AN ASSESMENT OF NATURAL AND SOCIO- ECONOMIC IMPACTS ON INDIGENEOUS CHICKEN PRODUCTION:-A CASE STUDY OF KATANGI AND IKOMBE DIVISIONS OF YATTA SUB COUNTY, MACHAKOS COUNTY

BY

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DECLARATION

I declare that this research thesis is my original work and has not been presented in part or whole for any academic award in any University.

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This thesis towards a Master of Science Degree in Agricultural Resource Management has been submitted with our approval as University supervisors.

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DEDICATION

This work has been dedicated to my beloved daughter Hilda Mwende, sons; Kelvin Mutombo and Charles Wambua as an encouragement in their future academic Endeavour's.

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I would like to pass my great indebtedness to those individuals and institutions who were involved directly or indirectly in this work so that my study came to success.

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ABSTRACT

The purpose of this study was to identify the natural and socio economic factors that affect indigenous chicken production and the level of their impact in Katangi and Ikombe divisions of Yatta sub county, Machakos County. The study therefore sought to establish why despite the Government, Non Governmental organizations and the communities spending a lot of resources in tackling food insecurity among the local communities through poultry keeping, there has been an increase in the number of persons suffering from hunger across the sub county. Data were collected using questionnaires as the main research instruments. The questionnaires were administered to 150 respondents composed of farmers, extension Officers and animal Health Officers. The study sought to identify the main chicken predators, diseases and pests and their impact on indigenous chicken production, to establish the level of gender influence on indigenous chicken production, determine the effects of household incomes on indigenous chicken production, and to determine the market and marketing challenges in Katangi and Ikombe divisions of Yatta sub county Machakos County. Data for this study was analyzed by both descriptive and inferential statistics. Under descriptive analysis, frequency distribution tables were constructed showing the categories, responses and percentages which were used in analyzing the data. Under inferential statistics, several hypothesis were formulated which were tested using Pearson's correlation coefficients to test the strength of the relationship between the independent and dependent variables, Chi- square test was used to test whether there was statistical independence between gender and poultry keeping. Pearson moment correlation was used to test the relationship between chicken production and household income . All the analyses were done using statistical package for social scientists (SPSS). The study established that the main challenges to poultry keeping were disease and predators. It was also revealed that 80% of the respondents use the indigenous technical knowledge (thereafter referred to as ITK) way of disease control while 20% used conventional methods. There was a strong negative relationship between diseases /predators and poultry keeping. It was also established that majority of poultry farmers in the rural areas were female. They also market the poultry. There is significant relationship between gender and chicken production. There is a significant relationship between chicken production and household income. That means poultry keeping is a significant economic activity in enhancing livelihood for the communities and food security. The study also revealed that the majority (50%) of the respondents keep chicken for sale while 12.5% and 7.5% were keeping chicken for eggs and meat respectively. This is the main economic activity for majority of the respondents. The study established that majority (60%) of poultry farmers were selling their poultry at the farm gate. 40% were selling at the local market. If these poultry were sold in the major markets and hotels they would earn more. The study recommendations are; The Government should increase the Animal Health personnel to assists poultry farmers on diseases and predators control. The chicken farmers should be advised on how to increase their level of production.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASALS	**Arid and Semi Arid Lands**
CFRS	**Confined full-ration system**
FAO	**Food and agriculture organization (of the UN)**
FRS	**Confined ration system**
IC	**Indigenous chicken**
KARI	**Kenya Agricultural Research Institute**
MOLD	**Ministry of livestock development**
SIS	**Semi-intensive system**
SPFS	**Special programme for food security**
SPSS	**Statistical Package for Social Sciences**
ITK	**Indigenous technical knowledge**

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

Over 70% (24 million) of the Kenyan population live and derive their livelihood from livestock related enterprises of which poultry is the most abundant type of livestock. Kenya has an estimated poultry population of 32 million birds (KNBS, 2009), 75% of which are indigenous chicken that are kept under a free range system in small flocks of less than 30 birds by over 90 % of the rural households. These birds are mostly owned and managed by resource poor farmers who are mainly women and children (Gichohi, 1992). But despite their numbers, indigenous chicken have low productivity and only contribute 60% and 50 % of the chicken meat and eggs respectively consumed in the country ((Njue *et al.,* 2001)). The low productivity has been attributed to among others frequent disease outbreaks, inadequate feed, cultural practices, low farmers' incomes, marketing constraints and housing (Njue *et al.,* 2001) associated with a lack of information, knowledge and skills in poultry production. Improvement in the agricultural output in rural areas could be greatly enhanced by the proper harnessing and utilization of local resources (Ndegwa et al., 2000)

Indigenous chicken are among the many local resources available in rural areas that, if well managed, could ease the poverty burden of the people (Mbugua, 1990). Reasons for keeping indigenous poultry are diverse but could be summarized to four major ones. These include a store of value for future monetary exchange (sell when there is need to solve household petty problems), for home consumption, for entertaining visitors and provision of gifts (gifts to wedding friends, to new born and to spouses in the event of successful delivery of a new born)

Further reasons for keeping indigenous chicken are nested within cultural systems that recognize indigenous chicken as major inputs to ethno-medicine. Families could improve their incomes and supply of chicken products (meat and eggs) by practicing a combination of chicken integrated management practices. These practices include feeding the birds with balanced diet, water in specific protective housing, proper breeding shortening the reproductive cycle, serial hatching, synchronized hatching, proper management of chicks and prevention of disease and pests (Ondwasy et al., 2006).

Chicken production may be broadly classified into subsistence and commercial levels based on the scale of operation, the way in which outputs are used and the level of management the chickens are given. Commercial production systems tend to be capital and labour intensive undertakings where exotic birds predominate (Kitalyi, 1998). The Indigenous chicken is managed under subsistence systems where they have shown not only a remarkable ability to perform, albeit poorly, under constant disease and parasite challenge, but also to sustain their populations through natural incubation (Kitalyi, 1998). These birds are mainly kept for dual purposes, producing both meat and eggs for the family (Horst, 1988). Typically, based on types and levels of inputs and the various outputs, three systems are identified under the subsistence production system:

i. Free-range system (FRS) or scavenging system where feed supplementation is not provided (Kitalyi, 1998). Both the chicks and mature chicken are left to forage within the homestead for whatever available feed resources. About 95% of indigenous chicken (There after referred to as IC) are raised under the FRS by rural smallholder farmers

(Tadelle et al., 2003).

ii. Semi-intensive system (SIS) or semi-scavenging system, where the chickens are confined part of the time, especially in relation to the prevailing activities in arable agriculture. They are provided with crop residues, grains and kitchen wastes to supplement their daily feed requirements (Gunaratne, 1998).

iii. Confined full-ration system (CFRS) or intensive system, where the flock is confined all the time and supplied with a balanced diet (Gunaratne, 1998). The Indigenous chicken under the FRS and SIS has limited foraging range, which keeps the feed resource base fixed. The implication is that the fixed-feed resource base results in a fixed carrying capacity, and thus extra chicken (biomass) above the carrying capacity cause a reduction in productivity (McArthur, 1987). In the FRS and SIS, the flock is usually not given any veterinary care (Gueye, 1998), except the use of herbal medicines (i.e. ethno-veterinary practices), which may not contribute significantly to costs of healthcare. In the CFRS, the flock is given prophylactic cover and vaccinated against endemic diseases (Gueye, 1998).

1.2 Problem statement

Indigenous chicken is an appropriate livestock for the rural farmers when viewed in terms of its scavenging for most of its nutritional requirements (Nzioka, 2000) and are hardy; well adapted to the arid and semi arid conditions and survive with minimal inputs and still produce (Ndegwa and Thompson1996). Chicken therefore can provide the much-needed source of protein for the vulnerable groups which include HIV infected persons, children and the old in the ASALS and at the same time generate income from sales of surplus birds and eggs (Tuitoek *et al.,* 1998). Despite this potential many households in the ASALS do not consider poultry farming important

and as such they do not keep chicken (Nzioka, 2000). Most farmers do not view poultry farming as a commercial undertaking and as such they practice it as a hobby in small scale and hence do not harness the commercial benefits associated with poultry farming. In addition, studies have documented various challenges hindering poultry farming which include predators, feeding, marketing and ecto-parasites (Danda *et al.,* 2010).To this end, the constraints affecting chicken production in ASALS and in particular Machakos County have not been studied. Therefore the research was carried out to determine the impact of natural, socio-economic factors on the level of indigenous chicken production.

1.3 General objective

The purpose of this study was to identify the natural and socio-economic factors that affect indigenous chicken production and the level(s) of their impact.

1.4 Specific Objectives of the study

(i) To identify the main predators, diseases and pests and their impact on indigenous chicken production in Katangi and Ikombe divisions of Yatta sub county Machakos County.

(ii) To determine the level of gender influence on indigenous chicken production in Katangi and Ikombe divisions of Yatta sub county Machakos County.

(iii) To determine the effects of household incomes on indigenous chicken production in Katangi and Ikombe divisions of Yatta sub county Machakos County.

(iv) To determine the market and marketing challenges in respect to demand for indigenous chicken products in Katangi and Ikombe divisions of Yatta sub county Machakos County.

