Sudan University of Science and Technology

Collage of Graduate Studies

A Study of the Extent of Appling of Meat Hygienic Quality Criteria at Sales and Consumption Centers at Khartoum State

دراسة مدى تطبيق انظمة الجودة لصحة اللحوم في نقاط البيع والاستهلاك في ولاية الخرطوم

By

Mohammed Omer Ahmed Ibrahim

U of K Vet 2000 (BVSc)

A thesis Submitted for Sudan University of Science and Technology to fulfillment for the master degree of Preventive Veterinary Medicine (MPVM)

Supervisor : Prof Mohammed Abdelsalam Abdalla

July 2018

Dedication

I honorably dedicate this work to my beloved family who sincerely encouraged me and shouldered all endeavors to bring this work to reality. I dedicate also to the spirit of my father. Thanks to the valuable support of my mother and elder sister, my wife, my brothers, my sisters and my sweet heart Marin, Renad and Reval, I am able to endure and overcome all unforeseen impediments that might have hindered my path. Your trustworthy support has motivated me to proceed to the shore of success.

To you all I owe you millions thanks and appreciation.

Acknowledgments

Praise be to God who helped me in the research and study.

Praise and respect should be attributed to the great people who did not deny me any advice, guidance and coaching through the research terms. Special recognition to my supervisor Prof. Mohammed Abdul AL Salam who benevolently facilitated all his broad knowledge and expertise for the purpose.

Also my appreciation to Dr. Yahya Sabeel, Dr. Mona, and all the staff of Soba Veterinary Research Institute, Department of Bacteriology for their help and providing all the equipment's I needed in the lab.

Also my thanks and appreciation to Prof. Hassan Mirghani, at Qassim University, for helping me to publish my research paper.

My thanks and appreciation to Mei Shamoun and Jihad in the Ministry of Planning for their assistance in statistical analysis.

Also my thanks and appreciation to my friend Prof Amir Mahjoub who helped me with his advice, guidance and support.

Finally, I cordially every person – to name few not all – the technicians and labor force in all fields, and friends who contributed in helping me to convert this work into reality.

ABSTRACT

The research was aimed to study and assess the microbial evidence on the meat market in Khartoum. And the extent of their safety for human consumption and the non-application of any quality programs such as HACP in the trade and circulation of meat in the sales centers and restaurants in the state of Khartoum and the relationship of lack of hygiene and place on the rates of

The aim of the microbiological examination is to control the quality of the product and extend its validity for as long as possible and to ensure that it is free of microbes that may pass themselves or toxins to the consumer, causing health problems sometimes in up to the risk level.

The study included a questionnaire distributed in meat sales and trading centers as well as samples of local beef were analyzed for the searching for contamination microbes .

The study found presence of high contamination *E.coli* bacteria by 25% , *Staph.aureus* bacteria by 23% , Different proportions of some other strains of bacteria were isolated , the study also showed that the contamination was not related to the place after the statistical analysis by the Chi-Square program and it was mean non-application of quality systems in the meat trade , and the lack of attention to personal hygiene workers and the cleanliness of the place and the proper ways to transfer the meat to the sales centers and meat display in the centers was not in accordance with health requirements according to the laws of the Sudanese Standards Authority.

الملخص باللغة العربية

الغرض من البحث تقييم جودة اللحوم في ولاية الخرطوم ومدى وجود تلوث في اللحوم ومدى سلامتها للاستهلاك البشري وعلاقة نقص النظافة بوجود التلوث وعدم وجود تطبيق لبرامج الجودة في مراكز بيع وتداول اللحوم مثل نظام تحديد المخاطر (الهاسب) .

شملت الدراسة استبيان تم توزيعه في مراكز بيع وتداول اللحوم وايضا عينات من لحوم الابقار المحلية تم تحليلها في المعمل وتم اثبات وجود تلوث عالي ببكتريا *E.coli* وبكتريا *Staph.aureus* وبعض الاجناس الاخرى .

الهدف من الفحص الميكروبيولوجي هو السيطرة على جودة اللحوم وتمديد صلاحيتها لأطول فترة ممكنة وضمان خلوها من الميكروبات التي قد تسبب ضرر للمستهلك وبالتالي تكلفة عالية على المواطن والحكومة.

النتائج كانت وجود تلوث عالي بكتريا *E.coli* بنسبة 25٪ وبكتيريا بنسبة *Staph.aureus* 23٪، ونسب مختلفة لبعض سلالات البكتيريا وبواسطة التحليل البياني تم التأكيد بأن التلوث نتيجة لسوء النظافة وعدم تطبيق الاشتراطات الصحية على حسب المواصفات القياسية السودانية والمواصفات العالمية لأنظمة الجودة في مجال الاغذية .

List of Contents

List of Figures

List of Tables

Abbreviations

HACP	HAZARD ANALYSIS AND CRITICAL CONTROL POINT
ACMSF	Advisory Committee in Microbiological Safety of Food
WHO	World Health Organization
FAO	Food and Agriculture Organization
ANZFA	Australia New Zealand Food Authority
C.D.C	Center for Disease Control and Prevention
HES	Household Expenditure Survey
AOAC	Association of Official Analytical Chemists
CIEH	Chartered Institute of Environmental Health
EU	European Union
ISO	International Organization for Standardization
GMP	Good Manufacturing Practice
FSSC	Food Safety System Certification
GFSI	Global Food Safety Initiative
PRP	Prerequisite Program Requirements
FDA	Food and Drug Administration
NASA	National Aeronautics and Space Administration
CCP	critical control point
SQF	Safe Quality Food
SSOP	Sanitation Standard Operating Procedures
XLD	Xylose lysine deoxycholate Media
USDA	United States Department of Agriculture
RNA	Ribonucleic acid
MRI	Magnetic Resonance Imaging
DNA	Deoxyribo Nucleic Acid

Introduction

Food safety is a scientific organization, which describes the ways of dealing with the manufacture, stockpiling and handling food, through ways to prevent foodborne diseases this includes a number of traditional methods, which must be followed to avoid any possible sharp health risks. Food ability to transfer many of the disease from one person to another, as well as playing the role of a mediator for the growth of bacteria that cause food poisoning. (Satin, 2008)

The meat comes first in the safety of food because the meat is one of the most important nutrients in the human diet as an important source of protein, which is one of the most important food sources for human needs, also meat of basic foods for form cells and tissue, the restoration of the destruction of these cells and tissues and is working to revitalize jobs gut and blood and brain, the per capita consumption of the criteria indicating the food situation of a society on the other hand, meat can be a source of danger to human rights. As the meat exposed to biological and chemical pollution, Bacteria are the most important groups of microorganisms that occur during the process of producing red meat. And are the most important in both food corruption and diseases of food infections, fungi may cause some problems but they are not of great importance, while viruses and protozoa are more important than fungi, It is difficult to identify them through routine microbiological tests (Sara, L.L 1999) , so the focus of this study will be on bacteria, E. coli is the most important bacteria in food poisoning that causes diarrhea and bloody urine, especially in children and the elderly, the main factor of infection by meat, as some reports published during the last ten years. (Tuttle, *et al*,1999) *Staphylococcus aureus* (Geo, *et al*, 2007) is also found in meat contaminants, as well as salmonella bacteria and many species of bacteria.

During preparation and processing of meat, it could be subjected to the pollution more than types of foods through water sources (ACMSF 1995) or through with slaughtering process (Van, *et al*,1998) or by workers in the processing and handling of meat or meat trading places surfaces or through a defect in temperature control (AL-Sheddy, *et al* , 1995), Thus, the meat is one of the most important causes of food contaminants and infections of food in countries commonly consumed meat.

The safety and quality of meat two concurrent demonstrated their suitability for human consumption and the nutritional value.(Codex Alimentarius 1997)

The presence of bacteria in meat reduces the quality and leads to the injury of the consumer diseases and cause diarrhea and vomiting and in fact describe this type of disease by the World Health Organization (WHO) as the most affecting diseases of public health in the modern world, these diseases have become a significant burden on health systems, social, economic and cultural characteristics of different countries and at all levels "diseases of the infection is one important reason for which they are relying on food safety management systems such as a risk analysis and critical control points (HACCP). The main challenge in the meat industry in terms of cleanliness is to reduce the microbial contamination of meat by microorganisms by sequencing all stages of the production process and following the necessary health requirements by controlling the critical limits through which contamination can occur eg temperature , meat is not covered and workers do not follow proper health requirements.

and points of sale for the importance of these studies to stop the risk of pollution, which causes health problems and economic losses of the country.

For example: a study was conducted in Mosul about extracting the bacterium *Staphylococus aureus* was isolated from the meat in the meat market where it formed bacterial isolation ratio of 14.6% . (Omer, *et al*, 2009)

Also study was conducted in for the existence of bacteria in meat in the markets where it *Staphylococus aureus* was isolated and found no *Salmonella*. (Ali, *et al*, 2013)

Also a study on different samples of meat it was found that 47% contain *Staphylococcus aureus* and 96% of them were resistant to at least one of the antibiotics and 52% ere resistant to three types. (Anderson, 2003)

The aim of the study was as follows

1- Investigate the quality of food safety and identify critical points at the sale and consumption of meat points in Khartoum State

2-Contribute to maintaining the health of the environment

3-Access to healthy food product

Search method

1- questionnaire to clarify the health supervision of the sale of meat points and . Clarify the extent of matching quality standards in meat hygiene in the places

included in the study (in terms of product , quality used tools , quality buildings , transport , workers and waste disposal)

2- To isolate and identify the contaminated bacteria of the selected sale point.

Chapter One

Literature Review

Chapter One

Literature Review

1.1. Citizens' Rights

People have the right to the meat they eat is safe and suitable for consumption be. Disease they are carrying the meat of animals and damages that result from them irritating, but it can be fatal. There are also many other findings that may result from eating meat unhealthy or unfit for consumption. Pervasive meat-borne diseases can damage trade and tourism, and lead to the loss of income, unemployment and litigation. The meat spoilage and food generally leads to a waste of resources, including the cost, and can adversely affect trade and consumer confidence.(UN document, 1999)

1.2. Meat trade and safety

International trade in meat and food is increasing, including the social and economic benefits. But it also increases the possibility of disease spread around the world. On the other hand changes in food habits are often in many countries during the past two decades, this coincided with new ways to produce food and meat, preparation and distribution. The responsibility for ensuring the safety of food and validity of consumption is the responsibility of all. There are many common diseases among humans and animals and proceeds of those diseases from animal to human rights in many ways the most important meat and milk has been defined as those diseases term zoonoses diseases**.** (Ibrahim, 1990) (WHO, 1982)

The principles and strong foundation for food safety, meat and should be used along with the specific rules for health practices, as well as guidelines for microbiological specifications. You must track down the food chain from food production to final consumption and highlight key health controls. Recommend the application of curriculum-based pollution risk analysis and critical control point, where possible, to increase safety, as shown in the contamination hazards analysis and critical control point and guidelines for its application. Meat safety and quality twin qualities indicate the suitability for human consumption and nutritional value even discuss the matter in some detail we must identify the terminology of meat safety live roads for their production and circulation. (Codex,1997)

Healthy meat production starts from the farm through the slaughterhouse to the consumer through retail outlets and through the foundations if there ensure

proper meat production and scientific manner and thoughtful and healthy and fit for human consumption.

1.3. composition of meat:

The meat is divided into two parts: red meat such as beef, sheep, goats and camels white meat such as chicken, ducks, geese, turkeys and fish.

Animal carcass are muscles and fat and bones of these ratios vary depending on the type of animal parts and degrees as shown in (table 1.1) (Alawda and Saleh, 1984)

Meat is define animal muscle tissue, muscle tissues within the nerves and blood vessels and fat and connective tissue. (Mohamed, *et al* 1992)

1.4. Meat Quality Concepts and Terminology

Meat safety means ensuring meat does not cause harm to the consumer when preparing or dealt with according to their intended use.

Validity of meat to ensure that acceptable meat for human consumption and be in accordance with the intended use.

Meat quality means conforming to standards and meet the requirements of the consumer.

Hygiene means dusting, and the remains of food, fat and other unacceptable material.

pollutant means any biological or chemical substance or strange, or any other substance not intentionally added to food, which could affect safety or suitability.

Contamination means that meat or food generally or the environment where there are no pollutants.

Clearing meat or disinfect meat means reducing microorganisms in the environment to a level that does not affect the safety of meat or expired, using chemical and physical methods.

Butcher shop is any building or area where selling or trading meat and surrounding areas under the control of the same administration.

Restaurant means any building or area in which the sale meat cooked.

Food hygiene is all conditions and measures necessary to ensure the safety and suitability of food at all food chain.

Dangers are any biological, chemical or physical agent found in food or in circumstances where the potential to cause adverse health effect.

Hazard Analysis and Critical Control Point system - to determine the risks of the job for food safety, and evaluation and control.

Traders in food are anyone doing business directly or indirectly with the packaged food or unpackaged, or with equipment or food items or surfaces in contact with food, and thus be required to comply with the terms of food safety.(Satin, 2008)

Food safety is a scientific discipline describing handling, preparation, and storage of food in ways that prevent food-borne illness. The occurrence of two or more cases of a similar illnesses resulting from the ingestion of a common food is known as a food-borne disease outbreak. This includes a number of routines that should be followed to avoid potential health hazards. In this way food safety often overlaps with food defense to prevent harm to consumers. The tracks within this line of thought are safety between industry and the market and then between the market and the consumer. In considering industry to market practices, food safety considerations include the origins of food including the practices relating to food labeling, food hygiene, food additives and pesticide residues, as well as policies on biotechnology and food and guidelines for the management of governmental import and export inspection and certification systems for foods. In considering market to consumer practices, the usual thought is that food ought to be safe in the market and the concern is safe delivery and preparation of the food for the consumer. (Satin, 2008)

1.5. basic standards of food hygiene

The World Health Organization (WHO) recognizes basic food hygiene standard As follows

1- Cooking foods for a period of time and under the right temperature to kill bacteria and pathogens.

2- Store foods in appropriate temperatures.

3- Use safe water and raw materials.

(FAO and WHO, 2003).

1.6. Ideal steps for meat processing and trade

Should get to know the best methods and controls to handle manufacture and produce and meat handling.

Environmental health

Should consider possible sources of pollution caused by the environment. In particular, should not be producing or handling meat in areas could potentially harmful substances to contaminate meat. **(** FAO and WHO, 1984**)**

Health food sources production

Should at all times take into account the possible effects of meat production activities on the safety and validity of the meat. This includes, in particular, to identify any specific points in such activities chances of contamination may be high and take specific measures to reduce these possibilities. Hazard Analysis System and Critical Control Point in taking such measures may help - see Hazard Analysis System and Critical Control Point and Guidelines for its Application. **(** Robert, 1996**)**

1- Control pollution of air, water or feed, fertilizers (including manure), pesticides, veterinary drugs, or any other material used in the production of foodstuffs.

2- Control animal and plant diseases so as not to pose a threat to human health or adversely affect power production.

3- Protection meat sources of fecal contamination or other contaminants.

4- Take care of waste disposal, keeping harmful substances properly. Programs implemented in the fields to achieve specific objectives which relates to food safety an important part of primary production operations have become, and should be received every encouragement**.** **(** FAO and WHO, 2003 **)**

Trade and transportation

Producers should take care on:

Inspection and sorting meat to get rid of meat unfit for human consumption and disposal in a healthy way unacceptable materials; and protect meat from contamination by insects, or chemical pollutants, physical or microbiological or other unacceptable material during trade or transportation. Care should be taken, as far as is reasonably practical, to prevent deterioration or damage to the meat,

through the appropriate measures which may include temperature control, humidity, and other similar measures such as cleaning, maintenance and hygiene in the production and trade of meat. **(**Buzby and Roberts, 1997**)**

Installations

This is design and facilities should be located, equipment and facilities are designed and located to ensure:

Reducing pollution to a minimum and to allow maintenance operations design and cleanliness and proper cleansing, reducing air pollution; and not be raw materials and surfaces which is especially touching to meat which leads to poisoning when using meat in their intended purpose, and to be made of high durability and easy maintenance and cleaning. Walls and roofs should be commas and flooring materials impermeable to liquids. The walls and ceilings must be of high height and the floor allows for cleanliness and prevents accumulation of dirt, The contact surfaces for the food are clean, the temperature control is available, having effective protection against the entry of insects or harboring.

It is necessary to take into account the quality of design and construction from a health point of view, choose the appropriate location, and provide adequate facilities, so it is possible to control the pollution risks effectively. (ANZFA 1999)

Equipment

Should be of material resistant to rust and easy to clean and does not have a toxic effect. Equipment design and the packaging should be touching the meat (unlike containers and packaging materials that are used once), ensuring the possibility to carry out cleaning and disinfection and adequate maintenance, when necessary, to avoid exposure to contamination. It should be made of materials and packaging equipment has no toxic effect when used for the intended purposes. When should be heavy duty equipment and removable or can be decomposed to permit maintenance, cleaned, disinfected, and control, and to facilitate the inspection of insects that may affect them. (Codex,1997)

Water supply

There should be an adequate supply of drinking water with appropriate facilities for storage, distribution and temperature control, when necessary, to ensure the safety and suitability of meat. Drinking water should be conforming to

standards and specifications. Iit should be a separate distribution system. You should also identify non-potable water systems and not linked to drinking what has led to the mixing of water. (Knoppert, 1980)

Waste and drainage systems collection

Vessels should be reserved for waste collection, secondary products, inedible or harmful, making it easier to identify it, and be properly manufactured, and, where appropriate, made of materials impermeable to liquids. Either the vessels used to keep harmful materials, marking them and, where appropriate, sealed to prevent contamination of food either in bad faith or in a casual manner.

They should provide adequate drainage systems, waste disposal, and should be designed and constructed to shape that helps to avoid the dangers of contamination of food or drinking water supply. (Mark, 2010).

Hygiene facilities and toilets

hygiene facilities should be provided to ensure the proper degree of personal cleanliness and avoid contamination of meat. These facilities should include the following:

1- Suitable means to wash and dry hands, including wash basins with hot and cold water (or water temperature control)

2- Bathrooms conform to the health requirements in terms of design and location and be far from the area and meat processing.

3- Appropriate rooms to change clothes.

4- These buildings should be suitable in terms of location and design.

temperature control

Depending on the nature of the meat-processing operations, the provision of adequate facilities for heating, cooling, cooking, food preservation and freezing refrigerators and cold storage or freezer, temperature monitoring, as well as to control the ambient temperature to ensure the safety of meat and if necessary. Should provide sufficient means of natural or mechanical ventilation, especially for the following purposes:

1- food pollution reduction of air pollutants.

2- control the temperature of the surrounding air.

3- humidity control to ensure food safety and suitability, if necessary.

Ventilation systems should be designed to prevent airflow from contaminated areas to clean areas. (Youssef , 1996)

Curtain air, which prevent the entry of flies.

Lighting

Take advantage of natural lighting as much as possible , the electric power shall be suitable for the slaughterhouse , the lighting shall be healthy and shall not produce any shade. Also protect the lamps and make sure to clean them periodically so as not to become a source of food contamination.

Storage

Providing storage facilities for meat and meat products such as refrigerators and freezers and separating them from chemicals such as detergents, and fuel, and be sure to clean them from harmful insects and rodents.

Transport

Transportation must be done in sterile transport and chilled to the proper temperature (4 ° c) and easy to clean.

Packaging

Should provide materials that make them adequate protection for meat to reduce Contamination, prevent damage.

Managers and quality

They should be keen to operate meat facilities to control food contamination risk systems such as hazard and critical control point (HACCP) risk analysis.

In that they should: determine steps which are critical to the safety of meat in their operations. Implement effective control measures in these steps and monitoring of control measures to ensure continued effectiveness and review time to time, when a change in the nature of operations. control measures from. (lutfi and Ali, 2007)

Lack of adequate control on the temperature of the meat of the most common causes of food-borne diseases and exposure to damage. These controls include time , cooking temperature, cooling and processing. There should be systems that ensure temperature control effectively where the temperature is critical for

the safety of meat. It should take into account the temperature control systems: the nature of the meat, the degree of PH, the initial level of the existing potential of micro-organisms, bacteria, meat processing, packaging and expected way. (Recommended International Code of Practice 1969)

Also you must consider mutual microbiological contamination, pathogens can be transmitted from food to another, either by direct contact or by individuals who deal with food or food contact surfaces or by air. Also must consider the physical and chemical pollution, should develop systems prevent contamination of meat with exotic materials, such as glass and metal fragments that may come from machinery, dust, harmful vapors, unwanted chemicals.

Employment

You should take into account periodic medical examination and vaccinations and obtain health certificates to prove their safety from diseases such as tuberculosis, hepatitis, other blood diseases, typhoid, parasites and the absence of wounds on their limbs and be required to wear a uniform covering the head cover and special shoes and hand gloves. Extract health certificates for workers from accredited health authorities.

