ANIMAL SLAUGHTER PRACTICES IN RURAL KERALA
A DESCRIPTIVE STUDY

Dr. P. Vinod kumar

Dissertation Submitted in Partial Fulfillment
for the Award of Master of Public Health Degree

ACHUTHA MENON CENTRE FOR HEALTH SCIENCE STUDIES

Sree Chitra Tirunal Institute for Medical Sciences and Technology

Thiruvananthapuram, Kerala, India

1999

Certificate

This is to certify that the dissertation entitled, "**ANIMAL SLAUGHTER PRACTICES IN RURAL KERALA-A DESCRIPTIVE STUDY**", is an authentic record of the work carried out by Dr.P.Vinod Kumar under our guidance for the fulfillment of the **Master of Public Health degree** examination and that not part thereof has been presented for any other degree.

Dr.K.R.Thankappan

Associate professor

(Guide)

Dr.P .Sankara Sarma

Assistant professor

(Co - guide)

Thiruvananthapuram

20-5-1999

Achutha Menon Center for Health Science Studies,

Sree Chitra Tirunal Institute for Medical Sciences and Technology,

Thiruvananthapuram.

Acknowledgment

I express my sincere gratitude to all the respondents in my study. Without the co-operation of them this study would not have been a success.

I express my deep sense of gratitude to my research guides Dr.K.R.Thankappan and Dr.P.Sankara Sarma for the constant encouragement and help through out the period of my work.. I also thank other faculties of the Achutha Menon Center Dr.D.Varatharajan and Dr.Mala Ramanathan for their valuable suggestions and guidance. I also thank Dr. Sajitha Basheer, Dr.R.S.Vasan and Dr.Krishnaji for their valuable suggestions and guidance. I also like to thank Assistant registrar SCTIMST, Mr.Sundar Jayasingh and the Mrs. Jayaprabha in charge of the documentation center of the Achutha Menon Center, for their help.

I am grateful to Dr.K.Mohandas, Director SCTIMST, Thiruvananthapuram for providing all the facilities to complete the study in time.

I am also grateful to Dr. K.Udayavarman Joint Director in Kerala Animal Husbandry department and Dr.P.P.Vava the Director of Kerala Animal Husbandry Department for the help given to me which helped me a lot in completing this study.

I am thankful to the head and staff of the meat product technology unit in the Veterinary college Trichur for their co-operation.

I owe my sense of gratitude to my wife Sapna and all others in my family, without their moral and financial support this study could not have been a success .

I also extend my sincere gratitude to my batch mates for their whole hearted co-operation.

P.Vinod Kumar

CONTENTS

Abstract

Background

In Kerala about ninety percent of the people consume meat. Zoonotic diseases (diseases transmitted from animals to man) like Weil's disease and Japanese encephalitis were reported from Kerala in the recent years. Food poisonings associated with meat consumption and problems associated with animal slaughter for meat production were also reported.

Objectives

The major objectives of the study were

1. To describe and analyze the situation of animal slaughter practices (of cattle, goat and pig) in rural Kerala (village panchayath) and identify the problems related to it.
2. To study the knowledge, attitude and practices (KAP) of butchers, meat consumers, vegetarians and people who live near the slaughter places, about the animal slaughter practices in rural Kerala.
3. To study the opinions of panchayath authorities and veterinarians about the animal slaughter practices in rural Kerala.

Methods

Five village panchayaths of Kozhikode district of Kerala state were selected for the study. Observation of animal slaughter practices (cattle, goat and pig) in the slaughterhouse of Veterinary College, Trichur, and in the selected village panchayaths were done. Interview with 33 butchers (slaughter workers), 79 meat consumers, 23 vegetarians and 20 people who lived near the slaughter places in selected area was done with the help of pre-tested questionnaires, to study their knowledge attitude and practices with regard to animal slaughter. Focus group discussions were conducted with the panchayath authorities and veterinary surgeons in the selected village panchayaths to gather their opinion in this aspect.

Results

From the observation of animal slaughter at the veterinary college and rural area it was seen that the animal slaughter practices in the rural area were highly unhygienic and unscientific compared to that in the Veterinary College. From the interview with butchers (slaughter workers) it was seen that their knowledge about the scientific aspects of animal slaughter and slaughter waste disposal was minimum. They dispose the slaughter wastes according to their convenience. Their knowledge about the spread of diseases to human beings through meat was poor. No meat inspection was being carried out in rural areas before, during or after slaughter. Eighty six percent of meat consumers were satisfied with the quality of meat they get from the existing meat shops in rural areas. Eighty nine percent were satisfied with the cleanliness in these meat shops. Ninety percent of consumers were unaware of the possibility of getting diseases from animals or by eating meat. Among the vegetarians interviewed eighty-seven Percent were aware of diseases

transmitted from animal to man which is much better than that of consumers of meat. Sixty-five percent vegetarians reported that the present animal slaughter practices in the rural areas were unscientific and unhygienic. Seventy-four percent of vegetarians reported that the government should enforce laws so that the quality of animal slaughter could be maintained at a higher level. People who live near the slaughter place reported foul smell from the slaughter place, dragging of the slaughter waste into the house premises by dogs, carrying of slaughter waste by crows to their wells, and attacking of the domestic animals by stray dogs who grow in large numbers near the slaughter houses. From the focus group discussions with the panchayath authorities and veterinary surgeons it became clear that non-availability of land for starting the slaughterhouses was the major problem in the panchayath. The lack of sufficient number of veterinary surgeons to do the meat inspection was also pointed out. The veterinarians had the opinion that the scientific inspection of meat has to be done in the panchayaths. Other problems they pointed out include the difficulty in meat inspection of all the animals slaughtered in different places of panchayath as a part of their current job. So it was suggested that one veterinarian be posted for 5-10 panchayaths for performing meat inspection works only.

Conclusions

The vegetarians interviewed were more aware about the chance of spread of diseases through meat to human beings compared to non-vegetarians. There is no provision of slaughter waste disposal in the village panchayath area studied, which causes a lot of problems for the people particularly for those who lived near the slaughterhouses. Corrective measures are to be taken in rural areas for the proper disposal of slaughter

wastes. Measures should be taken to stop unlicensed slaughtering in the area and to improve the hygienic practices in the licensed animal slaughterhouses in the village panchayaths. Routine inspection of the meat and meat shops by the qualified professionals has to be ensured by the panchayath authorities.

The possibility of recent epidemics of Weil's disease, Japanese Encephalitis and food poisoning having its origin in unhygienic animal slaughtering and animal rearing practices cannot be ruled out. Even though all the necessary conditions were there for such a possibility a link can be established only after a well designed study. Such studies are warranted in Kerala.

Chapter 1

INTRODUCTION

Kerala is a state with low mortality rates and the life expectancy over 70 years is one of the highest among the developing world. But the state has a very high reported morbidity compared to other Indian states. High morbidity due to infectious diseases are still rampant. Epidemics of Japanese encephalitis and Weil's diseases were reported from the state in recent years. Food poisoning associated with meat consumption is also being reported. Most of these infections have their origin in the environment. So health improvements in Kerala would need focus on improving the environmental hygiene. In addition to the household solid waste, waste from animal slaughter also make an important contribution to the accumulation of solid waste in Kerala's environment.

Kerala has 29.4 million people (1991 Census). Its religious composition is as follows - Hindus 60 percent, Christians 20 percent and the rest 20 percent Muslims. Traditionally Hindus are vegetarians but now majority of them are becoming non vegetarians. This may be due to the mixing of cultures. In Kerala now eighty-five to ninety percent of people consume meat [1]. The meat consumption in Kerala has an increasing trend .Meat consumption has increased from 46,500 tones in 1976-77 to 1,42,340 tones in 1996-97 [1]. To meet this increasing demand, people started illegal slaughtering of animals. The meat production in the state is reported to be taking place in a crude way, in the open place and unhygienic environment. The wastes of meat production (slaughter wastes) are disposed in an improper manner causing public health problems in many parts of the state. Lot of complaints is raised in the media about the animal slaughtering. Of late the local newspapers started reporting improper slaughter waste

management [2]. The current methods of waste disposal include throwing of the waste into the open area and rivers as per various news paper reports [3]. There are also newspaper reports of food poisoning associated with meat consumption [4].

Seventy-five percentage of eighty-six panchayaths (rural village units) in Kozhikode district have mentioned that the animal slaughtering taking place in the panchayaths are unscientific and unhygienic. They have also demanded for the scientific and hygienic animal slaughter facilities in the panchayaths [5].

There is not even a single published study on the situation of animal slaughter practices in Kerala, which inspired me to look at the situation of animal slaughter practices in a selected rural area of Kerala with the following objectives.

1.1 Objectives of the study

1. To describe and analyze the situation of animal slaughter practices (of cattle, goat, pig) in the rural area (panchayaths) of Kerala and identify the problems associated with it.
2. To study the knowledge and practice of butchers in rural area regarding the hygienic and scientific aspects of animal slaughter and slaughter waste disposal.
3. To study the knowledge and attitude of public (who consume meat and who do not consume meat) about the animal slaughter practices in the rural area.
4. To study the attitude of the people who stay near the slaughter place about the animal slaughter practices in the rural area.
5. To study the attitude and opinion of local leaders and professionals of rural area regarding animal slaughter practices.

Chapter 2

Importance of meat, history of meat control measures, meat-borne diseases, zoonotic diseases, slaughtering of animals and meat inspection practices are reviewed.

REVIEW OF LITERATURE

2.1 Importance of Meat in Diet

Meat is not an essential food, vegetarians often seem to thrive, but is tasty, easily digestible, and highly efficient source of the multifarious proteins of animal body. Meat is important as a food for two scientifically based reasons. The first is that the assortment of amino acids in animal protein more closely matches the needs of the human body than does the assortment of amino acids in plant protein. The second is that vitamin B12, which is required in human nutrition, may be obtained in adequate quantities from consumption of meat or other animal products and not from the consumption of plants.

Some forms of malnutrition eventually manifest when essential proteins are not replenished by the diet. E.g. The extreme emaciation or the hunger edema of prisoner-of-war camps in Europe and the Far East, and the peculiar 'Kwashiorkor' (red-boy syndrome) in dark skinned Africans. Low levels of serum protein hinder the production of immune globulins and may predispose to infection.

Moreover, certain animal viscera, especially the liver, serve as an important source of vitamin A and B12. Crow's liver was an ancient Chinese remedy for anemia. Roasted ox liver was advocated for eye diseases in the Ebers pappyrus (an Egyptian medical treatise dating from about 1600 B. C.). In parts of the fourteenth century Europe, goat liver was known as a cure for night blindness. The Eskimos of King William Island,

who cannot satisfy their vitamin A needs with green vegetables and dairy products, feast on raw seal liver. Nomadic Tartars of central Europe were almost exclusively meat eaters in the sixteenth and seventeenth centuries, and yet were renowned for longevity. The Masai tribe of East Africa, the gauchos of certain South American countries, and of course the Eskimos, consistently eat very large amount of meat with impunity.

Food animals help to sustain human life, but there is a negative aspect. A number of diseases can be directly transmitted by direct contact with animals. Diseases can also be transmitted indirectly by eating food such as eggs, meat, poultry, fish, shell fish and dairy product. Indirect transmission of disease can occur in two ways. Food may serve as a medium, which allow bacterial pathogens to grow or may merely act as a passive vehicle of pathogen (as occurs with parasitic and viral diseases).