1.5 Research questions

(i) What are the main predators, diseases and pests affecting indigenous chicken production in Katangi and Ikombe divisions of Yatta sub county Machakos County?

(ii) What are the effects of gender influence on indigenous chicken production in Katangi and Ikombe divisions of Yatta sub county Machakos County?

(iii) What are the effects of household income on indigenous chicken production Katangi and Ikombe divisions of Yatta sub county Machakos County?

(iv) What is the market demand for indigenous poultry and poultry products in Katangi and Ikombe divisions of Yatta sub county Machakos County?

1.5.1 Hypothesis for the study

This study shall be guided by the following hypothesis:-

i) H_0: There is no significant effect of diseases /predators on indigenous chicken production

ii) H_0: There is no significant effect of gender on indigenous chicken production.

iii) H_0: There is no significant effect of household income on indigenous chicken production.

1.6 Significance of the study

The research findings revealed major barriers of indigenous poultry production within the divisions and therefore the findings may be used to formulate policies by relevant implementing

agencies (policy makers and other stakeholders) to improve this enterprise with the eventual aim of improving livelihood in ASALS.

1.7 Scope

The study covered indigenous chicken only and all farmers keeping more than one chicken. All households in the study area were considered irrespective of income levels. The study was limited to Katangi and Ikombe divisions of Yatta sub- County.

1.8 Limitations

i. Uncooperative respondents

ii. Poor infrastructure in the Division interfered with distribution and collection of questionnaires.

1.9 Definition of terms

Gender	The level of involvement of men, women and the youth in production of indigenous chicken
Household income	Total earnings of a household from different economic activities the household members engage in.
Household:	Comprise a person or group of persons generally bound by ties of Kinship who live together under a single roof or within a single compound and who share community way of life in that they are answerable to the same head and share a common source of food.
Impacts	Factors that influence the level of indigenous chicken production .

Indigenous chicken	Chicken kept under free range system and scavenge with little subsidy from family food leftovers. Crossbreeds were also considered.
Natural factors	They included predators, diseases, and pests that affect IC production.
Poverty	The inability to meet the basic needs
Production system	The specified method and management practices applied in rearing chicken
Social economic factors	The human behavioral factors and all exchange transactions that affect the level of IC production

Indigenous Technical Knowledge (ITK) is the knowledge that a particular community acquired from their personal experience which they gain from ancestors over a long period of time.

Indigenous Knowledge (IK) is the local knowledge – knowledge that is unique to a given culture or society.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Types of indigenous chicken in Kenya

In most developing countries indigenous chicken populations are the result of uncontrolled cross breeding programmes between various lines of local and exotic breeds (Dare, 1977). Distinct indigenous chicken ecotypes have been identified and named in Cameroon, Egypt, Kenya, Morocco and Sudan (Dare, 1977). The names used to describe the common phenotypes in Kenya are-frizzled feathered, naked neck, barred feathered, feathered shanks, bearded, dwarf sized (Nyaga, 2007). The local ecotypes of the chickens vary in body size, conformation, plumage colour and performance. Kenyan indigenous chickens are a heterogeneous population with no standardized characteristics and performance. They vary in size, plumage colour, comb type and skin colour. Plumage colour varies widely with black, brown or red dominating. Rare colour patterns are light orange, yellow, grey and white laced and mottled (Ndirangu *et al*., 1991). There is also variation in comb type, length and colour of wattles, earlobes and beaks. The head appendages of cockerels are relatively large but those of the hens are small (Waliamson and Payne, 1990). Average comb length and height for cocks is 6.36 and 4.88 cm respectively as compared to 3.64 and 1.63 cm for hens (Ndirangu *et al*., 1991). Nearly all combs and wattles irrespective of plumage colour are red. A proportion of birds have wattles mottled red with white and black spots. Majority of indigenous chicken have red earlobes. Other earlobe colours include white and mottled red which occur in small proportions. The most common beak colour is black. Most birds have a cream skin colour although off white, yellow and red skin colours exist. Indigenous chicken feet and toes have a black or cream colour (Ndirangu *et al*., 1991). Cocks are

generally heavier than hens at maturity. Live weights of 2.6 kg and 1.8 kg for cocks and hens respectively were reported by Ndirangu *et al*. (1991) while naked-neck ecotypes are heavier than feathered chicken. A flock of indigenous chicken from KARI Naivasha under a deep litter floor system was classified based on live weight as heavy, medium and light. Cocks had an average live weight of 2.02, 1.77 and 1.33 kg while hens had a live weight of 1.84, 1.54 and 1.21 kg for each class respectively (Chemjor, 1998). At 25 weeks of age indigenous chickens under scavenging conditions are supplemented with 3.2 g Crude Protein per bird per day (CP/b/d) between 14-25 weeks of age had a live weight of 1.30 and 1.96 kg for hens and cocks, respectively (King'ori, 2004). Hens over 30 weeks of age had a live weight of 1.54 kg (King'ori, 2004). This is similar to Tanzanian indigenous chicken that have a mature live weight of 1.95 kg and 1.35 kg for cocks and hens respectively (Mwalusanya *et al*., 2001).

2.1.1 Uses of indigenous chicken

Indigenous chicken play a vital role in the human livelihoods and contribute significantly to food security of the rural communities as chicken products have no cultural or religious taboos (Tadelle *et al.*, 2003; Danda *et a*l., 2008) . Rural poultry is also an important element in diversifying agricultural production and increasing household food security. The chicken provides readily harvestable animal protein to rural households and In some parts of Africa chicken are raised to meet the obligation of hospitality to guests. Egg dishes and chicken meat cook faster than pulses and red meat, and therefore use less fuel wood. Chicken projects in Asia and Africa, are important diversification component in rural farming systems, particularly for women. Income accrued from the sale of eggs in a women's project in the Sudan was used to

purchase household consumable goods, thus increasing household welfare. Gittinger, Leslie and Hoisington (1987), in a survey on food production by women and its impact on food security, found that rural households that had cropping as their only source of food production were more food insecure than households that had livestock, including poultry. Similarly, Bembridge (1988), assessing the impact of a maize extension programme based on a survey of farmers' needs. Indicated that diversification including poultry would be beneficial to women.

The importance of household poultry in improving household food security and increasing household welfare has been reported in other regions. In India, Desai (1996) reported successful rural poultry projects involving women, that led to increased production and empowering of women through provision of training and credit. Similar projects have been reported in Thailand and Honduras (FAO, 1994; Bradley, 1996), as well as Bangladesh (Saleque and Mustafa, 1996). The importance of organizational and capacity building in enhancing increased rural women's poultry production featured highly in the projects in Asia and Latin America. The recent developments in the importance of poultry in household food security, especially for the poorer members of the community, including increased distribution of resources through involvement of women, have been appreciated globally. Household poultry has been included in the FAO Special Programme for Food Security (SPFS) (FAO, 1997b), endorsed in the Rome Declaration and World Food Summit Plan of Action in November 1996 (FAO, 1997a).

2.2The important predators, diseases and pests and their impact on indigenous chicken production

According to the World Health Organisation (WHO), at least 80% of people in developing countries depend largely on indigenous practices for the control and treatment of various diseases affecting both human beings and animals (chenge et al., 2014). It was not until recently that more attention was drawn to these practices. Increased attention on ethnoveterinary medicine (EVM) is justified because; it is accessible, easy to prepare and administer at little or no cost at all (Jabbar et al., 2005). These practices may be the only option in areas where conventional services are economically unavailable or cannot effectively reach the people (Mathias and McCorkle Dare, 1977, 2004). Many EVM practices do work and make sound veterinary sense (Schillhorn van Veen, 1996). Herbal medicines are known to be broad spectrum and therefore may be a future answer to pathogen resistance to conventional drugs (Mwale et al., 2005).

Diseases were ranked as the most important constraints in both villages. Predation was ranked second most important, while scarcity of feed came third in ranking. Other important constraints identified were theft, poor animal health service delivery, inadequate poultry management skills among farmers, poor housing, neglect by Government, poverty amongst farmers and farmers' low attitude. Newcastle was the most important disease in terms of prevalence and mortality. Gumboro disease ranked second, while Fowl pox ranked third most important. Fowl typhoid was ranked as the fourth most important disease. Other diseases were non-specific coughing, helminthosis and ascitis in that order (Olwande *et al.*, 2013) .

Most rural households in Africa and other continents keep poultry native to their areas, especially chickens. The major constraints in the production of poultry under rural settings include diseases, poor nutrition and predation (Guèye 1997; Mungube et al,. 2008). Rural farmers are aware of the need to keep their flocks in good health. However, conventional drugs are either unavailable or too expensive for these resource-poor farmers, hence their dependence on EVM. The use of herbs and other medicinal plants is an integral part of ethnoveterinary practices. It is interesting to note that a number of medicinal plants found in different countries are used to cure the same ailments in livestock.