Records

There should be appropriate records of processing operations, production and distribution, cleaning and maintenance programs and emergency employment certificates and records of contained and retain these documents can promote a sense of confidence in the efficiency of the control system for meat safety.

Planning

There must be a plan emergency manual illustrating how to act in the event of any framework and measures supposed to be implemented in such cases, the plan of implementation of the system of analysis of the sources of risk in critical control points. (Hershdoerfer, 1968)

Drag of market measures

must ensure the existence of effective measures to ensure that dealing with any threats to the safety of the meat, and allow the withdrawal of all meat raised around the doubts of the Markets quickly. In the case of a withdrawal of any product from the market if they represent a direct threat to health, should assess the safety of other products that are produced in the same circumstances, which

may represent a similar threat to the health of consumers, and perhaps needed to be withdrawn from the market.

The product should be withdrawn from markets under surveillance to be disposed of, or used for purposes other than human consumption, or decision as unfit for human consumption, or recycled in a manner that ensures their safety.

1.7. Industry and the consumption of meat

Processing meat or meat packing includes the slaughter of cattle, sheep, meat processing and transfer of the sales process. This process is sometimes called a meat packing. The meat manufacturing process of the most important industries in many countries of the world. In industrialized countries, most farmers sell animals cattle, sheep meat manufacturers directly. This is called type of direct marketing sales, buy some owners live animals in large markets to trade in live animals known as central markets. Animal yard provides in those markets with cages, scales and other facilities for the handling and sale of large numbers of live animals. Farmers also have their animals by selling small markets called auction markets. And live animal owners transferred their animals to market or industry trains or vans.

Runs many makers of meat slaughterhouses in big cities of central market, all animals are sold to supermarkets and not manufactured in the same place but some were purchased and transferred to the meat processing plants in other cities.

Meat pass more than 25 process before they are placed in refrigerated warehouses equipped. Skilled workers and lead these processes rapidly. In some setup factories it is slaughtered and processed the equivalent of 150 head of cattle or 600 sheep to 1200 per hour.

Workers used in the West and some other countries in order to mechanical shock animal loses consciousness, and then slaughtered animal and equipped. In the Muslim world it is slaughter use directly without the use of electric shocks, or otherwise, in accordance with Islamic law. It attaches carcasses in the overhead bars to conduct processing operations, in which the animal is removed and the skin of the viscera (internal organs). The workers cut processed into semi-finished carcasses are washed and moved on rails to the refrigeration rooms are inside these rooms cool carcasses to about 2 ° C for between 12 and 24 hours. Then the workers cut off half-carcasses to the front and rear quarters.

The butcher shops in the wholesale or retail division of the rear quarter to the navel, and groin and femur. Used in the past processes and smoking to save meat, meat is being saved. The process of emergency treatment and smoking produces a special flavor to processed meats.

Manufacturers shall deal with most meat processing lotion pump through the veins of the flesh, or by injecting the meat directly to the processing solution. Injecting lotion consists largely of water and salt, and sometimes sugar may be added. And some other ingredients usually added to help configure cherry color red for meat processor and save the flavor.

Smoked meat flavor smoking process produces a characteristic required by the consumer in certain types of meat. Modern non-smoking homes consists of cabins made of stainless steel and are air conditioned. And injected into the closets of amounts smoke from hardwood sawdust, earning the warm smoke meat color and distinct flavor. **(** Hinman ,*et al*, 1939**)**

1.8. The sausage industry

Manufacturers produce more than 200 types of sausage, but they are using the same manufacturing process for the production of most of these species. And rely on making sausage meat cutting process or shredded and then mixed with spices and processing. The resulting mixture pushes through the covers, a long tube made of cellulose. And they are banding those casings at regular intervals to produce a so-called sausage chains. And then being smoking or cooking, or drying the resulting sausage depending on the type to be manufactured.

1.9. Meat trading in Sudan

Livestock is the largest source of the Sudanese economy and Sudanese animals estimated at more than 140 million head of cattle and meat and meat products of the latest industries to Sudan. Studies show that there are 14 industrial plants in the country working in the meat industry.

Khartoum witnessed by a leading meat industry Sudanese Hassan Guenjari establishment of the first supermarket attached to a factory for the manufacture, assembly and display various meat products similar to what is happening in Europe and America as the Maxim Supermarket.

The beginning of the meat industry was the early seventies through Guenjari Inc., a leading meat export African companies which have established plants for meat in Yemen, Egypt and the countries of Africa, the Middle East and the Gulf

from different regions of Sudan, then it turned to manufacturing through Maxime Berger, in addition to the butchers who were staying some light of sausage and meatballs industries and in the early eighties began to concerns show industry meat and until 2001 there was not more than three factories commercial sense, noting that there has been an acceleration in the growth of plants, according to the meat room statistics now reached the number of factories operating in the field of meat processing to 14 factories in addition to the more than 30 small factory is not registered and there are six large factories, and estimated the volume of employment in the factory one of them between 200 to 300 workers in addition to the medium and small factories up the volume of employment in the factory between 50 to 70 workers.

The meat industry as a whole industries in Sudan has common problems involving with all industries, but if we took it as a stand-alone industry facing difficulties and problems which may lead them out, there are some large factories spend huge money owners stopped, there are 7 large factories among 15 factories at a standstill now, plus 50% of the plants is small, there are other factories threatened to quit if interested executive official and the industry might deteriorate further and is a very promising industry and all investors business highly competent national and, and is now standing at the level existing in the world, and Sudan leader of the industry on the Arab and African level, but suffers from the many inconsistencies in the terms of reference by the executive authorities and their intervention in the affair of the industry rightly or wrongly addition to the issue of inconsistency in the prices of meat and the lack of hard currency the official price for the import of some special materials industry, making the cost price fluctuating, and funding problems, as the actors and financing banks do not deal with it as an industry rather than a business, in addition to the intersections in the laws in the different levels of governance, which exhausted the industry as they share with other industries in the problems that the industry suffered in general. (Al-Sahafa Newspaper, 2016)

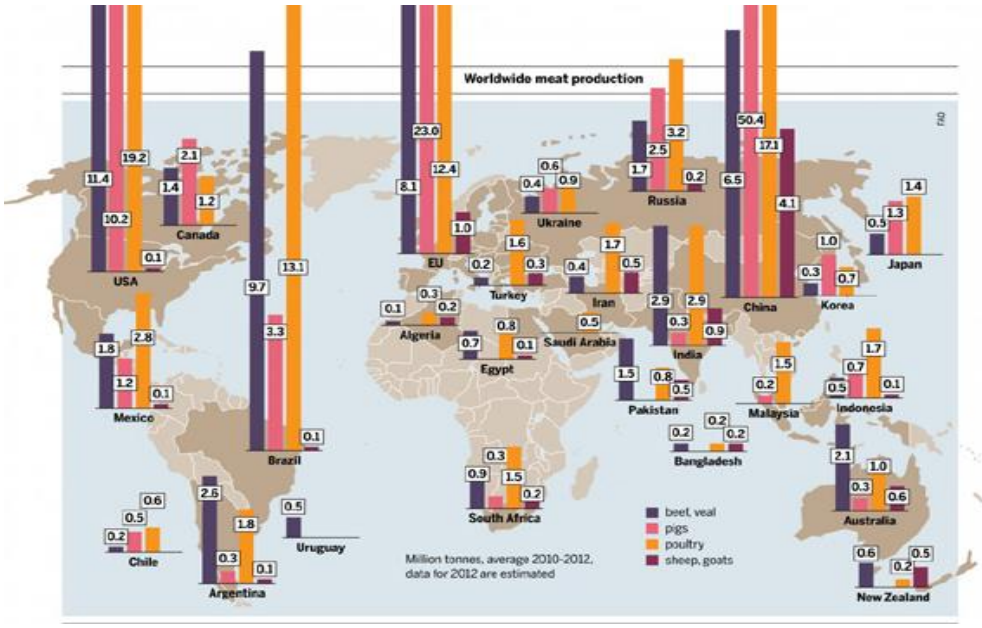
1.10. The consumption of meat

Meat can be part of a balanced meal, because it provides valuable nutrients beneficial to health. They contain high levels of protein, vitamins and minerals which are essential for growth and development. It also allows further processing of meat a chance to add value to this meat and cut prices, added to improve food safety and extended her life catalogue. What leads to increased.

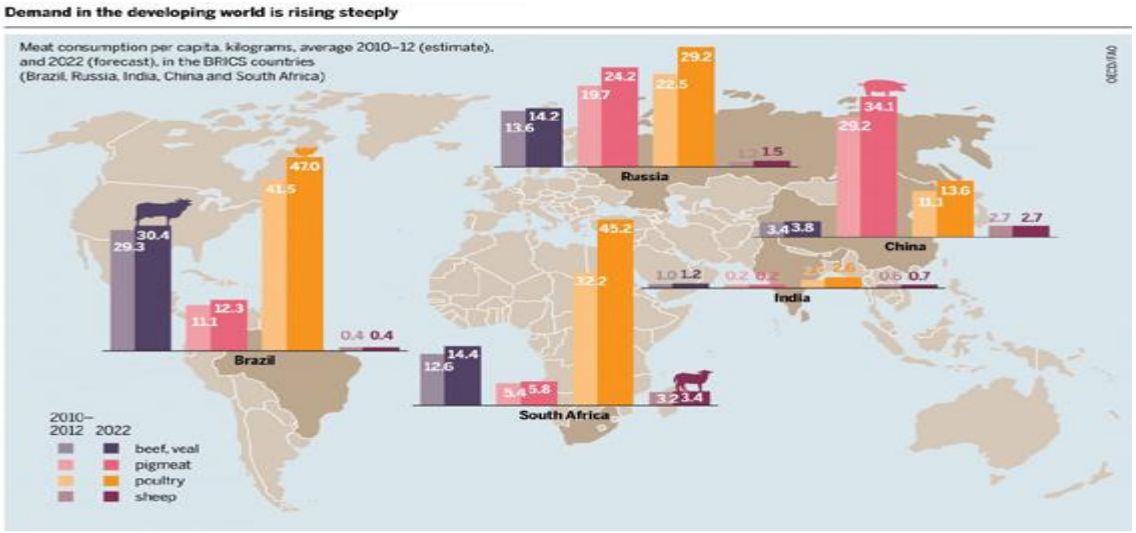
Although the per capita consumption of meat in some industrial countries is high, it must be considered a per capita of less than 10 kg of consumption in developing countries is insufficient and often leads to undernourishment and malnutrition. Estimates also indicate that more than two thousand million people in the world to have a lack of key vitamins and minerals, especially vitamin A, iodine, iron and zinc. Due to the lack of people have access to balanced food. The majority of the population who have a shortage of food in low-income countries, where in many cases suffer from a lack more than nutritious at the same time. High nutrition food is necessary in particular for populations affected by HIV/AIDS, as well as for women and children, that logic is the meat on the economic level and significance of living in most countries, for example in Britain testify North high consumption of meat and rich part of Britain is South Britain consumed much less. (FAO, 2013) Surprisingly, the use of 70% of the arable land in the world for the germination of food for the animals rather than human food.

For example, multiply the total consumed meat in the world. We have now increased to nearly four-fold in the past fifty years; to meet the demand of the growing middle class sector. The diets which are based on meat-intensive energy and water consumption, much higher than mainly based on carbohydrate diets. It requires the production of one kilogram of wheat, 1,500 liters of water, while the same amount of beef requires ten times the amount of water. **(**FAO, 2013**)**

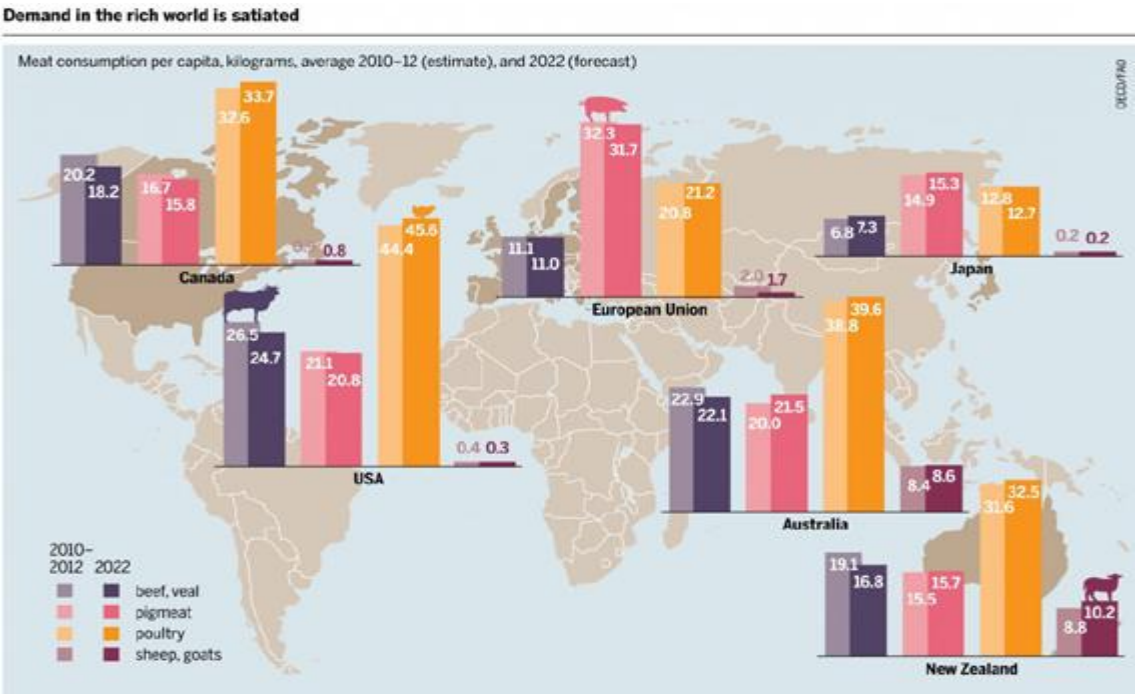
For the consumption of meat in the Arab world, which consists of 21 countries and operates a large and diverse area of about 14 million kilometres with about 220 million people. And it extends from the Gulf states in the east to the west of the Maghreb. these countries vary in geographical characteristics, climate, economic, social and health status. It includes the world's poorest and richest. Therefore, the study of the production and consumption of meat in general in these countries is difficult because of the lack of the necessary statistical data and uncertainty to the accuracy , and based on current food systems and study trends in consumption of meat into two basic statistical are the food balance sheet issued by the Food and Agriculture Organization FAO ' and ' Household Expenditure Survey (HES) which gives estimates of household food consumption rates at a particular time based on a representative sample of the population.**(** FAO, 2013**)**



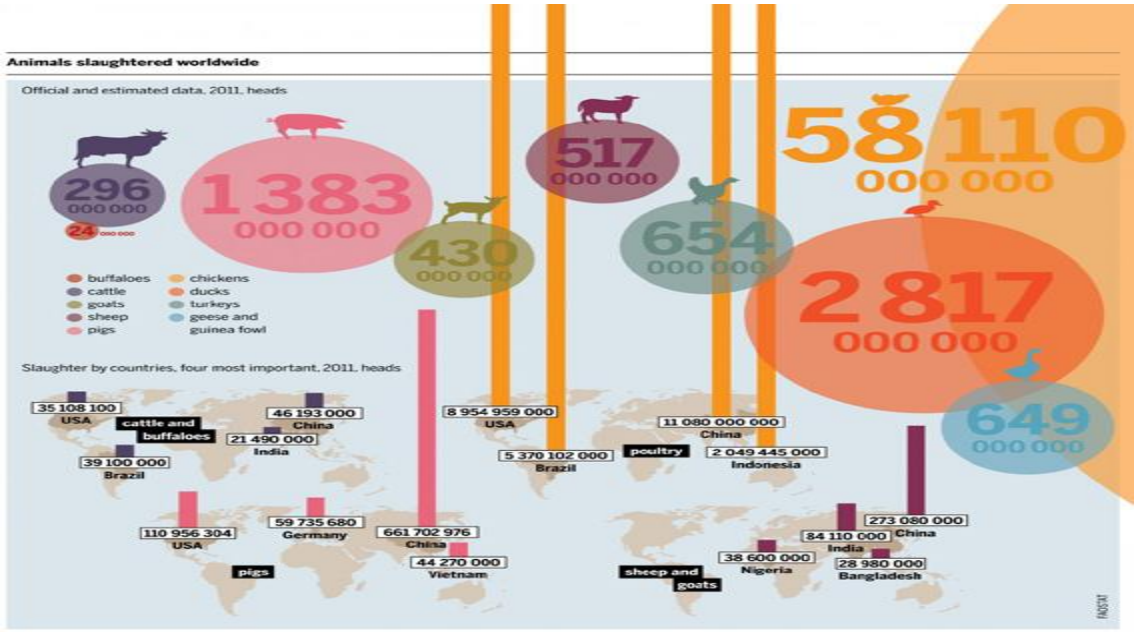
The above chart shows meat production around the world in millions of tons from the average between 2010 and 2012. The first lines describe the production of beef and veal, purple, pink, pork, oranges, poultry, and sheep and beef. (British Telegraph ,2016)



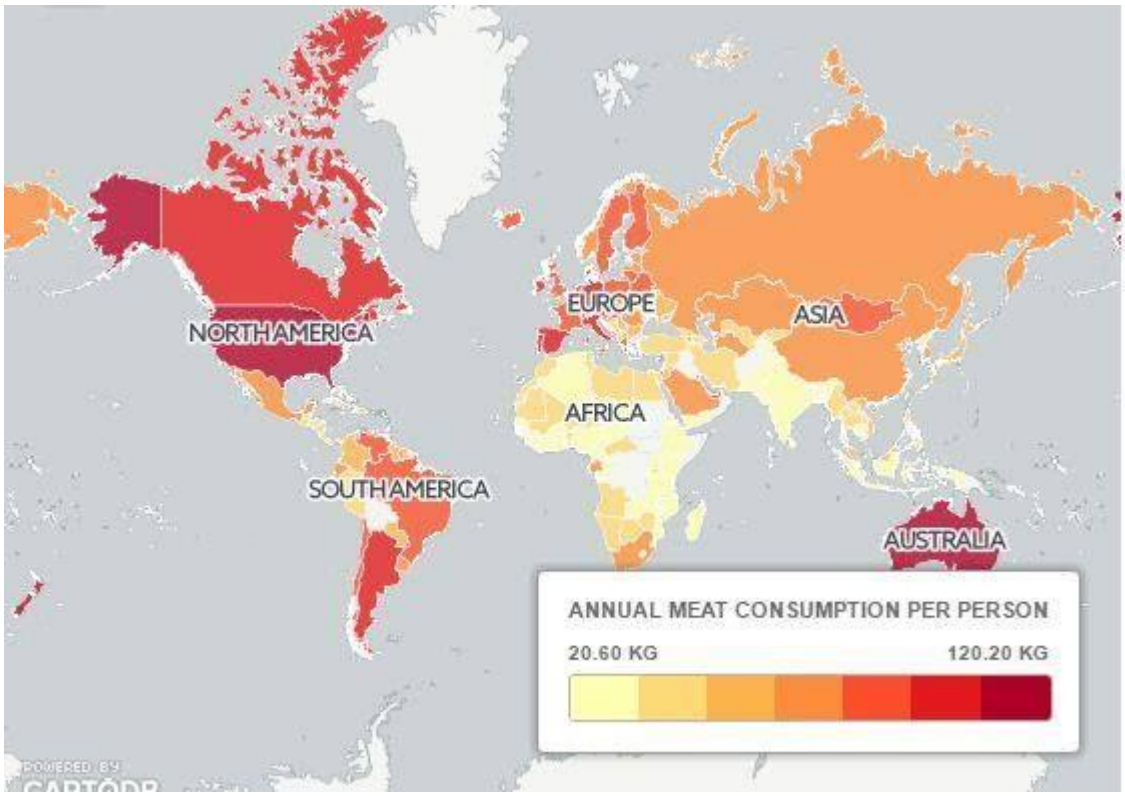
The above chart shows the per capita meat kg in the developing world (British Telegraph ,2016)



The above chart shows the per capita meat consumption in kg in the rich world, and is expected in 2022 (British Telegraph ,2016)



The above chart shows the animals that were slaughtered in 2011 by official data (British Telegraph ,2016)



The above map of meat consumption in the world by the British Telegraph newspaper 2016

1.11. Meat inspection tests

Meat inspection tests is a series of integrated and coordinated regulatory action between several quarters begins inspection of animals before slaughter through inspection after slaughter through a series of tests to be up to the consumer in the form of fresh meat or canned meat products.

Primary rules to detect animals before slaughter:

A- Detected of animals before slaughter to verify the following cases for each animal individually.

The general situation of health

Physical status

Fever

Epidemic diseases and infectious

Wounds

Fractions

Abscesses

Virtual cancerous diseases

Dermatology

Identification of sacrificial sex (male or female) as well as her age to follow the General rules, and conditions for the slaughter for either sex or age.