Many bacterial diseases due to microbes obtaining from food animals have emerged during past 25 years. Inappropriate hygienic practices of animal husbandry, slaughter houses and food processing levels are some of the factors which facilitate the multiplication and spread of these bacteria in foods. Non typhoid salmonella and compylobacter are the 2 most important organisms in this context. Salmonellosis in particular has increased tremendously over past 2 to 3 decades. Poultry, meat, eggs and food containing eggs are often the predominant source of pathogen. Compylobacteriosis has increased in last 10 to 20 years in several industrialized countries. Another pathogen is Enteroheammorhagic Eschericia coli first identified in the US. This organism has caused serious out-breaks in several parts of the world, and beef has often been the vehicle of transmission.

There are also parasitic and viral diseases transmitted by foods of animal origin. E.g. Toxoplasmosis (caused by protozoa), Trichenellosis (by a nematode) cestodiasis (tape worm). Toxoplasma Gondi in women affects 3 out of every 1000 pregnancies, resulting in fetal deaths, perinatal morbidity or chronic infection. More than 10% of the world's population are thought to be at risk of being infected [6].

2.2 Historical development of meat control measures

Meat hygiene began with the earliest civilizations of the Mediterranean area. The food edicts of the ancient Egypt proclaimed the pig unclean and cow sacred, and banned their flesh as food animals. The butchering of the ox, goose, and kid was governed by quite elaborate rules, many of them linked to religious taboos and rituals as much as to sanitation. The Israelites adopted these edicts about 2000 B.C, with certain extensions such as the prohibition of the Egyptian custom of collecting, for cooking purposes, the blood of slaughtered animal. In mediaeval Europe meat inspection was sporadic, cursory, and carried out against heavy odds. In France it was practiced as early as 1162. In Germany special inspectors of pigs were appointed at Aachen in 1385, and a citizen of Regensberg was imprisoned in 1434 for attempting to sell 'measly' pigs in which the cysts has been punctured. In England, early civic records indicate that one of the duties of the mayor and his officers in the larger cities was to oversee the flesh markets. For example in 1319, the wardens of the city of London condemned two carcasses of beef seized as being "putrid and poisonous". The present law in England and Wales governing the hygienic manufacture, storage, and wholesomeness of meat products is based on the Food and Drugs Act of 1938. In North America only rudimentary meat inspection was carried out in a few cities of the USA before 1884, when the Federal Bureau of Animal Industry was

formed. Seven years later a meat inspection department was created within this bureau, and the inspection of meat destined for human consumption was made compulsory. But the law remained rather ineffective, until the Federal Meat Inspection Services was re-established under the Food and Drugs Act of 1906. In Canada there is a clear history of two centuries of meat hygiene legislation. Compulsory meat inspection was instituted in Canada in 1907. In 1707 the first public health laws were passed in New France, to procure the sale of only good- quality meat.

Throughout human history, meat has been a commodity both greatly desired and somewhat feared. The slow evaluation of slaughtering rituals and inspection regulations points to early recognition of some of the dangers inherent in the consumption of meat abnormal to eye and nose. The inadequacy of these criteria as safeguard is, of course, still too little realized. In the light of current knowledge, the basic purposes of meat hygiene appear to be averting spoilage and preventing meat borne infection. This can be achieved by reducing to a minimum the opportunities of microorganisms, particularly the pathogens, to gain access to meat and to proliferate therein.

2.3 Meat-borne diseases

Meat-borne diseases can be classified into

1. Meat-borne diseases of chemical or toxicological origin.

2. Endogenous animal infections transmissible to man by meat.

3. Infections and intoxication due to exogenous contamination (human and environmental) of meat and manufactured meat products (bacterial food poisoning).

Almost every disease of zoonotic importance should be regarded as potentially meat-borne. Because during handling and slaughtering of food animals and then dressing

them for meat purposes, numerous opportunities arise for the transferring of infective agents from animals to human being. The infection need not necessarily enter through the digestive tract. It may be contracted by direct contact with the abraded skin and in some diseases even through the unbroken skin. Hygienic slaughter can basically be described as the removal of the skin of animal or bird without contamination of the carcass, followed by the removal of the viscera.

2.4 Animal diseases transmitted to man through meat

2.4.1 Anthrax

Anthrax is primarily an acute infectious disease of animals and human being caused by Bacillus anthracis. The modes of transmission in Anthrax are ingestion and direct or indirect contact with the infected materials. So if an animal with this disease is slaughtered the butchers can get the disease by contact. Also the consumers who handle the meat can get this disease either through contact or by the ingestion of undercooked infected meat. So it is very important to make sure that the animals slaughtered are free from these type of diseases.

2.4.2 Brucellosis

Brucellosis is a specific infective disease of cattle, goat, sheeps, pigs, horses and human being. Animal infection is characterized by infertility and abortion in female and orchitis in male. Undulant fever (irregularity of temperature) and a tendency to recur characterize human infection with brucella. In the case of Brucellosis the infection occurs by drinking raw milk from infected animals or handling of infected meat and animals. So if the animal slaughtered is suffering from this disease the butchers and consumers who handle the meat

can get this disease. So it is very important to make sure that the animals slaughtered are free from these types of diseases.

2.4.3 Botulism

Spores of Clostridium botulinum can contaminate meat. Source of contamination is practically confined to the soil and to animal feces. So special care should be given to avoid conveying soil organisms during the process of slaughtering and dressing. To avoid contamination from animal faces, all operations in the slaughterhouse should be carried out under strict hygienic conditions. Meat at all stage should be kept under dust proof condition. Surface contamination of meat with Cl. Botulinum will hardly cause any trouble, but occasionally the spores might be lodged beneath meat surface where oxygen tension might be low enough to permit germination of spores. Then the motile vegetative forms of organisms move into deeper strata and multiply rapidly with the production of the toxin.

2.4.4 Salmonellosis

Several members of the salmonella group produce powerful toxins, which on ingestion produce what is termed 'meat poisoning'. The modes of transmission are inadequately cooked meat from the animals suffering from salmonellosis. So if the animal slaughtered is having salmonella infection and the meat from this animal is ingested inadequately cooked the consumers can get this disease. Gently fried sausages, large masses of roasted meat when enough heat might not have reached the center can act as a source of salmonella infection to human beings. So it is very important in this era of fast foods to ensure that the animals slaughtered for meat purpose are free from diseases like

salmonellosis. Further contamination of meat by human carriers of salmonella infection can occur. So the personnel hygiene of the butchers handling the meat is also important

2.4.5 Staphylococcal meat intoxication

A toxic metabolite, the so called enterotoxin, is produced by certain strains of staphylococci in meat and meat products, without causing change in their appearance odour and taste. Prevention of enterotoxin production in meat and meat products is difficult because the organism is present almost everywhere. To minimize the contamination attention should be paid to personal hygienic handling of meat, and to the sanitation in slaughter house, butchers shop, restaurant and kitchen. Keeping meat in the glass or plastic boxes and provision of fly screen for doors and windows in butcher shop greatly help to reduce the chance of staphylococcal contamination.

2.4.6 Tape worm infection

'Measly' beef (cysticercus bovis) and 'measly' pork (cysticercus cellulosae) are source of adult tape worm to human being when consumed in inadequately cooked form or as raw sausages. Now a days fast foods are getting popular. So there is every chance that persons may consume inadequately cooked food. So it would be better to ensure that animals slaughtered are free of infections like tape worm. Meat inspection can detect this and appropriate measures can be taken to prevent the spread of the infection..

2.4.7 Trichinosis

Trichinosis is a disease where larval forms of Trichenella spiralis is encysted in the muscles. Trichinosis meat when eaten in the improperly cooked condition, and as slightly smoked ha n or sausages is definitely harmful to health. By performing the meat inspection while slaughtering this can be identified and such meat can be condemned.

2.4.8 Toxoplasmosis

A systemic coccidian protozoan disease of zoonotic importance that is transmitted by the ingestion of meat from infected animals. The house spouses and butchers handling the infected meat can also get this disease. So it is very important to make sure that the animals slaughtered are free from these types of diseases.

2.5 Zoonotic diseases of public health significance transmitted from animals to man

Zoonotic diseases are diseases transmitted from animals to man and viceversa. It is a major concern of public health in developing countries. Even developed countries are facing problems in eradicating these diseases. World Health organization has given due importance in the control of zoonotic diseases worldwide. All most all-zoonotic diseases should be regarded as meat-borne. There are about three hundred diseases in this category some of them are mentioned below.

Actinomycosis, African tick-borne fever (rickettsial), Amebiasis, Anthrax, Blastomycosis (North America), Botulism, Brucellosis (Undulant fever), Bunyamwera fever (animal reservoir suspected), Bwampa fever (animal reservoir suspected), Cat scratch disease (cat fever) Chikungunya fever (animal reservoir suspected), Clonorchiasis (Chinese liver fluke disease), Coccidiomycosis (valley fever), Colarado tick fever, Crimean heammorhagic fever, Cryptococcosis (European blastomycosis), Dengue, Diphasic meningioencephalitis, Diphyllobothriasis (fish tapeworm infection), Dracontiasis (Guinea worm disease), Eastern encephalitis,Echinococcosis (hydatid disease), Endemic relapsing fever (tick borne), Fasiolopsiasis, Glanders, Histoplasmosis, Influenza, Japanese B encephalitis, Jungle yellow fever, Korean heammorhagic fever, Kysanur forest disease, Larva migras (visceral), Leishmaniasis (cutaneous), Leishmaniasis, visceral (kala azar),

Leptospirosis (weils disease), Loaiasis, Louping ill, Lymphocytic choriomeningitis, Malaria (quartan), Murine typhus fever, flea borne, Murray valley encephalitis, Omsk heammorhagic fever, Ornithosis (psittacosis), Paragonimiasis (oriental lung fluke disease), Phlebotomus fever (sandfly fever), Plague, Philippine heamorhagic fever (animal reservoir suspected), Q fever, Rabies, Rat-bite fever (streptobacillus moniliformis infection), Rat-bite fever (spirillum minus infection), Rift valley fever, Ringworm(scalp tinea capitis), Ringworm(body tinea corporis), Rocky mountain spotted fever, Russian spring-summer encephalitis, Salmonellosis, Schistosomiasis, Sporotrichosis, St. Louis encephalitis, Staphylococcal infection, Strerptococcal infection (heamolytic) (a. scarlet fever b. streptococcal sore throat), Strongyloidiasis, Taeniasis and cystecercosis (a. bovine (Taenia saginata) b. porcine (Taenia solium)), Tetanus Thailand heammorhagic fever (animal reservoir suspected), Toxoplasmosis, Trichinosis, Trypanasomiasis, African (African sleeping sickness), Trypanasomiasis, American (Chaga's disease), Tsutsugamushi disease(scrub typhus), Tuberculosis(avian), Tuberculosis(bovine), Tuberculosis(human), Tularemia, Venezulean encephalitis, West nile fever, Western encephalitis.

2.6 Slaughtering of animals

The two essentials in the slaughter of food animals are that they shall be dispatched without unnecessary sufferings and that bleeding shall be as complete as possible.

2.6.1 Stunning

Humane slaughtering methods have been in existence in many countries of the world. Legislation in the major developed countries of world requires that all animals slaughtered in an abattoir shall first be stunned (rendered unconscious) by mechanical means. The permitted methods at present are

1. Free bullet pistol- In this method the pistol is held against forehead and fired

2. Captive bolt pistol- In this method the pistol is held against the fore head and fired. Then the bolt attached to the pistol is propelled forward on discharge of the blank catridge and automatically recoils into the barrel. The bolt with sharp end will penetrate the frontal bone of the animal, which produces immediate insensibility by physical brain destruction. The important force in producing the unconsciousness with the captive bolt pistol is the actual velocity of the bolt and the speed at which it strikes the brain, rather than the penetration of the brain.