2.3 Gender issues in poultry production

Despite all the regional differences in smallholder poultry production, one observation seems to remain the same, whether talking of smallholder households in Africa, Asia or Latin America – namely that the day-to-day management of poultry is undertaken by women, often with assistance from their children. Whereas men may assist in the construction of housing (night shelters for the animals) and in some localities in bringing birds and eggs to the market, women and children are, as a general rule, the ones who feed and water the birds, clean the housing and apply treatments (Ibrahim and Abdu, 1996; Rushton and Ngongi, 1998; FAO, 1998; Bravo-Baumann,2000; Gueye, 2000; Tadelle *et al.*, 2003; Tung, 2005; Mapiye and Sibanda, 2005; Mathias, 2006;). It should be noted, however, that according to ACI (2007) , and the more general observations of Mathias (2006), the division of labour tends to change when poultry production intensifies, i.e. when it moves from being a small-scale to a medium-scale. In such

cases, women's involvement decreases while that of men increases. Despite the typical division of tasks within smallholder households, which gives women the main responsibility for poultry-keeping activities, women are not necessarily endowed with complete ownership of the birds or with decision-making power regarding the use of the poultry products and income from sales. Different scenarios prevail in different parts of the world, depending on socio cultural norms and intra household relationship practices, i.e. whether husband and wife run one common enterprise or each their own separate enterprises. Whereas in some cases poultry ownership rights are clearly defined and the woman or the man – and sometimes even a child – is the entitled owner of some or all of the birds, in other cases the poultry belong to the household in general, meaning that final decision-making in relation to sales and consumption is likely to remain with the husband as he is the household head (FAO, 1998; Gueye, 2003a). Interestingly, ACI (2007) finds gendered differences in ownership and decision making patterns depend on the species in question; while Vietnamese women have the final say in relation to household chickens, their husbands decide about the ducks. The question of the distribution of ownership among household members has implications for the use of the poultry products and the income generated via their marketing (Bravo-Baumann, 2000). Moreover, women and men have different access to capital and other resources, and they act from different positions – as husbands and wives, parents, sons and daughters' in-law, etc. – depending also on their age and wealth status. All this affects their agricultural activities, including those of poultry keeping (FAO/IAEA, 2002; Mapiye and Sibanda, 2005;).

Ownership of rural poultry is shared among the family members but is predominantly by women (63%) and children (18%) (Okitoi *et al.*, 2007). Decision-making regarding selling, consumption, and gifts to guests in rural poultry in western Kenya is the responsibility of men. All family

members provided labour to a rural poultry production enterprise. Men and children mainly do construction of poultry sheds as women do cleaning, feeding and treatment of rural poultry. Women and children do most of the daily routines in rural poultry management. Men did occasional jobs that were cash requiring such as purchase of inputs and treatment of poultry using conventional drugs. Women do occasional sale of eggs. Women dominated the access and control of food and gifts to guests while men dominated cash and cultural benefits arising from poultry. Danda *et al.,* (2008) observed that there was change of ownership and control with increasing numbers of women to men. Ownership and control issues were also seen to be linked with cultural and religious systems.

2.4 Markets and marketing of indigenous chicken

In West Africa, chicken women farmers prefer marketing their chicken on their own if the local markets are not far from their village. When markets are within reach, the prices obtainable there are higher than those offered by the intermediaries who come to the village to buy birds (Thomsen, 2005; Riise *et al.*, 2007). At times, the price at the market can be twice that paid by the intermediaries (Thomsen, 2005; Riise *et al.*, 2007). Another reason for the women preferring to sell the birds on their own for East Africa (Ethiopia), is that by letting her husband take the birds to the market, the woman risks losing control over the spending of the money earned. Sometimes, however, women are left with no choice, and thus depend on intermediaries to take their birds and, occasionally, eggs to the market (Aklilu *et al,*. 2007). This may be the case, in Africa as well as in Asia, when markets are very far to be reached within a couple of hours on foot. Under these circumstances, the women prefer to stay at home to take care of household work, and therefore sell their birds to intermediaries passing through the village, albeit at a lower price (Gueye, 2003; Tung, 2005; Riise *et al.*, 2007; Aklilu *et al.*, 2007). Another reason for the

women not taking their birds to the market is that in some parts of Africa, as for example in northern Benin, northern Ethiopia and the United Republic of Tanzania, men dominate livestock markets. Therefore, as it is uncommon – or maybe even considered inappropriate – for women to go to the market to sell their poultry; instead they sell to the intermediaries or send their husbands to the market place (Aklilu *et al.*, 2007)

An economic analysis of the market channels and factors influencing indigenous chicken marketing in Kenya revealed that ,the main factors influencing middlemen's profit for sale of indigenous chicken included; age, gender, education, occupation, market type, number of birds and eggs sold, price per bird ,agent commission, transport cost , council charges (levies and cesses) cost of dead birds and treatment cost. Bett et al.,(2009) concluded that it was mainly men who were involved in marketing of indigenous chicken in major market outlets .The IC and its products were highly demanded by consumers and there demand needs were not adequately met This means that there is need to improve production and supply in order to meet this demand.

Market outlets for indigenous chicken follow respective demand profiles for the commodity along with various uses for indigenous chicken. Mapping of utilization patterns indicate that local (neighborhood) purchases and middlemen are the most significant market outlets (Danda *et al.,* 2008). The enterprise is characterized by 2 to 4 market players that include; the farmer, at least two middlemen and the final buyer. Pricing mechanism is on bargain basis for a willing buyer/seller. The prices are also based on size and condition of the birds. A crude hand – weighing estimation is often used by middlemen to exploit producers (Danda *et al*., 2008) . A study by (Bett *et al.,* 2009) found out that more men than women participated in marketing of indigenous chicken and eggs in the existing market both in rural and urban areas.

2.4.1Role of poultry in poverty reduction

Indigenous chickens are among the local assets of poor people living mainly in rural areas and who make up between 65 to 80% of total population in sub-Saharan Africa. Over 90 % of rural households keep and rear chicken in small flocks of about 30 birds (Gichohi, 1992). Not until quite recently, there hardly had been any meaningful investment in harnessing this valuable resource as means to alleviate poverty.

Productivity of these birds has therefore been discouragingly very low. Bearing in mind that indigenous chickens comprise close to 80% of total poultry population, ample investment in research and development in this sector then, is indeed a matter of great importance and for urgent consideration (FAO, 1996). There is also the emphasis on its potential in contributing to development of sustainable livelihoods and poverty eradication among the poor, often marginalized section of the population, majority of who are rural women.

In the classification of world livestock production systems, poultry systems are described under landless monogastric systems, where feed is introduced from outside the farm (FAO, 1996). Poultry production systems exclusively based on hybrid and high-production exotic breeds and high energy concentrate feeds are described by Sere, Steinfeld and Groenewold (FAO, 1996). Although the intensive poultry production systems can be found in rural areas of Africa, the most dominant production systems are the extensive systems that are based on the local indigenous type and on scavenging feeding systems. Intermediary or semi-intensive systems also referred to as backyard poultry, have developed recently with higher input and output.

The scavenging system dominates the rural poultry sector of most African countries, and the domestic fowl (*Gallus domesticus*) is the most common species. In this study, the term indigenous chicken is adopted from recent studies in rural poultry development, which differentiates the scavenging chickens from the intensive production systems. The term indigenous chicken best describes the scavenging chickens because of the effect of the village socio-economic and biophysical environment on the production and health status of the chicken. The human settlement pattern, communal housing of chickens, exchange of live chickens and chicken products affect production performance, breeding pattern and disease epidemiology.

Table 1: Characteristics of chicken production

Characteristic	Intensive	Semi-intensive	Scavenging
Breed and flock size	Specialized breeds 500–5 000	Specialized and dual-purpose breeds: 50–200	Local indigenous type: <50
Housing	Modern housing, generally with concrete walls and regulated internal environment	Varies from modern houses to simple housing made from locally available materials	Specific poultry houses are rare
Feed resource	Commercially compounded feeds	Commercially compounded, homemade mixtures and scavenging	Scavenging and occasional feeding with home grains and household refuse
Health programme	Standard and regular animal health programme	Disease control and health programme at varying levels	No regular health programme of disease control measures in place
Markets	Cold chain system for input-output distribution	Input and output distribution is based on existing trading centre's	No formal marketing channels
Infrastructure	Water, electricity and communication available	Modest infrastructure depending on proximity to urban centers	Underdeveloped infrastructure
Product storage and processing	Products refrigerated; dressed birds and table eggs refrigerated	Minimum refrigeration, occasional dressing of birds	No refrigeration, sales of live birds and eggs
Technology/information	Formal training, extension services available - information disseminated through producer and consumer associations	Moderate formal training and extension services	Local knowledge, with moderate or no extension services

Source: Aichi J,and Kitalyi, A (1998)

2.5 Theoretical frame work

The focus on gender is adopted in the study on the assumption that improving the village chicken production systems in rural Africa will result in increased opportunities and more equitable distribution of food and income within and among households in rural Africa. This school of thought is supported by the following facts about the production system:

i. The management of village chickens can easily be combined with other activities because of the proximity of the chickens to homesteads (Bradley, 1992);
ii. Chicken products are among the few agricultural products directly accessible to women in rural areas and increased food production from chickens improves household food security;
iii. Village chicken production is not strongly linked to land resource, which is one of the main production constraints among the disadvantaged members of the community.