Allows slaughter sterile females of any age as well as females that transcends age:

1- Sheep over the five years

2- Cows for over eight years

3- Camel above fifteen years

B- Put the animals and especially their bovine species under surveillance for at least 12 hours to be mutilated before slaughter again

C - In case of a rise in temperature of an animal postpones the slaughter if the doctor saw these transient fever go away after a short and simple treatment .

D - Animals that are slaughtered before disclosing them alive treated like emergency slaughtered animals which must assume she's sick and you should carefully inspect all glands.

E -You must before permission to slaughter animals, ensure health rules for cleanliness of wards at the slaughterhouse and provide water and sewerage crashes not. (Abdul Aziz, 1994)

1.12. Disclosure rules on animals after slaughter

1- Slaughter must be performed according to Islamic law.

2 - Inflatable animals are not allowed in the mouth for fear of infection or contamination but allows automated blowing.

3- Preferably being detected in daylight or enough light

4 - Begins to reveal the proper carcass ostensibly especially sheep them and postpone disclosure of the suspect animals in her illness until after the completion of the detection of the whole meat because of suspected need to check out all the glands in the body or perform laboratory testing if necessary, but if the number of doctors veterinarians enough is being detected at once.

5 - You must provide the following conditions during the detection and not to execute the body whole or in part, or released due to the appreciation veterinarian:

A - Should be put under the equipment and intestines the body on their own to leave the spleen in normal intestine to be connected to the rectum when separated.

B- Must be the liver and lungs, heart, kidneys and reproductive organs and) udder and bladder installed and attached to the corpse own confirmation naturally closest

C- Must not remove any part of the members or viscera or lymph nodes or meat.

D -Prevents any similar cuts in the meat or the lymph glands or genitals but by doctor.

6 - The seals should be visible on the carcass and on most parts and each kind of meat a special stamp, ink is of a type that does not dilute with water and contains confidential material easily detected.

7 - Must skinning animals after slaughter directly and does not allow animals to exit their hides from slaughter and skinning accuracy ceaseless even sensitive skins.

8 - Transfer meat: must be clean cars transport closed and lined with zinc and wash daily with soap and water after the meat transfer.

9 - Do not allow the export of leather but with a certificate from the veterinarian after revealing it is allowed to export only dry and salted and free from diseases that may infect man.

1.13. Interpretation of the provisions on as a result of the meat inspection

When applying these provisions are intended to the following terms and corresponding actions.

1 - Total execution

Is the book and the execution of the body and its members fully due to lack of suitability for human consumption as infected with general or localized changes or pathological lesions cannot be separated from the meat or to be the case of pathological effect on the general health status of the animal.

2 - Partial execution

Is the book and the execution of parts of the body with the removal of the lymph nodes and its subsidiaries so as infected localized changes or pathological lesions do not affect the general health status of the animal.

3 - Restricted release provided

Is a statement in meat and offal for human consumption, provided sent to a special processing by boiling or sterilization or icing factories and in the absence of factory-mentioned actions taken execution.

4 -indiscriminate release provided

comprehensive statement meat or insides as fit for human consumption without any restriction. (Abdurrahman , 1976)

With increased global attention in recent years with zoonotic disease transmitted between animals and humans, and the problem that occurred with some epidemiological surveillance has become the meat of animals is something compulsory in accordance with international laws.

1.14. The division of zoonotic disease

The division of zoonotic disease by pathogen is one of the most common methods of dividing zoonotic disease:

1 - bacterial diseases

2 - viral diseases

3 - fungal diseases

4 - parasitic diseases

Bacterial diseases

Examples of bacterial diseases:

Tuberculosis

Brucellosis

Anthrax

Listeria (rotation)

Leptossbera

Shigella disease (Shigellosis)

Septicaemia

Salmonella

Food poisoning clostridial (Clostridial food) (Adams and Moss, 2000) poisoning

Viral diseases

Examples of viral diseases:

Yellow fever

West Nile fever

Vesicular stomatitis

Bovine spongiform encephalopathy bovine (BSE)

Sindbis fever

Rift Valley Fever

rabies

Pox cows

Ebola disease

Lassa fever

Foot and Mouth Disease

Congo fever

Peste des Petits Ruminants (PPR)

Rinderpest

Fungal Infections

Examples of fungal disease:

Asperigellosis

Blastomycosis

Candidiasis

Dermatophytosis

Parasitic diseases

Examples of parasitic diseases:

African trypanosomiasis

Amebiasis

Babesiasis

Chagas disease

Leshmaniasis

toxoplasmosis

Schistosomiasis

1.15. Infectious diseases to be reported:

List of epidemic diseases

In case of injury to any disease of the following diseases must be booked the body and then reported to local health authorities and veterinary to take action towards preventing the spread of human infection or the animal and that the execution of the animal and the full cleansing of the place and secretions, as well as cleansing workers and their clothes and their tools and cleanse the land and the walls of the slaughterhouse. **(**Abdul Aziz, 1994**)**

The list of high-risk disease

Foot and mouth disease
Vesicular stomatitis
Rinderpest

Peste des petits ruminants

Contagious bovine pleuropneumonia

Lumpy skin disease

Rift valley fever

Blue tongue

Sheep and goat pox

Anthrax

Bovine spongiform encephalopathy

The provisions concerning tuberculosis

First: the execution of the carcass in the following cases:

1 - If the carcass lean and has a mild infection with TB

2 -A - If the injury is generally spread by blood circulation

B-TB is widespread, f two members of the following members was injured, and there were initial infection in the respiratory or digestive or lymph glands:

spleen-kidney- uterus –the udder - ovaries-testicles – the gland above the kidneys

C-TB is widespread in the case of tubers spread lung regularly and one size (miliary tuberculosis)

3 - If you find infection in the muscles or in the bones or joints, or in a large number of lymph glands to carcass

4 - If you were many and widespread infection in a thoracic or abdominal grooves or both (TB cluster)

5 - If the infection is multiple sharp and in constant progress and signs of progress is the inflammation around the injury or the presence of a small, modern tubers

6 - Carcass execute well if the temperature of the animal slaughtered by the high temperatures

7 - Genetic tuberculosis in baby calves

Second: The partial execution of a sacrifice in the following cases:

executed member or infected carcass part only in case of positional

(WHO ,1982)

Examples of some other infectious diseases and judging them (Table 1.2), (Abdul Rahman, 1976)

1.16. Non-communicable diseases

Tumors (Table 1.3)

Change in color, taste and smell (Table 1.4)

Defect metabolism and food shortages and diseases poisoning: (Table 1.5)

Diseases of the internal organs (Table 1.6)

Internal parasites diseases (Table 1.7)

Slaughtered cases made an emergency landing outside the slaughterhouse

1 . Check vital slaughter and the bleed

2 . A thorough examination of the body and all the lymph glands

3 . Check the smell and color of meat

4. If you can identify the pathological changes of laboratory research that there was potential slaughterhouse managed to save meat without damage even show the result if I knew the condition of the carcass executed wholly or partly by provisions of each disease. (Izzet , 1991)

Whole carcass and executed in the following cases:

1.Slaughter is vital

2.Not the bleeding

3.Change the color of the meat

Baby animals:

Executed in the following cases

1.Calf cow or buffalo that at least two weeks old and weighed about 33 kg

2.Sheep and goats infant under the age of one month

3 .Calves, sheep and goats suckling if it finds the following

A - Soft meat loose

B- lack of muscle growth is complete

C- Odemi infiltration around the surrounding envelope of the kidneys

D- Oedemic serum infiltration between the muscles

(Abd Alrahman, 1976) (Abdul Aziz, 1994)

1.17. Examples of some common diseases that appear on carcasses in slaughterhouses

Jaundice

And occurs due to increased Bilirubin concentration in blood, and noticed that all tissue carcass parts colour turns yellow, unlike natural colour.

ill bleeding

Known to be animal blood is compromise fit for the growth and proliferation of microbes specifically when you stop his life so it was one of the most important phenomena that takes into consideration the veterinarian when it looked at the amount of blood that comes out when the helmet first the normal situation is that poses during sacrifice as much of the blood sacrifice in the least possible time and non-bleeding carcass displays good quickly perishable or detract from the quality of the carcass value, the average time required to bleed in cattle about 5 minutes while the sheep in about 3 minutes and going good when you do not bleed more animal if cutting the spinal cord immediately after slaughter so as not to damage the medulla oblongata due to the continuation of the heart and lungs work. (Abdul Rahman, 1976)

The most important condition must be provided for the completion of the process of bleeding the animal is to be enjoyed in good health as the process of bleeding associated with the work of the heart, lungs, muscles and so the bleeding is not completed in the infected animals developed fever or heart and lung disease or dyspepsia owing:

1- Emergence of blood vessels under the skin of the congestion of blood.
2- Be the internal organs (intestines, rumen, kidney, liver, lungs, heart) congested and water.

3- Veins between the ribs are filled with prominent and clear.

4- Lymph nodes are filled with blood and shows it clearly is held in front of the shoulder. (Abdul Rahman, 1976)

Pyrexia or fever

In this case, we note a sharp rise in the animal's temperature caused by a number of microorganisms (such as bacteria, viruses, parasites) or their toxins are usually the condition be accompanied by fast breathing and increase in heart.

Among the most important anatomical signs is inferred by the veterinarian on the animal's injury as follows:

1- Occurrence and congestion of blood vessels and capillaries, especially under the skin.

2- High pH which reduces the value of meat.

The carcasses infected with the disease is unfit for human consumption because of fever caused by diseases or pathological microbes in addition to the discovery of the animal by infection by a veterinarian, the issue requires a take a decision to execute and destroy these carcasses to maintain human health and public health. (Abdul Aziz, 1994)

Oedema

Oedema is an increased amount of body fluids into the tissue or body cavities abnormally and this is a disease, or an offer to disease

And it can be seen when examining the carcass in several forms such as:

Accumulate of fluid in the chest cavity (Hydrothorax).

Accumulate of fluid in the abdominal cavity (Ascites or Hydroperitoneum).

anasarca edema, which is an abnormal amount of body fluids to accumulate in tissues in general and see clearly under the skin and connective tissues free liquids between muscle.

Fluid to accumulate in the tissues of the body public in addition to the thoracic cavity and the abdominal and so-called generalized Oedema. (Abdul Aziz, 1994)

Hydatid Cyst

Hydatid Cyst is the larval stage of the worm ***Echinococcus Granulosus*** This worm is located in the intestines of dogs and predators and the length of the worm 2 - 8 mm. Central host and be in the life cycle of the worm are ruminants (cows sheep camel) and horses, as well as humans and can live aquatic animal

tire vesicles to the bone infection spread in all countries of the world, particularly in developing countries.

To combat the disease and control it must eliminate stray dogs and bulk and prevent cats and dogs from eating the bowels of carcasses taking damage meat and organs in municipal slaughterhouses in a healthy way. (Abdul Aziz, 1994)

Hepatic worms

Hepatic worms or so-called Flukes is a worm infected the animal's liver and cause acute or chronic inflammation of the liver, when the discovery of infection are infected liver damage but if the injury is accompanied by jaundice or wasting it decides to destroy the whole carcass. The most important of these flat worms *Fasciola* and *Dicrocoelium dendriticum*.

Uraemia

A disease that is caused by an imbalance in the urine out of the body, starting from the kidneys until the exit and in most cases it is caused by blockage of the ureter Pyelonephritis or gravel or college polycystic leading to leakage of urea and other nitrogenous substances into the blood and be meat smell like the smell of urine.

Can identify the smells non-natural in one of the following methods: Smell by cut out in different parts of the carcass, especially in the deeper parts of the muscle and the fat.

laboratory tests examined by Boiling Test.

Septicaemia

A disease suffered by a particular weak or weary of them animals as a result of exposure to some microbes high ferocity that grow and multiply and produce toxins and the body can resist or by Antibodies (antibodies formed in the body to resist microbes) which helps to reach the bloodstream.

As evidenced by the signs the veterinarian carcass infected with the disease are carcass congestion and lack of good bleeding swollen lymph nodes and contain the hemorrhagic points and appearing watery appearance having hemorrhage heart, liver, kidneys, and some membranes carcass muscles.

The existence of fatty changes and swelling of the liver, kidneys, heart, and an splenomegaly.

The meat of these animals unfit for human consumption and for the following reasons.

The existence of pathological microbes and toxins.

Do not bleeding and congestion carcass is complete.

Pyemia

A disease that occurs due to the presence of pyogenic bacteria in the blood of festering areas destined to other parts of the body, consisting hotbeds of pus in all areas of the body. This situation is similar to the case of septicemia but they different about the existence of spots pus or watch them on the carcass from the outside and the inside.

Sarcocystis

Vesicles are infecting different animals, birds and mammals, as well as human muscles. These vesicles are concentrated in active in the animal's body such as the heart and the muscles of the esophagus and the muscles of the neck, face and diaphragm and possible to be published in all muscles of the body in case of severe infection. Judging the carcass Total execution or the affected part, either the fresh meat outlets and factories is discrimination and physical examinations through meat inspection and chemical and preferably there is a separate room for the tests in the case of meat factories.

1.18. Physical examinations (sensory evaluation):

1- meat price: If the price is low on price or trader that suspicious quality meats.
2- X-rays examination: where shed rays on meat When a whitish appearance bluish it indicates the presence of strings and when you see the yellow evidence of fat.

3- Color and shape: the color of fresh for human consumption meat color pink color and the fat is bright white as the buffalo, lamb, italic-yellowing as it is in beef, while the corrupt be dark in color.

4- Texture the meat: fresh meat be coherent and feel normal, unlike the meat corrupt and incoherent when pressed by a finger left a clear mark in addition also to the viscous texture and the appearance of heavy water mixed with blood.

5- The smell of the meat: fresh meat will find acceptable smell and often smell non distinctive, and the the meat corrupt, we find it smells unpleasant non grainy.

6- Make sure seals the meat: shows the regulator overseeing the seal slaughter in slaughterhouses to make sure meat sources and also make sure the type of meat and make sure the date of slaughter. (Honikel, 1998)

7- Check the temperature with the meat thermometer with a metal probe can deep ties in the flesh (prevents using a glass thermometer).

8- Boiling tests here are chemical compounds found in meat smells show.

9- Make sure there is no physical contaminants such as glass, plastic or anything that felt.

10- Frozen meat examine if there were signs of melting flesh and freeze it again (the accumulation of frozen blood fluid on the side of the bag) and must be saved at -18 ° C and not exceeding the period of validity of 9 months from the date of slaughter and have clear data on completion and the source, weight, name, date of.

11- Refrigerated meat: must be saved -5 degrees to 1 degree Celsius and a maximum expiration date for 3 weeks.

12- Minced meat: It is the most vulnerable to pollution because of the large number of transactions and moves through several diseases such as tuberculosis, worms and also prone to cheat additions meat entrails.

1.19. Chemical tests (laboratory evaluation):

1 - measuring pH to see estimate the degree of stiffness throwing a pH of no more than 6 (5.4 to 8.5)

2 -chemical tests to determine the degree of bloodying

3 -chemical tests to determine the degree of validity or the corruption of the meat and the presence of ammonia (Nessler test) (Raymond, *et al* , 2016)
4 -Chemical tests for the detection of corruption, meat and fish specials (the change in the disintegration and nitrates)

5 -detect the presence of antibiotics

6 -Food Scan Pro meat analyzer (for meat chemical analysis)
Vos equipment to analyze the meat is considered the gold standard for assessing and analyzing the components of the meat, and the device is used to estimate the chemical ingredients for meat from (Moisture-protein-fat-collagen) in any of the meat, whether white or red in the fresh or preserved meat or artifacts. (AOAC) Association of Official Analytical Chemists.

1.20. Microbiological tests:

Detecting the presence of infection and infection (viral - bacteria - fungi – parasitic) (Milan and Pomeranz, 1973)

1.21. Serological tests:

To determine the type of bacterial infection

1.22. Histological tests:

Performed on the Minced meat to detect cheating

1.23. cheating in the meat:

Aappeared in the recent fraud in meat and technically detected by DNA genetic fingerprint that can distinguish between beef and donkeys and dogs by examining the DNA of the animal and how it animal characteristics, if any differences in DNA this adulterated meat, also can be detected by MRI.

1.24. Contamination of food and bacteria meat

Bacteria of the most important microorganisms that coincides presence during the production and circulation of red meat as it is the most important from the standpoint of food spoilage and disease, food poisoning and infection, and so will be the focus of this study on bacteria.(Sara and Latta,1999)

Bacteria present during the production of meat in the roofs of slaughterhouses or slaughtering equipment and can avoid this presence through cleansing and immunizations, and also found in the outer skin and the head of the animal and can avoid this presence careful when taking out the skin and lack of contact with meat because the meat has no bacteria and should also be careful when outputting belongings the gastrointestinal tract in slaughterhouses and also must be guessing when transferring meat sales centers that are dedicated to the transfer of a sterile and cooled appropriate vehicles. The biggest problem

remains at points of sale and how to control the quality of the meat and prevent bacterial contamination.

There are many strains of bacteria, fungi and yeasts cause food spoilage, and all share in the important property is the ability to secrete enzymes that specializes in the analysis of food components, And also that some of these strains secreted enzymes analyst protein, others secretes enzymes analyst fat or carbohydrates, and some breeds may shed more than one type of enzymes degrading; In general, the enzymatic degradation by microorganisms cause many negative changes on the structural characteristics and the characteristics of sensory food material (Mathews, *et al*, 1990**)**. It should be noted that some microbial strains may be causing the corruption of food poisoning at the same time, and most important of the B. cereus bacteria that cause corruption of milk, cream and milk products, rice strains, as well as of the bacterial strains Cl. perfringens causes of the corruption of meat and poultry. **(**Andersson, *et al*,1995**)** The most important types of bacteria that cause food poisoning (Eley, 1996) as follows:

A. ***Salmonella enteritidis,*** **S.** ***typhimurium*** are responsible for a high proportion of cases of food poisoning, and up these types of food through the Adamic waste or animal, as well as by patients or carriers of disease from working in the preparation and production of food, and the most important food responsible for the occurrence Salmonella poisoning is Salmonellosis in poultry, eggs, meat, milk and milk products.(Jantsch, *et al*, 2011)

B**.** ***Staphylococcus aureus*** is also responsible for many cases of food poisoning called poisoned cluster Staphylococcal poisonings, because the spread of this kind of poisoning mainly to the lack of hygienic conditions in the workers during the preparation of food production, where there *S.aureus* cells is very high numbers in festering wounds beside the presence of natural micro flora on the skin, nose, throat, hands and nails, and the most responsible for the occurrence of food poisoning cluster is in a private candy containing cream, and all the meals that enter the workforce in their preparation.(Vesterlund, 2006).

C. ***Bacillus cereus*** is responsible for food poisoning cases associated with meals mainly grains such as rice or wheat mixture special baby food with milk, and the source of the bacteria is grain and soil.(Turnbull, 1996)

D**.** ***Escherichia coli*** is one of the normal flora of the human intestine and animal; therefore, its presence in the food guide on fecal contamination, where

these bacteria reach the food through human waste, and sewage and raw meat, and there are a few strains of these bacteria, the most important of ***E.coli 0157*** is responsible for the occurrence of food poisoning, and the most responsible for the food poisoning is occurring in the meat is not well-cooked and raw milk. (Lukjancenko, *et al* 2010)

Bacteria ***Escherichia*** divided into three types

Enterpathogen that cause intestinal infections such as travelers

Entroinvasive and causing acute intestinal infections for children under two years of age.

The latter type is secreted foreign toxins such as type ***E.coli 0157.*** E. ***Clostridium botulinum*** is this type of bacteria is responsible for a small percentage of cases of food poisoning and that you know botulism. They were situations where the mortality rate rises to a great extent if you did not save fast for the injured, and considers these bacteria species, heat-resistant, so responsible for food poisoning cases are in canned food, canned fish, especially canned meat next to the salted fish, smoked fish. There is another type of bacteria which ***Cl. perfringens*** also is responsible for a small percentage of cases of food poisoning, and up to food through animal waste, raw materials or soil, as well as meat and some vegetables are considered, such as carrots and potatoes from the responsible food for the occurrence of poisoning with this type of bacteria. (Arnon, *et al* 2001)

1.25. Requirements that must be met to ensure food safety

Reflective food important aspects of the social and cultural life of individuals and communities, which is a basic requirement in human life. When human testing certain food for a meal it is often expected to be available in the nutritional value of the accepted health and safety of the safety of a meal components of any factors that may be harmful to public health. This automatic expectation of consumers poses a significant and essential responsibility of all workers in the field of food production, as well as officials in the application of food legislation and laws to protect and monitor food quality and ensure food and health consumer rights. Therefore, the precise application (by managers and supervisors of production in any unit to prepare or manufacture or fill or storage of food or transport) for all the requirements, conditions and boundaries prescribed standard specifications is considered a fundamental guarantee to achieve food safety.

