the substance, alkaline, acidic or neutral on the product label. Gould (2005), acknowledged that cleaning substances together with the suspended dirt particles and fat must be rinsed off immediately after cleaning.

According to Baird (2005) a relatively new cleaning method for the food industry particularly the large-scale plants is sprayed foam on wetted walls, floors and surface of equipment. Water foam containing detergents and other cleaning agents does not run off but clings to the surfaces. This allows a longer time contact on the surface to be cleaned. After a sufficient impact period (15 minutes) the foam is washed down with water (water hose or low-pressure water spray). As no high pressure water spraying is needed for washing off the foam, the spreading of water droplets (aerosol) in the room to be cleaned is minimized using potable water.

2.4.2. Disinfection Techniques

Baird (2005) found that cleaning reduces a substantial amount of micro organisms but it does not have the potential to completely eliminate all surface contamination. Persistent microorganisms will be in the food to be processed and continue to grow in number by using remaining protein as nutrients and pose a further risk to the Food. Gould (2004) said that the elimination of micro organisms is achieved through disinfection, either by using hot water (better steam) or chemical disinfectants. Busta (2008), opined that chemical disinfectants are preferred to most applications in the meat industries as they are easy to use and do not involve the risk of accidents or other negative side effects such as damage to equipment, by generating high humidity or water condensation which may occur when using steam.

Busta further explained that best disinfection results are achieved when chemical disinfection is preceded by intensive dry or wet cleaning against the disinfection chemicals. Moreover, reaming protein may inactivate chemical.

As stated by Baird (2005) adequate rinsing with water after cleaning and prior to disinfection is also indispensable as chemical disinfectants may be neutralized by remaining cleaning substance. All these have to be taken into account; otherwise the disinfection procedures may be ineffective and hence waste of money. A compromise on this issue is proposed by the chemical industry by offering combined disinfection or cleaning agents. They are made on the basis of quatemary ammonium compounds which have surfactant and disinfectant properties. The combined method should be considered only in cases of very little dirt contamination (Busta, 2005).

According to Gould (2004), it is very important that disinfection chemicals are strictly used according to the specifications given by the suppliers. Lower concentrations and shorter impact periods than prescribed will considerably reduce the efficacy of disinfection or make it totally ineffective. Surfaces should be dried after cleaning and rinsing before starting disinfection. Bibec (2004) observed that this is important, as the concentration of the disinfection solution would be lowered with remaining water on the surfaces and possibly ineffective when becoming too highly diluted. The application of chemical disinfectants is done with stationary or mobile spraying devices. In medium or small scale meat plants, mobile spraying devices are sufficient. The disinfectant is applied by means of spraying lances and manual or electrical pump. Gould (2004), remarked that the disinfectant solution must be applied from top to bottom, that is, first upper parts of walls, and the lower parts of walls and the floor last. The same applies to equipment.

According to Baird (2006) hot disinfectant solutions up to 50^0C are more effective than cold one. After application, the disinfectant solution must remain for a certain period of time on the surface and a thorough rinsing with potable water is needed.

2.4.3. Time and Temperature Control of Meat

Once animal is slaughtered the defence mechanism are destroyed and meat tissue is subjected to rapid decay (Domowe, 2010). Once the animal is killed it is the race between external perseveration technique and the decomposition of the raw meat to decide the fate of the tissue (Domowe, 2010). Controlling time and temperature is the most critical way to ensure food safety (McSwane et al, 2003). Meat and poultry products must be considered as requiring time and temperature control. Raw meat and poultry currently require safe-handling instruction and labelling that includes a time/temperature control provision. Because meat offers a rich nutrient media for microbial growth, products that incorporate meat and poultry as ingredients also must be considered as requiring time and temperature control (Jol *et al*, 2006).

High risk or potentially hazardous foods are foods that require temperature control because they are capable of supporting the repaid and progressive growth of infectious of toxin-producing microbes. If potentially hazards foods are held in the temperature danger zone between 41^0F (5^0) and 135^0F (57^{0C}) for two hours or more infectious and toxic-producing microbes can grow to dangerous level (McSwane *et al*, 2003). No perishable food such a raw meat should be kept at room temperature for more than two hours (Wardlow, 2000).

Red meats and poultry come from warm-blooded animals and their microbial flora is heterogeneous, consisting of mesophilic and psychotropic bacteria. These bacteria include pathogenic species from the animal itself and from the environment, and bacterial species introduced during slaughter and processing of raw products (Jol *et al*, 2006). Raw meat and poultry have a water activity ($a_{w)}$>0.90) and pH range of 5-7, which is an optimal combination for microbial growth. Storing and processing the flesh of meat at low temperature is the strongest weapon for fighting the growth of bacteria (Domowe, 2010).

Freezer and refrigerator need to be kept at correct temperature to do a proper job of storing food safely: $+5^0$C for refrigerator and -18^0C for freezer. Storage area should be kept dry so microbes do not have the moist environment they need to breed (Folaga, 2007). Length of time and the temperature at which meat is kept have the greatest impact on food safety and quality. The importance of monitoring temperatures under Hazard Analysis and Critical Control Points (HACCP) food safety management program and HACCP-based food safety programmes during processing, distribution, retail, display and customer storage of potentially hazardous food(PHF) is key to ensuring that temperature abuse does not occur (Jol *et al*, 2006). The United State Department of Agriculture (USDA's), Food Safety and inspection Services (FSIS) Meat and Poultry Hotline recommends that foods subjected to temperature abuse can remain at room temperature for up to 2 hours taken from the refrigerator or freezer, or 3 hours (Jol *et al*, 2006). Microbes can grow in potentially hazardous foods when temperature is between 41 of (5^0C) and out of the temperature danger zone to prevent most microbes from growing (McSwane *et al*, 2003).

Domowe (2010), stated that duties like cutting, grinding, missing and stuffing all increase the temperature of meat and should be performed at the lowest possible temperature and as fast as possible otherwise condition for the growth of bacteria will be created and that will decrease the shelf life of the meat. McSwane *et al* (2003), remarked that there are unavoidable situation during food production when food must be cooked, cooled and handled. During these activities there is the need to minimize the amount of time foods are in the temperature danger zone to control microbial growth. This implies that when it is necessary for food to pass through the temperature danger zone, it must be as quickly as possible and as fast as possible to prevent the growth of micro-organism and contamination.

2.4.4. Insect and Pest Control

Every food establishment should have a pest control programmes. The target of this programme is insect and rodents that can spread disease and damage food. These pests carry disease causing-micro organism in and on their bodies and can transfer them to food and food-contract surfaces (McSwane *el al*, 2003).Pest destroys millions of dollars of food each year by eating and contaminating it with urine and droppings (Robinson, 1998). McSwane *et al* (2003) and Knowles (2002), revealed that the key element of a successful pest control programme is prevention and takes a combination of three separate activities to keep pest in check.

- Prevent entry and rodents into the establishment
- Eliminate food, water and places where insect and rodents can hide.
- Implement an integrated pest management (IPM) program to control insects and rodent pets that enter the establishment.

2.4.5. Control Methods of Pest and Insects

McSwane (2003) and Knowles (2002), stated the following methods of controlling pest and insect as:

- Eliminate the insect food supply; store food, garbage and other waste in fly-tight containers, regular clearing of food premises and storage and waste facilities.
- Equip windows, doors, loading and unloading areas with tight fitting screens or air curtains.
- Insect electrocuting devices must be installed so that insects and parts of insects cannot fall on food and food contact surfaces. Non electrocuting systems, using glue traps and pheromone are allowed.

- Chemical insecticide may be applied by professional pest control operators as a supplement to proper food handling practices and clean establishment.
- Keep floors, tables, walls and equipment clean and free from wastes.

2.4.6. Disposal of Meat Waste

The production of meat from the farm to fork as described by Duda (2000), produces not just meat for human consumption but also waste the carcasses of dead animals, parts of animals which are treated as inedible, bones, hide and blood. Joshi (2000), described the quantity of meat production waste as staggering. Joshi further explained that human consume only a portion as food. A significant portion of animal food becomes waste, Approximately 50-54% (percent of each cow, 52% percent use one of each sheep or goat, 60-62% percent of each pig, 68-72% percent of each chicken and 78% percent of each turkey end up as meat consumed by humans with the remainder becoming waste after processing.

Edinburg (2003), revealed that the meat waste from federal and provincial abattoirs in Ontario is believed to be 333,000 tonnes each year. This does not take into account other waste from meat processing which is also substantial. The enormous volume of the waste makes the issue of the meat safety and risks associated with its disposal an immediate, ongoing and serious issue.

According to Edinburg (2003) under the meat Inspection Act (MIA) and its regulation, the waste be disposed of by delivering in a vehicle has been issued the Dead Animal Disposal Act (DADA) to a rendering plant or by burying it with a covering of at least 60 centimetres of earth, incineration and other methods agreed by the regional veterinarian European Commission.

2.5 Microbial Contamination of Meat

Food-borne diseases present a serious threat to public health. Such diseases are due to the consumption of food contaminated with micro organisms or their toxins (Hugas & Tsigarida, 2008). Food-borne diseases is not the result of single pathogen, but is caused by a range of pathogenic organisms that have different ways of behaving in foods, causing human illness (Hilton, 2002). In the meat industry, the microbiological quality of carcass depends mainly upon hygienic slaughter and dressing processes (Shale, 2006).The risk of carcass contamination is increased if animals are dirty when presented for slaughter (Hilton, 2002). This is the case in Accra abattoirs due to the fact that we have no clean livestock policy where visibly dirty animals could be rejected for slaughter.

Zoonotic diseases according to Norrung & Bunicic (2008), are not only transmissible to humans through contact with animal body fluids but also through the ingestion of contaminated meat. Also, studies show that the correlation between meat consumption and food borne disease outbreaks is considerably higher in the United Kingdom than in other countries in Europe (Holt and Henson, 2000). This may be the situation in many other countries (Hilton, 2000), including Ghana.

2.5.1. Sources of Meat Contamination

Sources of meat contamination may be primary, thus coming directly from an infected food animal or its secretions, or excretions, or secondary, resulting from contamination in handling of food (Marrist&Gravini, 2006).

Primary Sources

A food animal may be slaughtered while it either infected with a microbial pathogen or contaminated with chemical or other residues. In some instances, this

presents an occupational hazard to stockyard or abattoir workers, but more often it poses a threat to the consumer. Ante-mortem inspection reveals only a small percentage of these cases (Hubbert et al, 1996).

Secondary Sources

Secondary infection may come from infected humans or live-animal carriers of pathogens, soil, equipment, excreta and hands, nasal discharges, contaminated wounds, contaminated water, insects or feed additives. Infected humans may be the source of contamination at any point in the food chain but are most frequently implicated when preparing food for the table (Hubbert et al, 1996).

2.5.2 Food Borne Hazards

Food borne hazard is a biological, chemical or physical hazard that can cause illness or injury when food is consumed. Food borne hazards are generally classified into biological, chemical and physical hazards. Chemical hazards are toxic substance that may occur or may be added to food example of chemical contaminates include agricultural chemicals (McSwane *et al*, 2003). Biological food hazards includes bacteria, viruses' parasites and fungi according to Robinson (2008), are very small and can only be seen with the help of microscope. Robinson is of the view that micro organism are commonly associated with animals, humans and raw foods produce. Robinson further stated that the most common form of food borne illness is caused by biological food hazard and it is the primary target of food safety programme.