For village chicken improvement programmes to have a positive impact on household economies and gender equity, women's concerns should be integrated in the programmes as a gender variable. This would require a more explicit understanding of gender issues in village chicken production systems through gender analysis

2.6 Conceptual framework

The main concept of the study is that indigenous chicken form the basis for increasing food production and income in the rural communities of Africa. The study aims at analyzing natural and socio economic factors that influence the level of IC within the study area.

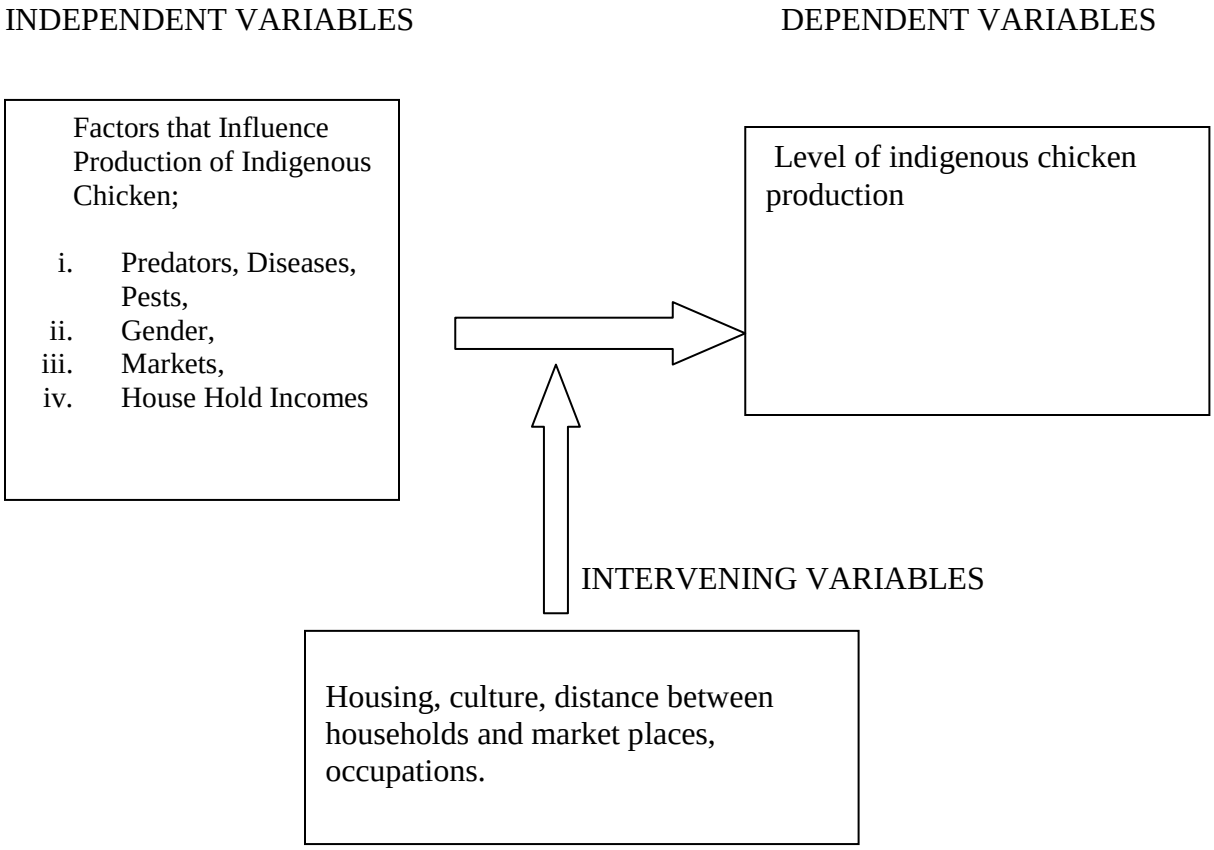


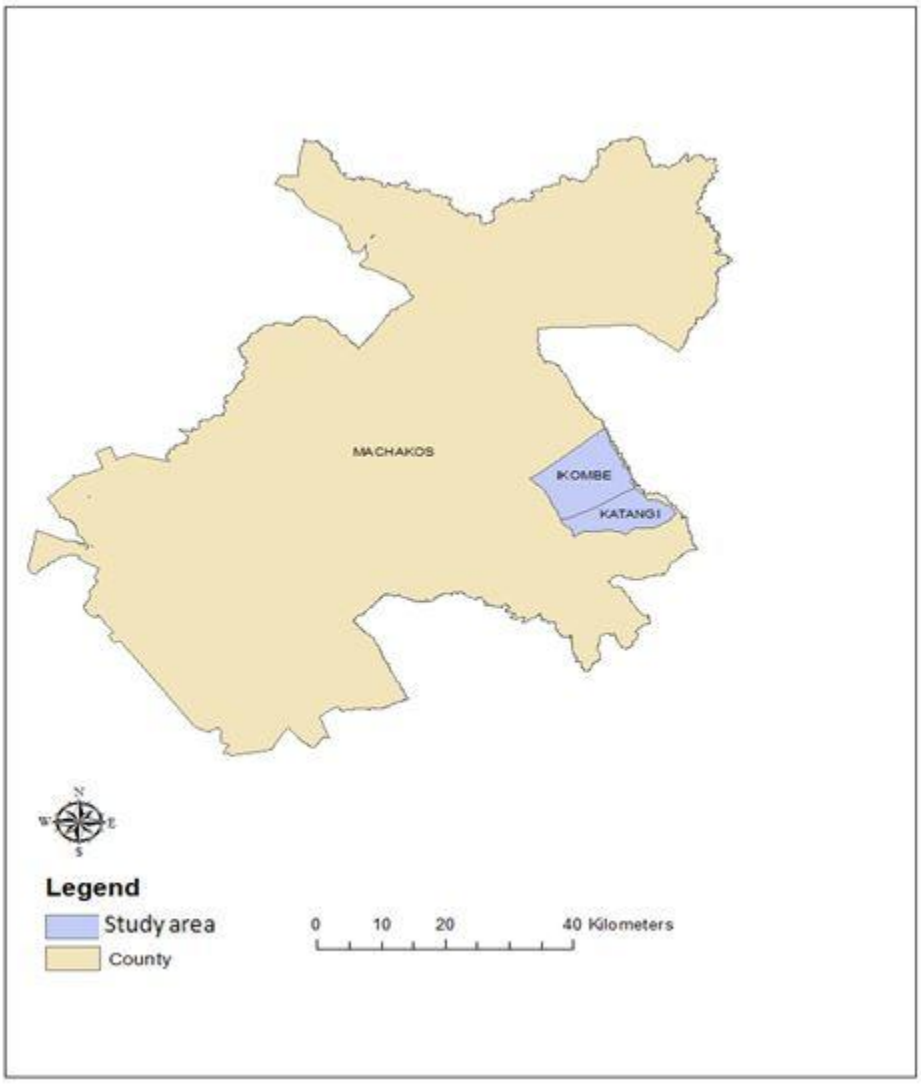
Figure 1: Conceptual framework

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study area

The study covered Katangi and Ikombe divisions of Yatta sub county in Machakos County. The main reasons for choosing these areas were that; first there was no documented information on chicken production in the area and secondly, the study aimed at seeking the main reasons as to why residents of katangi and Ikombe divisions were not taking advantage of this cheap and viable enterprise.



Fingure 2: A map of machakos county

3.2 Research Design

This study adopted a descriptive survey design which was chosen particularly since it is mainly looking at phenomena, events and issues the way things are (Mugenda, 2003). The descriptive survey design was also concerned with making accurate assessment of the inference, distribution and relationship of phenomenon (Edwards, 2006). In addition the design provided accurate descriptive analysis of characteristics of a sample which can be used to make inference about the population (Kerlinger, 1973).

3.3 Target Population

According to the ministry of agriculture Katangi and Ikombe divisions have a total of 9410 farm families and 15 active organized groups that keep indigenous birds .This study treated each farm family as a unit of sampling.

3.4 Sampling procedures and sample size

Simple random sampling was used to generate sample size required for the study. This method was preferred because it ensures that all members of a population have an equal chance of being selected for study (Mugenda and Mugenda, 1999). The study used a sample size of 150 farmers as supported by Kathuri and Pals (1993) who contends that a minimum sample of 100 is sufficient to infer the whole population. An extra number of 50 were necessary to cater for attrition. This gives a reasonable number from each location of the study.

3.5 Research Instrumentations

The research utilized both primary and secondary data. The secondary data was mainly obtained from existing documentary records from Ministry of Livestock Development at Katangi Division

headquarters. The primary data was collected through self administered questionnaires and oral interviews. The questionnaires and interview schedules were structured to solicit information regarding the socio- economic factors affecting poultry production.

3.6 Validity

The researcher proof read and requested friends to review the instrument to address aspects of validity including content, construct and face validity. The validation of the instrument is aimed at ensuring that the instrument measures what they were intended to measure (Kathuri et al., 1993).