Food safety means to be a food product is free of any dangers can any damages occur the consumer for this food to human beings, and this reflects the importance of and the need for food production process management, regardless of the size of the production process; the right way, which is not likely with absolutely no adverse effects from the product to occur food on the consumer.(CIEH, 2000)

To achieve this, it is practically necessary to ensure that:

1. Food Protection, from raw ingredients to finished product against any of the types of natural pollution or chemical or microbial through the application of the monitoring and control of adequate roads.

2. Apply methods and take precautions to prevent the proliferation of microorganisms to levels that allow for corruption cases or food poisoning.

3. kill or remove microorganisms associated with health problems from food; to ensure that there are no future problems.

4. disposed continuously from all food and contaminated waste and waste from food production sites; to ensure that no contamination of food at any stage of production.

5. Application of Sanitary requirements prescribed for workers in the preparation, manufacturing and trading of food and the importance of educating them so lines through health education sessions at periodic intervals appropriate, with the use of illustrations influential inside the food establishment.

6.Apply health requirements prescribed for food factories in terms of design, lighting, ventilation, or manufacturing or availability Bathrooms lines ... etc as required by standard specifications.

7.convinced capital owner in the food organization that proper planning and careful implementation of the policies of food safety is the guarantor is certain to produce a quality distinct level of food products, which is reflected in its impact on increasing consumer confidence, and gain a good reputation, and increase production and profits, and reduce the wastage of food products.

1.26. Previous studies in the field of meat and quality

Been conducted numerous studies around the world in the field of quality meat and centers and points of sale of the importance of these studies to stop the risk of pollution that cause health problems and economic losses to the country and here we are going to some studies, reports and pamphlets that have been in this field.

It is well known in developed countries, the number of microbial meat slaughtered under strict sanitary requirements microbe is 100 / sq cm and under the typical requirements and is prevalent in most of the developed world is slaughterhouses 100,000 microbe / sq cm.

1- It resulted in studies conducted on meat slaughtered in the massacres of Egypt that the number of microbial amounted to 15-20 million microbe / cm square a few hours after slaughter. As the number of bacterial arrived per gram in the flesh after the access to the shopping places to 34 million in the groin area and 26 million in the liver and spleen at 35 million and 69 million in the lung. These microbes may be aerobic or anaerobic, and this is due to poor health awareness for those working in this area and other causes of pollution, for example, water, for example, which is an important source of pollution sources, but the most prominent and most important. This heavy presence leads to disease transmission and analyze food ingredients essential for meat and consume bacteria large part of the fatty substances and sugary and protein are considerably less so the nutritional value addition, these bacteria secrete toxins are resistant to cooking temperature and cause the consumer many diseases and sources of pollution and other antibiotic residues and pesticides. In a study conducted in Mexico in 1996 has been estimated concentrations of organic chlorine pesticides in 174 samples (53 samples of meat and 121 sample the bowels) of cattle have been slaughtered in a slaughterhouse government was appointed and the presence of pesticide residues in the lung and meat. In a study in Yugoslavia it was collected 561 cattle and 358 sheep samples for five years were analyzed and examined and found to contain the remains of Hecsa chloride and benzene. (El Bassioni, *et al* 2003)

2 - A study was conducted in Mosul by Omar Hashim Shit and Iqbal al-Jubouri and Antitsar Rahim Kanani about extracting the bacterium *Staphylococus aureus* and isolated from the meat in the meat market where it formed bacterial isolation ratio of 14.6% also noted the effect of the poison bacterial on each of

the intestines, liver and kidneys were published research in the journal Iraqi**. .** **(**Omer, *et al*, 2009**)**

3 - Master study conducted for the Contamination of carcasses in the slaughterhouse by slaughtering equipment and has by Hassan, Abdul Wahid in 1992 at the Faculty of Veterinary Medicine University of Mosul has proved the existence of contamination have been isolated Salmonella. (Abdel Wahed, 1992).

4 - study was conducted in Iraq by Samir Ali and Abdul Amir Jawad, Salah al-Mahdi and Manaqz Alwan for the existence of bacteria in meat that displays in the markets where it was isolated amount of Staphylococus *aureus* and found no salmonella has been published research in the Iraqi (Ali, *et al*, 2013)

5 - Study conducted in Libya by Yusuf Mohamed Acharik, Nuri Alsahali, Amari Ali Baccouche, Abdul Rahman Ataiweyel for quality microbiological discs minced meat (beef burgers), cooked and uncooked served in restaurants and shops of fast food in the city of Traplos and its suburbs. The results of microbiological tests conducted on 151 samples (92 cooked and 59 uncooked) and a high contamination with bacteria in all samples, whether cooked or uncooked. In cooked disks, containing the results showed 74.5% of the sample to the bacteria *Escherichia coli*, and 28.8% on the invading bacteria, and 27.1% on the *Staphylococcus aureus* bacteria, and 18.6% on the bacteria *Escherichia coli O157: H7*. The results showed well-cooked disks contain the *E. coli* bacteria in 11.9% of the sample, and the invading bacteria at 9.9%, and the bacteria *E.coli O157: H7* in 5.4%, and the bacteria *Staphylococcus aureus* in 3.2%. The results that have been reached in this study clearly shows that minced meat cooked and uncooked, which are processed and sold in most cafes and restaurants surveyed, is not matching the standard specifications of the microbiological, and due to the high content of the total number of microbes live aerobic, high most likely to microbes colon number, in addition to the pollution of many of them with bacteria pathogenic *E. coli 0157: H7, S. aureus* can be considered the results a serious indication of the failure to follow the requirements of health in most of these establishments, and thus the need to tighter health control them in order to preserve public health. (Yusuf, *etal*, 2008)

6 - Study conducted in Sudan by Mr. Khalid Ali and published on 01.04.2004 repository.sustech.edu to know the extent of contamination of fresh meat and meat intended for the manufacture of processed meats and aerobic bacteria, and

to find out the effect of cold storage in the refrigerator on the bacterial content and chemical composition of each of meat manufacturer / minced meat - sausage - burgers where the researcher found bacteria with reduced cooling with improved softness of the change in protein.

7 - study and the Dutch Ministry of Agriculture, 2004, entitled: food safety control systems in Europe.

The study identified a problem in Europe that in many European countries have weak health controls on food due to excessive legislation and because of the multiplicity of the competent authorities and because of the weaknesses in the oversight and monitoring and implementation points, Serious incidents of food safety has been pushed through the nineties the European Union and other countries in the world to review their systems for food safety and the search for better ways to protect consumers from unsafe food. The study aimed at improving health services and food safety in Europe by enacting a law to control food safety and which defines the general principles of food safety and food safety procedures in the European Union.

The study found a number of the most important results

A - is Employees food trade are fully responsible for the quality and safety of food they produce, and they bring to the consumer markets.

B-the food safety legislation in Member States of the European Union must coordinate substantially.

C - the coordination process, leading to significantly reduce the previous policy differences between Member States and contribute to increased transparency in the European Union (EU) for import and consumer markets system.

8- Haitham study , 2005 entitled: Who is responsible for food safety in Syria

Food production and processing leads to the likelihood of being struck several pollutants, such as microbiological contamination, which causes many diseases are rampant among the people. and chemical pollution, especially heavy metals, which have an impact on the serious cumulative health the use of random pesticide in agricultural production and the use of antibiotics and hormones in agricultural production poses significant risks to public health and is an obstacle to acceptance of the country's exports abroad. this confirms the growing

problems of any state officials, the food laws under hygienic conditions to avoid the dangers of contamination.

study found the most important set of results

A - Lack of food products to the requirements of quality both locally and globally.

B - Weak control on imports of food items measures.

C - The lack of external courses for workers in the field of food control.

D - Default by the food establishments in the introduction of quality systems that ensure access to safe products, such as HACCP, and ISO.

E - To be an effective administration for food control mission is to develop and implement food legislation.

F - The establishment of a full technical laboratories conducting the tests and food analysis. G - Health supervision of drinking water and the food industry.

H - Concerned government agencies to address the existing imbalance because human health is the most important, healthy mind is in a sound body and human life is the very basis of a life. (Haitham, 2005)

9 -Dulaimi study, 2007 (food poisoning)

Is called term food poisoning on any disturbances occur after eating and more precisely, the food poisoning calling illness or fatigue caused by the presence of a toxic substance in the food after eating. cases of food poisoning have risen in the world in recent times due to the increase in population and the development of production and public services factors, In addition to the change in consumption patterns of food led to eating large group of people to a greater number of meals outside the home in restaurants and shops to prepare foods of all kinds and the emergence of the phenomenon of so-called collective nutrition, it has helped the spread of fast food shops in large and small cities.(Dulaimi, 2007)

The study found a number of conclusions and recommendations, including:-

a -Contamination can occur in food from farm to consumer table .

b -Tighter health controls at all stores with the supply of food and compel it to apply health conditions that must be provided in places preparation, preparation and presentation completely.

c -Ensure the safety of workers in places of preparation and the preparation of food and they are free from infectious diseases through laboratory and examined periodically on the condition that not more than one year.

d - Do programs to educate employees of these stores, through which their sense of the importance of what they are doing work and teach them the rules that they must abide by.

e -Do not use the tools that are chopping and preparation of meat and poultry in the cutting and preparation of the authorities and appetizers, but after being washed and cleaned well.

10 - Ameen and Awatif ,study,2009 (food contaminants)

Food safety is closely linked to and directly proportional to health, the fact that good food is a basic factor in the growth and integration of health and to compensate the damage of tissues and cells so that it can be performed functions and activities vital efficiently being able to resist disease and infection, and healthy food is essential to the integrity of the body and mind (a healthy mind of a healthy body).

The role of food and its impact on the consumer became clear as we find borne diseases are many and pervasive food and as a result a lot of die consumers after eating food health standards for food do not apply (growing human numbers obliges states to find adequate food for each consumer), we mean food safety all measures necessary to ensure the health and hygiene of food and lack of contaminants in every step of production, preparation and distribution to consume.

Be sure of the safety of food in several types of natural and chemical and bacteriological tests for example, it can detect the smell of damaged meat and fruit of damaged appearance either microbial contamination, fraud or toxins They discover by chemical laboratory analyzes.

The study recommends a number of conclusions and recommendations, including :-

Control of the common diseases among animals and humans through meat and animal products.

Consumer protection from diseases that occur from damaged food.

prevent the sale of inappropriate food in the form or taste.

prevent the sale of adulterated food.

daily supervision of places to prepare food and drinks. (Ameen and Awatif , 2009)

11 - In another study, erected on beef carcasses collected from slaughterhouses for meat, had reached the test results to 52% of the samples contain *E.coli* , and that 81% of the bacteria are resistant to one or more antibiotics. (John, 1970)

12 - Another study conducted on samples from the carcasses of sheep and samples from the carcasses beef collected from different farms for the study of bacterial contamination Superficial observed that the contamination with *E.coli* concentrated mainly on meat surfaces, reflecting shortages and weaknesses in following proper sanitary conditions in slaughterhouses and trading, the sacrifices which posed a threat great consumer. (Siham and Taha, 2009)

13 - In a study on different samples of meat it found that 47% contain bacteria *Staphylococcus aureus* and 96% of them were resistant to at least one of the antibiotics of life and 52% are resistant to three types. (Anderson, 2003)

14 - Studies have established to investigate the *Salmonella* bacteria in humans had reached one of them, which included extensive and comprehensive study to 9% in the European countries and 15% in Denmark gave a positive result and was linked to eating contaminated beef and pork salmonella bacteria. (Ojha and Kostrzynsk, 2007)

15 - Abdullah and Munir study, they are collected from stores that sell meat in the city of Taif from all kinds of meat and proved the presence of infection by *Salmonella typhimurium, Klebsiella, Proteus, Escherichia coli, Staphylococcus aureus, Micrococcus.* (Abdullah and Munir, 2005)

16 - Study was performed to assess the presence of Enterobacteriaceae in raw meat and handlers in Egypt using cultivation and matrix-assisted laser desorption ionization time-of-flight mass spectrometry. A total of 100 raw meat samples (chicken and beef meat, 50 each) were randomly purchased from butchers and local meat retailers located at Mansoura city, Egypt. Fifty human

samples were collected from meat handlers (hand swabs and stool specimens, 25 each). 228 bacterial isolates were recovered from these samples. Unidentified isolates were characterized by partial 16S RNA gene sequencing. *Escherichia coli* isolates were further typed using a DNA microarray system. *Proteus spp*. (60.0%) were found to be the most abundant followed by *Escherichia coli* (38.7%), *Klebsiella* spp. (17.3%), and *Citrobacter spp*. (13.3%). The presence of different *Enterobacteriaceae* in locally produced retail raw meat demonstrates the risk of infection of people through consumption of raw or undercooked meat and the risk for cross-contamination of other food products. Harmonized and concerted actions from veterinary and public health authorities are needed to reduce the risk of infection. (Fatin, 2004)

17 - study evaluated the microbiological quality of hamburgers and the microbe community on the hands of vendors in Cuiabá, Mato Grosso, Brazil, in relation to vendors´ awareness as to what constitute acceptable food-handling practices as part of a broad-spectrum research program on street foods in Brazil . Sale of the hamburger known as the 'baguncinha' is common and widespread in urban Cuiabá, Mato Grosso, Brazil. Food inspectors encounter various difficulties in carrying out inspections. One hundred and five hamburgers samples were evaluated using conventional methods including tests for facultative aerobic and/or anaerobic mesophytic bacteria, coliform counts at 45 °C, the coagulase test for *Staphylococcus*, Gram-staining for the presence of *Bacillus cereus*, *Clostridium* sulphite reductase and *Salmonella* spp. The hamburgers were categorized as unsuitable for human consumption in 31.4% of samples, with those testing positive for coliforms and *Staphylococcus* at unacceptably high levels by Brazilian standards. High levels of microbiological contamination were detected on the hands of the food handlers and mesophytic bacterial counts reached 1.8 × 104 CFU/hand. Interviews were carried out by means of questionnaires to evaluate levels of awareness as to acceptable food handling practices and it was found that 80,1% of vendors had never participated in any kind of training. (Bezerra, *et al* 2010)

The researcher concludes through its auditing of previous studies following results:

First, all of the previous studies were unanimous on the importance of the oversight function on food safety from contamination at all stages of preparation and prepared and submitted to the consumer.

Second, the weakness of departments in providing health services and control it because the special circumstances of each country is different from the other country, in a country led by successive wars and a weak upper departments to poor health control services and food safety In another country the lack of laws and regulations of food and health programs control led to the weakness of the health control and food safety services in another weak departments of health control in the examination of a country and the diagnosis of the safety of workers in the field to prepare and serve food led to health problems affecting the health and safety of food.

Researcher finds in his study of a proposal to draw a map of the health control work in how to maintain food safety, whether the food is imported or locally.

1.27. Domains to take advantage of previous studies

1 -Possible from which to see and learn about some sources, periodicals, research and the use of the Internet has facilitated the way for a researcher to develop a theoretical framework for the current study.

2 -To contribute to the formulation of the objectives of the study and build a model study and formulate hypotheses.

3 -Choice of appropriate statistical methods to study the light of the statistical methods used in previous studies.

4 -To identify the methodologies of these studies and the sequence of paragraphs, which enabled the researcher of the study design methodology.

What distinguishes this study from previous studies:

1 -Approached the current study from previous studies in the adoption of the same variables mentioned by previous studies, but add to it a broker variable is the environmental contamination at the level of individuals, shops and the role of regulators, which distinguishes itself from previous studies.

2 -This study came to take firm foundations to ensure consumer protection and standards of quality and food safety and HACCP system HACCP independent variables and variable contamination and food poisoning broker types (normal, microbial and chemical) as a variable certified. that did not consume any study has been presented to some extent informed researcher.

1.28. Food Quality Programs

Food safety is a scientific discipline describing handling, preparation, and storage of food in ways that prevent food-borne illness. The occurrence of two or more cases of a similar illnesses resulting from the ingestion of a common food is known as a Food-borne disease outbreak. This includes a number of routines that should be followed to avoid potential health hazards. In this way food safety often overlaps with food defense to prevent harm to consumers. The tracks within this line of thought are safety between industry and the market and then between the market and the consumer. In considering industry to market practices, food safety considerations include the origins of food including the practices relating to food labeling, food hygiene, food additives and pesticide residues, as well as policies on biotechnology and food and guidelines for the management of governmental import and export inspection and certification systems for foods. In considering market to consumer practices, the usual thought is that food ought to be safe in the market and the concern is safe delivery and preparation of the food for the consumer.

Food can transmit pathogens which can result in the illness or death of the person or other animals. The main mediums are bacteria, viruses, mold, and fungus (which is Latin for mushroom). It can also serve as a growth and reproductive medium for pathogens. In developed countries there are intricate standards for food preparation, whereas in lesser developed countries there are less standards and enforcement of those standards. Another main issue is simply the availability of adequate safe water, which is usually a critical item in the spreading of diseases. In theory, food poisoning is 100% preventable. However this cannot be achieved due to the number of persons involved in the supply chain, as well as the fact that pathogens can be introduced into foods no matter how many precautions are taken. The five key principles of food hygiene, according to WHO, are:

1- Prevent contaminating food with pathogens spreading from people, pets, and pests.

2- Separate raw and cooked foods to prevent contaminating the cooked foods.

3- Cook foods for the appropriate length of time and at the appropriate temperature to kill pathogens.

4- Store food at the proper temperature.

5- Do use safe water and safe raw materials.

The safety of food in general and the safety of meat subject matter special importance and shared for workers in the food institutions and also consumers because the safety of food could affect the trading rate within the food industry. Food safety also plays a major role in reducing the cost of health.

This cost may hinder the economic progress of the country, while at the smaller level it may lead to the closure of the food establishment. It is therefore necessary for the food organizations to develop hygiene standards and apply them through quality food quality programs.

These programs emphasize:

Quality and safety of food offered for sale and trading.

The conformity of the programs with the laws related to the production, handling and sale of food.

Reduce food losses to as little as possible.

Avoid problems caused by the presence and spread of insects.

Followers of means that prevent food contamination in all its forms .

Generating a good environment and product for work .

Develop and deepen the relationship between the institution and the inspectors of the health departments.

Raise knowledge and training in the field of hygiene.

There is no doubt that the hygiene of food is the responsibility of all and the reputable institution responsible for the management of equipment and the possibilities and the elements of training to ensure and maintain the high level of performance and hygiene.

With the growing global interest in food quality, applications, programs and plans to reach safe food have emerged as a risk-free food. Examples of scientific methods to enhance food safety, identifying potential risks and control.

1.29. First, international specifications ISO 22000

The set of international specifications ISO 22000 , issued by the International Organization for Standardization ISO, in 2005 is the result of a series of developments and the accumulation of experience owing to the application of

the recommendations of the Codex Almntarius Codex Commission issued in 1993 and known as the Hazard Analysis & Critical Control Point . "risk analysis and points of critical control "in short, HACCP, which have been used over the years prior to the issuance of this specifications by ISO organization, and is concerned with this group of technical specifications, Committee ISO / TC 34 in the International Organization working Group 17 of it.

The international standard ISO 22000 consisting of the following basic elements requirements:

Scope

The scope focuses control procedures to be implemented to confirm the presence of operations which can meet the requirements of the client and legislative requirements for food safety, and apply this standard to the organizations that are involved directly or indirectly in one or more of the steps in the food chain, and that regardless of the size or complexity Organization.

Standard References

This element shows the referents that can be used to determine the terms and definitions associated with the terminology used in this standard specification.

Terms and Definitions

This element indicates as one of the necessities of consistency in the use of terms and definitions to those definitions and vocabulary contained in the standard specification ISO 9000 (about 82 definition) This is in addition to a number of other definitions concerning the vocabulary used in particular in the food applications.

Food Safety Management System

This element demonstrates the requirements of establishing of an integrated system for food safety and focuses on the required documents and records needed to confirm an effective building and implementation and updating of the food safety management system.

Management's Responsibility

This element specifies a set of requirements, including the responsibility of senior management – and the formation of a team to the safety of food and a representative of the management responsible for the system in addition to the

development of policies and objectives with clear plans and responsibilities in emergency situations, then put the mechanisms of effective communication within and outside the organization, especially with customers and finally this element identifies the need for senior management to periodically follow up the system to check its status and to determine the corrective and preventive actions to be taken and the possible methods of continuous improvement.

Planning and implementation of safe products

This element merges all the requirements of Good Manufacturing Practice GMP and HACCP requirements in addition to the legislative requirements applicable to the organization and its operations. The element includes a particular program for the basic requirements (such as: training - sterilization - maintenance - consecutive - review suppliers - adjust non-matching products - call procedures.. etc) which constitutes the general requirements for a sound foundation for the production of food.