3. Electrical stunning -- This method consists in passing a low voltage alternate current through the brain of the animal.

4. Carbon dioxide -- In this method the animal is anesthetized using carbon dioxide before slaughter.

Stunning has to be performed in a good stunning box. This is not applicable for those animals slaughtered by the Jewish and Muslims. The welfare of the animal is a major consideration in members of Jewish and Muslim faith. In both faiths the eating of dead animals, consumption of blood and of swine is forbidden.

In Spain, parts of Italy, Mexico and some South American countries, however, cattle are slaughtered by the neck stab or evernazione method. In which a short double-edged knife (puntilla) is plunged into the occipito-atlantal space at the nape of the neck, severing the medulla oblongata. In the Arctic Circle reindeer are killed by a curved, single-edged knife, which after being inserted into the occipito-atlantal space, is directed forward to destroy the brain.

In India and in the Far East practically all animals are slaughtered whilst conscious. In India majority of sheep and goats are killed by Halal method in which throat is cut transversely. The Sikh method is also practiced, the sheep or goat being decapitated by one stroke of a sword.

2.6.2 Bleeding

In cattle there are two main methods

1. Bilateral severance of the carotid arteries and jugular veins by an incision across the throat region caudal to larynx.
2. Incising the jugular farrow at the base of the neck. The knife being directed towards the entrance to the chest to sever the anterior aorta and anterior venacava.

In sheep bleeding is carried out by incision in the jugular close to the head, severing both the carotid artery and jugular vein. In pigs the knife is inserted in the mid line of the neck at the depression in front of sternum and is then pushed forward to sever the anterior venacava at the entrance of the chest.

2.6.3 Sources of bacterial contamination

Bacteria play an important role in the spoilage and decomposition of meat and also in food poisoning. Bacterial contamination of meat may occur in several ways.

- Under ordinary condition the heaviest and potentially the most dangerous load of bacteria is in the animals' digestive tract. Early invasion of the blood vessels by microorganisms from the intestines is likely in animals weakened by long journey or ill before slaughter

- Contamination of the surface of the dressed carcass with bacteria from the outside of the hide is of considerable importance. Studies have shown that a clean knife on penetrating the hide may acquire 2 million organisms
- Actual contagion with dirty hands, clothing, or equipment is another important factor in accounting for the number of bacteria found on meat. The use of wiping cloth is expressly prohibited in most progressive countries.
- Muscles may be infected before slaughter by specific organism responsible for the illness of the animal. Some of these microorganisms may belong to the group responsible for bacterial contamination food poisoning in human being.
- The high PH of the flesh from exhausted or ill animals favours bacterial growth and prejudice carcass quality.

A study "Microbial contamination acquired in meat works", council for scientific and industrial research bulletin no 126, 1939 showed that the main source of bacterial contamination were hides and hairs, soil, content of stomach and gut, water, air borne pollution and utensils and equipment

2.6.4 Production of wholesome meat

To produce wholesome meat, safe to the consumer, it is essential to enforce strict hygienic standards at all stages of meat production. The essential stages requiring application of effective measures for production of quality meat are

1. Animals should be given sufficient rest (not less than 12 hours) before slaughter. Ample drinking water should be available to them. And one hour before slaughter they should be given very little to eat but should not be starved. The practice of allowing the animal to rest in between arrival and slaughter have some purpose. The vascular engorgement

of the subcutaneous and muscular tissues is reduced and better bleeding of carcass is therefore ensured. The glycogen content of muscles that becomes depleted by exhaution, is wholly or partially restored and as a result there is adequate formation of lactic acid and the development of satisfactory postmortem acidity. The accepted practice of allowing copious amount of water to animals awaiting slaughter is directed towards lowering the load of intestinal bacteria, the vast majority of these consist of E.coli.

2. The animals should be examined before slaughter to eliminate weak, debilitated and diseased ones. Only those animals that produce carcass of quality and nourishment should be slaughtered.
3. Slaughtering and bleeding of the animal should be done without causing excitement and completely before dressing of the carcass.
4. The carcass should be examined to detect, remove, condemn and destroy all diseased or otherwise unfit material for human consumption.
5. While separating the condemned portions, great care should be exercised to ensure that the edible portions of the carcass do not get contaminated.
6. All clean operations like dressing of the carcass should be separated from unclean operation like clearing of stomachs and guts, to prevent the contamination of the carcasses.
7. Personal hygiene of all those engaged in the slaughter, dressing and handling of the meat and meat products is equally important.
8. All equipment used to process meat must be kept thoroughly clean and disinfected before use. Meat and meat products should be stored in fly-proof containers.

9. To ensure the production of wholesome and safe meat, it is very necessary to have an inspection by the personnel specially trained for this job. The inspectors will have to carry out ante-mortem and post-mortem examinations of food animals to ensure that meat is handled under hygienic conditions right from the slaughtering stage till it reaches the consumer.

2.7 Meat inspection practices followed in the developed countries

A proper meat inspection service consists of a veterinary examination of the live animals or birds (ante mortem examination), and examination of carcass and offals (post mortem examination). Necessary laboratory test of body tissues and fluids is also important.

2.7.1 Ante- mortem inspection

European Economic commission (EEC) regulations specify that on the day of arrival at the slaughterhouse the animal must undergo antemortem inspection. If the animal is in the slaughterhouse for more than 24 hours the inspection must be repeated immediately before slaughter. The inspection must determine

- Whether the animals are suffering from a disease which can be transmitted to human.
- Whether they show symptoms or are in a general condition such as to indicate that the disease may occur which may make the meat unfit for human consumption
- Whether they are tired or agitated.

Most countries stipulate that antemortem examination be performed by veterinarian. Ante-mortem inspection is of great value in the detection of animals suffering from diseases that are communicable to human being. In some country e.g. Sweden, the veterinarian also examines animals on the farm before they are consigned for slaughter.

2.7.2 Post-mortem inspection

A routine postmortem inspection should be carried out soon after carcass dressing is complete. The main purpose of the postmortem examination is to detect and eliminate abnormalities, including contamination. Thus ensuring that only meat fit for human consumption is passed for food. It determines the characteristic and extent of disease lesions. Meat inspection legislation through out the world requires examination of the carcass and viscera of each animal and bird. Post-mortem examination should be carried out as the animal is being slaughtered and dressed or soon after the dressing is completed. Every carcass should be examined for the state of nutrition, bruises, traumas or heammorhages, edema, efficiency of bleeding and abnormal odours. After general examination each, organ should be subjected to a detailed examination. The following points should be noted while examining the organ size, color, consistency, general appearance, character and nature of pathological lesions.

The entire carcass, organs and viscera should be condemned as unfit for human consumption when the animal is suffering from certain diseases like, Actinobacillosis (generalized); Actinomycosis (generalized); Anthrax; Black leg; Caseous lymphadinitis (generalized); Cysticercous cellulosae; Cysticercous ovis (generalized); Cysticercous bovis (generalized); Foot and mouth disease (acute stage), Glanders; Mastitis (acute septic); Metritis (acute septic); Pericarditis (acute septic); Peritonitis (acute diffuse, septic); Pleurisy (acute, diffuse, septic); Pneumonia (acute, septic); Sarcocysts (generalized); Swine erysipelies (acute); Swine fever; Tetanus; Trichnosis; Tuberculosis (generalized); Tuberculosis with emaciation;

The entire carcass, organs and viscera also should be condemned as unfit for human consumption when the animal is suffering from certain conditions like Anemia (generalized); Bruising (extensive and severe); Decomposition (generalized); Emaciation (pathological); Fever; Jaundice; Edema (generalized); Septicemia and toxemia; Tumor either malignant with secondary growth or multiple tumors; Uremia.

All necrosed tissues and organs, gangrenous parts, those showing degeneration, caseation, calcification, cysts or any pathological condition must be removed and condemned with a fair margin of surrounding healthy tissue. All diseased and infective condemned material should be immediately removed from the slaughterhouse and be subjected to simple incineration, chemical or thermal treatment, to reduce it to an inoffensive, non-infective state.

2.8 Meat by-products

Although animals are slaughtered mainly for production of food for human beings, the by-products that are available from the sacrificed animals are of greater value than is generally considered. The uses of the slaughter by- products are the following.

Table 2.1 Uses of slaughter by products

By products	Uses
Skin	Leather Industry
Bone	Industry, Ossein, Gelatin, Bone meal
Hoof and Horn	Gelatin, Glue
Fat	Cooking, Industry
Blood	Plasma, Red cells, Poultry feed
Intestines	Sausages
Organs	Edible, Pig feed, Poultry feed
Glands	Pharmaceutical
Stomach and intestinal contents	Bio-manure and Biogas plant

The safeguarding of a country's meat supply depends on the effective implementation of legislation to slaughterhouse construction, operation and meat inspection along with control of the following.

1. The use of chemical and pharmaceutical preparation on the farm.
2. Promotion of high health standards in livestock, general care during transportation, at auction market, and in slaughter house.
3. Ante mortem examination- to eliminate unfit animals.
4. Post mortem examination of the carcass, including laboratory testing where necessary.
5. Removal of materials unfits for human consumption and its efficient destruction.
6. High standards of hygiene at all stages from the farm to slaughter house, meat processing factory, cold storage restaurant kitchen and consumers home.

In most countries of world all the food offered for sale is subject to safety and quality control under the foods and drugs act.

In a study conducted in India, in 1995 a total of 2075 women in child bearing age with bad obstetrical history were serologically examined by the indirect immunofluorescence antibody test for Toxoplasma antibodies. One hundred and sixty (7.72%) serum samples were positive with a titre of 1:64 or more [7]. In another study in Mexico seropositivity has been found to vary from 18.2% to 44.8% in women with abnormal deliveries or abortions. Three hundred and fifty women with high-risk pregnancies were studied, and 122 (34.9%) were found to be IgG seropositive and 76 (20.7%) were IgM positive [8].

In a study from the college of veterinary science Tirupati, India a total of 2534 food animals (cattle, buffaloes, sheep and pigs) were examined in certain states of southern

India (states of Karnataka, Maharastra, Kerala, Tamilnadu, Pondicherry and Goa) to know incidence of Cystic Echinococcosis. Among these 7.61% (193) were found infected with cystic echinococcosis. In an exhaustive study on the incidence of cystic echinococcosis in food animals of Andhapredesh alone, a total of 1206 animals was screened for cystic ecchinococcosis. Among these only 3.98% (48) harbored the cyst [9]. The fact that majority of slaughter animals come to Kerala state from the above-mentioned states of south India is a matter of concern because of the possibility of the Echinococcosis transmission.

In a study in the United states of America the role of processing station and slaughter practices in carcass contamination was mentioned [10].

In another study in Finland hygienic practice was found associated with the carcass contamination level, especially the disinfection frequency. In those slaughterhouses, where the disinfection frequency was low, the contamination level of carcasses was high. However, the enforcement of hygienic practice, such as the regular disinfecting of working tools, is also important in reducing the microbiological contamination of carcasses [11].

A study in Netherlands has pointed out that as far as safety, environmental care and nutritive value of animal by-products are concerned, and diversification and separation of slaughter by-product collection, storage, disposal and processing is necessary [12].