3.7 Reliability

The instrument was pre-tested for its reliability with a sample of 20 poultry farmers and 2 extension workers. This was done in Kiusyani division, Kitui County that has similar characteristics to the study area. This is the smallest number that can yield meaningful results on data analysis in a survey research (Kathuri and Pals, 1993). Consistency of reliability alpha coefficient of 0.70 or more is acceptable (Fraenkel et al., 2000). Reliability alpha coefficient should be at least 0.70 or preferably higher for research purposes in social sciences. If reliability alpha coefficient is to be less than 0.7, revision of the instrument should be done accordingly. A high alpha coefficient (0.7 and above) implies that the items correlate highly among themselves, that is, there is consistency among the items in measuring the concept of interest (Fraenkel et al., 1990) at reliabity coefficient of 0.85

3.8 Data collection

The study employed self administered questionnaires with the help of enumerators. The leaders of organized groups were contacted in order to determine appropriate time for interviews and issuing of questionnaires. Indigenous chicken traders were randomly sampled at Katangi open Market and interviewed in order to obtain information regarding marketability of indigenous chicken.

CHAPTER FOUR

4.0 RESULTS AND DISCUSIONS

4.1 Introduction

The purpose of this study was to identify the natural and socio economic factors that affect indigenous chicken production and the level of their impact in Katangi and Ikombe divisions of Yatta sub county , Machakos County.

The study therefore sought to establish why despite the Government, Non-Governmental organizations and the communities spending a lot of resources in tackling food insecurity among the local communities through poultry keeping, there has been an increase in the number of persons suffering from hunger across the sub counties . Data were collected using the questionnaires as the main research instruments. The questionnaires were administered to 150 respondents composed of Farmers and Agricultural extension Officers. The study sought to identify the natural and socio-economic factors such as predators, diseases and pests and their impact on indigenous chicken production, to establish the level of gender influence on indigenous chicken production, to determine the effects of household incomes on indigenous chicken production, and to determine the market and marketing challenges in respect to demand for indigenous chicken products in Katangi, Kinyaata, and Ikombe divisions of Yatta sub county Machakos County.

Data for this study was analyzed using both descriptive and inferential statistics. Under descriptive analysis, frequency distribution tables were constructed showing the categories, responses and percentages which were used in analyzing the data. Under inferential statistics, several hypothesis were formulated which were tested using Pearson's correlation coefficients to test the strength of the relationship between the independent and dependent variables, Chi-

square test was used to test whether there was statistical independence between gender and poultry keeping generated and pearson correlation was used to show the correlation coefficient between diseases/predators and the level of poultry production. All the analysis was done using statistical package for social scientists (spss).

4.2 Demographic data of the respondents

All the 150 questionnaires for the study were returned hence obtaining enough data for analysis. Majority of the indigenous chicken farmers in Katangi and Ikombe divisions of Yatta sub county , were aged between 18 and 50 years (95%). Among these farmers, 55% are single while 50% are illiterate. Majority of the respondents had big families with 5- 8 family members. The major economic activity for the respondents was chicken production (57%).

Table 2: Distribution of respondents by academic qualifications

Category	Number	Percentage (%)
Illiterate	75	50%
Primary	40	27%
Secondary	23	15%
University/College	12	8%
TOTAL	**150**	**100%**

Table 3 Respondents family size

Family size	Number of households	Percentage
1- 4	40	27%
5-8	60	40%
over 9	50	33%
Total	**150**	**100%**

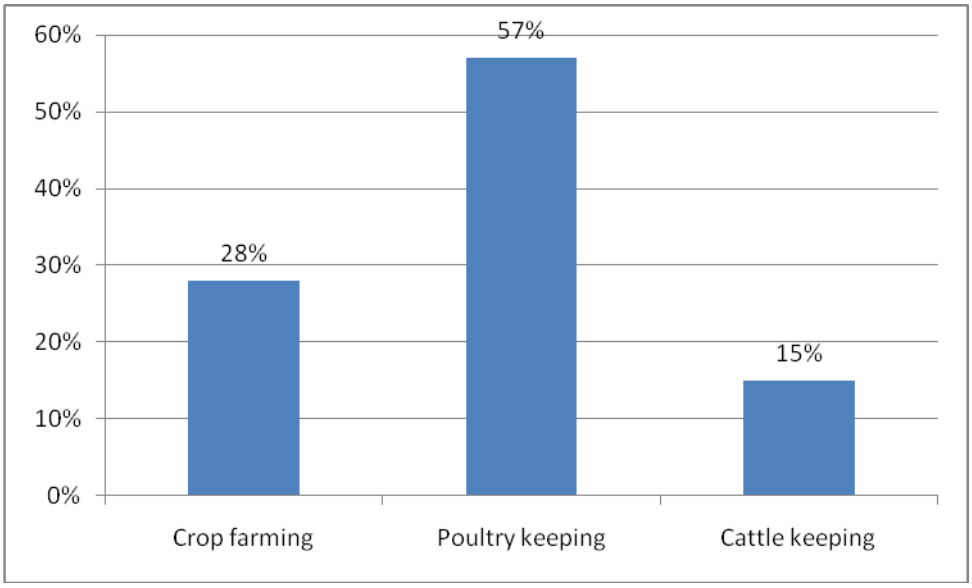


Figure 3: Primary economic activities of farming households

4.3 Predators, diseases and pests and indigenous chicken production

The study established that the main predators affecting indigenous chicken production in Katangi and Ikombe divisions of Yatta sub county , includes eagle, mongoose and hawks with eagles and mongoose being the most severe. On the other hand the main diseases and pests include Newcastle, chicken pox and Coccidiosis with the most severe disease being Coccidiosis (Table 4). These diseases seem to be a major challenge to the indigenous chicken producers. This agrees with Guèye (1997) and Mungube et al 2008), that the major constraints in the production of poultry under rural settings include diseases, poor nutrition and predation.

On disease control, the study established that to a great extent (87%) of the respondents used ITK method to control diseases and pests while only13% used the conventional control method. This agrees with the Jabbar et al.,(2005) who argued that at least 80% of people in developing

countries depend largely on indigenous practices for the control and treatment of various diseases affecting both human beings and animals.

There is a significant relationship (P = 0.084) between diseases/ predators and poultry keeping. The correlation coefficient between diseases/ predators and poultry keeping was r = -0.80 .This means that there is a strong negative relationship between diseases /predators and poultry keeping. This shows that when poultry diseases/ predators increase the level of production of indigenous poultry decrease. This agrees with (Ndegwa *et al.,* 2000) who argued that improvement in the agricultural output in rural areas could be greatly enhanced if diseases/predators were well controlled.

Table 4: Disease control methods

Responses	**Responses**	**Percentage (%)**
ITK	130	87%
Conventional	20	13%
Total	**150**	**100%**

Table 5: Ranking of chicken Disease according to their severity

order	**Newcastle**	**Chicken pox**	**Coccidiosis**
Most severe	56(37%)	5(3%)	120(80%)
Second	90(60%)	25(17)	30(20%)
third	4(3%)	120(80%)	0(0%)
total respondents	150(100%)	150(100%)	150(100%)

Table 6: Ranking of chicken predators according to their severity

order	**Eagles**	**Mongoose**	**Halks**
Most severe	130(87%)	120(80%)	10(7%)
Second	20(13%)	30(20%)	20(13%)
third	0(0%)	0(0%)	120(80%)
Total respondents	150(100%)	150(100%)	150(100%)

Table 7: Relationship between diseases / predators and indigenous chicken production

		Disease/ Predators	Poultry keeping
Diseases/ Predators	Pearson Correlation	1	-0.8
	Sig. (2-tailed)		0.084
	N	150	150

4.4: Level of gender influence on indigenous chicken production

There is a significant relationship ($p < 0.05$) between gender and poultry keeping with majority of the poultry farmers being the female (73%) as opposed to male (27%). Also the computed chi – square (χ^2) = 20.627 while the table value of $\chi^2 = 3.8414$ at $\alpha = 0.05$ and 2 - 1 =1 degree of freedom. This shows $\chi^{2\ computed}$ (20. 627) is greater than (>) 3.8414 (χ^2 from the table) implying that there is a strong association between gender and poultry keeping (Table 8). This agrees with Ibrahim and Abdu (1996) who argued that, whereas men may assist in the construction of housing (night shelters for the animals) and in some localities in bringing birds and eggs to the market, women and children are, as a general rule, the ones who feed and water the birds, clean the housing and apply treatments.

It should be noted, however, that according to ACI (2007) , and the more general observations of Mathias (2006), the division of labour tends to change when poultry production intensifies, i.e. when it moves from being a small-scale to a medium-scale. In such cases, women's involvement decreases while that of men increases. Despite the typical division of tasks within smallholder households, which gives women the main responsibility for poultry-keeping activities, women are not necessarily endowed with complete ownership of the birds or with decision-making power regarding the use of the poultry products and income from sales. Different scenarios

prevail in different parts of the world, depending on socio cultural norms and intra household relationship practices, i.e. whether husband and wife run one common enterprise or each their own separate enterprises.