2.5.3 Food-Borne Illness

According to Noss and Randy (1993) FDA lists food borne illness as the leading food safety concern because episode of food poisoning far outnumber episode of any kind of food contamination. Noss and Randy clearly pointed out that every one experience food borne illness at least once a year whether they realize it or not.

Yockey and Lesley (1998) classified food borne illness as food borne infection, intoxication or toxin medicated infection. Food borne infection is caused by eating food that contains living disease-causing micro organisms. According to Yockey and Lesley, food intoxication is caused by eating food that contains a harmful chemical or toxin produced by bacteria or other source. Toxin – mediated infection is caused by eating food that contains harmful micro organisms that produce a toxin once inside the human intestinal tract. Toxin can either be chemical or bacteria.

Yockey and Lesley mentioned that food poisoning is everyday term used to describe a variety of food bone illness these foods illness are caused by eating food contaminated by pathogens (disease carrying micro organisms) or animal parasite or their eggs. Meat samples sold in retail shops in Karachi were found to be contaminated with bacteria species of which 66% were potential pathogens (Nafisa *et al,* 2010).

2.5.4. Outbreak of Food Borne Diseases in Ghana

Food production, processing, delivery, distribution and safety are generally not regulated and there is no traceability. There are some challenges in logistics, quality and safety. No modern concepts of quality and safety management are applied making consumers vulnerable to food borne illness (Sefa –Dedeh, 2009). Many foods borne outbreak in Africa go unrecorded and Ghana is not an exception (FAO, 2008).

According to Okai (2011), 6000 cases of cholera outbreak with deaths were recorded in Ghana in 2010/2011. The cholera outbreak was attributed to poor environmental, food and personal hygiene (Okai, 2011). Semedo (2010), remarked that on daily bases the Ghanaian public faced many dangers and hazard which are food related including environmental contamination, poor sanitation, unauthorized food additives, poor sanitation at processing units and transportation of food in unhygienic container. He further explained that the total number of out-patients reported with food borne diseases in Ghana is about 420,000 per year, with an annual death rate estimated at 65,000 and total cost to economy at US$69 million. Other figures gave a total number of 84,000 deaths per year with 25% percent being children under five years. Based on this FAO would start a project with University of Cape Coast to develop a learning course in Food Standards (Semedo, 2010).

2.5.5. Impacts on Human Health

Food-borne diseases constitute an important public health problem in both developed and developing countries, although the health and economic aspects are often obscured by an insufficiency of data (Tauxe, 1997; WHO, 1995). They are responsible for high levels of morbidity and mortality in the general population, particularly in high risk groups, such as infants, young children, the elderly and the immune-compromised (WHO, 1995).While some developed countries have reasonably accurate data on the impact of food-borne diseases, it is rarely possible to derive similar statistics for developing countries because of a lack of surveillance systems for collecting reliable data (Schneider, 2004).It is therefore difficult to estimate what proportion of these disease can be ascribed to eating contaminated meat, as most cases go to local clinics where treatment is given by nurses and few

records are kept. The causes of deaths in rural areas of developing countries are seldom investigated, as autopsies are culturally unacceptable (McCrindle, 2004).

In Ghana, there is very little information available on the true level of exposure of specific population to potential hazards, particularly in the case of bacterial diseases transmitted by consumption of meat and meat products. Even at the international level, it is difficult to obtain accurate estimates of microbiological food-borne diseases. In the United States of America (USA), it is estimated that each year approximately 76 million cases of food-borne disease occur, resulting in 325000 hospitalization and 5000 deaths. In England and Wales, food-borne diseases were responsible for 2366000 cases, with 21138 hospitalization, and 718 deaths (Adak *et al*., 2002; Mead *et al,* 1999).

2.5.6. The Economic Impact

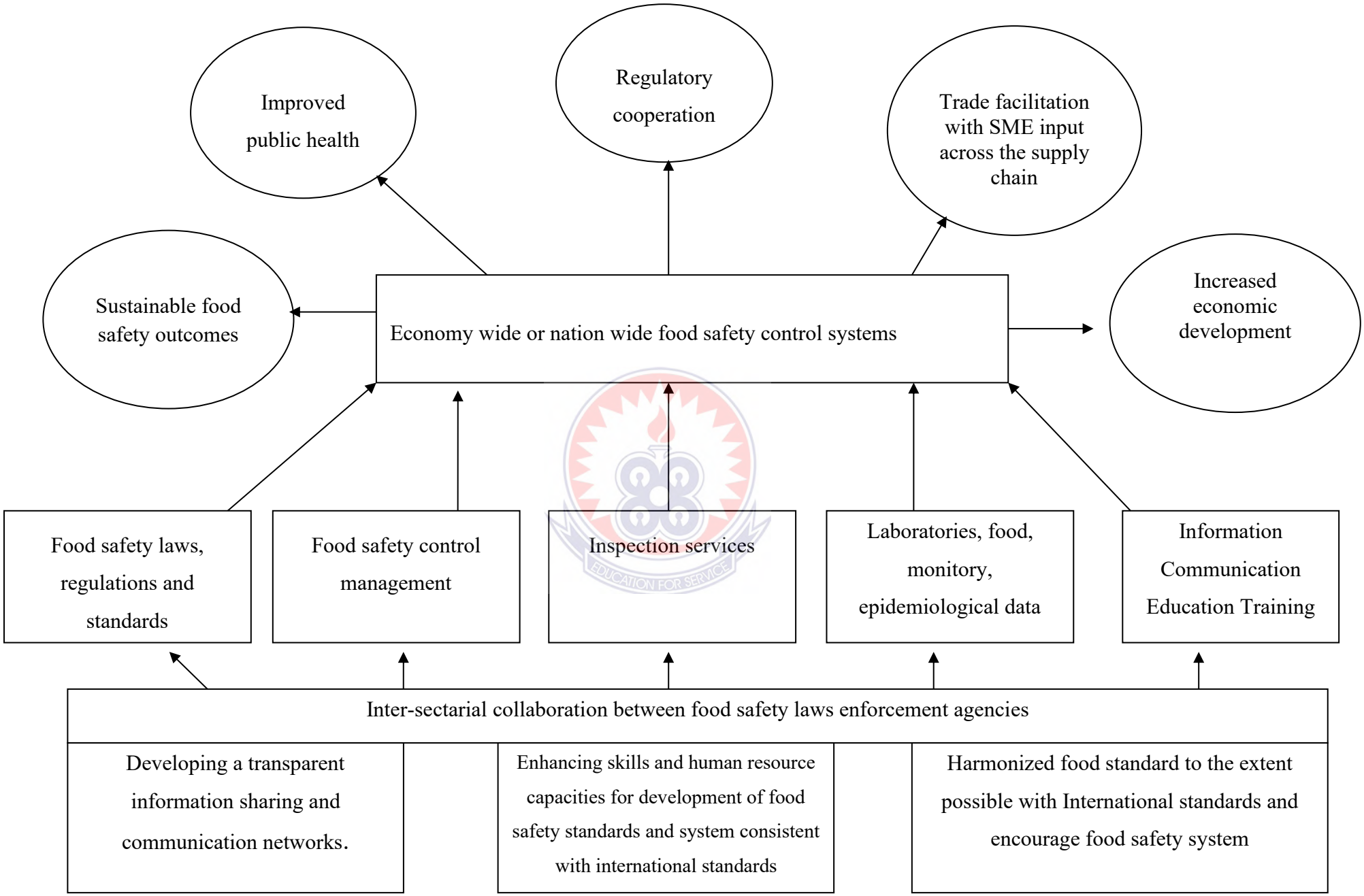
Travel patterns of tourists have changed over time. Bradley (1988), showed that over the last four generations, the spatial range of travel has increases 10-fold. In particular, air travel has increased the potential spread of disease. Problems include the transmission of food-borne and water diseases, the translocation of insect vectors, the rapid transport of people with sub-clinical diseases as well as direct transmission while in the aircraft and the transmission of zoonoses through animal transport (Royal & McCoubrey, 1989). Food safety is growing global concern not only because of its continuing importance for public health but also of its impact on international trade (Barendsz, 1998). The food industry is facing tremendous challenges as it strives to meet consumer demands and continues to produce the most affordable, highest quality and safest food.

The adoption of HACCP throughout the meat industry probably provides the greatest control and offers assurance of food safety to consumers (Jackson et al, 1996). Food-borne pathogens move with the food across borders and a number of reported outbreaks of food-borne disease have been related to the globalization of the food supply (CDC, 1996; D'Aoust, 1994; Mahon et al, 1996). International trade in raw products and animal feed between regions with a different prevalence level of food-borne pathogens in the food chain has been shown to contribute to the increasing problem of food-borne disease.

During the last decades the incidence of food-borne disease such as salmonellosis, campylobacteriosis and enterohaemorrhagic E. coli infections have increased in many parts of the world. A substantial proportion of re-emerging infections are associated with farm animals and meat. Agents include salmonella spp: Campylobacter spp: Yersinia enterocolitica: Escherichia coli: 0157, Listeria monocytogenes and Toxoplasamagondii (Nesbakken & Skjerve, 1996; WHO, 1995).

2.6 Conceptual Framework for the Study

The conceptual framework of the study is based on the harmonization of elements such as food safety regulation and standards, food safety control management, inspection services, laboratories food monitoring epidemiological data and information communication education training to achieve a nationwide an effective food safety control system. This nationwide food safety control system when properly managed will lead to desirable outcomes such as improve public health, regulatory cooperation, trade facilitation with SMEs input across the supply chain, increased economic development and sustainable food safety outcomes. Below is a diagrammatic representation of how the study is conceptualized by the researcher and an explanation of the various elements of the conceptual framework.



Public Health Impact: *More than one-third of the population of developed and middle income countries are stricken by food borne diseases each year and the problem is even more wide spread in developing countries (FAO, 2013). According to Lamba (2012) food borne disease continues to represent a serious threat to the health of millions of people in the world, particularly those in developing countries with poor nutritional status. There is therefore the need for the harmonization of food safety law, information communication education training, food safety control management and laboratories food safety epidemiological data for effective implementation of food safety controls and standards if there is to be and improve public health.*

• ***Improved Economic Development:*** *food safety incidents can always have severe economic impact, which affects both the private sector and governments. Governments are usually plagued by the macroeconomic effects, such as lost of productivity, declines in trading activities and increases in health costs (Smith, 2008). Many a time, the small and medium enterprises in the agri-business sector are disproportionately affected by post-harvest losses. This leads to both loss of domestic and export markets, absenteeism and loss of productivity.* Food safety is an doubted a Priority for Improving Public Health and Economic Growth. *In modern times,* food supply chains are increasingly becoming global in nature. Food stuff grown in one country is processed or prepared in another country and distributed for consumption in yet another country. This has led to the emergence of several safety challenges and the need to ensure food safety has become increasingly significant in the protection of global public health and economic growth and development. *This indicates the correlation between food safety and economic development.*

Regulation Cooperation

There are the need food safety actions to be undertaken in a coordinated way. This involves the targeting of food safety capacity building needs through regulatory cooperation and collaboration with stakeholders. This calls for the improvement of information sharing and communication networks and the advancing regulatory cooperation among member economics using best practice methods for establishing food safety control (FAO, 2013).