Recognition, verification and optimization of the Food Safety Management System

This element covers a group of requirements, including that the Organization must approve that all assumptions used in their programs and planning for the system are scientifically valid 'In addition, the organization must plan to carry out periodically check acts on all components of the system to make sure that the system is working as designed or that there are amendments must be entered, with the need to make checking as a part of the continuous improvement processes when the Organization is reviewing the verification.

The basic specification and other supporting specifications

ISO 22000:2005

Food safety management systems -- Requirements for any organization in the food chain .

ISO/TS 22002-1:20091

Prerequisite programs on food safety -- Part 1: Food manufacturing.

ISO/TS 22003:20072

Food safety management systems -- Requirements for bodies providing audit and certification of food safety management systems.

ISO/TS 22004:20053

Food safety management systems -- Guidance on the application of ISO 22000:2005

ISO 22005:20074

Traceability in the feed and food chain -- General principles and basic requirements for system design and implementation.

Phases of application and evaluation food safety management systems

In general, the organization wishing to apply the system to manage the food safety by following these steps:

1. This single standard applies to the organization or overlap and integration with whatever or all of the specifications of ISO 9001 & ISO 14001 as suitable for the process of obtaining a certificate or self-declaration of the Organization for compliance with it.

2. The senior management of the organization to appoint a representative of the management and teamwork for the system of food safety management and developing an implementation plan.

3. Undertakes a study on a food safety laws in the state that apply to the organization and its products , activities and its operations.

4. Develop the basic general requirements Prerequisite Program PRP (such as: training - sterilization - maintenance - consecutive - review suppliers - adjust non-matching products - call procedures.. etc), and do what it takes to achieve it and set it in the facility.

5. To undertake a risk analysis and identification of critical points and the way to tune it into the organization in the course of food production by the Hazard Analysis & Critical Control Points (HACCP).

6. The senior management of the organization to participate with the team to developed an executive plan for the steps and actions to be taken to cover the specified program in step 4 and processes that have been identified in 5. With providing the necessary resources for doing this.

7. The organization shall in parallel adopt and implement an awareness training program for all employees in the facility of the requirements of food

safety management system for the preparation of the target facility for the desired change.

8. Implementation of the executive plan developed in Step 2 should be by officials and experts and the senior management of the organization to provide the necessary resources for implementation.

9. After the implementation of the new system and the supposed conformity to food safety management system and for a reasonable period of time confirms the stability of the new system, the senior management of the organization assign specialists with appropriate expertise, both from within or outside the organization to perform a comprehensive audit about the implementation of the new system in the organization, and usually do this audit systematically and in accordance with established plan in advance.

10. Audit results are usually "non-matches" to the requirements of food safety management system targeted, and is assisted by senior management of the organization to take appropriate corrective action to close the "no-matches".

11. The Organization to execute processes contained in item 9 & 10 on a regular basis to maintain a satisfactory level of performance of the organization and in accordance with the requirements of food safety management system.

12. The senior management should rebound and periodically planned reviews of the organization, and the execution of the laid down system, solving the problems of implementation to the extend that senior management assured that the organization match the management system and requirements contained in the standard ISO 2200.

13. The organization selected and contracted with an Issuer of recognized certificates that are in coordination with the organization`s management representative for arranging the timing of the audit.

14. The issuer of the certificate audit the organization and in the case of the audit was positive the organization is awarded ISO 22000 certificate subject to periodic audits by the donor to ensure the continuity of the organization`s compliance with the requirements of international standard.

The benefits of getting ISO 22000 certificates

I. Customer satisfaction and consumer safety.

II. Improve the relationship with the community and fulfill one of the elements of social responsibility.

III. Satisfy investor.

IV. Improve the image of the facility and the participation rate in the market.

V. Meet the requirements of authorization the system.

VI. A better control of the cost.

VII. Reduce the risk of accidents arising from the lack of food safety.

VIII. Show interest in.

IX. Providing inputs of raw materials and energy.

X. Facilitate obtaining permits.

XI. Improve the relationship with the government.

1.30. FSSC 22000 System

The FSSC 22000 System was designed to provide companies in the food industry with an ISO-based food safety management system certification that is recognized by the Global Food Safety Initiative (GFSI). Recognition by GFSI provides worldwide recognition and acceptance by food manufacturers and retailers. FSSC 22000 defines requirements for integrated processes that work together to control and minimize food safety hazards.

Once a facility implements processes that address all the requirements of FSSC 22000, they can be certified to FSSC 22000.

The certification program is managed by the Foundation for Food Safety Certification.

The FSSC 22000 system uses a management systems approach to food safety, using ISO 22000 for the management system requirements and ISO Technical Standards (for prerequisite program requirements). The food safety management system integrates nicely with other management systems such as ISO 9001 and ISO 14001.

FSSC 22000 Prerequisite Program Requirements (PRP)

Prerequisite programs are programs and practices put in place to address the role the production environment plays in producing safe food products.

FSSC 22000 requires that the organization establishes programs to control the likelihood of introducing contamination through the work environment. There are different , requirements depending on your industry :

ISO/TS 22002-1: Food Processing

ISO/TS 22002-3: Farming

ISO/TS 22002-4 Food Packaging Manufacturing

FSSC 22000 REQUIREMENTS

The certification scheme and requirements are defined in three documents:

Food processors, food packaging, manufacturers and others in the industry are becoming certified to meet customer demands and to stay competitive in the marketplace . Becoming certified can help you stay competitive and qualified to work with your current customers as well as to gain access to new ones.

BENEFITS OF FSSC 22000

Managing Risk

First and foremost, building an FSSC 22000 System will provide your company with effective management of food safety hazards by creating an environment capable of producing safe product and a management system to continually manage, monitor, validate and improve the system.

Maintain Current Customers.

Increase your market reach.

Prepare for upcoming regulatory changes.

Begin implementation:

1. Designate and train your FSSC 22000 Food Safety Team Leader

2. Designate teams to design, document and implement the required processes and food safety fundamentals.

3. Train your internal team

4. Run your system, collect records, perform internal audits, management review and Food Safety Team meeting.

5. Make corrections and improvements to your system.

6. Schedule and complete your audits.

What is the difference between ISO 22000 and FSSC 22000 ?

ISO 22000 is not recognized by Global Food Safety Initiative (GFSI).

ISO 22000 is broad in scope.

FSSC 22000 is recognized by GFSI.

FSSC has a more limited scope. Current scopes included are: farming, perishable animal products, food processing, feed production, food ingredients and food packaging material manufacturing.

Most companies will benefit by choosing FSSC 22000 and achieving a GFSI recognized certification. This is because many companies require that their suppliers be certified to a GFSI recognized standard. ISO 22000 is not recognized by GFSI.

FSSC 22000 is similar to ISO 22000 in that the FSSC 22000 scheme uses ISO 22000 as the requirements for the management system. However, FSSC 22000 includes additional requirements.

1.31. Hazard Analysis and Critical Control Points or HACCP

Is a systematic preventive approach to food safety from biological, chemical, and physical hazards in production processes that can cause the finished product to be unsafe, and designs measurements to reduce these risks to a safe level. In this manner, HACCP attempts to avoid hazards rather than attempting to inspect finished products for the effects of those hazards. The HACCP system can be used at all stages of a food chain, from food production and preparation processes including packaging, distribution, etc. The Food and Drug Administration (FDA) and the United States Department of Agriculture (USDA) require mandatory HACCP programs for juice and meat as an effective approach to food safety and protecting public health. Meat HACCP systems are regulated by the USDA, while seafood and juice are regulated by the FDA. All other food companies in the United States that are required to register with the FDA under the Public Health Security and Bioterrorism Preparedness and Response Act of 2002, as well as firms outside the US that export food to the US, are transitioning to mandatory hazard analysis and risk-based preventive controls plans. (Goue, *et al* 2016)

HACCP is believed to stem from a production process monitoring used during World War II because traditional "end of the pipe" testing on artillery shell's firing mechanisms could not be performed, and a large percentage of the artillery shells made at the time were either duds or misfiring. HACCP itself was conceived in the 1960s when the US National Aeronautics and Space Administration (NASA) asked Pillsbury to design and manufacture the first foods for space flights. Since then, HACCP has been recognized internationally as a logical tool for adapting traditional inspection methods to a modern, science-based, food safety system. Based on risk-assessment, HACCP plans allow both industry and government to allocate their resources efficiently in establishing and auditing safe food production practices. In 1994, the organization of International HACCP Alliance was established initially for the US meat and poultry industries to assist them with implementing HACCP and now its membership has been spread over other professional/industrial areas.

Hence, HACCP has been increasingly applied to industries other than food, such as cosmetics and pharmaceuticals. This method, which in effect seeks to plan out unsafe practices based on science, differs from traditional "produce and sort" quality control methods that do nothing to prevent hazards from occurring and must identify them at the end of the process. HACCP is focused only on the health safety issues of a product and not the quality of the product, yet HACCP principles are the basis of most food quality and safety assurance systems.

Principles

Conduct a hazard analysis

Plan to determine the food safety hazards and identify the preventive measures the plan can apply to control these hazards. A food safety hazard is any biological, chemical, or physical property that may cause a food to be unsafe for human consumption.

Identify critical control points

A critical control point (CCP) is a point, step, or procedure in a food manufacturing process at which control can be applied and, as a result, a food safety hazard can be prevented, eliminated, or reduced to an acceptable level.

Establish critical limits for each critical control point

A critical limit is the maximum or minimum value to which a physical, biological, or chemical hazard must be controlled at a critical control point to prevent, eliminate, or reduce that hazard to an acceptable level.

Establish critical control point monitoring requirements

Monitoring activities are necessary to ensure that the process is under control at each critical control point. In the United States, the FSIS requires that each monitoring procedure and its frequency be listed in the HACCP plan.

Establish corrective actions

These are actions to be taken when monitoring indicates a deviation from an established critical limit. The final rule requires a plant's HACCP plan to identify the corrective actions to be taken if a critical limit is not met. Corrective actions are intended to ensure that no product is injurious to health or otherwise adulterated as a result if the deviation enters commerce.

Establish procedures for ensuring the HACCP system is working as intended

Validation ensures that the plants do what they were designed to do; that is, they are successful in ensuring the production of a safe product. Plants will be required to validate their own HACCP plans. FSIS will not approve HACCP plans in advance, but will review them for conformance with the final rule.

Verification ensures the HACCP plan is adequate, that is, working as intended. Verification procedures may include such activities as review of HACCP plans, CCP records, critical limits and microbial sampling and analysis. FSIS is requiring that the HACCP plan include verification tasks to be performed by plant personnel. Verification tasks would also be performed by FSIS inspectors. Both FSIS and industry will undertake microbial testing as one of several verification activities.

Verification also includes 'validation' – the process of finding evidence for the accuracy of the HACCP system (e.g. scientific evidence for critical limitations).

Establish record keeping procedures

The HACCP regulation requires that all plants maintain certain documents, including its hazard analysis and written HACCP plan, and records

documenting the monitoring of critical control points, critical limits, verification activities, and the handling of processing deviations. Implementation involves monitoring, verifying, and validating of the daily work that is compliant with regulatory requirements in all stages all the time. The differences among those three types of work are given by Saskatchewan Agriculture and Food.

Standards

The seven HACCP principles are included in the international standard ISO 22000 FSMS 2011. This standard is a complete food safety and quality management system incorporating the elements of prerequisite programs (GMP & SSOP), HACCP and the quality management system, which together form an organization's Total Quality Management system.

Other standards, such as Safe Quality Food Institute's SQF Code, also relies upon the HACCP methodology as the basis for developing and maintaining food safety and food quality plans and programs in concert with the fundamental prerequisites of good manufacturing practices.

Good manufacturing practices (GMP) are the practices required in order to conform to the guidelines recommended by agencies that control the authorization and licensing of the manufacture and sale of food and beverages, cosmetics, pharmaceutical products, dietary supplements, and medical devices. These guidelines provide minimum requirements that a manufacturer must meet to assure that their products are consistently high in quality, from batch to batch, for their intended use. The rules that govern each industry may differ significantly; however, the main purpose of GMP is always to prevent harm from occurring to the end user. (Nally, 2007)

Sanitation Standard Operating Procedures (SSOP) is the common name given to the sanitation procedures in food production plants which are required by the Food Safety .

SSOPs are generally documented steps that must be followed to ensure adequate cleaning of product contact and non-product surfaces. These cleaning procedures must be detailed enough to make certain that adulteration of product will not occur. All HACCP plans require SSOPs to be documented and reviewed periodically to incorporate changes to the physical plant. This reviewing procedure can take on many forms, from annual formal reviews to random reviews, but any review should be done by "responsible educated management". As these procedures can make their way into the public record if there are serious failures, they might be looked at as public documents because they are required by the government. SSOPs, in conjunction with the Master Sanitation Schedule and Pre-Operational Inspection Program, form the entire sanitation operational guidelines for food-related processing and one of the primary backbones of all food industry HACCP plans.

SSOPs can be very simple to extremely intricate depending on the focus. Food industry equipment should be constructed of sanitary design; however, some automated processing equipment by necessity is difficult to clean. An individual SSOP should include:

- The equipment or affected area to be cleaned, identified by common name
- The tools necessary to prepare the equipment or area to be cleaned
- How to disassemble the area or equipment
- The method of cleaning and sanitizing

SSOPs can be standalone documents, but they should also serve as work instructions as this will help ensure they are accurate.

Application

- Fish and fishery products
- Fresh-cut produce[]
- Juice and nectar products
- Food outlets
- Meat and poultry products
- School food and services

CHAPTER TWO

MATERIALS AND METHODS

CHAPTER TWO

MATERIALS AND METHODS

2.1. Distribution of visits

Distribution of visits was at the state of Khartoum ,the survey was conducted in the meat centers as follows:

1 . Points of Sale location (Khartoum - Omdurman - Khartoum North)

(300 trading center meat)

2 . Sale of meat-point type (butchers - restaurants – grills)

Khartoum :

70 meat butcher on all areas

20 restaurant that serves meat meal branches

10 grill provides basic meat meal

Omdurman:

70 meat butcher on all areas

20 restaurant that serves meat meal branches

10 grill provides basic meat meal

Khartoum North

70 meat butcher on all areas

20 restaurant that serves meat meal branches

10 grill provides basic meat meal

2.2. Questionnaire

A questionnaire was distributed to meat sales and handling centers and contains of the following questions:

1 . Transfer method of meat from slaughter points to points of sale

• refrigerated cars matching the quality systems

• cars not conforming to quality systems

2 . Veterinary meat inspection

• accordance with veterinary health methods with veterinary seal

• Not according to veterinary health roads

3. Meat Inspection location

• Followed by the Veterinary Health Administration

• Followed by others

4. Supervisory authority overseeing the point of sale:

• veterinary health department

• belonging to others

5. Method of keeping meat inside the point of sale

• conforms to quality standards in keeping meat

• does not meet quality standards in keeping meat

6. Periodic examination of workers at points of sale

• regular medical examination

• medical examination is not a regular

7. Commitment to health dress (Clean clothes, hair cover, glove)

• Workers are committed to the health standards in the work environment

• Workers are not committed to the health standards in the work environment

8 . Show meat

• matching the quality standards

• not conform to the quality standards

9 . Cleanliness of the place in general

• Excellent cleaner

• Medium or low cleaner or acceptable

10. The conformity based point of sale of building quality standards in terms of ventilation and temperature :

• Matching

•Non-conforming

11. conformity of health quality standards in how to dispose of waste:

• Conform to quality

• Non-conforming health quality standards

2.3. Analysis Laboratory

2.3.1 Materials Lab:

1 – Beef meat samples from the butchers and grills and restaurants

2 - Plastic sterile bags

3 - Media suitable for the multiplication of bacteria, (bacterial cultures)

a. Blood Agar Media

b. Nutrant agar Media

c. Xylose lysine deoxycholate Media (XLD)

d. MacConkey agar

4 - Normal Saline

5 - Swab

6 - Gram stain and Microscope

7 - Api 20e kit*

8 - Api staph kit**

9 – Vortex mixer

10 - In addition to the lab equipment such as incubators flame stove and tools.

***2.3.2. Api 20e kit to determine the type of isolated bacteria**

API 20 E (bioMerieux) is a standardized identification system for Enterobacteriaceae and other non-fastidious, Gram negative rods which uses 21 miniaturized biochemical tests and a database.

The API 20 E strip consists of 20 micro tubes containing dehydrated substrates. These tests are inoculated with a bacterial suspension that reconstitutes the media.

During incubation, metabolism produces color changes that are either spontaneous or revealed by the addition of reagents.

The reactions are read according to the Reading Table and the identification is obtained by referring to the Analytical Profile Index or using the identification software.

API 20 E should only be used with *Enterobacteriaceae* and/or non-fastidious Gram-negative rods.

CONTENT OF THE KIT

- 25 API 20 E strips

- 25 incubation boxes

- 25 result sheets

- 1 clip seal

- 1 package insert

****2.3.3. Api staph kits to determine the type of isolated bacteria:**

API Staph is a standardized system for the identification of the genera *Staphylococcus*, *Micrococcus* and *Kocuria*, which Uses miniaturized biochemical tests and a specially adapted database.

PRINCIPLE

The API Staph strip consists of 20 micro tubes containing dehydrated substrates These micro tubes are Inoculated with a bacterial suspension, prepared is API Staph Medium, that reconstitutes the rests. Daring incubation, metabolism produces color changes that are either spontaneous or revealed by the addition of reagents.

The reactions are read according to the Reading Table and the identification is obtained by referring to the Analytical Profile index or using the identification software.

CONTENT OF TNE KTT

API Staph strips 25 , incubation boxes 25 , result sheets 25 and

ampules of API Staph Medium 25

2.3.4. Collection of Samples:

Meat samples were collected from local beef of 25-30 grams of meat-processing centers in Khartoum, Omdurman and Khartoum North. The sample number was 60 samples from the mentioned areas. The samples were collected aseptically, each in a sterile plastic bag and transported immediately on ice to the Veterinary Research Institute, (Soba) for isolation of bacteria.

2.3.5. Processing of samples for analysis:

Sterilized surfaces of the lab and the work place and operate the flame 10 minutes of work before. Put 5 ml of normal saline in each sample is washed with brine because the purpose knowledge of surface contamination of meat.

2.3.6. Procedures for Isolation of Bacteria:

Type of media used for isolation of bacteria like blood, brain heart infusion nutrient, MacConkey and brilliant green agar (Madigan, 2006) . A piece of meat was cultured and streaked onto sheep blood agar then incubated at 37 ° C for 24 hr and all were subcultured on a blood and nutrient agar plates. The cultures were incubated aerobically at 37 ° C for 24 hr . Any plate that did not show growth within 24 hr was incubated and examined daily for a week to ensure bacterial growth before considering it negative .(Ryan and Ray, 2004(a). Then gram stain was used to differentiate between and Gram negative bacteria (Figure 1) and gram positive bacteria (Figure 2) under the microscope.

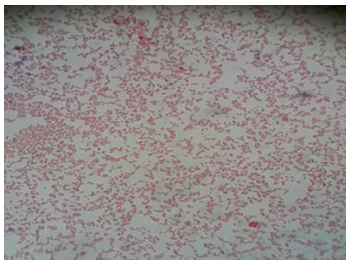


Figure 1: Gram-negative bacteria appear under the microscope (*Escherichia coli*)

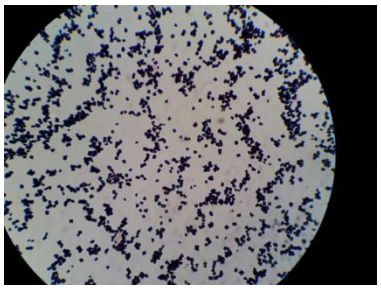


Figure 2: Gram- positive bacteria appear under the microscope (*Micrococcus sp*)

The isolates recovered were identified at the generic and species levels according to Api kits method (Biomeriouex), APi 20 e kits method was used for gram negative . And APi staph kits method for gram positive. Was recorded the results on the result sheet, the tests were separated into groups of 3 and a value of 1, 2 or 4 is indicated for each. By adding together the values corresponding to positive reactions within each group, a 7-digit profile number is obtained. Results are read in a table Api 20e test (Figure 3). (table 2.1)

Figure 3: Image of Api 20e test to determine the type of isolated bacteria

2.3.7. Characterisation of the Staphylococci and Enterobacterase isolates using API:

For identification of *Staphylococcus* isolate with the Api kits, the organisms were subcultured on blood agar plates, each separately and after incubation for 24hours at 37ºC, colonies from each fresh culture, were emulsified in Api Staph medium and adjusted visually to 0.5 MacFarland opacity tube that was prepared by adding 0.05 of 1.0% barium chloride to 9.95 of 1.0% sulfuric acid then distributed into the tubules and incubation at 37°C for 24 hours. The results were read after adding reagents according to the manufacture instruction. The same method was applied for *enterobacterase* after emulsifying the culture in normal saline 0.85. Results are read in a table Api 20e test (Figure 4). (table 2.2)

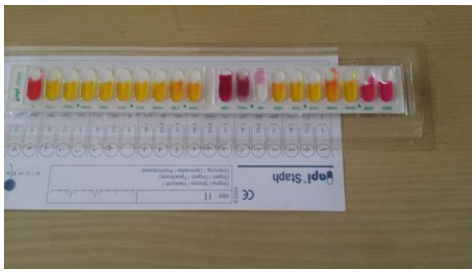


Figure 4: Image of Api staph test to determine the type of isolated bacteria

2.4. Statistical analysis

The Statistical hypothesis: the existence of a relationship between the site and the contamination. Use of statistical program Chi-Square Tests found the moral value of 0.6 greater than 0.5 This conclusion is supported by the presence of harmful. (Waleed , 2009)

CHAPTER THREE

RESULTS

CHAPTER THREE

RESULTS

3.1. Theoretical observation of result:

Three hundred distribution center or trading of meat was visited including one hundred Centre in Khartoum, one hundred Center in Khartoum North and one hundred center in Omdurman. These centers included the central meat market in all these areas and also included grills and restaurants.