In another study in India to find out the Prevalence of Sarcocystis in domestic pigs. Muscle samples from 890 slaughtered pigs were examined for the presence of sarcocysts. A high prevalence rate of 67.98% was observed [13].

In his study in 1996 John TJ has mentioned that Leptospirosis appears to be on the increase in Kerala, Tamilnadu and the Andamans during the last 2 decades. Animal anthrax is very common in many parts of India, but human anthrax is recognised in only

certain limited locations. In the Chittoor and North Arcot districts, its prevalence had increased in recent years [14].

In a study Hathaway SC of Newzland has mentioned that meat hygiene consists of three major activities: post-mortem inspection; monitoring and surveillance for chemical hazards; and maintenance of good hygienic practice throughout all stages between slaughter and consumption of meat [15].

In his study Bryan Christie responded that "Food safety controls are to be tightened in Britain after an inquiry into the world's second worst outbreak of Escherichia coli, which killed 18 people and affected almost 500. The source of the infection was a local butcher's shop, which supplied contaminated meat products to several retail outlets in the surrounding area. The inquiry looked into every stage of food production from "the farm to the fork" and called for greater awareness among farmers of the nature of the E coli bacteria; higher standards in abattoirs to prevent meat becoming contaminated with fecal material; the introduction of a licensing system for butcher's shops to ensure that good hygiene practices are maintained; and improved education on food preparation in schools as well as training for food handlers. The report of the inquiry also recommended that a program of clinical, microbiological, and epidemiological research should be funded to improve current understanding of the E coli organism" [16].

Robert V Tauxe describe that "Foodborne diseases continue to move newspapers and bowels around the world. A century ago, concern about cholera, typhoid fever, and other enteric diseases led to the sanitary revolution, which controlled these diseases in the industrialized world. Now, newer pathogens have emerged, and they are delivered fresh to our dinner plates by the increasingly centralized and global production of food.

Escherichia coli O157:H7, Cyclospora cayetanensis, caliciviruses, and Salmonella typhimurium DT104 are all part of the growing list of pathogens that may lurk in the stools of the patient with diarrhoea, taxing the diagnostic laboratory. E coli O157:H7, a Shiga toxin-producing E coli, is a good example of this new breed of pathogen. Unheard of before 1982, it is now of major concern in Europe, North and South America, and Japan. The toxins cause the illness, which can include renal failure and death. The illness is essentially untreatable, although the organism is susceptible to antibiotics. The organism lives in cattle. Contamination of meat could be reduced by cleaner slaughter practices, as being implemented throughout the USA. The practice of public health is changing as new surveillance strategies develop to detect food borne pathogens. In the USA, an active surveillance system called Food Net tracks the frequency of specific infections, to better determine their sources and the burden they pose" [17].

In a study in the United States 19,356 adults in eight states (1995: Colorado, Florida, Missouri, New York, and Tennessee; 1996: Indiana, New Jersey, and South Dakota) were interviewed. The survey included questions related to food-handling and/or food-consumption practices. It was found that risky food-handling and food-consumption practices were not uncommon. Overall, 19% of respondents did not adequately wash hands or cutting boards after contact with raw meat or chicken. During the previous year, 20% ate pink hamburgers, 50% ate undercooked eggs, 8% ate raw oysters, and 1% drank raw milk. Men were more likely to report risky practices than women. The prevalence of most risky behaviors increased with increasing socioeconomic status [18].

India has the world's largest number of livestock. India has potential to produce 3.5 million metric tones of meat and meat products the value that is estimated to be 82500

Million Rupees. Hygienic processing of meat and meat products and their distribution for domestic consumption and export markets are to be done with utmost care and quality is important. There is a vast potential for utilizing blood, liver and certain glands from animals for pharmaceutical purpose. Intestines could be processed to casings. Organs like liver, heart, lung, kidney are most suitable for pet foods. Skin and hides when processed suitably will further increase value of leather and leather products.

In India there are two types of slaughterhouses Public- managed and controlled by public bodies and local municipal administration. Private- something like privately owned especially in rural areas. Many of meat bye products are wasted in the slaughterhouses, which if utilized can generate revenue All cities and big towns have one or more public slaughter houses. A large number of private slaughterhouses are also being used for slaughter of animals particularly in rural areas. Big public slaughterhouses have qualified veterinarians on their staff as meat inspectors. Due to the lack of suitable legislation and regulated system of meat inspection, control and supervision of private slaughterhouses is beset with great difficulties. The quality of the meat produced in the public slaughterhouses cannot be expected to be of high quality as far as public health aspect is concerned. Fortunately meat is thoroughly cooked in our country before consumption, but this is no consolation for its production in unhygienic environments.

In kerala 85-90% of people consume meat. Majority of the animals for slaughter comes from the neighboring states[1]. A study in 1998 shows that 64% of the animals for slaughter are imported from neighboring states and rest 36% are produced locally. Out of this imports 46% is beef and 16% is chicken. Of the local production 16% is beef, 12% is chicken, 5% is mutton and 3% is pork [19].

It has been estimated that 1/3 rd of the total meat production in the state is from recognized slaughterhouse and rest 2/3rd from illicit slaughters [20]. So the majority of slaughtering in the state are illicit. In the illicit slaughter there is every chance that animals are some how killed and sold without any restriction or control. There is also a chance that the meat of dead or diseased animals is sold. In Kerala there are three corporations and fifty five municipalities. There are slaughterhouses in all corporation and some of the municipalities. Nineteen municipalities do not have slaughterhouses. But in panchayaths there are no slaughterhouses. There are several meat shops in panchayaths for which panchayaths give slaughter license. In Kerala 56% of meat consumption is in rural areas, 28% is in urban areas and 16% in institutions [19]. So the majority of slaughtering may be occurring in the panchayaths.

Table 2.2 Annual Consumption of meat and fish (MetricTones per year) 1997

	Rural	Urban	Total	Institutions	Grand Total
Beef	57987	25950	85617	14494	100111
Mutton	11485	4769	16254	2811	19065
Pork	1876	603	2479	291	2770
Chicken	18043	13191	31234	8191	39425
Total meat	89391	44513	135584	25787	161371
Fish	596494	200623	797117	7088	804205
Total flesh food	685885	245136	932701	32875	965576

Table 2.3 Market share of individual meats

Type	Percentage (%)
Beef	62
Chicken	24
Mutton	12
Pork	2

Table 2.4 Meat consumption by segments

Segments	Percentage (%)
Rural	56
Urban	28
Institutions	16

Table 2.5 Availability of local and imported meats

Type	Local production(%)	Imports(%)
Beef	16	48
Chicken	12	16
Mutton	5	0
Pork	3	0
Total	36	64

(Source - Kerala Livestock Development Board 1998) [19].

Kerala Panchayath act 1994, rule 231 states that no slaughter of cattle, sheep, goat, pig for sale as food or skin should be allowed with in panchayath area except in the public slaughter house or licensed one. Skin should not be dried in such a manner as to cause nuisance. The said slaughterhouse has to be kept clean. Slaughtered meat for sale as food shall not be sold without inspection by the prescribed officers. The carcass of animals or birds should not be exhibited or expose to public view in such a manner as to cause annoyance or offense to the sense of sight of public.

In this peculiar situation prevailing in the state the following matters need to be answered

- What is the existing situation of animal slaughtering in Kerala?
- What are the problems associated with animal slaughter?
- What are the knowledge, attitude, and practices of butchers regarding animal slaughtering?

- What are the knowledge and attitude of meat consumers, non-meat consumers about the current animal slaughter practices?
- What are the attitudes of people who stay near slaughter places about the current animal slaughter practices?
- What are the attitudes of the local leaders with regard to animal slaughter practices?
- What are the attitudes of the Veterinarians in animal slaughter practices?

Chapter 3

METHODOLOGY

3.1 Study area

3.1.1 Selection of the district

I was working for the past nine years in the Kozhikode district as Veterinary Surgeon. With this much years of service I was familiar with several panchayaths in Kozhikode district. The study involves inspection of illegal slaughter places and interview of butchers, which would not be possible in an unfamiliar place. With the experience in the district and contact with people in the district including local leaders and veterinarians it was expected that such a study would be possible only in a place where the researcher has very good contacts with different groups of people. So I decided to choose Kozhikode district for conducting the study.

3.1.2 Selection of the panchayath

The number of animals slaughtered in the panchayaths of Kozhikode district for the year 1997 were collected from the reports in the Directorate of Animal Husbandry Thiruvananthapuram. Five panchayaths having the highest number of animal slaughters were selected. From these panchayaths one panchayath was selected randomly which happened to be Balussery panchayath. Subsequently four panchayaths lying adjacent to Balussery panchayath were also selected. So the study area consisted of five adjacent panchayaths in Kozhikode district namely

1. Atholi panchayath
2. Balussery panchayath

3. Nanminda panchayath

4. Narikkuni panchayath

5. Unnikulam panchayath

3.2 Methods

3.2.1 Observation at the slaughter house in veterinary college Trissur

There is only one Veterinary College in the state, which is situated in Trichur district. Trichur is about 150 kms away from the study area and is in central part of the state. Since this is a demonstration and teaching unit it was expected that the performance of this unit would be the best in the state and could be used as a standard. Observation of animal slaughter practices in this unit was then compared with that of the selected panchayaths. The major areas of scientific and hygienic aspects of animal slaughtering include antemortem examination, stunning, bleeding, skinning, evisceration, postmortem examination and slaughter waste disposal. It was planned to observe all these aspects. In order to accomplish this objective it was decided to observe the entire procedure of slaughtering of a cattle, a goat and a pig.

3.2.2 Observation of the animal slaughter in the panchayaths

It was decided to observe the scientific and hygienic aspect of animal slaughtering procedures viz. Ante-mortem examination, stunning, bleeding, skinning, evisceration and postmortem examination. The slaughtering of animals (cattle, goat and pigs) both in licensed and unlicensed places were planned for observation.

After identifying all the seventeen meat shops by asking to butchers, the authorities of each panchayaths were contacted to find out how many of those meat selling shops were licensed. From the panchayath records only eleven out of these seventeen were

found to have license to sell meat. Remaining six of them was unlicensed. Out of these seventeen shops thirteen shops sell only cattle and buffalo meat. Rest four sells only goat meat. So it was planned to choose randomly one shop from each group, one from the licensed group and one from the unlicensed group. This procedure of selection was followed for the groups of shops selling goat meat and those selling cattle and buffalo meat. The total number thus was 4; two from the licensed group and two from the unlicensed group. All these four meat-selling shops and the places of slaughter were observed.

3.2.3 Interview with butchers

A semi-structured questionnaire was prepared to collect the knowledge, attitude and practices of butchers relating to the hygienic and scientific aspects of animal slaughter and slaughter waste disposal. At first butchers in one of the meat shops in the panchayath were approached. By asking them other shops were identified. Besides the slaughtering in these meat shops animal slaughter takes place in rural areas during festival seasons and marriage occasions. This type of slaughtering and the butchers involved in those slaughtering could not be captured in this study. The interview of the butchers was done in the meat selling shops and in the places of slaughter.

3.2.4 Interviews with public in the panchayath who consume meat

With an objective of understanding the knowledge, attitude and practice of people who consume meat about animal slaughter practices a small sample of those people were interviewed with a semi structured questionnaire. The consumers were identified from the seventeen meat shops in the study area. For this I remained in each of the meat shops for two hours. The consumers who came to purchase meat with in this two hours were

interviewed at random. Only two shops were covered in a day. The time spend was 7am to 9am in the first shop and 9am to 11am in the second shop each day. Those selected persons were interviewed near the meat selling shops. Some people particularly women could not spare this time for interview in the field near the meat selling shops. I could get only one female in the total sample of 79, willing to spare her time for the interview. It was probably not the willingness alone but also cultural factors, which would prevent women being interviewed in the open but due to paucity of time I had no other option.