Food Laws and Regulations

This element of the Food Control System model calls for the enactment of relevant and enforceable food legislations, regulations and food standards. The enactment of relevant and enforceable food legislations, standards and regulations, are important ingredient for any modern food control system. This needs both political will and well resourced agencies to enforce these laws (APEC, 2006).

Food Safety Control Management

It is imperative to note that the success of an effective food safety control systems demands policy and operational coordination at the national level coupled with a concerted efforts by all relevant stakeholders. However According to APEC (2006), the details of these functions is determined by the national legislation and they would have include the establishment of a leadership function and administrative structures with a well and explicitly defined accountability for issues which may include the formulation and implementation of a national food control strategy; a national food control programme; securing funds and allocating resources; setting standards and regulations; participation in international food control related activities; developing emergency response procedures; and carrying out risk analysis. Otinkono (2003).

Inspection Services

There is the need for qualified, trained, and efficient food inspection service in order to ensure an effective administration and implementation of food laws. The Food Inspectorate Division officers or inspectors are the key stakeholders who have day-to-day contact with the food industry, trade and often the public. The reputation and integrity of the food control system is determined by the integrity and skill of these officials.

Laboratory Services: Food Monitoring and Epidemiological Data

Laboratory services are essential elements of a food control system. The food safety analysis laboratories should not be under the control of one agency or ministry. The Food Control Management should spell out clearly the laid, down norms for food control laboratories and monitor their performance and at a minimum, laboratories should be resourced with adequate facilities for physical, microbiological and chemical analyses. It is not only the type of equipment and logistics available that determines the accuracy and reliability of analytical results but also the qualification integrity and skills of the analyst. The reliability and validity of the method used should also be of a concern.

Information, Education, Communication and Training

One major essential role for food control systems is delivery of information, education and advice to stakeholders on the farm-to-table continuum. These demand the provision of balanced factual information to consumers; information packages and educational programmes for key officials and workers in the food industry (Lagenbrunner 2010).There should also be the development of train-the-trainer programmes; and reference codes for workers in the agriculture and health sectors

2.7 Theoretical Framework

The theoretical framework underpinning the study is Simelane's (2005), Knowledge, Attitude and Practice model (KAP). This model as propounded by Simelane (2005) would be used to discuss the relationship among knowledge, attitudes and practices of food handlers in the abattoirs. The KAP Model is used to investigate how knowledge, such as culture-specific knowledge of hygiene and illness notions and explanatory models are related to food preparation and handling (Hausmann-Muela et al. 2003)

Knowledge: Pelto and Pelto (1997) asserted that our public health professionals are many times of the view that *knowledge* and *beliefs* are contrasting terms. The assumption is that *knowledge* is based on scientific facts and universal truths which include "knowing" biomedical information. On the other side of the coin, *beliefs* refer to traditional ideas, which are erroneous from the biomedical perspective, and which form obstacles to appropriate behaviour and treatment-seeking practices (Launiala, 2009). It is worthy to note that in the field of Anthropology knowledge and beliefs are not contrasting terms. The KAP model posits that Knowledge is accumulated through learning and socialization processes. These processes either through socialization or other forms of learning may be formal or informal instruction, personal experience and experiential sharing. According to Glanz & Lewis, 2002) knowledge is automatically translated into behaviour and it will therefore not be impropriate to assert that there is a correlation between the knowledge of butchers and their meat handling practices. Knowledge, however, is not insignificant and it is found to be vital in cognitive processing of information and in the attitude behavior relationship (Simelane, 2005).

Attitude: *This* usually has to do with evaluative concepts associated with how humans think, feel and behave. This calls for the evaluation of people issues, objects or events. Such evaluations are often positive or negative but they can also be uncertain at times. For example, you might have mixed feelings about a particular person or issue (Cheery & Keller, 1998). Attitude is usually interlinked with one's knowledge, beliefs, emotions, and values, which are either positive or negative. Pelto and Pelto (2004) are also of the view of that *causal attitudes* or *erroneous attitudes*, which are considered derivatives of beliefs and/or knowledge. Presentation of results regarding attitudes should be done with caution because of the substantial risk of falsely generalising the opinions and attitudes of a particular group (Cleland 1973, Hausmann-Muela et al. 2003). Extant literature suggests that there are several different components that make up attitudes namely the emotional dimension which refers to how the object, person, issue or events makes one feel; the cognitive dimension which refers to one's thoughts and beliefs about the subject and behavioral dimension which refers to how the attitude influence one's behavior.

Attitudes can also be said to be explicit and implicit. Explicit attitudes refer to those behaviors that one is consciously aware and that clearly influence our behaviors and beliefs. Implicit attitudes on the other hand though unconscious can still have an effect on ones beliefs and behaviour. According to Rutter & Quine (2003) attitudes may influence one's intention to perform a given behaviour or practice. This implies that the knowledge and attitude correlate with behaviour and for that matter practices. Likewise the knowledge and attitudes of food handlers can influence their practices and behaviour as they handle food and for that matter meat. For example, a person who has a positive attitude towards hand washing is more likely to wash the hands regularly while handling food or meat (Simelane, 2005).

Practices: The third integral part of the KAP model are practices (behaviours) which are usually concerned with the use of different treatment and preventionof illness and substances which are health related such as food and drink . This is many a times hypothetical. The KAP model has been criticised on the grounds that it provides only descriptive data which does explain *why* and *when* certain treatment prevention and practices are chosen. Better still; the model fails to explain the logic behind people's behaviour (Hausmann-Muela et al. 2003, Nichter 2003). Critics are also of the view that KAP model is often used to plan activities aimed at changing behaviour, based on the false assumption that there is a direct correlation between knowledge and behaviour. studies have shown that knowledge is only one factor influencing practices, and in order to change behaviour, health programmes need to address multiple factors and dimensions ranging from socio-cultural to environmental, economical, and structural factors, etc.(Balshem 2008, Farmer 2007). However, some scholars have argued that the KAP model does not necessarily adequate to provide enough for programmatic planning. (Launiala, 2009).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter discusses, research design, population, sampling technique and sample size and data collection techniques or instruments used.

3.2 Research Design

A descriptive survey design was used to determine food safety knowledge and food safety practices of meat handlers in abattoirs and butcheries in Accra Metropolis of Ghana. The descriptive survey design seeks to gather information so that description of what is going on can be made. The reason for the researcher to use the descriptive survey is to observe, describe and document aspects of phenomenon as it naturally occurs in the study area and to make inference about some characteristics, attribute or behavior of the abattoirs and butcheries in order to generalize.

3.3 Population

The targeted populations for this study involve the following:

- Ghana Standard Authority (GSA).
- Veterinary Services.
- Environmental Protection Agency (EPA).
- Environmental and Sanitary Inspectorate Division of AMA.
- Workers in the various abattoirs within the Accra Metropolis.

3.4 Study Location

The study was conducted in six selected sub-metros in Accra Metropolis, the national capital of Ghana. Accra 'district' is an urban metropolis with a total population of 4,010,054 from the 2010 census Ghana Statistical Service (2013). It is most densely populated part of the region. It was divided in to six sub-metros namely Ablekuma, Osu-Clottey, Ashiedu Keteke, Ayawaso, Kpeshie, and Okaikoi up to mid 2004 when the number of sub-metros was increased by legislative instruments to 13 by further sub-dividing the original six.

3.5 Sampling Technique and Sample Size

The purposive sampling technique was used to select the head of officers of law enforcement agencies, Ghana Standard Authority (GSA), Veterinary Services and Environmental Protection Agency (EPA), Environmental and Sanitary Inspectorate Division of AMA responsible for food safety laws in the abattoirs in Ghana.

The stratified sampling technique was use to group abattoirs in the study area. The abattoirs were put into six strata. The strata used include Nima, Ashiedu Kekete, Kaneshie, Agyekotoku, Dakuman and Mambi abattoir. The stratified sampling was chosen in order to enable the researcher to compare findings between the various sub-groups and strata. The simple random sampling was used to select the workers in the various abattoirs within the Accra Metropolis. All the names under each stratum were written on papers folded and placed in separate boxes; the papers were randomly picked from each box. The names on the papers which were picked were used to represent the population.

The number of respondents from the heads of law enforcement agencies was as follows. Two (2) heads of department from Ghana Standard Authority (GSA), two (2) heads from the veterinary services, two (2) heads from the environmental protection agency (EPA), two (2) heads from the Environmental and Sanitary Inspectorate Division of AMA, and also, two (2) heads from two abattoirs within the Accra Metropolis and hence summing up to ten (10) heads of department for the study.

The workers from each of the abattoirs were as follows:

Nima, 30 respondents, Mamobi, 30 respondents, Agyenkotoku, 30 respondents, Kaneshie, 30 respondents, Darkuman, 30 respondents and Ashiedu Keteke, 30 summing up to 180 respondents.

3.6 Research Instruments

Three instruments of data collection were used namely: interview, observations and questionnaires.

3.6.1 Interview

Interview was used to solicit information from the heads of departments of agencies responsible for food safety in the country and two heads from the abattoirs and they include: Ghana Standard Authority (GSA), Veterinary Services, Environmental Protection Agency (EPA), Environmental and Sanitary Inspectorate Division of AMA, and two heads from the abattoirs. The main issues for the interview were to solicit information on how the agencies ensures meat coming from the abattoirs to be safe, how often they visit the abattoirs, and how to deal with non compliance or violation of safety standards. The interview was also to find out how

the agencies assess the meat safety situation in the abattoirs in the metropolis, the regulatory frameworks that were put in place and how this is communicated and enforced, and the challenges faced in enforcing these regulations.

3.5.2 Observation

Observation checklist was used to collect relevant information from the abattoirs and butcheries which was a modified version of the one used by the Food and Drugs Authority. The main areas observed consist of the following ten (10) items:

- The layout and fabrication.
- Personnel's hygiene.
- Personnel's facilities.
- Raw materials acquisition.
- Cold storage facilities.

Processing area.

- Equipment for processing.
- Waste management and
- Pest control.

Details of the observation checklist can be found in Appendix B.

3.5.3 Questionnaire

Questionnaires were administered to workers in abattoirs (butchers) to assess their food safety knowledge and food safety practices of meat. The content of the questionnaires consisted five parts as follows: part 1: profile of food handlers such as gender, age, and education. Part 2, 3, 4: concerning food safety practices in abattoir and butcheries, knowledge on food safety rules and regulations (food laws), hygiene

and training, health status and knowledge on food contamination. Appendix B were directed to and answered by each group of people chosen as the respondents. The question items include pre-coded and lexis scale, the answers were provided for the pre-coded question. With regard to the lexis scale, respondents were asked to indicate the extent to which they agree with a statement provided. In the case of persons whose level of literacy is such that they could not respond to question item, the questions were translated into the local language which was also suitable medium for collecting data in the metropolis.

3.6 Pre-Testing, Validity and Reliability

The validity of the instrument was ensured through the finding of the preliminary survey. The items of the questionnaire and interview schedule were based on the findings from the preliminary survey. The questionnaire was designed to make sure that they are simple, concise and understandable thus removing ambiguity while at the same time obtaining relevant information based on the suggestions from the supervisor. The instrument was considered valid and reliable. Tape recorder was used during the interview section. This helped for clarification and validity.

3.7 Data Collection Procedure

All questionnaires were collected by the researcher and assisted by trained personnel. The personnel who assisted in administering of questionnaire were trained by taking them through the vetted questionnaire. Some of the questionnaires were collected on the spot after the respondent filled them. Others were collected later.