Theoretical observation of reality were compared with the required health requirements as required by the international quality standard and according to the laws of the Sudanese Standards Authority (Sudanese Standard No. 0038/2008). I found the following observations:

1 - Cooperation centers owners and employees by confirmed their desire for improvement and development.

2 - Lack of cleanliness in the vicinity of those shops, especially the central meat markets.

3 - The presence of a dense numbers of flies in those shops which showed the absence of anti-fly plan and the lack of air curtains operate battering ram to enter the flies .

4 - No activity licenses and licensed shops in a conspicuous place so as to facilitate the work of regulators to know the legal status of the Centre .

5 - Veterinary inspection receipts were not placed in a prominent place to indicate the preparation of slaughters and timing to facilitate the work of the health supervisor .

6 - The health safety licenses for employees (health certificates) were not placed in a visible place for citizens and the health supervisor. A health license is a certificate of activity and proves that the worker is free of diseases. Found some centers with no health cards for the workers. The question of how the medical examination of the workers to obtain the health license shows us that the medical examination is not compatible with international standards. Table (3.1) to indicate the deficiencies in the medical examination conducted by the staff of the Medical Committee and the global standard for the medical disclosure

required of food workers. The presence of large quantities of workers in the centers of sale and circulation of meat from neighboring countries have spread in their countries significantly AIDS an d hepatitis disease.

7 – Transporting meat to some shops did not conform to the health requirements.(Figure 5)

Figure 5: Use of transport that does not conform to health requirements

8 -Carcasses was not checked by veterinarian detected in slaughterhouses.

9 -There was no record of visits to the regulator supervising these centers

10 - Among the most important observations that hardly be generalized to the majority of centers are external show meat whereby the seller or the butcher put a large part of meat outside, exposed at the entrance or front shop and be exposed to the dust and the flies and the high temperature problem. (Figure 6)

11 - The meat was hanged by iron hook and.(Figure 7)

12 - The centers were fitted with a knife, that matched the required specifications, but some noticed that the skin of the carcass was placed and the knife was wrapped . (Figure 8)

13 - There is no specific system of visits by supervisors to shops .

14 - Most of the centers agreed to object to their visitors and did not know who was following them and asked them to implement certain requirements.

15 - The lack of commitment of some shops wearing clothes subject to sanitary conditions, including head cover and gloves .

16 - Some stores did not match and there was holes in the wall and the absence of ceramic or wall insulation.(Figure 9)

17 - There were no fire extinguishers, civil defense equipment or contingency plans.

18 - Some centers put liver outside the shop.(Figure 10)

19 - The lack of ventilation in some stores .

20 - Dustbin did not meet health requirements .(Figure 11)

21 - some shops there were no hand-wash basins and there were no tools for sterilization and disinfection.

3.2. The questionnaire results:

As shown in the table (3.2):

1 . Transfer method of meat from slaughter points to points of sale

Transportation varied between refrigerated trucks belonging to the slaughterhouse and between the purchase of meat from the source (dealer), which was transported and delivered to the butchers.

Some of the butchers did not transport by fridge, there were found some irregular transportation at early morning meat transport, especially in the outskirt.

Restaurants were bought meat from the butchery and from unknown sources of transportation.

Some grills had cooling cars and in some of them the cooling did not work properly and also transported meat by private cars.

In Khartoum: 67 Center transfer the meat properly and 33 Center did not transfer conformed to quality systems.

Omdurman: 56 Center transfer the meat properly and 44 meat Center did not transfer conformed to quality systems.

Khartoum North: 59 Center transfer the meat properly and 41 Center did not transfer conformed to quality systems .

2 . Veterinary meat inspection

Through was visited found some of the butchers exposed meat is not sealed and some restaurants where there is meat in refrigerators for cooling is not sealed and anonymous and some restaurants where there are no receipt for the meat from the slaughterhouse.

271 Meat Center was identical to the conducting of veterinary inspection of meat

29 Meat Center was not identical to the conducting of veterinary inspection of meat.

3. Meat Inspection location

Varied answers about the location in which they were veterinary check on the meat between Khartoum or Kadro slaughterhouse or slaughterhouse Omdurman or slaughterhouse Gnawa.

4 . Supervisory authority overseeing the point of sale:

all shops followed main localities and localities Subcommittee.

5. Method of keeping meat inside the point of sale .

268 center did not meet quality standards in the conservation meat

32 center were identical to the quality standards in the conservation meat.

6. Periodic examination of workers at points of sale

Shops that had all their workers' health certificates was 174 center

Shops that had some workers health certificate was 126 Center.

7. Commitment to health dress (Clean clothes, hair cover, glove)

The number of centers that applied quality standards in the clothing were 129 center

The number of centers that did not applied the standards of quality in clothing were 171 center.

8 . Meat show

Number of stores that meat show identically health standards were 29 center

Number of stores that meat did not display identically health standards were 271 center.

9. Cleanliness of the place in general and the Note is free from insects

Number of centers which were perfectly clean 105

Number of centers which were acceptably clean 195

10. the conformity based point of sale of building quality standards in terms of ventilation and temperature :

Shops matched the quality standard were 44 Center

Shops of others conformed to quality standards were 256 Center

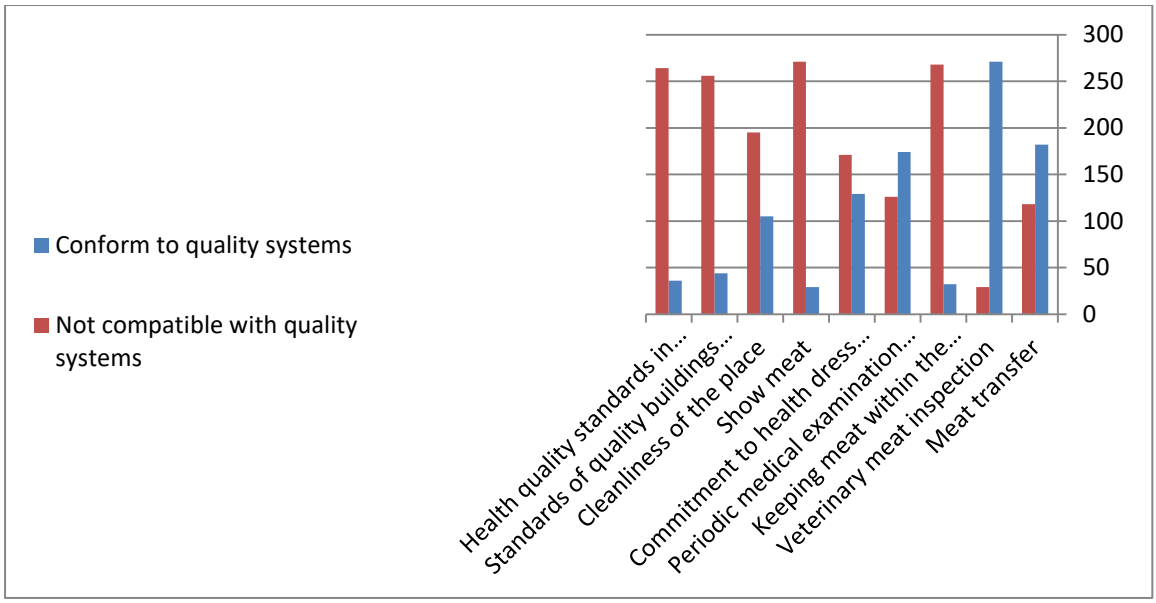
11. conformity of health quality standards in how to dispose of waste:

Number of centers matching the standards of waste disposal center were 36

Number of non-matching centers to standards of waste disposal were 264

Table 3.2. : A table shown the results of the questionnaire and field survey in meat centers

Question questionnaire	Conform to quality systems	Not compatible with quality systems	Notes	Quality standard
Meat transfer	182	118	Some means of transport did not match the movement of meat early in the morning, especially in the peripheral butchers	Transport means conforming to the quality systems is a car cooling temperature 4 ° C and clean from the inside and put the meat by hanging
Veterinary meat inspection	271	29	Meat that had not been checked inside refrigerators in some centers	Veterinary meat inspection and seal are clear and there is a certificate from the government slaughterhouse
Keeping meat within the point of sale	32	268	There were no refrigerators display meat in most centers	meat must be inside the refrigerator temperature 4 ° C
Periodic medical examination of workers	174	126	Some shops have 4 workers but the center has only two health certificates	Have health certificates for all employees
Commitment to health dress Clean clothes, hair) (cover, glove	129	171	Many centers did not adhere to the standards of cleanliness of clothes (Central Meat Market)	clothing should be clean with the head covering and the glove
Show meat	29	271	Meat was displayed outside shops in the air	Display meat is supposed to be in cooling refrigerators
Cleanliness of the place	105	195	Shops with a central level of cleanliness	Shops must be high level of cleanliness
Standards of quality buildings in terms of ventilation and temperature	44	256	Some shops did not find air conditioners, ventilation and suction fans	The sanitary standards have to be air-conditioned to adjust the temperature and proper ventilation and suction fans
Health quality standards in how to dispose of waste	36	264	Most centers did not have a dedicated waste bins	Meat boxes must be different from the rest of the waste bins



A graphical analysis of the results of the questionnaire

3.3. Results of laboratory analysis

There was a high percentage of contamination in the meat center due to lack of health requirements in meat shops and lack of attention to personal hygiene.

The results were the existence of colonies of bacteria and fungi in all media and was almost out more than one type, as some pictures show below those results (Figure 12,13,)

Figure 12: Image of bacterial culture in blood medea

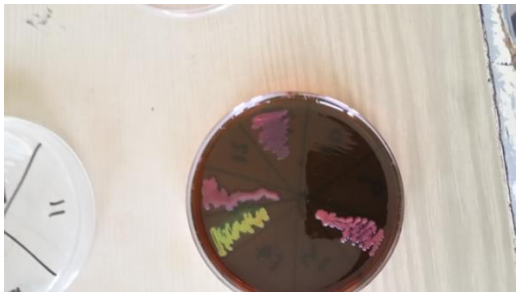


Figure 13: Image of bacterial sub culture in Medea showing the different colors

Table 3.3 . Type of bacteria isolated from meat of the sale centers in Khartoum area:

Below are tables showing growth rates and percentages of bacteria that have been isolated from meat of the sale centers in Khartoum area

Sample	Result	Concentration
Sample 1	*E.coli*	+++
Sample 2	*Klebsiella pneumoniae*	+++
Sample 3	*Bacillus cereus*	++
Sample 4	*Staphylococcus aureus*	++++
Sample 5	*Staphylococcus aureus*	++++
Sample 6	*Staphylococcus xylosus*	++
Sample 7	*Staphylococcus saprophyticus*	++
Sample 8	*Staphylococcus lentus*	+
Sample 9	*Staphylococcus aureus*	++++
Sample 10	*E.coli*	++++
Sample 11	*Kluyvera sp*	++++
Sample 12	*Klebsiella pneumoniae*	++++
Sample 13	*E.coli*	++++
Sample 14	*Micrococcus sp*	+++
Sample 15	*Kluyvera sp*	++++
Sample 16	*Staphylococcus capitis*	++
Sample 17	*E.coli*	++++
Sample 18	*Staphylococcus aureus*	+++
Sample 19	*Micrococcus sp*	++++
Sample 20	*E.coli*	++++

Scale: 1 Mm = +

Table 3.4 . Type of bacteria isolated from meat of the sale centers in Khartoum North area:

Below are tables showing growth rates and percentages of bacteria that have been isolated from meat of the sale centers in Khartoum North area

Sample	Result	Concentration
Sample 1	*Staphylococcus aureus*	++++
Sample 2	*Pseudomonas luteola*	++
Sample 3	*Staphylococcus epidermidis*	+
Sample 4	*Staphylococcus aureus*	+++
Sample 5	*Staphylococcus epidermidis*	+
Sample 6	*Micrococcus sp*	++++
Sample 7	*Micrococcus sp*	+++
Sample 8	*Staphylococcus hominis*	+
Sample 9	*Micrococcus sp*	++
Sample 10	*E.coli*	+++++
Sample 11	*Strep sp*	+
Sample 12	*Staphylococcus hominis*	+
Sample 13	*Micrococcus sp*	++++
Sample 14	*Staphylococcus capitis*	+
Sample 15	*Klebsiella pneumonia*	+++
Sample 16	*E.coli*	++++
Sample 17	*Staphylococcus aureus*	+++
Sample 18	*E.coli*	++++
Sample 19	*Staphylococcus aureus*	++++
Sample 20	*E.coli*	++++

Scale: 1 Mm= +

Table 3.5 . Type of bacteria isolated from meat of the sale centers in Omdurman area:

Below are tables showing growth rates and percentages of bacteria that have been isolated from meat of the sale centers in Omdurman area

Sample	*Result*	Concentration
Sample 1	*Staphylococcus lentus*	+
Sample 2	*Klebsiella pneumonia*	+++
Sample 3	*Staphylococcus aureus*	++++
Sample 4	*Staphylococcus saprophyticus*	++
Sample 5	*Pseudomonas luteola*	++
Sample 6	*Staphylococcus epidermidis*	+
Sample 7	*Staphylococcus aureus*	++++
Sample 8	*E.coli*	++++
Sample 9	*Staphylococcus aureus*	++++
Sample 10	*E.coli*	++++
Sample 11	*Staphylococcus aureus*	++++
Sample 12	*Staphylococcus aureus*	++++
Sample 13	*E.coli*	++++
Sample 14	*E.coli*	++++
Sample 15	*Staphylococcus hominis*	++++
Sample 16	*E.coli*	+++
Sample 17	*Staphylococcus aureus*	++++
Sample 18	*E.coli*	++++
Sample 19	*Staphylococcus xylosus*	+
Sample 20	*Staphylococcus hominis*	++

Scale: 1 Mm = +

Table 3.6. : Types and percentage of bacteria that had been isolated from Khartoum, Khartoum North and Omdurman

The results of laboratory analysis of bacterial contamination in the Khartoum area . The *E. coli* bacteria were the highest in the samples, followed by the *Staphylococcus aureus*. Khartoum North had the highest percentage of bacterial contamination of meat by 36%. Other types of bacteria were isolated As shown in the following table:

Type of bacteria isolated	Number in Khartoum	Number in Khartoum North	Number in Omdurman	the total number
Staphylococcus aureus	4 (6.67%)	4 (6.67%)	6 (10%)	14 (23.3%)
E.coli	5 (8.33%)	4 (6.67%)	6 (10%)	15 (25%)
Klebsiella pneumonia	2 (3.33%)	1 (1.67%)	1 (1.67%)	4 (6.6%)
Bacillus cereus	1 (1.67%)	0 (0)	0 (0)	1 (1.7%)
Kluyvera sp	2 (3.33%)	0 (0)	0 (0)	2 (3%)
Micrococcus sp	2 (3.33%)	4 (6.67%)	0 (0)	6 (10%)
Staphylococcus hominis	0 (0)	2 (3.33%)	2 (3.33%)	4 (6.6%)
Staphylococcus epidermidis	0 (0)	2 (3.33%)	1 (1.67%)	3 (5%)
Staphylococcus xylosus	1 (1.67%)	0 (1.67%)	1 (1.67%)	2 (3.3%)
Staphylococcus lentus	1 (1.67%)	1 (1.67%)	0 (0)	2 (3.3%)
Staphylococcus saprophyticus	1 (1.67%)	1 (1.67%)	0 (0)	2 (3.3%)
Staphylococcus capitis	1 (1.67%)	1 (1.67%)	0 (0)	2 (3.3%)
Pseudomonas luteola	0 (0)	1 (1.67%)	1 (1.67%)	2 (3.3%)
Strep sp	0 (0)	1 (1.67%)	0 (0)	1 (1.7%)
Total	20 (33.3%)	22 (36.7%)	18 (30%)	60 (100%)

.

3.4. Statistical analysis result :

Table 3.7.: Chi-Square Tests

The Statistical hypothesis: the existence of a relationship between site and Contamination as shown in the table (3.7) and (3.8) below

Chi-Square Tests shown the moral value of 0.6 greater than 0.5 This conclusion is supported by the presence of harmful bacteria converged ratios in Khartoum and Omdurman alone and Khartoum North , mean that there is no impact or difference between site and contamination Meat contamination is a result of non-compliance with health requirements As shown in the following table (3.7)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.137[a]	26	.681
Likelihood Ratio	29.482	26	.290
Linear-by-Linear Association	.027	1	.869
N of Valid Cases	60		

Table 3.8. : Statistical analysis of bacteria isolated from meat

Locality	The name of the bacteria	Frequency	Percent	Valid Percent	Cumulative Percent
Khartoum	*E.coli*	5	25.0	25.0	25.0
	Staphylococcus aureus	4	20.0	20.0	45.0
	kluyvera sp	2	10.0	10.0	55.0
	micrococcus sp	2	10.0	10.0	65.0
	Klebsiella pneumoniae	2	10.0	10.0	75.0
	staphylococcus xylosus	1	5.0	5.0	80.0
	staphylococcus saprophyticus	1	5.0	5.0	85.0
	staphylococcus lentus	1	5.0	5.0	90.0
	staphylococcus capitis	1	5.0	5.0	95.0
	bacillus cereus	1	5.0	5.0	100.0
	Total	20	100.0	100.0	
khartoum north	*E.coli*	4	18.2	18.2	18.2
	Staphylococcus aureus	4	18.2	18.2	36.4
	micrococcus sp	4	18.2	18.2	54.5
	Klebsiella pneumoniae	1	4.5	4.5	59.1
	staphylococcus saprophyticus	1	4.5	4.5	63.6
	staphylococcus lentus	1	4.5	4.5	68.2
	staphylococcus hominis	2	9.1	9.1	77.3
	staphylococcus epidermidis	2	9.1	9.1	86.4
	staphylococcus capitis	1	4.5	4.5	90.9
	pseudomonas luteola	1	4.5	4.5	95.5
	streo sp	1	4.5	4.5	100.0
	Total	22	100.0	100.0	
OMDURMAN	*E.coli*	6	33.3	33.3	33.3
	Staphylococcus aureus	6	33.3	33.3	66.7
	Klebsiella pneumoniae	1	5.6	5.6	72.2
	staphylococcus xylosus	1	5.6	5.6	77.8
	staphylococcus hominis	2	11.1	11.1	88.9
	staphylococcus epidermidis	1	5.6	5.6	94.4
	pseudomonas luteola	1	5.6	5.6	100.0
	Total	18	100.0	100.0	

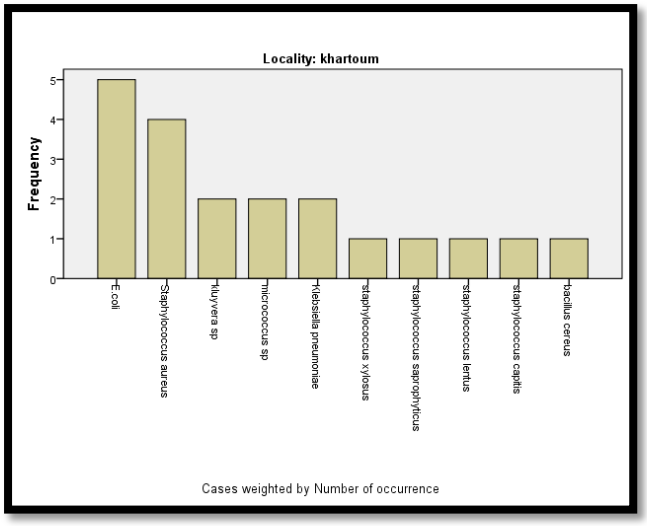


Diagram Type of bacteria isolated from Khartoum

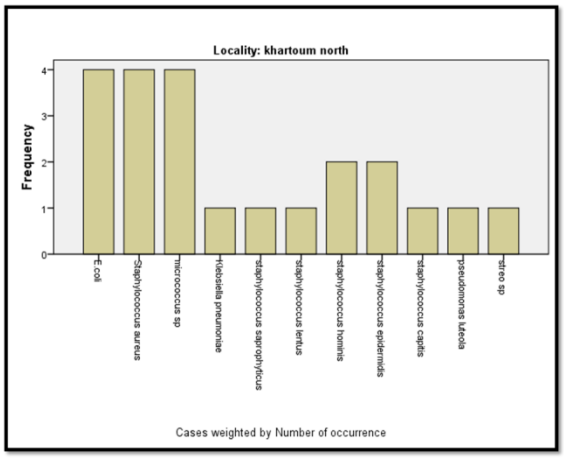


Diagram Type of bacteria isolated from Khartoum North

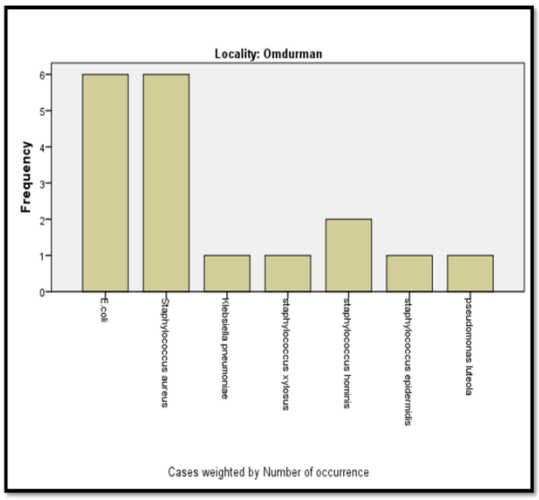


Diagram Type of bacteria isolated from Omdurman

CHAPTER FOUR

DISCUSSION

CHAPTER FOUR
DISCUSSION

4.1. DISCUSSION

Meat is a good medium for the growth of bacteria because it contains high moisture and nutrients necessary for the growth of most bacteria.(Gutcho, 1973). A large presence of pathogenic bacteria in meat samples due to the multiplicity of sources of contamination and the presence of a suitable environment for microbial growth and reproduction are represented in meat because fresh meat products do not contain salting factors, or portfolios, and did not subjected to thermal treatment , they are most likely to be contaminated (Sharf, 1966).