3.2.5 Interview with the public in the panchayath who do not consume meat:

The second group of people I interviewed was those who do not consume meat. Since these people do not come to the meat shop I selected a place where I could interview them in their houses. Another questionnaire was administered to those selected in this group. Out of the five panchayaths three were Muslims dominated panchayath. So the vegetarians were identified from the remaining two panchayaths. In these two panchayaths the households surrounding the temples or 'madams' were identified. It was expected that the houses near the temples and "madams" had more people who do not consume meat. Ten households from this place were randomly selected. The individuals in these households were interviewed. Only those vegetarians who were present in the house at the time of visit were interviewed. The house visits were performed in the day time from ten am to five p.m.

3.2.6 Interview with people in the households near the slaughter places

With the help of a semi-structured questionnaire to gather their opinion about the animal slaughter practices in the panchayath. The households near the slaughter places were

identified. From them ten households were randomly selected. The people who were present in these households during the daytime were interviewed.

3.2.7 Focus group discussions with the Panchayath Presidents and Veterinarians of the panchayath :

The objective of this focus group discussion was to gather their opinion about animal slaughter practices in the panchayath. The focus group discussions were made in the panchayath office in the study area. In each panchayath one group discussion was performed. In the group discussions the panchayath president, vice president, secretary, ward members and veterinary surgeon of the particular panchayath participated. The points raised in the group discussions were noted down. No video taping or audio taping was performed.

Study period January 01, 1999 to February 20, 1999

The data was entered in a computer and analyzed using SPSS PC+ software mainly for the descriptive analysis. .

3.3 Limitation of the study

The findings cannot be generalized because of the very small sample size. For generalization to whole of Kerala the study will have to be done in panchayaths representing the whole of Kerala with sufficient sample size. Single male interviewer was a limitation. Interview of consumers of meat was done near the meat sale shop which restricted the number of female respondents.

Chapter 4

RESULTS

4.1 Description of slaughter practices in the Veterinary college, Trichur

The slaughtering of cattle, goat and pig were observed in the slaughter house attached to the meat product technology unit in the Trichur veterinary college.

4.1.1 Stages of slaughtering -- cattle and goats

In an area called lairage the antemortem examination of the animals is performed. From the lairage the animal is driven to the stunning pen.

- Stunning

In the stunning pen the animal is stunned with the help of a captive bolt pistol. The captive bolt pistol is kept on the forehead and fired. The animal becomes unconscious.

- Bleeding

Immediately after stunning the animal is subjected to bleeding. An incision is made across the throat region caudal to the larynx to severe the carotid arteries and jugular veins. Then the hind limb is shackled and the animal is hoisted upside down an overhead rail. Then the blood is collected in a basin. After the bleeding is over (6 minutes of bleeding) the carcass is washed.

- Skinning

Then it is lowered on a skinning cradle. On this cradle the skinning process (removal of skin) is performed. The skin is removed from the hind limbs, forelimbs, belly, chest and neck respectively. Then the head is cut and removed. The esophagus is tied at the anterior end to prevent the leakage. The carcass is again hung on the hind limbs.

- Evisceration

The next step is evisceration that is the removal of visceral organs. For this, the abdominal cavity is opened and then the thoracic cavity is opened by breaking open the rib cage. The stomach and intestines in the abdominal cavity are carefully removed without causing any damage to it. Then the organs like lungs, heart, liver, spleen, kidney, uterus are removed. After this the lymph nodes of the hanging carcass are examined for any lesions. Then each fore limb of the carcass is removed separately and hung. Then the hind limbs are separated and hung. The meats from these limbs are cut and made into pieces on a stainless steel table and packed in polythene bags.

- Postmortem examination

The organs separated from the carcass will be subjected to the postmortem examination. The lymph nodes and the masseter muscles of the head are examined. All other organs like lungs, liver, heart, spleen, kidney, uterus are examined for any abnormal lesions.

4.1.2 Stages of slaughtering -- Pigs

- Stunning

The animal is driven to the stunning pen from the lairage. Then animal is stunned using electricity. In this method a low voltage alternating current is passed through the brain of the animal. The electrodes are placed just below the earlobes of the pig. Then the hind limb is shackled and the animal is hoisted upside down on an overhead rail.

- Bleeding (sticking)

After this for bleeding a hollow knife is inserted in the midline of the neck, at the depression in front of the sternum. Then it is pushed forward to severe the anterior venacava at the entrance of the chest. This method is called sticking.

- Scalding

After bleeding the carcass is washed and then are carried to the scalding tank through overhead rails. In the scalding tank there will be hot water and the carcass will be scalded. Then the hairs from the carcass are removed manually or mechanically using a machine

- Singeing

Then the carcass is subjected to singeing with the help of flame. Then the whole carcass is shaved and then washed. After this the head is removed.

- Evisceration

The next step is evisceration that is the removal of visceral organs. First making an opening on the abdomen opens the abdominal cavity and then the thoracic cavity is opened by breaking open the rib cage. The stomach and intestines in the abdominal cavity are carefully removed without causing any damage to it. Then the organs like lungs, heart, liver, spleen, kidney, uterus etc. are removed. After this the lymph nodes of the hanging carcass are examined for any lesions. Then each fore limb of the carcass is removed separately and hung. Then the hind limbs are separated and hanged. The meats from these limbs are cut and made into pieces and packed.

- Postmortem examination

The organs separated from the carcass will be subjected to the postmortem examination. The lymph nodes and the masseter muscles of the head are examined. All other organs like lungs, liver, heart, spleen, kidney, uterus are examined for any abnormal lesions

4.1.3 Disposal of by-products and wastes

Non edible organs like lungs, spleen, facia, will be sold as dog food. Other non-edible parts like bones, hoofs, facia, intestines, blood will be converted into bone and blood meal in the rendering plant. After pre-crushing the raw material is fed into the batch pressure cookers where it is heated and sterilized with water for about one hour. The material is then discharged into an intermediate buffer tank. In the decanter centrifuge the material is separated into solid and liquid. Most of the solids are fed to a continuos drier. The liquid, which consists mainly of fat, water, and some very fine particles of solids (fines), is consigned to a high-speed centrifuge that separates the three constituents. Process water is returned to the digesters through a suitable buffer and holding tank. The fat is discharged either as a product or to a second polishing separator. Fines are discharged either to the dryer or returned to the cooker.

4.2 Description of animal slaughtering in the rural area

4.2.1 Cattle (in licensed and unlicensed meat shops)

The difference between the licensed and unlicensed one is that the licensed one have the license from the panchayath to slaughter and sell meat The unlicensed one do not have the license from the panchayath either to slaughter or to sell meat. In the licensed shop, which I observed, the slaughtering was done in a concrete room. The meal is sold

from the same room. In the unlicensed one slaughtering is done somewhere else and the meat is brought to the shop from the slaughtering place. Usually the place of slaughter is very close to the shop. The slaughtering in both the licensed and unlicensed start at 4: am in the morning. One of the persons holds the head and the other one holds the forelimb bent at the elbow joint. Third persons press the animal on the hump region and make the animal fall on the ground. Then the hind limbs and forelimbs are tied using a rope. Now the animal will be lying in a lateral recumbent position. The head of the lying animal is stretched backward near a small pit built in the concrete floor. Then an incision is made on the throat region caudal to the larynx severing the trachea, esophagus and the carotids. The blood gushing out is collected in the pit built in the concrete floor. Usually this procedure of cutting the throat is carried out by the religious person called as 'Musaliyar.' After the bleeding is over that is within 10 minutes the skin of the animal is removed. The skin of the animal lying on the floor is removed from the hind limbs, forelimbs, belly, chest and neck. Then the internal organs are removed. For this first the abdominal cavity is opened and the stomach and the intestines are removed. Then the thoracic cavity is opened by breaking open the rib cage. Then the organs like lungs, heart, liver, spleen, kidney are removed. The hind limbs of the animal are separated and hung. Then the forelimbs are separated and hung on iron hooks tied to a rope. From these hanging parts the meat is cut and sold. For chopping the meat into pieces the stem of a wood is used which is called as "Poovam" in the local language.

4.2.2 Goat (in licensed and unlicensed)

In the licensed shop, which I observed, the slaughtering was done in a concrete room. In the unlicensed one there was no room, slaughtering was done in an open area. One person

holds both of the limbs and the animal is made to fall on the floor. Another person stretch the neck and usually the 'Musaliyar' make an incision on the throat region cutting the trachea and the carotids. After the bleeding is over the animal will be hung on the hind limbs with a rope. Then the skin will be removed from the forelimbs, hind limbs, belly, chest and neck respectively. Then the abdominal cavity is opened and the stomach and the intestines are removed. The thoracic cavity is opened and the organs are removed. From the hanging carcass meat is cut and sold.

4.2.3 Pig (in the unlicensed)

The pig slaughtering was observed from the house of a farmer who rears pigs. One or two people hold the pig. Then with the help of a hammer weighing 6-8 kg a blow is given on the forehead to kill the animal. Then the carcass is washed and shaved. Then it is singed using the flame. The internal organs are removed by cutting opening the abdomen and the thorax. Fore limbs and the hind limbs of the carcass are separated and meat is cut and sold from this parts.

4.2.4 Comparison between veterinary college and rural areas

In the veterinary college the slaughtering of the animals are carried out in a scientific and hygienic way. The methods of slaughter in the developed countries are followed here. The animals are subjected to ante-mortem examination before slaughter. They are stunned (made unconscious) before bleeding. For the effective bleeding the animal is raised on the hind limbs so that bleeding will be complete. The blood is collected in a basin. Before skinning the animal is washed which will help to reduce the bacterial load on skin. The skinning is performed in a skinning cradle to prevent the bacterial contamination. Skinning if performed on the floor there is every chance of bacterial

contamination. The evisceration is also done on the skinning cradle, which will help to prevent contamination from the floor. While evisceration the esophagus in the neck region is tied to prevent the contamination due to leakage of stomach contents. After evisceration the carcass is again hung. The carcass is made into parts in the hanging position, which will reduce the chance of bacterial contamination from the floor. The separation of meat from the bones is performed on the stainless steel tables. The postmortem examination of the carcass is performed.

In the rural areas the antemortem examination of the animals to identify the debilitated or diseased ones are not practiced. Animals are not made unconscious before bleeding. This is not applicable to animals slaughtered by Muslims. All the butchers I encountered in the study were Muslims. The bleeding is performed on the concrete floor or open ground. The animals are bled in the lying position and not in the hanging position. This can lead to incomplete bleeding. In some cases blood is collected in a pit build in the concrete floor. In other cases blood is wasted on the ground. The animals are not washed before the skin is removed. The removal of skin and evisceration are performed in the lying position on the floor. This can lead to the bacterial contamination of meat from the floor. The cutting of carcass is also performed in the lying position. After the slaughtering of one animal the floor is not cleaned. On the same floor the second animal is slaughtered. Besides the contamination problem it is also difficult for the workers to do the skinning, evisceration and cutting process on the carcass which is lying on the floor. The equipment used for slaughtering are not properly washed or disinfected. Nobody is performing antemortem or postmortem inspection of the carcass after slaughter in rural areas. So the animal slaughter is highly unhygienic and unscientific in rural areas when compared to that

of Veterinary College. A lot of improvements in many aspects of slaughtering have to be done to improve the quality of meat production in the rural areas.