Table 8: Contingence table of poultry keeping and gender

	Keep poultry	Don't keep poultry	Total
Female	56	24	**80**
Male	20	50	**70**
Total	**76**	**74**	**150**

Table 9: Chi- square (χ^2) for poultry keeping and gender

O	E	O - E	$\frac{(O-E)^2}{E}$
56	40	-6	0.9
24	39	15	5.7692
20	35	15	6.4286
50	34	16	7.5294
			$\sum \frac{(O-E)^2}{E} = 20.627$

4.5 Effects of household incomes on indigenous chicken production

The study established that there is a strong positive correlation (r = 0.86) between household income and production of indigenous chicken (Table 10). This implies that the more income a household has the more poultry they keep, and the less income a household has the less the poultry kept. The relationship between household income and production of indigenous chicken is significant ($p < 0.05$) r=0.86. This is because the amount of household income affected the number of chicken kept, method of controlling diseases and pests, and the marketing strategy significantly. This agrees with Guèye (1997) and Mungube et al (2008) who argued that the major constraints in the production of poultry under rural settings is the income to control diseases, poor nutrition and predation. Further they argued that although rural farmers are aware of the need to keep their flocks in good health, conventional drugs are either unavailable or too expensive for these resource-poor farmers, hence their dependence on ITK. The use of herbs and other medicinal plants is an integral part of ethno-veterinary practices. It is interesting to note

that a number of medicinal plants found in different countries are used to cure the same ailments in livestock.

The main sources of income reported by the respondents were sale of indigenous chicken, employment, sale of food crops and sale of other livestock. Most of the respondents (47%) earned between Kshs. 6,000 and 9,000 per year from the poultry with 8.3% earning above Kshs 20,000 per year. The income from other sources includes salaries and wages with a majority of 67% earning Kshs. 6,000 – 9,000 per year. Also some 57% of the farmers earned Kshs. 6,000 – 9,000 per year from the sale of food crops. The income from the sale of poultry was significantly higher than the other income sources (Table 11).

Table 10: Relationship between household income and indigenous chicken production

		Household income	chicken production
Household income	Pearson Correlation	1	0.86
	Sig. (2-tailed)		0.002
	N	150	150
Poultry keeping	Pearson Correlation	0.86	1
	Sig. (2-tailed)	0.002	
	N	150	150

Table 11: Sources of household income

Income in Kshs per year	Employment	Sale of Poultry	Sale of Food crops	Sale of other livestock
1,000-5,000	12.5%	8.3%	29%	40%
6,000-9,000	67%	47%	57%	37%
10,000 -15,000	20.5%	29%	14%	23%
16,000 -20,000	0%	7.5%	0%	0%
Above 20,000	0%	8.3%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**

4.6 The marketing challenges for indigenous chicken and their products

The reasons for keeping indigenous poultry in Katangi and Ikombe divisions of Yatta sub county , includes meat, eggs and selling. There is a significant difference ($p < 0.05$) between the reasons for keeping poultry with selling at the farm gate leading with 80%. The poultry mostly sold includes hens and cocks. Marketing was done either at the farm gate, local markets and hotels/shops. There was a significant difference ($P < 0.05$) between the market strategies with farm gate selling leading with 60% for hens and 57% for cocks. This agrees with the mapping of utilization patterns by Danda *et al., (*2008) which indicate that local (neighborhood) purchases and middlemen are the most significant market outlets. The enterprise is characterized by 2 to 4 market players that include; the farmer, at least two middlemen and the final buyer. Pricing mechanism is on bargain basis for a willing buyer/seller. The prices are also based on size and condition of the birds. A crude hand –weighing estimation is often used by middlemen to exploit

producers (Danda *et al*., 2008). A study by (Bett *et al.*, 2009) found out that more men than women participated in marketing of indigenous chicken and eggs in the existing market both in rural and urban areas.

The study also established that majority of the respondents were keeping poultry for sale with a few keeping for meat and eggs. There is a significant relationship ($p \geq 0.05$) between poultry keeping and household income. This was also advocated by Danda *et a*l., (2008) who argued that indigenous chicken play a vital role in the human livelihoods and contribute significantly to food security of the rural communities as chicken products have no cultural or religious taboos. Therefore rural poultry is an important element in diversifying agricultural production and increasing household food security. The chicken provides readily harvestable animal protein to rural households and in some parts of Africa is raised to meet the obligation of hospitality to guests. Egg dishes and chicken meat cook faster than pulses and red meat, and therefore use less fuel wood. In the same review, citing poultry projects in Asia and Africa, the authors highlighted the importance of chicken as a diversification component in rural farming systems, particularly for women. Income accrued from the sale of eggs in a women's project in the Sudan was used to purchase household consumable goods, thus increasing household welfare. Gittinger, Leslie and Hoisington (1987), in a survey on food production by women and its impact on food security, found that rural households that had cropping as their only source of food production were more food insecure than households that had livestock, including poultry. Similarly, Bembridge (1988), assessing the impact of a maize extension programme based on a survey of farmers' needs indicated that diversification including poultry would be beneficial to women. Farmers who did not access extension services outnumbered those who accessed the services i.e. 60% and 40% respectively (Table 14) .This could be one of the factors contributing to low chicken

production in the area .Majority of the farmers (80%) did not access loan facilities, a factor that could be attributed to the high levels of illiteracy as revealed earlier on and lack of extension services.

Table 12: Reasons for keeping indigenous chicken

Reason	Responses	Percentages
Meat for h/hold use	**18**	**12.5 %**
Eggs for h/hold use	**12**	**7.5 %**
Chicken for sale	**120**	**80 %**
total	**150**	**100 %**

Table 13: chicken sold in the last three months

Market	**Percentage Hens sold**	**Percentage Cocks sold**
Farm gate	60%	57%
Local markets	27%	23%
Hotel/shops	13%	20%
Total	**100%**	**100%**

Table 14: Extension services

Category	**Responses**	**Percentage**
Access	60	40.0
No access	90	60.0
Total	**150**	**100.0**

Table 15: Access to loan facilities

Category	Responses	Percentage
Access	30	20.0
No access	120	80.0
Total	**150**	**100.0**

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 **Conclusions**

The following conclusions were drawn from the study:

1. The study established that the main challenge to poultry keeping is Coccidiosis disease caused by a bacteria *eimeriaacervulina* and eagles that prey on the chicken.

2. 20% of the respondents were using the conventional way of disease control while 80% are using ITK. ITK is readily available, cheap, effective and acceptable. Conflicts table 4; which is which?

3. There was a strong negative relationship between diseases /predators and poultry keeping.

4. Majority of poultry farmers in the rural areas were females. These are the same people who were marketing the poultry. There is significant relationship between gender and poultry keeping.

5. There is a strong positive correlation (r=0.86) at (P = 0.002) between household income and production of indigenous chicken (Table 4.8). The household income affected the number of chicken kept, method of controlling diseases and pests, and the marketing strategy significantly.

6. Majority (50%) of the respondents were keeping poultry for sale while 12.5% and 7.5% were keeping poultry for eggs and meat for household consumption respectively.

7. Majority of poultry farmers were selling their poultry at the farm gate which might have not earned them enough income hence a great need for market expansion. If these poultry were sold in the major markets and hotels they would earn more.

5.2 Recommendations.

Based on the above findings the researcher wishes to make the following recommendation:-

(i) The farmers should be trained and encouraged on use of ITK as a cheap method of controlling diseases..

(ii) The low levels of household income significantly affect the level of chicken production and therefore the Government and other interested organization could sensitize farmers on the need for credit inorder to boost their capital base..

(iii)The ministry of agriculture should encouragethe male poultry farmers to improve their involvement in chicken production since it is an equal opputunity of earning income

5.3 Suggestions for further research

This investigated the natural and socio- economic factors that affect indigenous chicken production and the level of their impact in in Katangi and Ikombe divisions of Yatta sub county , Machakos County. Further research can be done on:-

i) The factors influencing the choice of poultry diseases and predators control methods.

ii) Factors influencing female participation in poultry keeping.

iii) The effect of poultry keeping on family income.

iv) Factors influencing the marketing strategies of indigenous poultry keeping.

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APPENDIX: SURVEY QUESTIONNAIRE

1. Date of the interview----------Questionnaire No ----------

2. Name of enumerator----------

3. Name of respondent----------

4. Relationship of respondent to household head----------

5. Division----------Location----------

6. Sub-Location----------Village----------

7. Age ----------Tel/Mobile No----------

8. Gender: Male / Female

9. Marital status Married / Single

10. Education level of respondent (a) None (b) Primary (c) Secondary (d) Tertiary

11. Number of dependents in the family----------

12. What is your primary occupation? ----------

13. What is the total size of your land? ----------Acres----------

14. What are the major activities on the farm?

i) ---------- ii) ----------

iii) ---------- iv) ----------

15. What is the type and number of livestock did you keep in the last one year?

Type of Livestock	**Breed**	**Number**	**Value in Kshs.**
Cattle			
Goats			
Sheep			
Poultry			
Donkey			
Others (specify)			

16. Did you belong to a community group in the last one year? Yes/ No

17. If yes, name of the group----------

18. What are the main activities of the group in the last one year?

    i) ---------- ii) ---------- iii) ----------

19. When did you start chicken production? (Year)----------

20. How many indigenous chicken did you have in the last one year? ----------

21. What type(s) of chicken did you have in this period?

Type of chicken	**Number**
Indigenous chicken	
exotic	

22. Why did you prefer this type of chicken?

Type of chicken	**Reasons for choosing type of chicken**
indigenous	i) ii) iii) iv) v)
exotic	i) ii) iii) iv) v)

24. Indicate the estimated amount of income of the household from the following sources

Source of income	Amount in KSH per month
Salaries & wages	
Sale of livestock	
Sale of crop produce	
Others (specify)	