It is very clear results in multiple types of bacteria offset by the multiplicity of sources of contamination as from the slaughterhouse and transport non-matching meat hygienic conditions, lack of cleanliness of the shops and the surrounding environment and the low quality in the sale of meat centers and lack of commitment to the health requirements, also having sewage problems clearly shows the high percentage of bacteria *Staphylococcus aureus* which accounted for the largest percentage of the bacteria that had been isolated from meat by 23.3 % and the percentage of the largest presence in Omdurman reached 10 % the reason for this is the presence of wounds on the hands of the workers and the knife coated with animal skin. *Staphylococcus aureus* is a Gram-positive, round-shaped bacterium; It is a famous bacteria in food poisoning and contamination of meat, also responsible for food poisoning. (C.D.C, 2016). It is capable of generating toxins that produce food poisoning in the human body. Its incubation period lasts one to six hours, with the illness itself lasting anywhere from thirty minutes to three days (Leloir, et al, 2003). There's the conclusion reached by the Mathieu, 1992 *staphylococcus aureus* isolate percentage found 87% of fresh cattle meat in 197 sample. This study also matched the findings of Anderson D, 2003 in the isolation of *staphylococcus aureus* and also coincided with the study (Omer, et al, 2009). They had an isolation ratio of 14.7% *staphylococcus aureus* . Researchers in Mexico also found a 2.3% percent *staphylococcus aureus* in beef (Norma, et al, 2001). The surrounding conditions were very good and the animals' health was good and not stressful. The highest blood rate was maintained and the meat was cooled, which contributed to the low contamination rate (Al-aboudi, et al, 1987). Also meat without cooling in the outside shops in the air has contributed significantly to its contamination. All isolated bacteria are considered pathogenic to humansn (Finegold and Baron 1986).With this high

percentage of the presence of *staphylococcus aureus* in the samples of beef that are exposed without cooling, this is a sign of the beginning of meat corruption, which affects the consumer. (Rose, 1983).

E.coli was isolated by 25% of beef sample due to the contamination of the butcher's equipment such as knives, shredding equipment, workers' clothing, transportation and the most important reason for the existence of sanitation . (Hinkins, *et al* ,1996). *E.coli* is a Gram-negative, facultative anaerobic, rod-shaped, coliform bacterium of the genus *Escherichia* that is commonly found in the lower intestine of warm-blooded organisms (Singleton ,1999) It is one of the most dangerous bacteria on public health, isolated from humans and animals (Finegold and Baron 1986), they cause symptomatic infection but the disease in humans is fatal (Chart ,1998). The presence of *E.coli* is explained by the presence of meat at room temperature without cooling and displayed in the air because *E.coli* known affected by cold and die of it always advisable to refrigerate the meat after slaughter (Elliott and Michner, 1961) and matched these results in terms of isolating *E.coli* study Siham and Taha (2009) and John (1970).

Klebsiella pneumoniae was isolated by 6.6% , *Klebsiella pneumoniae* is a Gram-negative, no motile, encapsulated, lactose-fermenting, facultative anaerobic, rod-shaped bacterium. It appears as a mucoid lactose fermenter on MacConkey agar, it can cause destructive changes to human and animal lungs if aspirated (inhaled), specifically to the alveoli (in the lungs) resulting in bloody sputum (Ryan and Ray, 2004(b)). It is the same result found by Refaie, *et a*l, 1991 and found by (Abdullah and Munir 2005) knowing that *klebsiella pneumonia* transmitted through breathing and are very sensitive to the simplest types of disinfectants and other indications that the lack of hygiene and they confirm the existence of the exposed meat and exposure to air contamination with *klebsiella pneumoniae* more prevalent in dogs. (Richard and Guillermo, 2008).

Bacillus bacteria had also been isolated by 1.7% ,was cause human diseases due to the survival of the bacterial spores when the food is cooked incorrectly (Turnbull, 1996). Some of them are resistant to heat and their presence means that the meat ph High (Joan and John, 2011).

Kluyvera bacteria were also isolated by 3% , they are modern bacteria and the studies that have been done on them are few. *Kluyvera* is a Gram negative, facultatively anaerobic bacterial and motile genus from the family of Enterobacteriaceae with have a peritrichous flagella.(Farmer 2015) *Kluyvera* occur in water, soil and sewage. *Kluyvera* bacteria can cause opportunistic

infections in immune compromised patients. As we also connected to sanitation problems, it causes severe urinary infections and causes diarrhea. (Farmer, 1985). *Micrococcus sp* has been largely isolated that is always present in wastewater and stagnant water. Has been previously isolated in drinking water contamination of the Hungarian Hospital (Felföldi, *et al*, 2010).

Micrococcus bacteria were also isolated by 10 % , it is a sensitive to moist heat and dry heat(Joslyn, 1991) . Growth of micrococci may be significantly reduced at temperatures >45 °C, pH <6 (Wieser, *et al*, 2002) this means that the pH of the meat was more than 6 this matter helped to the existence and proliferation of bacteria, this is another sign of contamination and lack of hygiene.

Staphylococcus hominis was also isolated by 6.6%, it is a coagulase-negative member of the bacterial genus Staphylococcus, consisting of Gram-positive, Recently installed in newborn poisoning. (Chavez, *et al*, 2005)

Staphylococcus epidermidis was isolated by 5% , too. It is a Gram-positive bacterium, and one of over 40 species belonging to the genus Staphylococcus. It is part of the normal human flora, their presence is evidence of their movement from the workers and thus the worker's lack of cleanliness and equipment.

Staphylococcus xylosus was also isolated by 3.3%, it is a species of bacteria belonging to the genus Staphylococcus. It is a Gram-positive bacterium that forms clusters of cells. Like most staphylococcal species, it is coagulase-negative and exists as a commensal on the skin of humans and animals and in the environment. Its presence is evidence of its transmission from workers and external skin of the animal by workers, thus the worker is unclean and the equipment is unclean.

Staphylococcus lentus was also isolated by 3.3%, it is a coagulase-negative *staphylococcus* that belongs to the *Staphylococcus sciuri* group (*S. sciuri, S. lentus, and S. vitulinus*). Those staphylococci are known animal pathogens and they have been isolated from rodents, chickens, mammals and in farm soil and water. (Stepanovic, *et al*, 2005).

Staphylococcus saprophyticus was also isolated by 3.3%, it is a Gram-positive, coagulase-negative facultative species of Staphylococcus, which is a leading cause of cystitis in women and is associated with uncomplicated urinary tract infection (UTI) in humans. It is the second most common pathogen associated

with UTIs, causing 10-20% of all UTIs in sexually active young women. Like other Staphylococci, *S. saprophyticus* is globular and resembles clusters of grapes. *S. saprophyticus* colonizes in the urinary tract of humans and is isolated from urine samples. Young women are more susceptible to colonization in the urinary tracts and sexual intercourse promotes its spread. *S.saprophyticus* is not normally present in the body. It is also isolated from the carcasses of dead animals. (Raz, *et al*, 2005) *Staphylococcus saprophyticus* was found to contaminate 16•4% of the various food samples with a high prevalence of 34 % in raw beef and pork. It was common in both domestic and imported raw meat products. There was no seasonal variation in the presence of *S. saprophyticus* in the samples obtained from carcasses. The bacterium was found in 69 % of all cultures from the workers' protective gloves. It conclude that *S. saprophyticus*, originating from slaughtered animals, contaminates food and eventually colonises the human intestinal tract, this corresponds to the results of the researchers (Hedman ,*et al*, 1990).

Staphylococcus capitis was also isolated by 3.3% in Khartoum North and Khartoum , It is part of the normal flora of the skin of the human scalp, face, neck, and ears and has been associated with prosthetic valve endocarditis, but is rarely associated with native valve infection (Kloos and Schleifer, 1975) Its presence is indicative of the non-use of the head cover.

Pseudomonas luteola was also isolated by 3.3% in Khartoum North and Omdurman , it is a Gram-negative, motile aerobe, found in South Africa in street vendors' foods by 12% . (Mirriam ,*et al*, 2012).

Streptococcus was also isolated by 1.7% in Khartoum North , it is a genus of coccus (spherical) Gram-positive bacteria belonging to the phylum Firmicutes and the order Lactobacillus's (lactic acid bacteria). Cell division in this genus occurs along a single axis in these bacteria, thus they grow in chains or pairs.

In addition to *streptococcal* pharyngitis (strep throat), certain *Streptococcus* species are responsible for many cases of pink eye, meningitis, bacterial pneumonia, endocarditis, erysipelas, and necrotizing fasciitis (the 'flesh-eating' bacterial infections). However, many streptococcal species are not pathogenic, and form part of the commensal human microbiota of the mouth, skin, intestine, and upper respiratory tract.

It was earlier reported that no impact or difference between site and contamination, Meat contamination is a result of non-compliance with health requirements. (Waleed , 2009).

4.2. Conclusion

Conclusions can be summarized as follows:
There is a high percentage of contamination in the meat center due to lack of health requirements in meat shops and lack of attention to personal hygiene and ineffective government administration supervising meat market.

4.3. Recommendations

Through search results recommend the following:

1. The establishment of a food regulatory authority comprising representatives from the Ministry of Animal Resources, Ministry of Health, Research Authority, Ministry of Commerce and Ministry of Interior, with the following tasks:

(A) Responsibility for medical examination and annual permits them in accordance with international regulations for examination on kompass.com to be in agreement with the pools and private hospitals that provide certain percentages of amounts to the State Treasury.

(B) Responsibility for controls and periodic inspection on markets and meat shops and slaughterhouses and fish restaurants on being responsible for meat and fish and slaughterhouses to veterinarians and health monitors restaurants we saved jobs assimilates a large number of graduates.

(C) Responsibility for training and to train staff on how to food control and personnel training in the food sector on how food safety training for workers should be a condition for obtaining the license and symbolic price to be paid to the State Treasury.

(D) Responsibility for research to serve as a warning to food and water pollution cases through samples for laboratory analysis.

(E) Responsible for issuing the license after fulfilling the health requirements and conditions of full civil defense until renovation shops gradually to suit appropriate conditions for safe food handling.

(F) Responsibility for planning and continued improvement.

2. Providing an information network comprising all about meat and research centers and food communications linked to electronic government to be available to the competent authorities.

3. Large fines for pollution and fines for not commitment to supply health standards the State Treasury.

4. Application of HACCP and food safety systems in all stages of the production and circulation of food which contributes to food producer confidence in Sudan and raise the value of exports and thus raise the economy. (Al-Kandari and Jukes 2011)

5. Conduct food safety awareness programs, reduce pollution and educate citizens about purchasing from food safety centers.

6. Preparation of cadres from the competent technical authorities to inspect, control and inspect all products for high-precision results.

7. Giving all powers to the regulatory body to prevent overlapping resolutions with political and legislative commitment to meet the resistance of change among the stakeholders.

8. Eliminating old markets and establishing new markets with international quality standards, all meat and vegetables are separated in special sections, these departments are leased to suppliers with a commitment to quality requirements, and this is reflected in confidence in the local product and is reflected in exports It will also be an income source for the government.

9. Finally, following these systems will greatly reduce contamination and reduce the huge material cost of treating food poisoning diseases and will cause the preservation of lives and help to reach an ideal society.

REFERENCES

REFERNCES

1. Abdul Aziz, T. (1994) . Zoonoses diseases. Khartoum University Publishing.

2. Abdul – Rahman, M. H. (1976). Diseases between humans and animals. Publishing business of Qafat Commercial Khartoum**.**

3. Abdullah D. T. and Munir, M. B. (2005) Bacteriological study on fresh meat sold in Taif Governorate - *Damascus University Journal of Agricultural Sciences*, **21** (1): 259

4. Adams, M. R. and Moss, M.O. (2000). Food Microbiology (Second Edition)- The Royal Society of chemistry.

5. Advisory Committee in Microbiological Safety of Food (ACMSF).(1995). Report on verocytotoxin-producing *Escherichia coli*. London HMSO.

1998.

6. Abdel Wahed, A.H.(1992). Investigation of the presence of some food poisoning bacteria from cows and sheep. Faculty of Veterinary Medicine, Mosul University. Iraqi, *Journal of Veterinary Sciences*. Volume **5** Issue 2

7. Al-aboudi, A.R. ; Majeed, K.N. and Ahmed, S.M. (1987). Hygienic quality of beef carcasses produced of mosul abattoir. *Vet. Med.J*, **35**:73-82.

8. Al-Kandari, D. and Jukes, D. J. (2011). Incorporating HACCP into national food control systems-Analyzing progress in the United Arab Emirates. *Food Control*. **22**(6), 851-861.

9. AL-Sheddy, I.A;Fung, D.Y.C. and Kastner, C.L.(1995). Microbiology of fresh and restructured lamb meat. a review. Crit. Rev. *Microbial*, **21**:31-52.

10. Ali, S.A; Zair, A.J.; Mohsen, S.M and Alwan, M.A. (2013). bacterial contamination in red meat, local and imported. *Journal of Veterinary Science*, **54** (2). 249- 254.

11. Alawda, K. and Saleh , A.(1984). Meat and Meat Processing, Faculty of Agriculture. *Journal of Damascus University*, 614-31.

12. Ameen and Awatif , Y. (2009). Food Control Department, Ministry of Health, Sudan.

13. Anderson, A.; Ronner , U. and Granum , P.E. (1995). What problems does the food industry have with the spore-forming pathogens *Bacillus cereus* and *Clostridium perfringens*. *Int J Food Microbiol* , **28**(2):145-55.

14. Anderson, D.I. (2003). Persistence of antibiotic resistant bacteria. *Current Opinion in Microbiology*, **6**: 452–456.

15. Arnon, S.S.; Schechter, R.; Inglesby, T.V.; Henderson, D.A.; Bartlett, J.G.; Ascher, M.S.; Eitzen, E.; Fine, A.D.; Hauer, J.; Layton, M.; Lillibridge, S.; Osterholm, M.T.; O'Toole, T.; Parker, G.; Perl, T.M.; Russell, P.K.; Swerdlow, D.L. and Tonat, K. (2001). "Botulinum toxin as a biological weapon: medical and public health management". *JAMA*. **285** (8): 1059–1070.

16. Australia New Zealand Food Authority (1999). Food Safety Standards – Costs and Benefits. ANZFA.

17. Bezerra, A.C.; Reis,R.B. and Bastos, H.M. (2010). Microbiological quality of hamburgers sold in the streets of Cuiaba' – MT,Brazil and Vendor hygiene-*awareness*. *Food Science and Technology*, **30**(2)520-52

18. BioMérieux, (2016). Reference Document and Annual Financial Report**.** www.biomerieux.com

19. *British Telegraph* newspaper(2016) May 22.

20. Buzby,J.C. and Roberts,T. (1997). Economic costs and trade implications of microbial foodborne illness. *World Health Statistics Quarterly*, **50** (2) 57-66.

21. C.D.C (2016) . Staphylococcal Food Poisoning".(2016). Food Safety, Center for Disease Control and Prevention ,USA. cdc.gov. hhs.gov.

22. Chart, H. (1998). Are all infections with *Escherichia Coli O157* associated with Cattle?. *Lancet*; **352**: 1005.

23. Chartered Institute of Environmental Health CIEH (2000). European Commission. Commission proposes new food safety hygiene rules.

24. Chavez, F.; Alvarez, M.G.; Sanz, F.; Alba, C. and Joaquin, R.O. (2005). Nosocomial Spread of *Staphylococcus hominis* subsp. novobiosepticus Strain causing Sepsis in a Neonatal Intensive Care Unit.Abstract. *Journal of Clinical Microbiology*, **43**(9): 4877-4879.

25. Codex Alimentarius. (1997) . Hazard Analysis and Critical Control Point (HACCP) System and Guidelines for its Application. Annex to CAC/RCP **1**-1969(General Principles of Food Hygiene) , Rev.3.

26. Dulaimi, K. (2007). Food Poisoning, Faculty of Agriculture, University of Baghdad. Dar Al Khayyal for Printing, Publishing and Distribution Beirut.

27. El Bassioni, L.;Barakat, I.; Nasr,E.;Gourville,E.M.; Hovi, T,; Blomqvist,S.; Burns, C.; Stenvik, M.; Gary, H.; Kew, O.M.;Pallansch,M.A. and Wahdan, M.H. (2003). Prolonged detection of indiggenous wild polioviruses in sewage from communities in Egypt. *Am J Epidemiol*. **158**: 807-815.

28. Eley , A.R. (1996).other bacterial pathogens, Microbial Food Poisoning. 2nd edition.London Chapman and Hall.57-73.

29. Elliott, R. P. and Michner, H.D. (1961). Microbiological Standard and Handling Codes for Chilled and Frozen Food. *Arevies. Appl.Microbiol.***9**:452-468.

30. FAO, (2013). Current Worldwide Annual Meat Consumption per capita, Livestock and Fish Primary Equivalent. Food and Agriculture Organization of the United Nations.

31. FAO and WHO. (2003). Assuring food safety and quality: Guidelines for strengthening national food control systems. Rome: Food and Agriculture Organization and World Health Organization.

32. FAO and WHO, (1984). "The Role of food safety in health and development"- A Report of a Joint FAO/WHO

33. Farmer, J.J. (2015). "*Kluyvera*". Bergey's Manual of Systematics of Archaea and Bacteria. John Wiley & Sons, Ltd: 1–18.

34. Farmer J.J.; Fanning, G.R.; Davis, B.R.; O'Hara, C.M.; Riddle, C.; Hickman, F.W.; Asbury, M.A.; Lowery, V.A. and Brenner, D.J.(1985) . Biochemical identification of new species and biogroups of *Enterobacteriaceae* isolated from clinical specimens. *J Clin Microbiol* , **21**:. 46-76.

35. Fatin, H.S.(2004) Bacterial Hazards Associated with Consumption of Some Meat products. *Benha Veterinary Medical Journal* **,15**(2):129-141.

36. Felföldi ,T.; Heéger, Z.; Vargha, M. and Márialigeti, K. (2010). Detection of potentially pathogenic bacteria in the drinking water distribution system of a hospital in Hungary. *Clinical Microbiology and Infection. PubMed* ,**16**:89–92.

37. Finegold, S. M. and Baron, E.J. (1986). Bailey and Scott's diagnostic microbiology, 7th ed. The C. V. Mosby Co., St. Louis, Mo.

38. Geo, F. B.; Karen, C. C.; Janet, S. B. and Stephen, A. M. (2007). Jawetz, Melnick, & Adelberg's Medical Microbiology. *Enterobacteriaceae*: In review of medical microbiology. 21rd Ed. By Geo F.; Janet S. and Stephen Mc Graw – Hill compais, USA. pp.218 – 229.

39. Goue, A. F.; Gavriel, A.A. and Drogui,P. (2016). Optimizing The Effectiveness Of HACCP In Agri- Food SMEs. *European Scientific Journal*, **12** (24): 18–32.