3.8 Method of Data Analysis

Data analysis was mainly descriptive. The data was edited and analyzed by computer using the Statistical Package for the social sciences (SPSS) and the results were be presented in frequency, percentage table.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter covers data presentation and analysis obtained from interviews, observations and questionnaires.

4.2 Results of Interviews and Discussions from Laws enforcement Agencies

Demographic Characteristics of the heads of food safety laws enforcement Agencies

This section presents the demographic description of the heads of food safety laws enforcement agencies. These institutions included the Ghana Standard Authority (GSA), Environmental and Sanitation Inspectorate Division of the AMA, the Environmental Protection Agency and the Veterinary Services Department of the Ministry of Food and Agriculture (MOFA). Data were gathered regarding regulatory systems and frameworks operating in the various abattoirs using interview assessment. These are as follows:

Age Distribution of the Heads of Food Safety Laws Enforcement Agencies

All the respondents were aged between 37 and 57 years. The two heads of department interviewed at the Food and Drug Authority (FDA) were aged 42 and 53. The officials at the Environmental and Sanitation Inspectorate Division of the AMA were aged 37 and 51 years while the officers at the Environmental Protection Agency were 39 and 54 years of age. Also, the Veterinary Doctors were aged 49 and 57years

Work Experience

Only official with ten years (10) and more working experience were interviewed for the study. This was in accordance with the assertion by Smith (2010) that work experience can affect both work output and input when it comes to enforcing food safety laws and quality food safety practices. Accordingly all the officers interviewed, had between 12 and 33 years of working experience. The two officers interviewed at the FDA have 21 and 29 years of work experience. However, those at the EPA have 12 and 30 years of work experience while their counterparts at Veterinary Services have 24 and 33 years of experience. The Sanitary Inspectors on the other hand have12 and 29 years working experience.

4.2.1 Result and Discussion of Interview from the Heads of food safety laws Enforcement Agencies

The data gathered from food safety laws enforcement agencies revealed that the regulatory systems or framework are many and they are enforced through a collaboration of different institutions. These institutions included the Food and Drugs Authority (FDA), the Environmental Protection Agency (EPA), the Veterinary Services Department of the Ministry of Food and Agriculture (MOFA) and the Environmental and the Sanitation Inspectorate Division (ESID) of the Accra Metropolitan Assembly (AMA). The constituents of the regulatory systems operating in the various abattoirs according to the heads of the above mentioned institutions who were interviewed comprises of the Food and Drug Law (PNDC Law 305b); the Ghana standards Decree of 1967 (NRCD 199); the Meat Inspection Law (1999) WHO Food and Drug Safety Standards; the Local government Acts of 1992, Act 462; Diseases of Animals Act of 1961, Act 83; Control of importation Ordinance and the

Ghana Standards Decree of 1973(NRCD 173). These are the legislations that regulate the activities of food handlers and for that matter butchers and other stakeholders in the food industry.

The veterinary Services are responsible for the enforcement of the Control of Importation Act 1961, Act 83 and the Animal Diseases Ordinance. The Control of Importation Ordinance is enforced examining all live animals imported from outside the country. Most of the cows and other animals which are slaughtered in the abattoirs are imported from countries such as Burkina Faso, and Mali. The Veterinary Services is mandated by the Control of Importation Act to examine all the imported animals in order to clear them of any disease which could be of a danger to animal and human health at the point of entry (national borders). If the animals are found to be healthy the importer is issued a certificate authorizing entry. When the animals arrive at the abattoirs they are further examined by the veterinary doctors again. This inspection is conducted for both imported and non imported animals. The animal declared fit and the owner given a certificate of fitness. Without this the animal could not be slaughtered. A statement made by one of the Officials at the FDA attests to this.

''You may be wondering why the Control of Importation Acts is Included in the list of legislations regulating the activities of the abattoirs. People do not always understand why that but the fact is that most of the animals killed in the abattoirs are imported from Mali, Niger and Burkina Faso. Hence the Control of importation Act seeks to prevent the importation of animals with disease which could be dangerous to animal and human health''

The two Ghana Standards Decrees and the food and Drugs Law as well as the WHO Food and Drug Standards are enforced by the Food and Drug Authority. These laws are enforced to ensure that all meat products and calibrated equipments such as

weighing scales are of standard in order to ensure that the consumer is not only protected but to ensure that he or she gets value for money. The local Government Act of 1992, ACT 462 and the Meat Inspection Law of 1999 are enforced by the Environmental and Sanitation Inspectorate Division. These two laws seek to ensure that the conditions under which the animals are slaughtered and dressed are neat and free from insanitary conditions which could lead to human to food contamination, equipment to food contamination and microbial contamination. These laws seek to avoid the selling of unwholesome food to the public so as to protect public health.

It is imperative to state that none of these regulatory frameworks are being enforced effectively. One of these laws which is usually abused by the butchers and neglected by the veterinary doctors and the sanitary inspectors is the Control of Importation Ordinance. Even though this law stipulates that all imported animals should be screened at the point of entry and at the abattoirs, some of the butchers slaughter them before they get to the abattoirs with the excuse that as a result of butting among the animals, the weather condition here (thus the weather here is different from that of Mali and Burkina) and the long journey cause the animals to be become weak so they were slaughtered. However, such animals are allowed to be dressed and possessed for market. This confirms the observations by Giritlioglu, Batman and Tetik (2010) that there exist strict legal regulations on the hygienic standards of handling and processing of meat. In most developing countries especially in rural communities, standard and hygienic methods of handling and processing meats are given less attention even though they are or form part of the countries rules and regulations on animal and meat production.

When the researcher asked a interviewees about some of the things some of his colleagues engage in which could adversely affect food safety they had this to say.

''Mmmmmh, when some of the butchers are coming from Mali with cows and realized they have fallen sick or become weak all of a sudden, they slaughter them on the way and when they come down they will tell the animal doctors that they killed because the animals became weak after butting each other and they will cook evidence to support that. They will then give the doctors something small and then proceed''

This contradicts the assertion found in the literature that the food handler would have to prove that he or she had taken all reasonable precautions to avoid situation occurring by carrying out all the necessary checks on the method of production and by obtaining details of storage and transportation temperatures of the food before delivery. Written records that show dates and the types of checks made are very important and would form a crucial part of the evidence (Ceserani *et al*, 2005). On the other, legislations regulating the activities of the abattoirs are also grossly abused. These is evidence in the fact that car tyres are still being used to singe animals in spite of the health risks it poses to the environment and the health of the consumer. Besides, there are still poor insanitary conditions at the abattoirs in spite of the numerous laws enacted to ensure food safety.

The researcher also sought to find out how awareness about these regulatory systems and frameworks are created or better still how these frameworks are communicated to the butchers in view of the fact that most of them are illiterates. All the heads of institution admitted that even though they are supposed to organized workshops for the butchers they are not able to do that as a result of resource constraints especially lack of funds. This corroborates the research findings of

Otupuri, Adam, Laing and Akonomori (2000) that butchers in Kumasi never receive any form of training, the knowledge, attitude, belief and practices are largely inadequate for their profession in view of the important role the butchers play. Some of these heads indicated that alternatively they go to the media houses especially the electronic media to educate not only the butchers but also the general public on food safety and the regulatory systems operating in these abattoirs. One of the officials at the EPA told me that

''We do go to the radio stations to educate the populace and for that matter the butchers. Last year and this year we have been to Adom FM and Peace FM several times to educate the public. This is very cost effective since for this we pay nothing''

- The institutions responsible for food safety also encounter quiet a number of challenges in trying to enforce the regulatory systems operating in the various abattoirs. Some of the officials from these institutions are threaten of physical and spiritual harm when they try to enforce some of these regulations such as closing down some of them for not meeting international and domestic standards. Almost all these institutions have inadequate resources and logistic such as vehicles, mobile laboratory kicks, protective clothing and funds to be used as impress for administrative purposes.
- In summary, the agencies responsible for the enforcement of laws regulating food safety were found to be Food and Drug authority, Environmental Protection Agencies, the Veterinary Service Department, Environmental and Sanitation Inspectorate Division of the Accra Metropolitan Assembly. It however noted that these laws are not fully enforced due to lack of logistics and co-operation.

4.2.2 Results and Discussions of Interview from Heads of Abattoirs

The findings from the interviewees on food safety knowledge and the safety practices of meat handlers in abattoir and butcheries reveal that bribery and corrupt activities could be a contributing factor responsible for violations of the laws enacted to ensure safety of food. A statement made by the head of one the abattoirs attest to this assertion.

''Yes, we at times we give the AMA people and the other big men money. You know we are in Ghana and every one eats from his work. No one is infallible so you do not know when you will play foul. So we have to make them happy. Some of them even ask for the bribe before they grant you the green light to kill the animal. We also occasionally contribute something for them during sala(Islamic festivals such as Ed-Adha) and Christmas''

An official of the Sanitation Inspectorate of the AMA also had this to say.

''Another challenge is that most of the butchers try to entice officers, not only sanitation inspectors with gifts instead of doing the right thing. Some of these gifts may be irresistible if you are not God fearing or better still a man of integrity. Even if you refuse to take these gifts officers from other institutions will take these gifts and the unwholesome meat will find itself on the market at the long round''

However the revelation by some of the heads of the food safety laws enforcement agencies that their lives are threatened by some of the butchers when they try to get the butchers to do the right thing before they bring the food to the market can also be said to be responsible for this situation. The situation could also be due to illiteracy on the part of the butchers as exposed in the literature by McSwame *et al*, (2003) that effective food safety programmes requires managers, supervisors

and people in charge who are knowledgeable about hazards associated with contaminated food. This finding further confirms the observations made by Otupuri, Adam, Laing and Akonomori (2000) that the butchers in Kumasi never receive any form of training and that their knowledge, attitudes, belief and practices are largely inadequate for their profession in view of the important role the butchers play. In view of these it will not be out of order to say that the problem seems to be a multi dimensional as one sees illiteracy, corruption and misbehavior on the part of the butchers as been the cause of this.

Another factor that has handed a blow to the safety of meat from the various abattoirs is the use of car tyres to singe the fur of animals instead of fire wood or liquefied petroleum gas (LPG) equipments which are the modernized way of singeing animals for meat. When the researcher asked the butchers why they prefer car tyres to safer alternative source of energy such as LPG and firewood the butchers were of the view that the car tyres lasts longer than all the other alternatives and it is relatively cheaper and easily accessible in Accra. This is because firewood which appears to be cheaper and abundantly available comes with additional transportation cost and risk transporting them from the forest zones to Accra hence, their reliance on car tyres. Unfortunately these car tyres contain chemicals which are not safe for human consumption. In spite of numerous media education against the practices, the problem still persists. This contradicts what was found in the literature that food safety demands that food handlers take the necessary measures to eliminate or ensure acceptable and safe level of content adulterants, toxins or any other substance that may cause food injuries to health on an acute or chronic basis (UNPD, 1998). Over here too the possibility of illiteracy and negligence on the part of the butchers and

food safety laws enforces cannot be ruled out as the root cause of this situation. One of the butchers told me in an interview that

''I prefer the car tyres because they last long and cheaper than the firewood or gas. You can't get firewood here in Accra meaning you have to go to the villages and mind you, you will incur additional transportation cost. But at times some of the mechanics even give the tyres free to us.''