25. Is there any taboo/regulation concerning the raising, consumption and sale of

Poultry which has special feature? 1. Yes 2.No

If yes,

i. What type of taboo/regulation is this? ----------

ii. To which type of birds this taboo/regulation applies----------

iii To which category of people this taboo/regulation applies----------

26 Do you practice supplementary feeding of your chicken? Yes----------No---------

27. If your answer to question 26 is yes, when do you usually offer the supplement?

(a) In the morning before they go out for scavenging

(b) In the evening after scavenging (c) In the afternoon while scavenging

(d) Any time during day times (e) others, specify----------

28. What are your reasons for keeping chicken?

(a) Meat (b) eggs (C) both meat and eggs (d) for selling

29 Indicate the member of the household who perform the roles under the table below

	Women	**Men**	**Children**	**Family**
Ownership				
Labour profile				
Shelter construction				
Cleaning chicken house				
Supplementary feeding				

Providing water				
Selling chicken				
Treatment				
Decision making				
Selling eggs				
Selling chicken				
Home consumption of eggs				
Home consumption of chicken				
Purchase of drugs				

30 Have you sold chicken in the last three months? (Tick where appropriate)

YES	NO

31. If yes where and how many did you sell? (Give numbers in the table below)

	CHICKS	GROWERS	HENS	COCKS
FARM GATE				
LOCAL MARKETS				
HOTEL/SHOP				
OTHERS SPECIFY				

32. At what price on average did you sell your chicken in the last three months at the indicated outlets? (Record prices for various classes of chicken on table below)

	CHICKS	GROWERS	HENS	COCKS
FARM GATE				
LOCAL MARKETS				

HOTEL/SHOP				
OTHERS SPECIFY				

33. Do you have a contract (written or verbal) with a buyer for your chicken and/or eggs? (Tick where appropriate)

YES	
NO	

34 Have you serviced this contract at any one particular time? (Tick where appropriate)

YES	
NO	

35 Do you maintain any written record from your poultry enterprise? (Ask to physically see these records and make a separate note describing them) (Tick where appropriate)

YES	
NO	

36 Flock dynamics (last 6 months)

	CHICKS	GROWERS	HENS	COCKS
SOLD				
DIED(DEASES)				
SLOUGTERED AT HOME				
EXCHANGED AS GIFTS				
OTHERS				

37 Are poultry diseases a challenge on your farm (Tick where appropriate)

YES	
NO	

38 If yes to Q37 list the 3 major diseases in order of priority (insert disease name)

	NAME OF THE DISEASE
MOST SEVERE	
2ND SEVERE	
3RD SEVERE	

39 Have you practiced disease control in the last 6 months? (Tick where appropriate0

YES	
NO	

40 If yes to Q39 above what method of disease control did you use? (Tick where appropriate)

CONVENTIONAL	
ITK	

41 Have you vaccinated your chicken in the last 6 months? (Tick where appropriate)

YES	
NO	

42 Are chicken predators a challenge in your farm? (Tick where appropriate)

YES	
NO	

43 If yes to Q42 list the three major predators in order of priority (insert predator name)

	NAME OF THE PREDATOR
MOST SEVERE	
2ND SEVERE	
3RD SEVERE	

44 Do you get extension services?

YES	
NO	

45 If yes to Q44 who provide the extension services

GOVERNMENT	
N.G.O.S	
PRIVATE COMPANIES	
OTHERS (specify)	

46 How often are these services?

WEEKLY	
MONTHLY	
OTHERS (specify)	

47 Which method do you use to hutch the eggs?

NATURAL(Birds sit on eggs)	
ARTIFICIAL(use of incubators)	
OTHERS(specify)	

48 what is the source of your chicks for replacement?

HUTCH IN THE FARM	
BUY FROM COMMERCIAL FIRMS	
OTHERS (specify)	

49 do you access financial credit? Yes/No

50 if yes indicate the financial institution

a) Commercial banks b) co-operative societies c) shylock d) micro finance institutions e)others specify

APPENDIX II

Coccidiosis, Upper Intestinal, E acervulina

Introduction

This is probably the commonest cause of coccidiosis in chickens and occurs worldwide. It is seen in layers and in broilers, both alone and in association with other species of coccidia and is caused by *Eimeriaacervulina*, which is moderately pathogenic. Morbidity is variable and mortality low or absent. *Eimeriamivati* is currently considered not to be a valid species distinct from *E. acervulina*.

Signs

- Depression.
- Ruffled feathers.
- Closed eyes.
- Inappetance.
- Poor production.
- Diarrhoea.
- Depigmentation.

Post-mortem lesions

- Thickening, and other lesions, restricted to upper third of small intestine - the duodenum and part of the ileum.
- Petechiae.
- White spots or bands in the mucosa. In severe infections they become confluent and cause sloughing of the mucosa.
- Poor absorption of nutrients/pigments.
- A system of assessing the severity of coccidial challenge by attributing a 'score' is often used. A detailed description is beyond the scope of this book. In general terms a score of

0 indicates no lesions and a score of 4 indicates maximal severity of lesion or death. Various publications provide a photographic key to severity of lesion.

Diagnosis

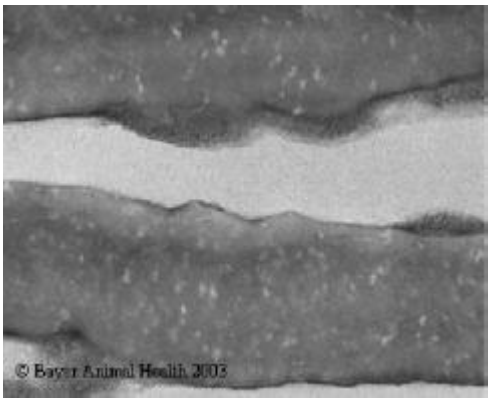
Signs, lesions, microscopic exam of scrapings. Differentiate from necrotic and non-specific enteritis.

Treatment

Toltrazuril, Sulphonamides, Amprolium, in feed or water.

Prevention

Coccidiostats in feed, vaccination by controlled exposure, hygiene. Immunity is quite short lived (about 30 days) in the absence of continued challenge.



Fowl Pox, Pox, Avian Pox

Introduction

A relatively slow-spreading viral disease characterised by skin lesions and/or plaques in the pharynx and affecting chickens, turkeys, pigeons and canaries worldwide. Morbidity is 10-95% and mortality usually low to moderate, 0-50%. Infection occurs through skin abrasions and bites, or by the respiratory route. It is transmitted by birds, fomites, and mosquitoes (infected for 6 weeks).

The virus persists in the environment for months. It is more common in males because of their tendency to fight and cause skin damage, and where there are biting insects. The duration of the disease is about 14 days on an individual bird basis.

Signs

- Warty, spreading eruptions and scabs on comb and wattles.
- Caseous deposits in mouth, throat and sometimes trachea.
- Depression.
- Inappetance.
- Poor growth.
- Poor egg production.

Post-mortem lesions

- Papules progressing to vesicles then pustules and scabs with distribution described above.
- Less commonly there may, in the diptheritic form, be caseous plaques in mouth, pharynx, trachea and/or nasal cavities.
- Microscopically - intra-cytoplasmic inclusions (Bollinger bodies) with elementary bodies (Borrel bodies).

Diagnosis

A presumptive diagnosis may be made on history, signs and post-mortem lesions. It is confirmed by IC inclusions in sections/ scrapings, reproduction in susceptible birds, isolation (pocks on CE CAM) with IC inclusions. DNA probes.

Differentiate from Trichomoniasis or physical damage to skin.

Treatment

None. Flocks and individuals still unaffected may be vaccinated, usually with chicken strain by wing web puncture. If there is evidence of secondary bacterial infection broad-spectrum antibiotics may be of some benefit.

Prevention

By vaccination (except canary).Chickens well before production. Turkeys by thigh-stick at 2-3 months, check take at 7-10 days post vaccination. There is good cross-immunity among the different viral strains.

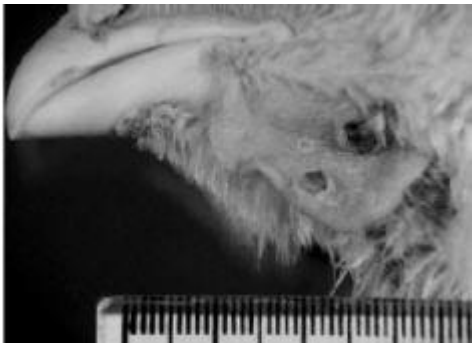


Figure 20. Fowl pox lesions o

Newcastle Disease (Paramyxovirus 1)

Introduction

Paramyxovirus 1 or Newcastle Disease is a highly contagious viral disease affecting poultry of all ages. Affected species include chickens, turkeys, pigeons and ducks. The condition is rarely diagnosed in ducks but is a possible cause of production drops/fertility problems. Other species can be infected including mammals occasionally (e.g. conjunctivitis in man).

The virus involved is Paramyxovirus PMV-1, which is of variable pathogenicity. Signs are typically of disease of the nervous, respiratory or reproductive systems. Morbidity is usually high and mortality varies 0-100%. Higher mortality is seen in velogenic disease in unvaccinated

stock.