Some aspects of standards followed in the veterinary college when compared to developed country standards are poor. The slaughter workers are not wearing any protective clothing. There should not be a time lag between stunning and bleeding. The bleeding has to be done immediately after stunning before the animal become conscious. But here a time lag occurs between stunning and bleeding and the animal regains consciousness before bleeding. Collection of blood while the animal is conscious is improper. Most of the blood gets wasted while it is collected in a basin.

4.2.5 Description of animal source and animal types

The butchers buy the animals directly from the local farmers who are rearing the animals or from local cattle markets and directly from the neighboring state. The animals come to the local cattle market either from the local farmers or from the neighboring states. In many panchayaths there is a local cattle market operating one day in a week. The animals slaughtered may be unproductive animals, which have become unproductive due to malnutrition, disease or aging. So the local farmers will sell their unproductive animals directly to the butchers or they may sell it at the cattle market. Which in turn will reach the butchers. The unproductive animals (which are diseased, debilitated or aged) from the neighboring states also reach the local cattle markets operating in the panchayaths of our state. Which will also reach our butchers. They are brought either in lorries or by walking. Both ways of transportation have problems because by walking a long distance the animals become unhealthy for slaughtering. The animals coming from the neighboring states are

mainly Buffaloes and cattle. Poultry also come from neighboring states but not included in this study.

4.3 Interview with Butchers

4.3.1 Sample characteristics

Total number of butchers interviewed from the study area - 33

Table 4.1 Characteristics of the butchers interviewed

Age group	*15-35 yr.*	*35-55 yr.*	*55-75 yr.*	*Total*
No.	19	10	4	33
Education	*1-4(Lower primary)*	*5-7(Upper primary)*	*8-10(High school)*	*Total*
No.	7	11	15	33
Marital status		*Married*	*unmarried*	*Total*
No.		22	11	33
Socio economic status	*Low*	*Middle*	*High*	*Total*
No.	14	15	4	33
Age of starting the Job	*10-20 yr.*	*20-40 yr.*	*40-50yrs*	*Total*
No.	20	9	4	33
Indulge in any other jobs		*Yes*	*No*	*Total*
No.		8	25	33
Father's occupation		*Slaughter job*	*Other job*	*Total*
No.		12	21	33
Ownership		*Owner*	*Daily waged*	*Total*
No.		17	16	33

Majority of the butchers interviewed was in the age group of 15-35 years. All of them were males and were Muslims. Majority (twenty-six out of thirty three) of them had more

than five years of schooling. Majority of them belongs to low socioeconomic status. Majority of them started the job in between ten and twenty years of age. All of them didn't have any union. Majority of them indulges only in slaughter jobs. Occupation of the fathers of twelve workers was slaughter jobs.

4.3.2 Knowledge

Table 4.2 Distribution of butchers by knowledge

	Yes	*No*	*Total*
Can identify sick animals from symptoms	31	2	33
Can identify diseased parts and organs of the carcass	3	30	33
Permission is required to do slaughter	33	0	33
Any Disease communicable from animals to human beings	0	33	33
Hanging of carcass parts are better	33	0	33

Regarding the knowledge of the workers, majority of them reported that they are able to identify the diseased animals by seeing the symptoms but are not able to identify the diseased parts and organs of the carcass. No body was aware of any diseases that are communicable from animals to human beings. All the workers knew that permission is required to do the slaughter but only some of them took the permission

4.3.3 Practices

Table 4.3 Distribution of butchers by selected practices

	Yes	*No*	*Total*
Animals for slaughter purchased locally from farmers	10	23	33
Animals for slaughter purchased from local cattle market	22	11	33
Animals for slaughter purchased from neighboring state	1	32	33
Slaughter place is self owned	16	17	33
Slaughter place is rented	17	16	33
Slaughter place is with roof and side walls	24	9	33
Slaughter place area is with roof only	2	31	33
Slaughter place is without roof and side walls	7	26	33
Slaughter place is a panchayath slaughter house	0	33	33
Water is available at the slaughter place	33	0	33
Water from well	32	1	33
Water from ponds	1	32	33
Washing of the carcass before slaughter	5	28	33
Washing of carcass after slaughter	0	33	33
Any body perform meat inspection before or after slaughter	1	32	33

Table 4.4 Distribution of butchers by time of slaughter

	3am	*4am*	*5am*	*6am*			*Total*
Starting time of slaughter	2	5	16	10			33
	8am	*10am*	*11am*	*12 noon*	*1am*	*3am*	*Total*
Ending time of slaughter	2	8	7	13	1	2	33

Table 4.5 Type of animals slaughtered and butchers involved

	Cow & Buffalo	*Goats*	*Total*
No.of animals slaughtered per week in study area	76	28	104
	Cow &Buffalo	*Goats*	*Total*
No.of butchers based on type of animal slaughtered	28	5	33

Table 4.6 Type and quantity of meat sold.

Quantity of meat sold per day in study area (Kgs)	*Cow & Buffalo*	*Goat*	*Total*
To individuals	380	11	391
To hotels	255	10	265
Total	635	21	656

Regarding the practices of slaughter workers majority (twenty two out of thirty-three) buy the animals for slaughter from the local cattle markets. Seven have the opinion that slaughtering of the animal is performed in an open area. No slaughter was performed in panchayath slaughterhouse. The starting time of slaughter range from three AM to six AM and ending time of slaughter ranges from eight AM to three PM. Average number of animals slaughtered in a week in these panchayaths were one hundred and four, which include seventy-six cattle and buffaloes and twenty-eight goats. Majority (twenty-eight out of thirty-three) had the opinion that the types of animal slaughtered are cattle and buffalo and type of meat sold more is of buffalo. Fifty percent interviewed (seventeen out of thirty-three) were the owners of the meat shop. The rest sixteen were a daily waged employee. All the workers reported that water is available at the slaughter place either from well or pond. But only few of them reported that they wash carcass before slaughter.

All of them reported that they do not wash carcass after slaughter. Meat is sold from the shop to individuals and hotels. From the seventeen meat shops in these panchayaths about six hundred and thirty-five-kg of cattle and buffalo meat and twenty-one kg of goat meat are sold in a day. Thirty-two out of thirty-three reported that nobody inspects meat before slaughter or after slaughter. So at present no meat inspection is performed in the study area. All of them prefer to sell meat by hanging the carcass parts.

4.3.4 By products utilization

Table 4.7 Methods of by product utilization by butchers

	Yes	*No*	*Total*
Sell the skin at market	33	0	33
Sell the bone, hoof and horn at market	17	16	33
Put bone, hoof and horn in a near by pit or tank	11	22	33
Transport away bone, hoof, horn and dispose	5	28	33

Regarding the by-product utilization, all reported that they sell skin at the market Some sells it daily or some sell it weekly. Regarding bone, hoof and horn seventeen out of thirty-three sell it at market. Eleven put then in a pit or tank. Five transport away and dispose.

4.3.5 Slaughter waste disposal practices (Slaughter waste include blood, inedible organs, facia, intestines, stomach etc.)

Table 4.8 Methods of slaughter waste disposal by butchers

	Dispose in a near by pit	*Transport away and dispose*	*Give as dog or pig feed*	*Give to hotels or individuals*	*Give to stray dogs*	*Total*
No.of butchers	4	13	11	1	4	33

Regarding the slaughter waste disposal majority of them (thirteen out of thirty three) transports away and disposes. They may be disposing this in the river or road sides.. Eleven reported that they give as dog or pig feed. Rest of them dispose in a nearby pit or give to stray dogs, which will create environmental problems to the people living near these areas.

4.4 Interview with meat consumers

4.4.1 Sample characteristics

A total number of 79 consumers were interviewed from the study area.

Table 4.9 Characteristics of the consumers interviewed

Age (Yrs)	*15-25*	*25-35*	*35-45*	*45-55*	*55-65*	*65-75*	*Total*
No.	14	16	13	16	17	3	79
Sex		*Male*		*Female*			*Total*
No.		78		1			79
Religion		*Christian*		*Hindu*	*Muslim*		*Total*
No.		1		19	59		79
Preferred meat	*cow's*	*buffalo's*	*goat's*	*poultry*	*pig's*	*No preference*	*Total*
No.	2	22	17	22	14	2	79

The age group of the consumers interviewed range from 15-75 years. Seventy eighty were males and one was female. The reason why there was only one female was that females who came to buy meat from the shops were comparatively less. Among those who came to purchase meat, majority was not willing to answer the questions, may be because of the fact that interviews were performed near the meat shops and because the interviewer was

male. A few female children came to buy meat but they were not able to respond to the questions. Majority of the consumers interviewed was Muslims. Out of seventy-nine consumers about twenty eight percent (twenty-two out of seventy nine) preferred buffalo meat, another twenty-eight percent preferred poultry meat.

4.4.2 Knowledge

Table 4.10 Responses of consumers of meat

	Yes	*No*	*Don't know*	*Total*
Diseases spread through meat	8	18	53	79
Any chance for adulterating the meat	11	54	14	79

Regarding the knowledge of the consumers only eight out of seventy-nine know that diseases spread through meat. Only eleven out of seventy-nine has the opinion that meat can be adulterated.

4.4.3 Attitude

Table 4.11 Distribution of consumers of meat with selected attitudes

	Yes	*No*	*Total*
Satisfied with the quality of meat they get from the meat stalls	68	11	79
Satisfied with the cleanliness in the meat stalls	70	9	79
Existing condition of meat stalls should improve	12	67	79
Prefer to buy meat from the hanging parts of carcass	70	9	79

Majority of the consumers' (sixty-eight out of seventy-nine) were satisfied with the quality of meat they get from meat stalls. Seventy were satisfied with the cleanliness in the meat stall. Only twelve out of seventy-nine recommended improvement in the existing condition

of the meat stall, which suggests that majority of consumers interviewed from the study area were satisfied with existing condition of meat sales. Majority prefers to buy meat from the hanging parts of carcass.

4.4.4 Practices

Table 4.12 Distribution of consumers of meat with selected practices

Quantity of meat purchased previous week	*<0.5kg*	*0.5-1kg*	*1-1.5kg*	*1.5-2kg*	*2-2.5kg*	*Total*
No.	3	21	34	9	12	79
Type of meat purchased previous week	*Cow*	*Buffalo*	*Goat*	*Poultry*	*Pig*	*Total*
No.	5	59	8	5	1	79
Wash meat before cooking		**Yes**		**No**		**Total**
No.		79		0		79

Majority (fifty five out of seventy-nine) bought 0.5- 1.5 kg of meat last week. Fifty-nine out of seventy-nine bought buffalo meat last week. Everybody reports that they wash meat before cooking.

4.5 Interview with non meat consumers (vegetarians)

4.5.1 Sample characteristics

Twenty-three non-consumers were interviewed from the study area

Table 4.13 Age group of the non consumers interviewed

Age (Yrs.)	*15-25*	*25-35*	*35-45*	*45-55*	*55-65*	*65-75*	*Not available*	*Total*
No.		0	9	2	1	4	4	23

Age of the non-consumers of meat interviewed range from 15-75 years. Out of twenty-three vegetarians twelve were males and eleven were females. All the vegetarians interviewed were Hindus. Among Hindus vegetarians are more but among Muslims vegetarians are less.