It is of interest to know that general sanitation at all the studied abattoirs except the one at Darkuman were very poor. One could see stagnant and choked gutters with animal wastes in them. This attracts all sorts of vectors and carnivorous animals. Besides, the hygienic practices of the butchers leave much to be desired. Dressing platforms are not washed regularly and when they are washed they are not washed with detergents. Pest control practices are typically absent and this does not augur well for food safety. This research finding does not confirm what was found in the literature which stipulates that Food safety and sanitation are the very important issues for the success of the food industry and good health (Robinson, 1998). This is because Food establishments provide a last line of defence in controlling or eliminating the hazards that cause food borne illness (McSwane, Ruc, Lincon and Graf, 2003). There are two types of meat handlers at the abattoirs: the permanent butchers at the abattoirs that kill and dress the animals and the butchers who are meat vendors at the various butcheries at the numerous markets in Accra. The former are known in the local parlance as "Mayanka" Sometimes private individual do send their animals there to be slaughtered for domestic or home consumption. The permanent butchers at the butcheries do not put in much effort in ensuring the safety of food. Their hands and other equipments are not washed frequently and when they are washed they are not done under running tap water but in bowls which are used almost

the whole day without changing the water in them. This is probably due to the fact that they are not the owners of the meat and also partly due to the fact that the consumers of these meats are not aware of how these animals are treated in the abattoir. The butcheries on the other hand are a bit cautious in ensuring food safety since their activities are always in the full glare of the consumers.

4.3 Results of Observation and Discussion from Abattoirs

With the aim of the researcher to obtain detail data about the food safety knowledge and food safety practice of meat handlers in abattoirs and butcheries hence a visit to the following abattoirs in Accra Metropolis for first hand information. These abattoirs are Ashiedu Keteke, Nima, Darkuman, Agyenkotoku, Kaneshie and Mamobi abattoir. The food safety practices observed at most of the abattoirs depicted that the safety of the meats coming from these abattoirs leave much to be desired. All of the abattoirs visited were open space at sea shore and some near open drainage. Again, it was observed that, animals were unhygienically slaughtered and carcasses are dressed on the bare ground as well as unsatisfactory transportation of meat to the butcheries. Animal wastes were openly disposed attracting carnivorous animals such as dogs and vultures to these abattoirs which had great opportunity to contaminate the exposed tissues of the carcass with micro-organisms. Observation showed that there was no proper disposing system as a result the pile up paunch content and other solid wastes, faeces, horns, scraps of tissue and other solid waste were found near to the abattoirs and serves for reside of rodents, cat, and dogs. The threat this situation posts to the safety of the meats slaughtered at these abattoirs is that scavenging dogs could spread pathogen (especially any meat containing anthrax spores) over a distance. Even though the EPA and the ESID of the AMA have oversight responsibility over these

things the problem cut across all the abattoirs. The situation is disturbing and unacceptable; however, nothing is being done by the stakeholders to alleviate the situation. This contradicts the assertion by the American Society of Food Safety Engineers (2009) is ensuring the safety of food involves creating the necessary conditions for which health risks are at an acceptable level, and tolerable in the setting being considered. Bribery could be a contributing factor responsible for this ugly situation.

Other essential observation made was about personal hygiene. Personal hygiene is highly compromised as people who are slaughtering these animals rarely are appear to wash their body or hands and use their own clothes without protective clothing such as aprons, hair net. There was no hot water, sterilizer and retention room (cooling facility) in the abattoirs. Some also, have not trimmed their nails short. These are hired people (casual labour) who are never taken for medical checkups and can thus easily transmit diseases. Some personnel's were also observed to be suffering from cold, coughs and opened wounds in the processing area and others were wearing jewellery. Further observation showed that there were no facilities like toilet, washing sink for personnel working in the abattoir.

Finally, it was observed that preventive mechanism was not installed and insects in the abattoirs had great opportunity to contaminate the exposed tissues of the carcass with micro-organism. Equipment and tools for meat processing were not colour coded and some of the abattoir workers were observed to be cashing money while serving meat.

From the discussion, it can be said that the food safety practices observed at most of the abattoirs depicted that the safety of the meats coming from these abattoirs leave much to be desired. All of the abattoirs visited were open space at sea shore and

some near open drainage. Again, it was observed that, animals were unhygienically slaughtered and carcasses are dressed on the bare ground as well as unsatisfactory transportation of meat to the butcheries

Figure 4.1: Cutting tools

Figure 4.2: Singing area

Figure 4.3: Scraps

4.4 Results of Questionnaires and Discussion from Abattoir Workers

In pursuant of food safety knowledge and food safety practices of meat handler in abattoirs and butcheries questionnaires were issued out to butchers to obtain their views.

Demographic Characteristics of Respondents

The questionnaire sought to elicit responses about the demographic characteristics of respondents. These characteristics included sex, educational background and job designation.

Table 4.1: Demographic Characteristics of Respondents

GENDER	FREQUENCY	PERCENTAGE
Male	160	100
Female	0	0
EDUCATIONAL BACKGROUND		
JHS	88	55
SHS	12	7.5
None	60	37.5
JOB DISCRIPTION		
Butcher	147	91.9
Attendants	13	8.1
Total	**480**	**300**

Table 4.1 showed that all the butchers and attendants participated in the study were males. It also indicated that, slightly more than half of the respondents have some sort of formal education and 91.9% of the respondents are butchers while the remaining respondents were attendants.

Food Safety Practices of Butchers

The researcher solicited from the respondents to know about the food safety practices of the butchers in the abattoirs. Table 4.2 presented varied views of the butchers on food safety practices.

Table 4.2: Food Safety Practices in Abattoirs

Item/statement	Freq/Per	Strongly Agree	Agree	Disagree	Strongly Disagree
Handling of meat	Freq.	1	3	55	101
	%	0.6	1.9	34.4	63.1
Frequent washing of hands	Freq.	16	16	91	37
	%	10	10	56.9	23.1
Touching of nose, mouth, hair	Freq.	8	4	52	96
and ear when handling meat	%	5.0	2.5	32.5	60
Wearing of white cloth and hair	Freq.	1	1	37	121
net while handling meat	%	0.6	0.6	23.1	75.6
Time and temperature control	Freq.	60	72	18	10
	%	38	45	11	6.0
Wearing of clean boot or pair of	Freq.	23	22	100	15
foot wear	%	14	14	63	90
Butchers should not touch	Freq.	75	50	28	7
money when handling meat	%	47	31	18	4

Table 4.2 showed that 63% of the respondent strongly disagree that meat requires any special handling. This contradicts what was founded in the literature that Food safety requires that the person in charge must be committed to implementing safe food handling practices and workers trained to understand proper hygiene and food hygiene practices (Wardlow, 2000).

Again, table 4.2 indicated that majority of the butchers disagree that hands must be washed frequently while handling meat. This corroborates the observation by Ablordy(2002) that many Ghanaians do not care how dirty their fingers are when handling money so the butcher with his bloody fingers, the artisan with dirty dusty hand, the street food vendor with the wetly and oily hand receive or pick Ghanaian currency notes with hand leading to contamination of the notes by micro organisms

hence causing cross contamination to food. The table further depicted that 92.5% of the respondents are of the view that the nose, mouth and ears could be touched while handling food. Again, this findings contradicts the assertion by Adigbo and Madah (2010), that the nose and mouth should not be touch with the hands when handling food. 76% and 23% of the respondents strongly disagreed and disagreed respectively that white cloths should not be wore while handling meat. Here again, the findings contradicts the clean hygiene habits spelt out by Adigbo and Madah (2010), that food and meat handlers should wear clean white clothes and apron when working around food since bacteria can accumulate on dirty clothes.

Time and temperature control on the table revealed that 38% and 45% strongly agree and agree respectively that, it is necessary to be conscious about the temperature and time meat is been kept whilst 11% disagree and 6% strongly disagree. The study also revealed that majority, thus 63% and 9% strongly disagree and disagree of wearing clean boots or pair of foot wear in the abattoir whiles 14% strongly agreed of wearing clean boots and pair of foot wear. This means that majority of the butchers are not in support of wearing clean boots or pair of foot wear in the abattoirs for work. The study also revealed that 47% strongly agree and 31% agree that, butchers should not touch money when handling meat whilst 22% disagree and hence has an opposing view. This means that majority of the butchers do not touch money when handling meat.

Table 4.3: Meat Handlers Hygienic Practices in Abattoirs

ITEM/STATEMENT	FREQUENCY	PERCENTAGE
Cleaning before start of work	160	100
Type of Cleaning		
Sweep & dust	155	96.9
Sweep & Scrub	5	3.1
Fuel Used		
Car tyres	154	96.2
Fire wood	6	3.8
Dumping of Animal Waste		
Into the gutter	0	0
Near the abattoir	160	100
Protection of Meats from Flies and Pest		
Protect meat from flies, pest, dust	120	75.0
Don't protect meat from flies, pest, dust	40	25.0

The table 4.3 showed that all the respondents clean their premises before work commences each day. This confirms the assertion by Ceserani *et a*l (2005) that the practice of clean habit is the only way to achieve satisfactory standards of hygiene. Again, 70% of the respondent used sweeping and dusting method of cleaning. This is in line with what was founded in the literature by Bibec (2004) that, the first step in floor and equipment cleaning is to physically remove scrap, i.e. coarse solid particles, with a dry brush or brush or broom and shovel. The table showed that 96% of respondents use car tyres to singe the fur of slaughtered animals whiles 6% used firewood. This confirms the observation by Herbert *et al* (2006) that most butchers use car tyres to singe the fur of animals and this presents an occupational hazard to

stockyard and abattoir workers, but more often it poses a threat to the consumer. Table 4.3 revealed that all the respondents dump animal waste close to the abattoir.

Moreover, it was revealed that 75% of the respondents do protect slaughtered animals from flies and pest whilst 25% do not do. This finding is in line with the literature that every food establishment should have a pest control program. The target of this programme should be the eradication of insects and rodents that can spread disease and damage food since pests carry disease causing-micro organism in and on their bodies and can transfer them to food and food-contract surfaces (McSwane *et al*, 2003).

In conclusion, it can be said that meat handlers do not handle meat properly. This is because 70% of the handlers only sweep and dust their working surface, 96% use car tyers to singe carcase and 100% dump animal waste close to the abattoirs. However, a sizable number (75%) of the meat handlers protect the meat from files and pest.

Table 4.4: Transportation of Meat

Item	Frequency	Percent
In a taxi cap	8	5
Big open bowl	6	4
Moto king/Kia truck	146	91
Total	**160**	**100**

Table 4.4 revealed that majority thus 91% of the butchers used' moto king/kia truck' to transport slaughtered meat to the butcheries for sale. However, few butchers representing 5% and 4% used taxi cap and big open bowl respectively to convey slaughtered meat to the butcheries for sale. This means that most of the meats sold in

the butcheries are transported by a moto king/kia truck which are not covered or having chilled equipment there by exposing the meat to other micro organisms in the atmosphere.

Hygiene Training

A casual interaction with the interaction with butcher during the observation revealed that only one of the butchers has had a formal training in hygiene. This confirms a similar findings of a research carried out by Otupuri, *et al* (2000) that the butchers in Kumasi abattoirs had never receive any form of training, and that their knowledge, attitude, belief and practices are largely inadequate for their profession in view of the important role the butchers play.