40. Gutcho, M. (1973). Textured Foods and Allied Products, Noyes Data corporation, New Jersey, U.S.A.

41. Haitham, M. (2005). responsible for food safety in Syria, *Tishreen Magazine*. No. **6**.

42. Hedman, P.; Ringertz,O.; Eriksson,B.; Kvarnfors, P.; Andersson,M. and Bengtsson,L. (1990). *Staphylococcus saprophyticus* found to be a common contaminant of food . *Journal of Infection,* **21**:11-19.

43. Herschdoerfer, S.M.(1968). *Quality Control In The food Industry*.Vol.**2**.Academic Press London and New York.

44. Hinkins, J.C.; Faith, N.G.; Lotang, T.D.; Bailey, P. ; Buege ,D.; Kaspar, C.W. and Luchansky, J.B.(1996). Validation of pepperoni processes for control of *Escherichia coli O 157* : H7. *J. Food Protection*, **59**: 1260-1266.

45. Hinman, R. B. and Harris, R.B.(1939). The Story of Meat. Swift & Company. Katherine.

46. Honikel, K.O. (1998). Reference methods for the assessment of physical characteristics of meat. *Meat Sci*. **49**:447-457.

47. Ibrahim, A.T. (1990). Human Health Hazard created by Animal Diseases. Khartoum University Press, Sudan.

48. Izzet ,T. (1991). Public Health. Publications of Al - Baath University, College of Veterinary Medicine, Directorate of Publications and University Books. Syria

49. Jantsch, J.; Chikkaballi, D. and Hensel, M. (2011). "Cellular aspects of immunity to intracellular Salmonella enterica". *Immunological Reviews*. **240** (1): 185–195.

50. Joan, L. and John ,W. F. (2011). Microbiology: An Evolving Science (2nd Edition), Norton.

51. John, R. W. (1970). Contamination of meat carcasses by antibiotics – resistant coliform bacteria. The *Lancet*, **296**: 561-563.

52. Joslyn, L. J. (1991). Sterilization by Heat. In S. S. Block (Ed.), Disinfection, Sterilization, and Preservation .Philadelphia, Lea& Febiger. (4th ed., pp. 495-526).

53. Kloos, W. E.; Schleifer, K. H. (1975). "Isolation and Characterization of Staphylococci from Human Skin II. Descriptions of Four New Species: *Staphylococcus warneri*, *Staphylococcus capitis*, *Staphylococcus hominis*, and *Staphylococcus simulans*". *International Journal of Systematic Bacteriology*, **25** (1): 62–79. doi:10.1099/00207713-25-1-62. ISSN 0020-7713.

54. Knoppert, P. L. (1980)."European Communities Drinking Water Standards" Awwa conference proceeding –USA.

55. LeLoir, Y.; Baron, F. and Gautier, M.(2003) . *Staphylococcus aureus* and food poisoning. *Genet. Mol Res*, **2**:63–76.

56. Lukjancenko, O.; Wassenaar, T.M. and Ussery, D.W. (2010). "Comparison of 61 sequenced Escherichia coli genomes". *Microbial Ecology*. **60** (4): 708–20.

57. Lutfi, F. A. H. and Ali, A. A.(2007) Total Quality Management and Food Security: Authoring - Ain Shams University Publications - Faculty of Agriculture – Egypt.

58. Madigan, M. and Martinko, J. (2006). Brock Biology of Microorganisms (11th ed.). Prentice Hall. ISBN 0-13-144329-1.

59. Mark, J. H. (2010). Water and Waste-Water Technology, New York, John Wiley.

60. Mathews , S. R. ; Singhal , S. and Kulkarni, P.R.(1990). Chemical indices of food decomposition , *Trends Food Sci. Technol* . **1** : 89 – 91.

61. Mathieu, A.M.; Isigidi, B.K.; Devriese, L.A.; Godard, C. and Vanhoof, R. (1992). Characterization of Staphylococcus Aureus and Salmonella spp. Strains Isolated From Bovine Meat in Zaire. *International Journal of Food Microbiology*, **14**(2): 119-126.

62. Meat Trading Chamber (2016)- Al-*Sahafa Newspaper* 12 February .

63. Meloan, C. E. and Pomeranz, Y. (1973). Food analysis laboratory experiments - The AVI, Publishing Company, INC.

64. Mirriam, E. N.; Collins, E. O.; Nicoline, F. T.; Ezekiel, G. and Roland, N.N. (2012). pathogens recovered from ready-to-eat foods from roadside cafeterias and retail outlets in Alice, Eastern Cape Province, South Africa: Public Health Implications. Int. *J. Environ.* Res. Public Health **9**:2608-2619.

65. Mohamed, K.Y.; Youssef, M. R.A.; Rashwan and El-Syiad ,S.I. (1992) Assessment of Egyptian beef and buffalo nutritive meat quality., 38th *ICOMST Clermont-Ferrand*, France.

66. Nally, J.D. (2007). Good Manufacturing Practices for Pharmaceuticals (6th ed.). CRC Press. p. 424

67. Norma, h.; Santos, G.; Guadalupe, R. and Lucia, S. (2001). condition of Microbiological ground meat retailed in Monterrey , Mexico, *Journal of Food protection*, **64**:(8): 1249-1251.

68. Ojha, S. and Kostrzynska, M. (2007). Approaches for Reducing Salmonella in Pork Production. *Journal of Food Protec tion*. **70** (11): 2676-2694.

69. Omer, H.; Iqbal, A. A.; and Entisar, R.A. (2009). extract poisons *Staphylococcus aureus* isolated from the flesh cut. *Veterinary Science*, **23**: (1) 27- 32.

70. Raymond, D.C.;Philippe, J.A.; Samuel, L.B.; Lonnel,C.; Robert, J.L.; Alan, S.N.; Frank,P.P.; Christopher, J.S and Judith, L.S (2016). Lexicon Chemicals & Pharmaceuticals. Defy Possible.U.S.A

71. Raz, R.; Colodner, R. and Kunin, C.M. (2005). Who are you-*Staphylococcus saprophyticus*?. *Clinical Infectious Diseases*, **40**(6):896-8.

72. Recommended International Code of Practice (1969). General Principles of Food Hygiene CAC/RCP-1

73. Refaie, R. S.; Mohammed, A. S.; Thabet, A. E. And El-Timawy, A.A.M. (1991). Microbiological Quality of Frozen Meat in Assiut. *Assiut. Vet. Med. J.* **24**,(48):158-163.

74. Richard, N. and Guillermo, C.(2008) Small Animal Internal Medicine 4th Edition , Mosby. p.1301.

75. Roberts, J.A. (1996) Economic evaluation of surveillance. London, Department of Public Health, and Policy.

76. Rose, A.H. (1983). Food Microbiology. Academic Press. London, New York.

77. Ryan, K.J. and Ray, C.G. (2004(a)) (Eds). Sherris medical microbiology. 4th Edition, McGraw Hill, 551-552.

78. Ryan K.J, Ray C.G, (2004(b)). eds. Sherris Medical Microbiology (4th ed.). McGraw Hill. pp. 293–4.

79. Sara , L. L.(1999). Food Poisoning and Foodborne Diseases . Enslow Publishers , Inc.

80. Satin, M.,(2008) Food Alert: The Ultimate Sourcebook for Food Safety, Facts on File, Inc., , 2nd ed

81. Sharf, J. M. (1966). Recommended Methods for The Microbiological Examination of Foods. Second edition. American Public Health Association Inc., Washington.

82. Siham N. and Taha H. (2009). Superficial bacterial contamination of ovine and bovine carcasses at El – Harrach slaughterhouse (Algeria). *European Journal of Scientific Research*, **38**(3):474 – 485.

83. Singleton P (1999). Bacteria in Biology, Biotechnology and Medicine (5th ed.). Wiley. pp. 444–454.

84. Stepanovic, S.; Dakic, I.; Morrison, D.; Hauschild, T.; Jezek, P.; Petrás, P.; Martel, A.; Vukovic, D.; Shittu, A. and Devriese, L.A.(2005) . Identification and characterization of clinical isolates of members of the *Staphylococcus sciuri* group. *J Clin Microbiol*; **43**:956–8.

85. Turnbull, P.C.B. (1996). *Bacillus.* In: Barron's Medical Microbiology (4th ed.). Univ of Texas Medical Branch. ISBN 0-9631172-1-1. (via NCBI Bookshelf).

86. Tuttle, J.1.; Gomez, T.; Doyle, M.P.; Wells, J.G.; Zhao, T.; Tauxe, R.V. and Griffin, P.M. (1999). Lesson from outbreak of *E. coli 0157*: H7 infections insights in to the infectious dose and method of wide spread contamination of hamburger patties. *Journal of epidemiology and infection*, **122**,(2):185–92.

87. UN document, 1999 Committee on Economic, Social and Cultural Rights, General Comment No. 12, Right to Adequate Food.

88. Van, N.P.; Valentijn, A.; Mossel, D.A.A. and Huis, J.H.J.(1998). The survival and growth of acid- adapted mesophilic pathogens that contaminate meat after lactic acid decontaminated. *Journal Of Applied Microbiology*, **84**:559-567.

89. Vesterlund, S. (2006). "Staphylococcus aureus adheres to human intestinal mucus but can be displaced by certain lactic acid bacteria" . *Microbiology. **152** (6): 1819–1826*

90. Waleed, A . Q. (2009). Principles of Statistics Programs.

91. WHO Tech. Report Scries No.682(1982) Bacterial and Viral Zoonoses Report WHO Expert Committee with Participation of FAO.

92. Wieser, M.I.; Denner, E. B.; Kampfer, P.; Schumann, P.; Tindall, B.; Steiner, U.; Vybiral, D.; Lubitz, W.; Maszenan, A. M.; Patel, B. K.; Seviour, R. J.; Radax, C. and Busse, H. J. (2002). Emended descriptions of the genus Micrococcus, *Micrococcus luteus* (Cohn 1872) and *Micrococcus lylae* (Kloos et al. 1974). *International Journal of Systematic and Evolutionary Microbiology*, **52,** (2):629-637.

93. Youssef, A, (1996). Meat Technology and its Offshore Quality, Conservation and Handling Cairo: Dar Al Arabeya for Publishing and Distribution.

94. Yousef, M. E.; Nuri, S. M. and El-Amari, A. E.(2008). Food Science . *Tripoli, Libyan Arab Jamahiriya EMHJ*, **14**(1): 172-178.

95. الهيئة السودانية للمواصفات والمقاييس. المواصفة القياسية السودانية , رقم م س د ق .2008/0038

APPENDIX

APPENDIX

Table 1.1 Meat components

Type of meat	Water %	Protein %	Fat %	ash (mineral elements)
Veal	66	18.8	14	0.1
Beef	63	18.7	17	1
Lamb	61	17	21	1
Chicken	70.9	21.4	6.8	0.9
Camel	72	18.4	7.2	0.9
Goat	71	18.4	9.2	1
Rabbit	72	21	5.8	1.2

Table 1.2 Meat inspection examples of infectious diseases

DISEASE	Ruling
Salmonella	Total execution
Pasteurellosis	Total execution
Coccidiosis	Total executions in cases with severe symptoms or fever or emaciation
Baroblazema	Total executions in cases with severe symptoms or fever or emaciation
gastroenteritis in infant animals	Total execution
diphtheria calves	Total execution
Tetanus	Total execution
Septicemia	Total execution
Jones Disease	Total execution in the case of emaciation otherwise would be released from the meat with the execution of the intestine
Pseudotuberculosis in sheep	Total execution in the case of emaciation or the execution of parts of infected glands in case of the carcass obese
Meat feverish	Total execution

Table 1.3 Meat inspection (Tumors)

DISEASE	Ruling
Tumors	1 - execute in the following situations malignancies spread accompanied by resurgence (complexity) and poor example: A. tumor Asercomi B. tumor Asercomi black C. lymphoma D. mucous fibroids E. neurofibromas

Table 1.4. Meat inspection (Change in color, taste and smell)

DISEASE	Ruling
Change in color, taste and smell	Total execution if change is causing for the following 1 -Condition 2 -food case 3 -eat a particular drug 4 -sexual or urinary smell like the smell of male goats advanced age 5 -embryos incomplete growth

Table 1.5 Meat inspection (Defect metabolism and diseases poisoning)

DISEASE	Ruling
1-emaciation accompanied by General infiltrates	Total execution
2-psychological conflict	Total execution
3 -plant poisoning	Total execution
4 -Rickets	Total execution
5 –osteomalacia	Total execution
6 –Jaundice	-execution of the carcass in the 1following cases A - for jaundice that causes an infectious disease or a source of poisoning B- jaundice that causes acute chronic liver injury C-functional jaundice in the newborn animals D -jaundice that causes all the bloodshed severe 2 -release is not restricted conditions in the following cases

	A - in cases not causing the items a-d B -in cases of jaundice light that) disappear after 24 hours of slaughter C-a distinction must be made between jaundice patients and functional yellow fat tissue between the color which may be caused by age in cows or eating a particular type of animal food

Table 1.6. Meat inspection (Diseases of the internal organs)

DISEASE	Ruling
Gastroenteritis	Total execution f it is accompanied by pus
Acute peritonitis	Total execution f it is accompanied by pus
Inflammation of the cavities of the head	Total execution f it is accompanied by pus
Severe Acute Respiratory Syndrome	Total execution If accompanied by wasting and fever
Inflammation of the heart	Total execution If accompanied by wasting and fever
Nephritis obstructive	Total execution
Suppurative inflammation of the kidneys	Total execution
Brucella	Execution reproductive organs
Fractures and festering	Total execution

Table 1.7 : : Meat inspection (Internal parasites diseases)

DISEASE	Ruling
Cysticercus Bovis	To decide judgments for Cysticercus Bovis distinction must be made between living or dead calcified Cysticercus Bovis Below these provisions: First: the whole execution in the following cases: 1 -If there are more than ten live vesicles 2 -in the case of more ten dead or alive vesicles or calcified 3 -If there are more than ten live and dead vesicles Second: the release of restricted conditions in the following cases: 1 -in the case of a ten vesicles live less 2 -in the case of a ten vesicles or less dead or calcified 3 -If there are ten vesicles or less alive and dead, and can

	then be released on the condition that the body be placed in a refrigerator for two weeks at a temperature of 10 ° C below zero, or for three weeks at a temperature of 7 ° C below zero. In the case of unavailability of refrigerators for keeping the body executes immediately and can be released from the intestine only, without any condition without saving it in the refrigerator. Third, the release is not restricted conditions in the following cases: If there are ten vesicles or less dead for cattle (cows) older than two years
Hydatid Cysts	1 -often infect the liver, lung and must complete execution of the injured part 2 -execution of a sacrifice if the injury was a muscle or meager carcass or swollen 3 -particular care should be here while executing carcass either cremated or buried deep so unreachable dogs
Hookworms	execute the intestine were many infection
Sarcocystis	Executed injured part if a few injury and executed carcass If the infection spread

Table 2.1. Reading table for Api 20e test

TEST	REACTION	NEGATIVE	POSITIVE
ONPG	ß-galactosidase (Ortho NitroPhenyl-ßDGalactopyranosidase)	Colorless	yellow (1)
ADH	Arginine DiHydrolase	Yellow	red / orange (2)
LDC	Lysine DeCarboxylase	Yellow	red / orange (2)
ODC	Ornithine DeCarboxylase	Yellow	red / orange (2)
CIT	CITrate utilization	pale green / yellow	blue-green / blue (3)

TEST	REACTION	NEGATIVE	POSITIVE
H2S	H2S production	colorless / greyish	black deposit / thin line
URE	UREase	Yellow	red / orange (2)
TDA	Tryptophane DeAminase	TDA / immediate Yellow	TDA / immediate reddish brown
IND	INDole production	JAMES / immediate colorless pale green / yellow	JAMES / immediate Pink
VP	acetoin production (Voges Proskauer)	VP 1 + VP 2 / 10 min Colorless	VP 1 + VP 2 / 10 min pink / red (5)
GEL	GELatinase	no diffusion	diffusion of black pigment
GLU	fermentation / oxidation (GLUcose) (4)	blue / blue-green	yellow / greyish yellow
MAN	fermentation / oxidation (MANnitol) (4)	blue / blue-green	Yellow
INO	fermentation / oxidation (INOsitol) (4)	blue / blue-green	Yellow

TEST	REACTION	NEGATIVE	POSITIVE
SOR	fermentation / oxidation (SORbitol) (4)	blue / blue-green	Yellow
RHA	fermentation / oxidation (RHAmnose) (4)	blue / blue-green	Yellow
SAC	fermentation / oxidation (SACcharose) (4)	blue / blue-green	Yellow
MEL	fermentation / oxidation (MELibiose) (4)	blue / blue-green	Yellow
AMY	fermentation / oxidation (AMYgdalin) (4)	blue / blue-green	Yellow
ARA	fermentation / oxidation (ARAbinose) (4)	blue / blue-green	yellow
Oxidase	cytochrome-Oxidase		

Table 2.2. Reading table for 2.7. Api staph test

TESTS	ACTIVE INGREDIENTS	QTY (MG/CUP.)	REACTIONS/ENZYMES	RESULT	
				NEGATIVE	POSITIVE
0	No substrate		Negative control	RED	--
GLU FRU MNE MAL LAC	D-glucose D-fructose D-mannose D-maltose D-lactose	155 1.4 1.4 1.4 1.4	(Positive control) (D-GLUcose) acldlftcation (D-FRUctose) acidification (D-ManNoR)	read*	Yellow

TRE MAN XLT MEL	(bovine origin) D-trehalose D-mannitol Xylilol D-meiibiose	1.32 1.36 1.4 1.32	acidification (MALtose) acidification (LACtose) acidification (D-TREhalose) acidification (0-MANnitol) acidification (XyLiToI) ecidificaIon (D-MELibiose)		
Nit	Potassium nitrate	0.08	Reduction of NIT rates to nitrites	Nit1+NIT 2/10min Colorless-light pink	Read
Pal	B-naphthyl phosphate	0.0244	Alkaline Phosphatase	ZYMA+ZYMB/10min yellow	Violet
Vp	Sodium pyruvate	1.904	Acetyl-methyl-carbinol production (Voges Proskauer)	VP1+VP2/10min Colorless-light pink	Violet-pin
RAF XYL SAC MDG NAG	0-raffinose D-xj1ose D-saccharose (sucrose) methyt-D glucopyranoside N-acetyl-glucosamine	1.65 1.4 1.32 1.28 1.28	acid ification (RAFfinose) acidification (XVLose) acidification (SACcharose) acidification (Methyl-Ud Glucopyranoside) acidification (N-Acetyi-Glucosarnjne)	read	Yellow
ADH	L-ARGININE	1.904	ARGININE DiHYDROLASE	Yellow	Orange – red

URE	Urea	0.76	UREase	Yellow	Red-violet

Table 3.1. Medical examination of food workers

The deficiencies in the medical examination conducted by the staff of the medical committee and the global standard for the medical disclosure required of food workers.

Medical examination for workers health professionals globally	Medical examination in Medical Commission
Tuberculosis screening (chest x-ray)	This examination is not
A blood test for AIDS	This examination is not
A blood test for hepatitis	This examination is not
Stool examination	This examination is done
Vaccinated against typhoid	This examination is not
Examination of ulcers and wounds	This examination is done

Figure 6: Display of meat in the air is susceptible to bacterial contamination

Figure 7: Carcasses was hanged and displayed in an iron hook with rust

Figure 8 : Use animal skins to encapsulate the knife

Figure 9 : Absence of ceramic or wall insulation

Figure 10: Liver outside the shop

Figure 11: Dustbin did not meet health requirements

Questionnaire

A questionnaire was distributed to meat sales and handling centers and contains of the following questions:

1 . Transfer method of meat from slaughter points to points of sale

• refrigerated cars matching the quality systems

• cars not conforming to quality systems

2 . Veterinary meat inspection

• accordance with veterinary health methods with veterinary seal

• Not according to veterinary health roads

3. Meat Inspection location

• Followed by the Veterinary Health Administration

• Followed by others

4. Supervisory authority overseeing the point of sale:

• veterinary health department

• belonging to others

5. Method of keeping meat inside the point of sale

• conforms to quality standards in keeping meat

• does not meet quality standards in keeping meat

6. Periodic examination of workers at points of sale

• regular medical examination

• medical examination is not a regular

7. Commitment to health dress (Clean clothes, hair cover, glove)

• Workers are committed to the health standards in the work environment

• Workers are not committed to the health standards in the work environment

8 . Show meat

• matching the quality standards

• not conform to the quality standards

9 . Cleanliness of the place in general

• Excellent cleaner

• Medium or low cleaner or acceptable

10. The conformity based point of sale of building quality standards in terms of ventilation and temperature :

• Matching

•Non-conforming

11. conformity of health quality standards in how to dispose of waste:

• Conform to quality

• Non-conforming health quality standards