4.5.2 Knowledge

Table 4.14 Response of the vegetarians

	Yes	*No*	*Total*
Diseases spread through meat to man	20	3	23

Regarding the knowledge of vegetarians majority (twenty out of twenty three) know that diseases spread through meat to man

4.5.3 Attitude

Table 4.15 Attitude of non consumers of meat -No. of Respondents (n=23)

Avoid unscientific slaughter practices	15
Avoid unhygienic practices	8
Enforce the lows against exhibition of carcass	17
Ban animal slaughter	6

Regarding the attitude of vegetarians' fifteen think that the slaughtering in panchayaths is unscientific and eight believe that slaughtering are unhygienic. Seventeen reported that government should enforce strict control over animal slaughter and six reported that slaughter should be banned.

4.6 Attitude and opinion of people living in the neighborhood of slaughter places

Twenty individuals from the surrounding households were interviewed. The questions were mainly intended to capture the problems they are facing. The people reported the following problems. Four of them reported that there is problem of foul smell. Six of them reported that dogs drag slaughter waste to the their house premises. Six reported that dogs attack their domestic animals. Four reported that the waste parts when carried away by crows fell in their well and polluted the well water.

TABLE 4.16 Problems reported by neighbors of slaughter places

Those who report that there is problem of foul smell	4
Those who report that dogs drag the slaughter waste to the house premises	6
Those who report that dogs attack domestic animals	6
Those who report that crows pollute the well water	4
Total	20

4.7 Attitude and opinions of Panchayath Presidents and Veterinarians

All the veterinarians were of the opinion that there is a need for meat inspection. But the practical problem they pointed out was that it is difficult for the veterinary doctor in the panchayath to do postmortem inspection of all the animals slaughtered in the panchayath routinely as a part of their current job. To overcome this only ante-mortem examination of

all the animals can be performed and fitness certificate given. To perform the ante-mortem examination either the person who want to slaughter the animals shall bring it to the veterinary hospital or he has to take the doctor to the premises were the animals for slaughter are kept. Another approach to this problem is to post a veterinary doctor for 5-10 panchayaths for carrying out the meat inspection works.

Focus group discussions with the presidents of these panchayaths revealed that the main problem in starting the slaughterhouse in the panchayath is the non- availability of land in the densely populated Kerala. If some land is available people living in the surroundings will oppose. So the slaughterhouse can be constructed in a remote area of panchayath that is thinly populated. Another problem pointed out was the lack of staff to carry out the meat inspection.

Chapter 5

DISCUSSION AND CONCLUSIONS

There were seventeen meat shops in the study area. All these shops were situated in the market area. These shops had thirty-three workers. Of these seventeen shops eleven had slaughter license. Rest six was unlicensed. The situation in the licensed and unlicensed slaughtering places in the rural area is not much different. This points to the lack of supervision from the authorities on the quality control of the licensed slaughterhouses.

From the observation of animal slaughter in the study area it was seen that the hygienic aspects of the animal slaughter are very poor. The animals are somehow killed on dirty floor or on soil. The floor is not washed properly or disinfected before slaughter. The equipment used for slaughter like knives for cutting and hooks used for hanging carcass parts are not washed or disinfected. The tin-sheeted table used for keeping the meat is not kept clean. Some shops do not have tin-sheeted tables, instead the meat is kept on banana leaves on benches. In between the slaughtering of two animals the floor is not washed. Since the removal of skin is done on the unclean floor there is every chance of meat being contaminated. The personnel hygiene of the workers is also poor. They do not wash their hands during the entire slaughtering process or in between slaughter. They even eat their breakfast without washing their hands. In most of the meat stalls there is an offensive smell, especially in those where animals are slaughtered there itself. In most of the meat shops the animals are slaughtered in the shop itself and sold from there. In some shops they are slaughtered outside and transported to meat shops.

Regarding the knowledge of the slaughter workers' majority were unaware of the fact that diseases can spread through meat to them. Majority was also not able to identify

the diseased parts or organs of the carcass. So there is a chance that diseased parts are also sold along with the meat. Thirty out of thirty-three are not able to identify the diseased parts or organs in the carcass.

Regarding the practice of buying the animals one person buys them directly from Tamilnadu. The rest purchase from the local farmers and local cattle markets. The animals come to the local market from neighboring states also.

Regarding the slaughter practices in fourteen shops and one animal is slaughtered daily. In the rest three shops two animals each are slaughtered in a week, which comes to a total of six per week. Ten out of the fourteen shops sell only cows and buffaloes meat. Rest four only sells goat meat. The average number of cows and buffaloes together slaughtered daily in the study area is ten. And in a week is seventy. The average number of goats slaughtered in a day in the study area is four and in a week is twenty-eight. Out of total meat sold about sixty percent is sold to individuals and rest forty percent is sold to hotels. In all the panchayaths water is available near the slaughter places but the worker's do not use it. All the workers prefer to hang the carcass parts. In their opinion if the parts are hanged it is easy to cut meat from the parts and will be more hygienic if carcass parts are hanged. Also majority mentioned that the consumers prefer to buy meat from the hanging parts rather than which is kept as pieces on table. In majority of the shops there is no wall or glass covering in the front side of the shop. The carcass parts are hanged in the front of the shop openly. The dust, flies and even crows approach the hanging parts of the carcass. The hanging of the carcass parts openly in front of the shop will create some problem among the people whom do not consume meat. The slaughter workers prefer to hang the carcass parts and the majority of the consumers like to buy from the hanging

parts. So the best solution to this will be putting a tinted glass in front of the shops so that others will not view the hanging parts of the carcass. It will also prevent the problems of flies, dust and crows in the meat shops. It will be hygienic if the floor and walls of the meat shops are fitted with glazed tiles.

In slaughter waste disposal practices majority transport away and dispose or give as feed to dogs and pigs. These transported away wastes may be disposed off on the road sides or into the rivers. Some give to stray dogs that lead to nuisance produced by these dogs in the surrounding areas. Some dispose in a pit that they do not close for several days that emit foul smell and cause nuisance.

Majority of the consumers is satisfied with the quality of meat they are getting and cleanliness in meat shop. This may be because they are unaware of the fact that human beings can get diseases by consuming meat processed in unhygienic environments. Majority was unaware of diseases that are communicable from animals to human beings. Majority of the consumers when asked like to buy meat from the hanging parts rather than which is kept made into pieces. Because if the meat is already made to pieces they will not know whether it is meat of some other animals or it is old meat. So they want to buy meat cut in front of them from the hanging carcass parts.

Majority of vegetarians knows about diseases that are communicable to human being through meat. All of them have the opinion that the slaughtering of animals in panchayaths are unhygienic and unscientific. Majority of them wants to have strict government regulation on animal slaughtering to make it hygienic and scientific.

Interview with the individuals in the households surrounding the slaughter place revealed the following problems. There is foul smell always since the pits in which the

wastes are disposed are not closed regularly. Another problem is dogs bite the waste part from these pits and bring it to the house premises. Some times crows carry the waste parts and it fall in the well. So some households are not using the water from their well. They are fetching water from distant wells. Dogs roaming around also bite the domestic animals in the houses.

All the Veterinarians in the study area had the opinion that there is a need for meat inspection in panchayaths. But the practical problem they pointed out was that it is difficult for the veterinary doctor in the panchayath to do postmortem inspection of all the animals slaughtered in the panchayath routinely as a part of their current job. To over come this only ante-mortem examination of all the animals before slaughter can be performed and fitness certificate given. Another approach to this problem is to post a veterinary doctor for 5-10 panchayaths for carrying out the meat inspection works.

Focus group discussions with the presidents of these panchayaths revealed that the main problem in starting the slaughter house in the panchayath is the availability of land in the densely populated Kerala. Another problem pointed was the lack of staff to carry out the meat inspection works.

The animal slaughter practices in the rural area studied are highly unhygienic and unscientific. The knowledge among butchers regarding the scientific and hygienic aspects of animal slaughtering and slaughter waste disposal is very poor. The meat consumers were unaware about the importance cleanliness in the meat shop. They were also unaware about the diseases that spread through meat. The vegetarians were more aware about the chance of spread of diseases through meat to human beings. They were of the opinion that animal slaughter and slaughter waste disposal in rural areas should be done scientifically

and hygienically. The people living near the slaughter places face the problems of foul smell. Dragging of the slaughter waste to their house premises by the dogs. Carrying of slaughter waste by the crows into the well. Attacking of the domestic animals by the dogs. All of which arise due to the improper waste disposal facilities. So some measures are to be taken in rural areas for the proper disposal of slaughter wastes. Focus group discussions with the panchayath authorities reveal the problems of the lack of place to start the slaughterhouse and the lack of staff to indulge in meat inspection works in the panchayaths. The discussions with the veterinarians reveal the difficulty in doing the meat inspection of all the animals slaughtered in the different places of panchayath as a part of their current job. To overcome all these problems associated with the animal slaughter practices in rural areas some measures are to be taken. The butchers have to be educated to do the slaughtering scientifically and hygienically. For this they have also to be provided with good working condition. Meat consumers have to be educated about the risk of getting diseases from unhygienically produced meat. The facilities for slaughter waste disposal in rural areas have to be improved. Considering all these aspects the following measures can be taken to improve the animal slaughter practices in the rural area of Kerala.

- Educate the slaughter workers in the panchayaths to do hygienic and scientific slaughtering.
- Educate the consumers about the risk of acquiring diseases through meat and their right for obtaining good quality meat. They are also to be made aware of the need for consuming thoroughly cooked meat.
- Panchayath should give license only to the meat shops in which slaughtering can be

hygienically and scientifically carried out. Routine inspection of the meat shops has to be carried out by the panchayath authorities.

- Rendering plants for the utilization of slaughter waste can be started at block level (the panchayaths in the Kerala state are grouped under various blocks). For starting a rendering plant in each panchayath under a block the cost incurred may be high.The slaughter wastes from the panchayaths under the block can be transported to the rendering plant and can be converted to meat meal, bone meal, fat, etc. This if sold can raise revenue (Most of these products are coming to Kerala from the neighboring States). Also for the transportation of the slaughter waste to the rendering plants some amount can be collected from the individuals running the meat shops.
- Scientific slaughterhouse can be started in each panchayath. The problem here is that every animal to be slaughtered has to be brought to the slaughterhouse. To overcome these veterinarians specially trained for meat inspection can be employed in each panchayaths or for five to ten panchayaths.

There is a possibility that the recent reported disease epidemics of weils disease, food poisoning and Japanese encephalitis in various parts of Kerala has its origin in the unhygienic animal slaughtering practices and animal rearing practices in the state. Further studies are required to establish a link between these diseases and animal rearing and animal slaughtering practices in the state.

References

1. Government of Kerala"Asoothranasahai", State planning board, 1998, PP 66-77.
2. "The Hindu news paper" dated 28 September 1998, Thiruvananthapuram edition.
3. "Malayala manorama news paper" dated 23 September 1998, Kozhikode edition.
4. "Malayalamanoramma news paper" dated 2 march 1999, Thiruvanandapuram edition.
5. Government of Kerala "Development report", Kerala state planning board, 1996.
6. World Health organization,"World health magazine", (July-August 1998)
7. Mittal V; Bhatia R; Singh VK; Sehgal S, " Prevalence of toxoplasmosis in Indian women of child bearing age" in Indian Journal of Pathology and Microbiology, volume 38(2): pp143-5 1995 April.
8. Galv´an Ram´irez M de la L; Soto Mancilla JL; Velasco Castrej´on O; P´erez Medina R, "Incidence of anti-Toxoplasma antibodies in women with high-risk pregnancy and habitual abortions" in Rev Soc Bras Med Trop, volume 28(4):pp333-7, 1995 Oct-Dec.
9. Scientific proceedings of Second pan Commonwealth conference 22 - 27 February 1998, Bangalore, India.
10. Galland JC, "Risks and prevention of contamination of beef carcasses during the slaughter process in the United States of America", in Rev Sci Tech, Volume 16(2): PP 395-404 1997 August.
11. Rahkio M; Korkeala H, "Microbiological contamination of carcasses related to hygiene practice and facilities on slaughtering lines", in Acta Vet Scandinavia, volume 37(3): pp 219-28. 1996

12. Urlings HA; van Logtestijn JG; Bijker PG, " Slaughter by-products: problems, preliminary research and possible solutions", Vet Q, volume14(1): PP 34-8 1992, January.