Health Status of Meat Handlers

Table 4.5: Frequency of Medical Examination and Check Up

Item/response	Response	Frequency	Percent
	Very often	8	5.0
Frequency of medical	not often	106	66.2
examination of workers	Never	46	28.8
	Total	**160**	**100.0**

Table 4.5 indicated that majority (66%) of the butchers do not often go for medical examination and checks ups. Again, 46% never go for medical check-up whilst few representing 8% very often go for medical examination.

Table 4.6: Meat Handlers Knowledge on Contamination

	Response	Frequency	Percent
Food borne diseases			
	Yes	18	11
	No	142	89
	Total	160	100.0
Symptoms of food- borne diseases			
	Yes	11	7
	No	149	93
	Total	160	100.0
Type of food borne diseases			
	Yes	16	10
	No	144	90
	Total	160	100
Micro organisms that cause food borne diseases			
	Yes	0	0
	No	160	100
	Total	160	100

Table 4.6 showed that 89% of the respondents do not know any food borne disease whilst 11% are aware of food borne disease. Majority (93%) were not aware of symptoms of food borne disease. It is further revealed that 90% are not aware of any type of food borne disease whilst 10% claim to have knowledge about types of food borne disease. Again, all of the respondents had no knowledge about micro organisms that cause food borne diseases.

Knowledge on Food Safety Rules and Regulations

Items 22 to 34 on the questionnaire sought to find out respondents' awareness or knowledge of food safety laws and regulations operating in Ghana. The results are presented in tables 4.7.

Table 4.7: Knowledge on Food Safety Rules and Regulations

Item/statement	Response	Frequency	Percent
Knowledge of any food laws in Ghana			
	Yes	0	0.0
	No	160	100.0
Prosecution of culprits on food laws			
	Yes	6	3.8
	No	154	96.2
Knowledge of Slaughtering of animals under unsanitary conditions as an offence			
	Yes	38	24
	No	122	76
Slaughter animals without inspection			
	Yes	80	50
	No	80	50
Selling of rotten or filthy food			
	Yes	85	53.1
	No	75	46.9

Table 4.7 revealed that all the respondents thus 100% do not know any food safety law. This contradicts the Food and Drugs Law (PNDCL 305B) (1992) found in the literature which states that where a standard is prescribed under an enactment for food, a person who manufacturers, labels, packages, sells, or advertises food in a manner that is likely to be mistaking for food or the prescribed standard due to ignorance or otherwise commits an offence. Again, it indicated that 96% of the respondents have never seen anyone prosecuted for breaking a law on food safety. This could be due to what was found in the literature as exposed by Sefa-Dede (2009) that there is lack of legal structure on meat inspection procedure in Ghana it is yet to pass by parliament.76% of the respondents were not aware that slaughtering of animals under insanitary conditions is an offence in Ghana whiles 24% claim they are aware. The study also revealed exactly 50% of the respondents being aware that it is illegal to slaughter animals without inspection. In terms of rotten or filthy food, 53% of the respondents were found to be aware that selling rotten or filthy food to the general public is a crime punishable by law whiles 47% are not aware.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter presents a summary of the findings.

5.2 Summary of Findings

This study sought to assess the food safety situation in the abattoirs within the Accra Metropolis.

- In summary, the agencies responsible for the enforcement of laws regulating food safety were found to be Food and Drug authority, Environmental Protection Agencies, the Veterinary Service Department, Environmental and Sanitation Inspectorate Division of the Accra Metropolitan Assembly. It however noted that these laws are not fully enforced due to lack of logistics and co-operation.
- It was also revealed that the food safety practices observed at most of the abattoirs depicted that the safety of the meats coming from these abattoirs leave much to be desired. All of the abattoirs visited were open space at sea shore and some near open drainage. Again, it was observed that, animals were unhygienically slaughtered and carcasses are dressed on the bare ground as well as unsatisfactory transportation of meat to the butcheries.
- From the study, it was found that meat handlers do not handle meat properly. This is because majority of the meat handlers only sweep and dust their working surface, used car tyers to singe carcasses and dump animal waste close to the abattoirs. However, a sizable number of the meat handlers protect the meat from files and pest.

5.3 Conclusion

There are several laws enacted to ensure food safety. However these laws are not effectively enforced in the abattoirs hence butchers engage in practices which could lead to microbial contamination of meat.

5.4 Recommendations

In view of the findings from this study the following recommendations were made for consideration:

- The necessary logistics that will enhance the effective enforcement of food safety laws should be provided or made available to the enforcement agencies for effective enforcement of laws.
- Public education on the various laws governing food safety should be intensified to enlightened butchers and the general public on the roles of these food laws.
- Intensive workshop should be organized for all the butchers in order to keep them abreast with the global trends of practices within the food processing industry and also to upgrade their knowledge on how to keep meat safe from microbial contamination as well as human to food contamination and equipments to food contamination (cross-contamination).
- The government should introduce effective animal and meat inspection procedures and insist that only certify animals are permitted for slaughtering and only stamped carcasses should be allowed for sale to butcheries. The government should also consider amending the Meat Inspection Act to make it more responsive to the challenges of the food industry and to better protect the consumer.

- Government should establish modern abattoir in each sub-metro in the Accra metropolis to guarantee the safety of meat from abattoirs to butcheries.
- The government should also construct biogas plants at the various abattoirs in the sub –metros. The animal excreta and other waste generated could be used as a source of energy to singe animals in the abattoir rather than using car tyres which poses environmental and health risk.
- Officials of food safety law enforcement agencies should not accept gifts from butchers at the expense of food safety.
- The government should consider improving the working conditions and remunerations of these institutions in order to alleviate the temptation to accept bribe and gifts from butchers.

REFERENCES

Adzitey, F, & Teye, Gayam, A. (2010*). Microbial quality of chevon and mutton sold in Tamale Metropolis of northern Ghana* Vol. 14(4) 53-153 www.bioline org.br. ja Retrieved August 4th, 2013.

Ansa, T., Dzoagbe, S., Teye, G.A., Adday, S., & Danquah, J. (2010). *Microbial Quality of Beef Sold in Selected Market in Tamale Municipality Northern Region of Ghana*. Retrieved 20 /08/2013.

APEC, (2006). Food Safety Issues: Essential Safety requirements for Street Vended Food (Revised Edition). *World Health Development. Report of a APEC Experts-Committee on Food Safety Technical Report.*

Arthur, C. (2012). A *Functional Approach to Educational Research Methods and Statistics*.

Baird, M. (2005). *Cleaning and Sanitation in the Meat Plant*. USA Retrieved on 4 /08/2013.

Balshem, M. (2003). *Cancer in the community: Class and medical authority*. Washington, DC: Smithson Inst. Press.

Busta, F. (2008). *Meat Processing*. Retrieved 4/08/ 2013.

Ceserani, V., Kinton, R., & Fosket, D., (2005).*The Theory of Catering*.11th edition, New Interlitho, Milan Italy.

Codex General Principles of Food Hygiene. Retrieved on 4/08/2013.

Connally, E. H. (2009*). Good food Safety Practices: managing risks to reduce or avoid legal liability.* CTAHR project.

D'Aoust, J. Y. (1994). Salmonella and the international food trade. *International Journal of food microbiology.24:11-31*

Dewall, C. S., Alderton, L., & Liebman, B. (1999*). Food Safety Guide*. *Nutrition Action Healthletter.* Retrieved 4 /08/2013.

Duda, Z. (2000). *Report of the Establishment of the Small Scale Slaughter House*. FAO Rome.

Egan, M. B., Raats, M., Grubb, S. M., Eves, A., Lumbers, M. L., Dean, M. S., & Adams, M.R. (2007). A review of Food Safety and Food Hygiene Training Studies in the Commercial Sector. *Food Control, 18;1180-1190*

Farmer, P.E. (2007). Social Scientists and new Tuberculosis. *Social Science and Medicine*.44(3), 347-358.

Federal Register (1997). *Sanitation Requirement for Official Meat and Poultry Establishment* Volume 62 number 164. Accessed online August,2014.

Food and Agricultural Organisation (FAO, 2013). *Essential Safety requirement for Street vended food (revised edition)*. FAO Food and Nutrition Paper

Food and Agriculture Organization of the United Nations and World Health Organization, (2001).

Ghana Statistical Service (2010). *Population and Housing Census*. Retrieved 20/08/ 2013.

Gould, R. (2004). *Meat Safety*. Retrieved on 29/08/ 2013.

Govender, R. (2010). *Advancing the Hygiene Management System at Red Meat Abattoirs*. Retrieved 20/08/2014.

Hausmann- Mueda, J. P., & Ratcliffe, J. W. (1976). Analyst biases in KAP surveys: A cross-cultural comparison. *Studies in Family Planning* **7**(11), 322-330.

Hilton, J. (2002). *Reducing food-borne disease: meeting the food standards agency's targets*. *Nutrition & Food Science*, 32(2):46-50. Retrieved 4/10/ 2014.

http://haccpalliance .org/sub/food-safety/sanitation.pdf. Retrieved 20/09/2013

http://who.int/zooneses/resources/foodborne/en/index.html Retrieved 20/09/2013

http:/www.lawcommission.gov.np Retrieved 25/08/2014

http:/www.Vphasia.org/electroniconference.htm Retrieved 10/11/2013

Hubbert, W., Hagstad, H. V., Spangler, E., Hinton, M. H. & Hughes K. L. (1996). Food Safety and Quality Assurance: Food of animal origin (2nd Edition). Iowa, USA: Iowa State University Press.

Jackson, S. L. (2009). *Research Methods and Statistics: A Critical Thinking Approach (3rd Edition)*. Belmont, CA: Wadsworth.

Jackson, T.C., Harris, K. B & Cross, H. R. (1996). International Meat and Poultry HACCP Alliance. *Food Control* 7(2):103-105

Joshi, A.(2001).Improving *Meat Inspection Control in resource Community*. The Nepal Example. Retrieved on 16/09/2013.

Kretch, C. E. E. & Morgan,. (1970). *Table for Selection of Respondent*. Retrieved on 20/08/ 2013.

Lagenbrunner, I. K. (2009). Health care switching behaviour of patients in a Kenyan rural community. *Social Science &Medicine* 54(3), 377-386.

Lamba, E. O. (2002). The Street Food Trade in Africa: Safety and Socio-Environmental Issues. *Food Control*, *9(4): 211-215*.

Launiala, A. (2009). The Importance of Understanding the Local Context: Women's Perceptions and Knowledge Concerning Malaria in Pregnancy in Rural Malawi. *ActaTropica* 98, 111-117

Leech, M. (2006). Industry's Role in Food and Health. Journal of the Institute of Food Science and Technology, 20 (2),11.

Maila D. T., Manderson, L. and P. Aaby. 1992. An Epidemic in the Field: Rapid Assessment Procedures and Health Research. *Social Science & Medicine* 35(7), 839-50.

Marriot, N.G & Gravani, R. B. (2006). Principles of Food Sanitation-Food Contamination Sources Accessed on 20/11/2014.

McCrindle, C. M. E. (1995) .The Community Approach to Animal Welfare: An African Perspective. Applied Behavioural Science 59:227-233

McSwane, D., Ruc, N.R., Lincon, R., and Graf, W.A (2003). *Food Safety Fundamental*. Upper Saddle River, New Jersey.

Mensa, P., Yeboah-Menu. D., Owusu-Darko, K., Ablordy, A. (2002). *Street Food in Accra*. Ghana Bull World Organization 80:446-546. Retrieved on 20/08/2013.

Mensah, G. A., Goodman, R. A., Zaza, S., Moulton, A.D., Kocher, P.L., Dietz, W. H., Pechacek, T. F. & Mark, J. S. (2004). *Law as a Tool for Preventing Chronic Diseases: Expanding the Spectrum of Effect Effective Public Health Strategies.* Volume 1.No.1. Center for Disease Control and Prevention.

Ministry of Food and Agriculture (2009). *Agriculture in Ghana. Facts and Fiugures*. Statistics Research and Information Directorate (SRID), Accra.

Nel, S, Lues, J. K. R., Buys, E. M., Venter, P. (2004). The Person and General Hygiene Practice in the Deboning Room of a High through put red meat abattoir. *Food control, 15:571-578*

Nesbakken, T. & Skjerre, E. (1996). Interruption of Microbial Cycles in Farm Animals from Farm to Table. *Meat Science 43*:47-57

Nichter, M. (2003). Social Science Lessons from Diarrhea Research and their Application to ARI. *Human Organization* 52(1), 53-67.

Nichter, M. (2003). 2008. *Global health: Why Cultural Perceptions, Social Representations, and Biopolitics Matter*. Tuscon: University of Arizona Press.

Norrung, B and Buncic, S. (2008). *Microbial Safety of Meat in the European Union.Meat Science*, 78:14-24.

Otikono, A., S., (2005), *Street Sending of Home-prepared Foods in the Informal Settlements of Afferidgeville.* Master's of Technologiae: Food and Nutrition thesis; Tshwane University of Technology

Pelto, J. P., & Pelto, G.H. (2007). *Attitudes and Persuasion—classic and Contemporary Approaches*. Dubuque, IA: W. C. Brown Co. Publishers

Pelto, J. P.,& Pelto, G. H. (2004). Studying Knowledge, Culture, and Behavior in Applied Medical Anthropology. *Medical Anthropology Quarterly* 11(2), 147-163.

Royal, L. & McCoubrey, I. (1989). *International Speed of Disease by Air Travel. American Family Physician* 40:129-136

Rutter, D. & Quine, L. (2002). *Changing Health Behaviour: Intervention and Research with Social Cognition Models.* Buckingham, Open University Press.

Sanlier, N. (2009). The knowledge and Practice of Safety by Young and Adult Consumers. Food control,20(6),538-542.

Schneider, H. (2004). FAO/WHO/OIE. Electronic Conference on Veterinary Public Health and Control of Zooneses in Developing Countries. Retrieved Sept., 2014

Seaman, P., & Eves, A. (2006). The management of food safety-the role of food hygiene training in the UK Service Sector. Hospitality management,25,278-296.

Sefa-Dede, S. (2008). Ghana: Over view of Food Safety Situation in Africa Country Position. . Retrieved November, 2014.

Semedo, S. (2010). *Increase in Food borne Illness*. Retrieved August 29th, 2013.

Shale, K., Jacoby, A. and Plaatjies, Z. (2006).*The impact of extrinsic sources on selected Indicator organisms in a typical deboning room.* International Journal of Environmental Health Research, 6(4):263-272.

Simelane, N. B. (2005). *The Knowledge, Attitudes and Practice Model.* A Descriptive Study. *Journal Food Protection*, 63(3):381-383.

Smith, (2008). *Technical support for Improvement within the Street Food Sector.* Pretoria. Unpublished Report.

Syposs, Z. (2003). *The Role of Risk Analysis in the Food Quality and Safety Management*. Retrieve 20/08/ 2013.

Tauxe, R.V. (1997). Emerging food borne diseases: an evolving public health challenge. Emerging Infectious Diseases 3: 425-434.Retrieved September, 2014.

Tshabalala, P.A. (2011). *Effect of Food Safety Systems on the Microbiological Quality*. Retrieved 20/08/ 2013.

Warriss, P. (2010). *Meat Science: An Introductory Te*xt. CAB International, Cambridge University Press, Cambridge, UK. 2ndEdition.Pp 77-84.

WHO, (1995). Report of the WHO consultation on emerging foodborne disease, Berline, German, 20-24th March, 1995.Retrieved September, 2014.

WHO, (2004). Regional Office for Africa "Developing and Maintaining food Safety Control Systems for Africa Current Status and Prospect for Change", *Second FAO/WHO Global forum of Food Safety Regulators. Bangkok, Thailand; 2004, p.1214.*

WHO, (2008). *Food Safety: a world-wide public health issue*. Retrieved August 29th,2013.

www.sprinerlink.com/content/V05322609481 pohx

Yockey , M., & Lesley, R.(1998). Food Science and You. New York: McGraw Hill

Yousuf, A .H. M., Ahmed, M. K., Yeasmin, S., Ahsan, N., Rahman, M.M., & Islam, M. M. (2008). *Food Chemical Composition and Functional Properties of Raw Meat*. Retrieved 20/08/ 2013.

APPENDIX A

UNIVERSITY OF EDUCATION, WINNEBA

(KUMASI CAMPUS)

M.TECH (CATERING HOSPITALITY MANAGEMENT)

INTERVIEW GUIDE FOR LAW ENFORCEMENT OFFICERS

RESPONSIBLE FOR FOOD SAFETY

TOPIC: Food Safety Knowledge and Food Safety Practices of Meat Handlers in Abattoirs and butcheries in the Accra Metropolis of Ghana

BY RICHARD ASIAM

Demographic status

Age of interviewee:

Sex:

INSTITUTION:

Work Experience:

Food safety situation in the abattoirs and butcheries

1. How does your institution ensure that meats coming from our abattoirs are safe for human consumption?
2. How often do you go to these abattoirs for inspection?
3. How do you deal with non-compliance or violation of safety standard?
4. What is your assessment of the meat safety situation in the various abattoirs in the Accra Metropolis?

Food safety Regulatory System that Operates in the Abattoirs and Butcheries

1. What are the regulatory systems which are operated by your outfit in our abattoirs?
2. How do you communicate these regulatory frameworks to the butchers?
3. How do you enforce these regulations in order to ensure food safety?
4. What are the challenges you face in enforcing these regulations?

UNIVERSITY OF EDUCATION, WINNEBA

(KUMASI CAMPUS)

M.TECH (CATERING AND HOSPITALITY MANAGEMENT)

INTERVIEW GUIDE FOR BUTCHERS

TOPIC: Food Safety Knowledge and Food Safety Practices of Meat Handlers in Abattoirs and butcheries in the Accra Metropolis of Ghana

BY RICHARD ASIAM

Demographic status

Age of interviewee:

Sex:

INSTITUTION:

Work Experience:

Regulatory systems in the abattoirs

1. What are some of the laws and regulations that regulate your activities here?
2. Do you think these laws are necessary?
3. How does these laws hinder or help facilitate your operations?
4. What are some of the institutions that come here to supervise your activities?
5. What are some of the problems you usually encounter with these law enforcement agencies?

Practices of butchers in the abattoir which could lead to microbial contamination

1. How do you slaughter and dress animals brought to the abattoir?
2. Why do you prefer car tyres to firewood when it comes to singeing the fur of animals?
3. Do you give gifts and moneys to law enforcement agencies who come here for supervision?
4. Do you take receipts for these cash you give to them?
5. What are the practices some of you colleagues the butchers engaged in which you consider as a threat to food safety?

APPENDIX B

QUESTIONNAIRE FOR MEAT HANDLERS

SCHOOL OF GRADUATE STUDIES

UNIVERSITY OF EDUCATION, WINNEBA – KUMASI COMPUS

DEPARTMENT OF CATERING AND HOSPITALITY MANAGEMENT

I am a student pursuing Master of Technology Education in Catering and Hospitality in the above mentioned University. I am carrying out a research on the topic: FOOD SAFETY KNOWLEDGE AND FOOD SAFETY PRACTICES OF MEAT HANDLERS IN ABATTOIRS AND BUTCHERIES IN ACCRA METROPOLIS OF GHANA. This study is pure academic which will help contribute to safe handling of and meat. Your views will be treated with confidentiality.

A. Administer …… Date ……. / ….. /……

B. DEMOGRAPHIC CHARACTERISTICS

1. Gender Male☐ Female☐
2. Age :

   Less than 20☐ 20-25☐ 26 -30☐ 31 – 40☐ 41 – 45☐

   above 45 ☐

C. EDUCATIONAL BACKGROUND:

JHS ☐ SHS ☐ Diploma☐ Degree☐ Others ……

D. **OCCUPATION**:

Butcher ☐ Attendant ☐

PLEASE INDICATE THE EXTENT TO WHICH YOU AGREE OR DISAGREE WITH THE FOLLOWING STATEMENTS.

FOOD SAFETY SITUATION IN ABATTOIRS AND BUTCHERIES

1. Meat requires special handling because it contains bacterial.

   Strongly agree☐ Agree ☐ Strongly disagree☐ Disagree☐

2. Butchers should wash their hands frequently as they sell the meat to the public.

   Strongly agree☐ Agree ☐ Strongly disagree☐ Disagree☐

3. Hair, nose, mouth and ear should not be touched when handling meat.

   Strongly agree☐ Agree ☐ Strongly disagree☐ Disagree☐

4. Butchers should wear clean white cloth and hair nets.

   Strongly agree☐ Agree ☐ Strongly disagree☐ Disagree☐

5. Time and temperature control is the best way of making meat safe.

   Strongly agree☐ Agree ☐ Strongly disagree☐ Disagree☐

6. Butchers should wear clean boots or pair of foot wear.

   Strongly agree☐ Agree ☐ Strongly disagree☐ Disagree☐

7. Butchers should not touch money when handling meat.

   Strongly agree☐ Agree ☐ Strongly disagree☐ Disagree☐

MEAT HANDLERS HYGIENE AWARENESS AND TRAINING

8. Do you always clean your premises before work?

   Yes ☐ No ☐

9. If yes what type of cleaning? Sweeping and Dusting☐

   Sweeping and Scrubbing ☐ Others (specify).....…….

10. Which of the following detergents do you use in cleaning?

    Powdered soap ☐ Cake soap ☐ Liquid soap ☐ others (specify).....…….

11. How do you singe the fur of the slaughtered animal?

    By burning lorry tire ☐ By using firewood ☐

    others (specify).....……

12. How do you dispose of animal waste?

    By dumping it near the abattoir ☐ By dumping it into a gather ☐

    others (specify)…....

13. Where do you dress the meat after slaughtering?

    At the slaughtering site ☐ at the selling point ☐ others (specify)……..

14. How do you convey meat from the abattoir to the butchery?

    By conveying in taxi cap ☐ in a big open bowl l ☐

    others (specify).....……..