13. Saleque A; Bhatia BB, "Prevalence of Sarcocystis in domestic pigs in India", in Veterinary Parasitology, volume 40(1-2): pp151-3 1991 October.

14. John TJ, "Emerging & re-emerging bacterial pathogens in India", in Indian Journal of Medical Research,volume 103:pp 4-18 1996 January.

15. Hathaway SC, "Risk analysis and meat hygiene", in Rev Sci Tech, volume 12(4): pp1265-90 1993 December.

16. Brayan Christie, "E.coli reports call for better food safety", in British Medical Journal, volume 314:1145, 1997(April 19).

17. Robert V Tauxe, "Foodborne illnesses: strategies for surveillance and prevention", in The Lancet, Volume 352, Supplement 5, 19 December 1998.

18. Altekruse SF, Yang S, Timbo BB, Angulo FJ, "A multi-state survey of consumer food-handling and food-consumption practices", Am J Prev Med 1999 Apr;16(3):p 216-21.

19. Kerala government, Livestock Development board, " Study on Kerala's meat sector " in 1998.

20. Kerala Government, Department of Animal Husbandry, "Report on 15 th quinquennial livestock census-1996",

21. J.F.Gracey, "Thornton's meat hygiene." English language book society, Bailliere Tindal, England 1985.

22. "Handbook of Animal Husbandry", I Indian council of agricultural research, New Delhi.

23. "Bulletin of Animal Husbandry statistics -1993", Department of Animal Husbandry, Kerala.

24. "Meat Hygiene", World health organization, Geneva 1957, PP 11-178.

25. F.G Daviej, " Clay's Public Health Inspection hand book", H.K.Lewis & Co Ltd,13 Edn, London, 1972

26. Ralph Bogart, Robert E. Taylor, "Scientific farm animal production", Macmillan Publishing Co Newark and London, 2 den, PP 1-4.

27. A. R Michael, " The advancement of veterinary science, The bicentenary symposium Series vol. 1, C.A.B international.

28. Thomas G Hull, "Diseases transmitted from animals to man", 5 edn (1963), Charles C Thomas publisher, USA.

29. World health magazine of WHO 1998, (July- august).

30. Indian Veterinary Association, Kerala "Guide Line-Veterinarians desk top clinical diary,1997.

31. Marshell Catherine, Rossman Gretchen B, "Designing Qualitative Research", SAGE publications, Thousand oaks, London, New Delhi, 2 edition , 1995.

32. Mason Jennifer, "Qualitative Researching", SAGE publications, Thousand Oaks, London, New Delhi, 1 edition, 1996.

33. Official report of the American Public Health Association),"Control of Communicable disease manual, 1995.

Annexure - 1

A. Questionnaire for butchers

Name:

Age:

Sex:

Religion:

Studied upto which class:

Marital status:

How many children:

Type of house: Thatched / Tiled/ Terraced

Do you own/possess: Bicycle/ scooter/motorbike/ others

T.V/ fridge/ phone/ others

From which age onwards you are doing this butchering job:

From whom did you learn the methods of butchering:

From what time you start this job:

To what time you do this job:

After this job do you indulge in any other jobs: yes/ no

If yes, which job:

Do you have any union: yes/no

For how many days you did this job in the last week:

Are you doing this job alone: yes/no

Are you doing this job under some body for daily wages: yes/ no

How many days in a week you do this job:

What income you get from this job:

For 1 week
For 1 month:

What is your father's job?

Will you send your children for this job?

What all changes do you notice in your job for the last 10 years?

Was there an increase in the number of animals slaughtered?

Which type of animal's slaughter was increased?

Did the slaughtering facilities improove

Any other changes specify

Do you consume meat: yes/no

On an average how many animals do you slaughter in a day?

Which type of animals you slaughter in a day: Cow/ buffalo/ sheep/ goat/ pig

Which type of meat is sold more: Cow/ buffalo/ sheep/ goat/ pig

From where do you get the animals for slaughter:

Local farmers
Local cattle market
Neighboring states
Other sources

Slaughtering place is:

Place owned by yourself
Panchayath place
Rented place
Other place (specify)

Structure of slaughtering place:

A shed with roof and side walls
A shed only with a roof

Open space
Panchayath slaughter house

Is water available at the slaughter place: yes/ no

If yes from where: well/ pond/ pipe/river/ stream

Do you sell the meat directly from the slaughter place: yes/ no

Do you sell the meat through meat stalls: yes/ no

How much kg of meat is directly sold in a day?

How much kg is sold through meat stalls in a day:

After slaughtering how long will you keep the meat?

What you do with the following bye products:

Skin:
Hoof:
Horn:

What you do with the remaining slaughter wastes:

Can you identify sick animals: yes/ no

If yes, how you identify explain:

If you identify that an animal is sick what you do with that animal:

Can you identify the diseased parts and organs of animals after slaughtering: yes/ no

If yes, how:

What do you do with the diseased parts:

By handling the meat of diseased animals will you get any disease.

Do you know about any diseases which man can get from animals. yes/ no

If yes mention the diseases:

Do you suffer from any diseases for the last 1 year: yes/no

If yes which disease:

Do you require anybody's permission to do slaughtering: yes/ no

If yes whose:

Does anybody come for inspecting the animals before, during or after slaughter: yes/ no

If yes, who:

Do you wash the animals before slaughter yes/ no

Do you wash the animals after slaughter yes/ no

What problems you face in your job,describe:

Does any body give any complaint against you regarding your slaughter job:

Does panchayath authorities or police take any action against you:

B. Questionnaire for meat consumers

Name:

Age:

Sex:

Do you consume meat: yes/ no

Which type of meat you consume:

Of cow
Of buffalo
Of goat
Of pig
Of poultry

Which type you like more:

Do you eat meat from hotel:

How frequently:

Daily
Weekly
Monthly

Do you purchase meat directly from slaughter places: yes/ no

Do you purchase meat from meat stalls: yes/ no

Last week how many kgs of meat did you purchase:

From where did you purchased: Slaughter place/ meat stall

Which type of meat you purchased: of cow/ buffalo/ sheep/ goat/ poultry/ pig

For how much money you purchased:

Do you wash meat before cooking: yes/ no

Will man get any disease through meat: Yes/ no

If yes which disease:

Are you satisfied with quality of meat you get from the meat stalls: yes/ no

If no, what is the reason?

Is there cleanliness in the meat shop: yes/ no

Are you satisfied with the cleanliness: yes/ no

Should the existing condition of meat stalls be improved: yes/ no

If yes, what improvement you suggest:

Is there any problem in the existing pattern of animal slaughter and meat sale in your panchayath: yes/ no

If yes, what is the problem:

For how much time the raw meat will remain fresh:

Is there a chance for adulterating meat: yes/ no

If yes, how, explain:

C. Questionnaire for vegetarians

Do you consume meat?

Why you do not consume meat:

It is sin to kill the animals
I don't like meat
Others

Have you seen carcass hanging in the meat shop?

What problem do you feel while you see the carcass hanging in the meat shop:

Does any diseases spread through meat to man:

If yes what diseases:

What all problems you see in slaughtering the animals and disposing the slaughter wastes:

During the last 10 years are the problems associated with slaughtering of animals increasing:

In your opinion what the government should do in this matter:

D. Questionnaire for households around the slaughter places

Are animals slaughtered near your house: yes/ no

If yes, when was it started?

Do you purchase meat from this place: yes/ no

If no why:

Do you face any problem due to the animal slaughtering near by your house: yes/ no

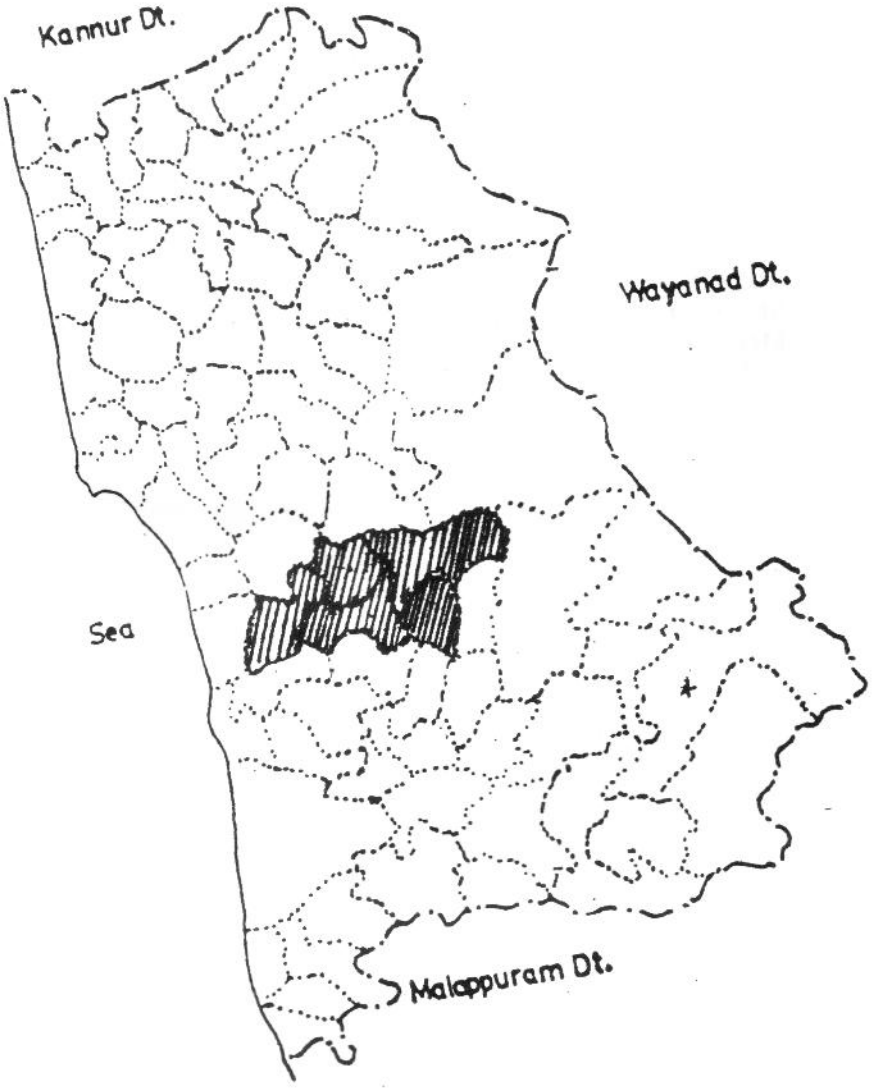
If yes, list the problems

Annexure 2

Map of Kerala showing the study district

Annexure 3

Map showing the study area in the district



Study area