15. Do you protect the displayed retail meat from pest, insect, and dust?

    Yes ☐ No ☐

16. Have you had any hygiene training before?

    Yes ☐ No ☐

17. Time and temperature control, is it the best way of making meat safe?

    Yes ☐ No ☐

18. Do you know how long raw meat should stay outside before storage?

    Yes ☐ No ☐

HEALTH STATUS OF MEAT HANDLERS

18. How often do you go for medical checkup?

    Very often ☐ not often ☐ never ☐

19. Have you ever done any blood related medical examination?

    Yes ☐ No ☐

20. Have you ever suffered from any blood related diseases?

Yes ☐ No ☐

MEAT HANDLERS KNOWLEDGE ON CONTAMINATION

21. Are you aware of the term 'food – borne illnesses?

Yes ☐ No ☐

22. Do you know any symptoms of food-borne diseases?

Yes ☐ No ☐

23. Do you know any type of food-borne diseases?

Yes ☐ No ☐

24. Do you know any micro-organism that causes food-borne diseases?

Yes ☐ No ☐

KNOWLEDGE ON FOOD SAFETY REGULATIONS

25. Do you know any of the food laws in Ghana?

Yes ☐ No ☐

26. Have you seen anybody who has been prosecuted for violating the food laws of Ghana? Yes ☐ No ☐

27. The slaughtering of animal under unsanitary condition, is it an offence?

Yes ☐ No ☐

28. Is it illegal to slaughter animal without supervision or inspection?

Yes ☐ No ☐

29. Is it illegal to sell food filthy or rotten?

Yes ☐ No ☐

30. Are you aware that it is illegal to convey food in the manner that does not preserve the quality and purity? Yes ☐ No ☐

SCHOOL OF GRADUATE STUDIES

UNIVERSITY OF EDUCATION, WINNEBA – KUMASI COMPUS

DEPARTMENT OF CATERING AND HOSPITALITY MANAGEMENT

I am student pursuing Master of Technology Education in Catering and Hospitality in the above mentioned University. I am carrying out a research on the topic: FOOD SAFETY KNOWLEDGE AND FOOD SAFETY PRACTICES OF MEAT HANDLERS IN ABATTOIRS AND BUTCHERIES IN ACCRA METROPOLIS OF GHANA. This study is purely academic which will help contribute to safe handling of food and meat. Your views will be treated with confidentiality.

Abattoirs and Butcheries Establishment Observation Checklist

A. Observer…… Date……/……/……

B. Contact Person and Position

……

C. Area

……

LAYOUT AND FABRICATION

1. Is the slaughtering facility located a distance away from open sewerage drains?

   Yes ☐ No ☐

2. Is the facility located a distance away from public urinals and lavatory?

   Yes ☐ No ☐

3. Is the facility located a distance away from refuse dumping areas?

   Yes ☐ No ☐

4. Are the building constructed of wood?

   Yes ☐ No ☐

5. The operations carried out in a building are not intended for slaughtering or butchery?

   Yes ☐ No ☐

6. Is the building interconnected with residential area or animal house?

   Yes ☐ No ☐

7. Is the area free from overgrown vegetation?

   Yes ☐ No ☐

8. Are there obsolete and decommissioned items around the facility?

   Yes ☐ No ☐

9. Does the layout prevent cross contamination?

   Yes ☐ No ☐

PERSONNEL HYGIENE

1. Do meat handlers change over to set of overalls when they enter the abattoir or butchery?

   Yes ☐ No ☐

2. Are the nails of meat handlers trimmed short and dirt free?

   Yes ☐ No ☐

3. Are personnel equipped with full complement of protective clothing?

   Yes ☐ No ☐

4. Does the head gear completely cover the hair?

   Yes ☐ No ☐

5. Are personnel's seen to be suffering from cold, coughs and opened wounds in the processing area?

   Yes☐ No ☐

6. Is the wearing of jewellery observed in the processing area?

   Yes☐ No ☐

7. Is smoking, spiting, and eating in the preparation area prohibited?

   Yes☐ No ☐

8. Are legends displayed to that effect conspicuously?

   Yes☐ No☐

PERSONNEL FACILITIES

1. Are the adequate toilet facilities for male and female personnel?

   Yes☐ No ☐

   2. Are the toilets facilities clean? Yes ☐ No ☐

3. Are hand sinks provided? Yes No ☐ ☐

   4. Are hand sink equipped with soap, disposable towels and water?

   Yes ☐ No ☐

RAW MATERIAL (ANIMALS) ACQUISITION

1. How are raw materials (animals) transported to the facility?

   ……

2. Is there documented list of suppliers? Yes ☐ No☐
3. Are suppliers inspected? Yes☐ No ☐
4. If so how often?

   ……

5. Is there documented set of specification for the raw materials? Yes ☐ No☐

COLD STORAGE FACILITIES

1. Are cold storage facilities provided for leftover meat? Yes ☐ No ☐
2. Does the unit have a thermometer? Yes ☐ No ☐
3. Is the thermometer monitored and record? Yes ☐ No ☐
4. Are the meats stored at the right temperature? Yes ☐ No ☐
5. Is the arrangement in the refrigerator such that contamination is avoided?

   Yes ☐ No ☐

WATER SUPPLY AND STORAGE

1. Is the water supplied portable? Yes ☐ No ☐
2. Is water holding facility secure? Yes ☐ No ☐
3. Is water holding facility clean? Yes ☐ No ☐
4. What cleaning agents are used……..
5. Are the cleaning tools used for other purposes? Yes ☐ No ☐
6. Are there cleaning records for verification? Yes ☐ No ☐

MEAT PROCESSING AREA

1. Is the processing area clean? Yes ☐ No ☐
2. Is the processing area enclosed? Yes ☐ No ☐
3. Are the area well ventilated? Yes ☐ No ☐
4. Are the walls washable up to the height of about 5 feet from the floor?

   Yes ☐ No ☐
5. Are the windows / vents screened? Yes ☐ No ☐
6. Are the doors fitted with self closing device? Yes ☐ No ☐
7. Is the floor smooth, washable and cracks and crevices? Yes ☐ No ☐
8. Is washing basin provided for hand wash? Yes ☐ No ☐
9. Does expert staff supervise work carried out in this section? Yes ☐ No ☐

10. Do the personnel including expert wear full compliment of protective clothing? Yes ☐ No ☐

EQUIPMENT FOR PROCESSING

1. Is the equipment so designed and constructed of materials which are suitable for the intended use?

   Yes ☐ No ☐

2. Are the tools or equipment placed in such a manner to facilitate easy cleaning?

   Yes ☐ No ☐

3. Are meat contact surfaces or equipment smooth, free from crevices or loose section?

   Yes ☐ No ☐

4. Is colour coding observed for knives and chopping boards?

   Yes ☐ No ☐

5. Are cutting boards and knives clean?

   Yes ☐ No ☐

6. Are work surface and tools clean and sanitized?

   Yes ☐ No ☐

WASTE MANAGEMENT

1. Are garbage cans clean and covered?

   Yes ☐ No ☐

2. Are waste bin areas maintained clean?

   Yes ☐ No ☐

PEST CONTROL

1. Is there a regular schedule of pest control by licensed pest control officer or personnel?

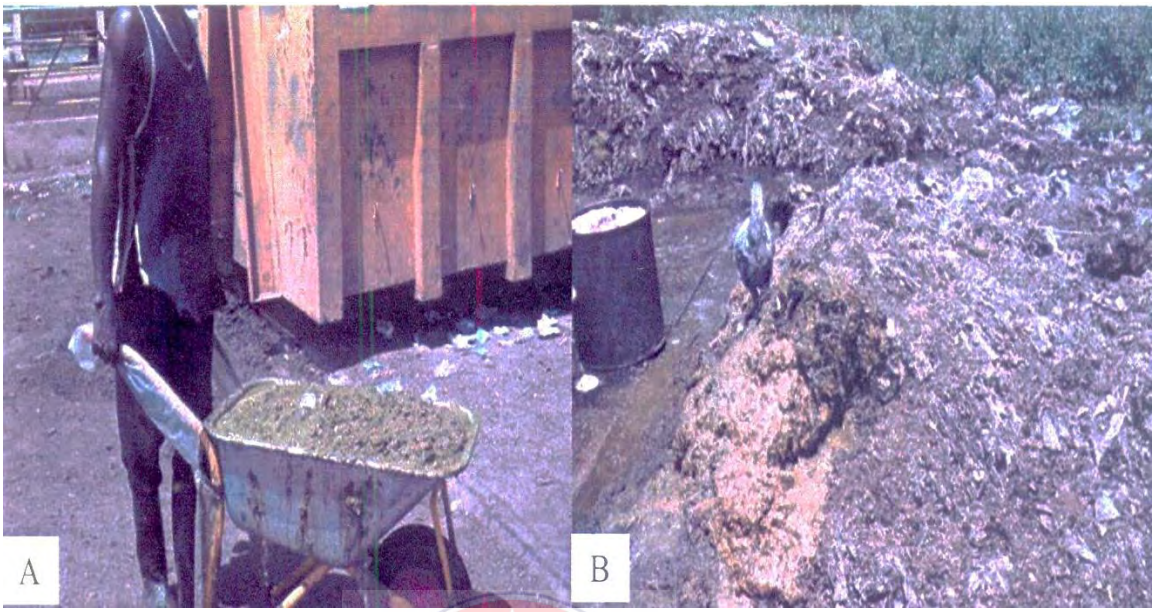
   Yes ☐ No ☐

2. Are there any signs of rodent activity such as droppings and chewed bags?

   Yes ☐ No ☐

APPENDIX C

Pictures from Observation

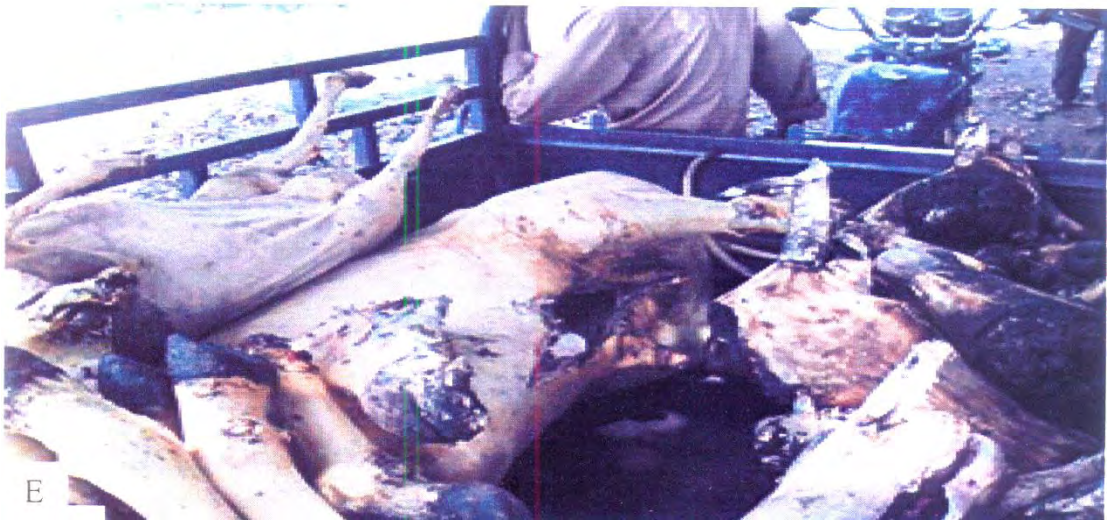


Abattoir Attendant Dumping waste close to Abattoir

Source: Field Survey, 2014

Tyres for Singe (A) Carcass Processing on the Floor close to a Pile of Gut Content (B)

Source: Field Survey, 2014



Beef ready to be transported to the market (Butcheries)

Source: Field Survey, 2014

Butchery

Source: Field Survey, 2014