Four manifestations have been identified:

- ND - VelogenicViscerotropic (VVND) - sometimes called 'asiatic' or exotic. It is highly virulent for chickens, less for turkeys and relatively apathogenic in psittacines.
- ND - Neurotropic Velogenic - Acute and fatal in chickens of any age causing neurological and some respiratory signs. Intestinal lesions are absent.
- ND - Mesogenic - Mortality and nervous signs in adult. These viruses have sometimes been used as vaccines in previously immunised birds.
- ND - Lentogenic - Mild disease, sometimes subclinical. Can affect any age. Strains can be developed as vaccines.

Transmission is via aerosols, birds, fomites, visitors and imported psittacines (often asymptomatic). It is not usually vertical (but chicks may become infected in hatcheries from contaminated shells).

The virus survives for long periods at ambient temperature, especially in faeces and can persist in houses (in faeces, dust etc). for up to 12 months. However it is quite sensitive to disinfectants, fumigants and sunlight. It is inactivated by temperatures of 56°C for 3 hours or 60°C for 30 min, acid pH, formalin and phenol, and is ether sensitive.

Signs

Signs are highly variable and will depend on the nature of the infecting virus (see above), the infective dose and the degree of immunity from previous exposure or vaccination.

- Sudden Death
- Depression.

- Inappetance.
- Coughing.
- Dyspnoea.
- Diarrhoea.
- Nervous signs.
- Paralysis.
- Twisted neck.
- Severe drop in egg production.
- Moult.

Post-mortem lesions

- Airsacculitis.
- Tracheitis.
- Necrotic plaques in proventriculus, intestine, caecal tonsil.
- Haemorrhage in proventriculus.
- Intestinal lesions primarily occur in the viscerotropic form.

Diagnosis

A presumptive diagnosis may be made on signs, post-mortem lesions, rising titre in serology. It is confirmed by isolation in CE, HA+, HI with ND serum or DID (less cross reactions), IFA. Cross-reactions have mainly been with PMV-3. Pathogenicity evaluated by Mean Death Time in embryos, intracerebral or IV pathogenicity in chicks. Samples - tracheal or cloacal.

Differentiate from Infectious bronchitis, laryngotracheitis, infectious coryza, avian influenza, EDS-76, haemorrhagic disease, encephalomyelitis, encephalomalacia, intoxications, middle ear infection/skull osteitis, pneumovirus infection.

Treatment

None, antibiotics to control secondary bacteria.

Prevention

Quarantine, biosecurity, all-in/all-out production, vaccination. It is common to monitor response to vaccination, especially in breeding birds by the use of routine serological monitoring. HI has been used extensively; Elisa is now also used. These tests do not directly evaluate mucosal immunity, however.

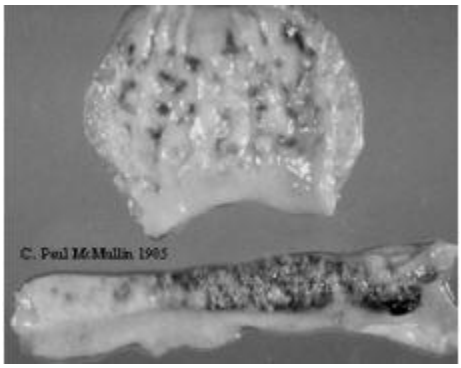


Figure 28. Severe haemorrhagic and necrotic lesions in proventriculus and Peyers patches in the intestines of a broiler chicken suffering from one of the severe forms of Newcastle disease (viscerotropicvelogenic).

Vaccination programmes should use vaccines of high potency, which are adequately stored and take into account the local conditions. A typical programme may involve Hitchner B1 vaccine at day old followed by LaSota-type vaccine at 14 days. The LaSota-type vaccine may even repeated at 35-40 days of age if risk is high. Use of spray application is recommended but it needs to be applied with care to achieve good protection with minimal reaction.

Inactivated vaccines have largely replaced the use of live vaccines in lay but they do not prevent local infections.

To prevent or reduce vaccinal reactions in young chicks it is important that day old have uniform titres of maternal immunity. Vaccinal reactions may present as conjunctivitis, snicking, and occasionally gasping due to a plug of pus in the lower trachea. In some countries it has been customary to provide antibiotics prophylactically during periods of anticipated vaccinal reaction. Use of *Mycoplasma gallisepticum* free stock under good management reduces the risk of vaccinal reactions.

Avian Influenza-Highly Pathogenic (HPAI), Fowl Plague

Introduction

One of only two 'Class A' diseases of poultry targeted for emergency disease control measures by OIE, the equivalent of the World Health Organisation for animal diseases. This viral disease can cause exceptionally high mortality, especially in turkeys. In addition official control measures disrupt trade in poultry products from affected areas. The cause is a virus, Orthomyxovirus type A, its pathogenicity is variable, and isolates are designated sero-type/ species/location/reference number/year/subtype designation(H/N). Highly pathogenic forms are usually of the H groups 5 and 7 and may now be identified (if H5 or H7) by the presence of a sequence at the haemagglutinin cleavage site that codes for multiple basic amino acids.

The definitive classification of high pathogenicity is an intravenous pathogenicity test (IVPI) in 6-week-old chickens result of greater than 1.2 . This is a test in which the virus is inoculated into susceptible chickens that are then kept under observation. The higher the proportion of the chickens dying or showing signs the higher the IVPI. The virus infects chickens, turkeys, ducks, partridges, pheasants, quail, pigeons, and ostriches. Effectively all birds are considered to be at risk of infection. Apathogenic and mildly pathogenic influenza A viruses occur worldwide.

Highly pathogenic avian influenza A (HPAI) viruses of the H5 and H7 HA subtypes have been isolated occasionally from free-living birds. Outbreaks due to HPAI were recorded in the Pennsylvania area, USA, in the years 1983-84. More recently outbreaks have occurred in Australia, Pakistan, Mexico and, from December 1999, in northern Italy. A serious outbreak occurred in The Netherlands in 2003 with a few linked cases in Belgium and one in Germany. H5 viruses of low pathogenicity may become highly pathogenic usually after circulating in poultry flocks for a time (Pennsylvania, Italy). Because of this, and the high mortality that 'low-path' AI can cause in turkeys, OIE and other bodies are currently examining ways to improve control of LPAI. See current OIE records for up to date information on distribution of HPAI. Morbidity is high but mortality usually relatively low, 5-50%.

The route of infection is probably oral initially, but possibly by the conjunctival or respiratory route and the incubation period is 3-5 days. Transmission is by direct contact with secretions

from infected birds, especially faeces, waterfowl, equipment, clothing, drinking water. The virus replicates mainly in respiratory tissues of chickens and turkeys but in the intestinal tract of clinically normal waterfowl. Avirulent in one species may be virulent in others. Broken contaminated eggs may infect chicks in the incubator simulating vertical transmission. The virus is moderately resistant, can survive 4 days in water at 22°C, over 30 days at 0°C. It is inactivated by a temperature of 56°C in 3 hours and 60°Cin 30 min, by acid pH, by oxidising agent and by formalin and iodine compounds. It can remain viable for long periods in tissues. Infections with other pathogens (e.g. *Pasteurella*) may increase mortality, even with 'low pathogenicity' strains.

Avian Influenza is a potential zoonosis. It can result in inapparent infection, conjunctivitis or severe pneumonia. The small number of human deaths associated with HPAI appear to have resulted from direct exposure to infected birds on farm or in markets.

Signs

- Sudden death.
- Marked loss of appetite, reduced feed consumption.
- Cessation of normal flock vocalisation.
- Drops in egg production.
- Depression.
- Coughing.
- Nasal and ocular discharge.
- Swollen face.
- Cyanosis of comb/wattles.
- Diarrhoea (often green).
- Nervous signs such as paralysis.

Post-mortem lesions

- Inflammation of sinuses, trachea, air sacs and conjunctiva.
- Ovarian regression or haemorrhage.
- Necrosis of skin of comb and wattles.

- Subcutaneous oedema of head and neck.
- Dehydration.
- Muscles congested.
- Haemorrhage in proventricular and gizzard mucosae and lymphoid tissue of intestinal tract.
- Turkey lesions tend to be less marked than those of chickens, while ducks may be symptomless, lesionless carriers of highly pathogenic virus.

Diagnosis

A presumptive diagnosis may be made on history and postmortem lesions. Confirmation is by viral isolation in chick embryo, HA+, NDV-, DID+. Commercial Elisa test kits are now available. However, as with many such tests occasional false positive reactions can occur. The agar gel precipitation test is non-group-specific and is used to confirm any positives. Differentiate from Newcastle disease, fowl cholera, infectious laryngotracheitis, other respiratory infections, bacterial sinusitis in ducks.

Treatment

None, but good husbandry, nutrition and antibiotics may reduce losses. Eradication by slaughter is usual in chickens and turkeys.

Prevention

Hygiene, quarantine, all-in/all-out production, etc.Minimise contact with wild birds, controlled marketing of recovered birds. Vaccination is not normally recommended because, although it may reduce losses initially, vaccinated birds may remain carriers if exposed to the infection. Vaccines have been used in recent outbreaks in Mexico and Pakistan. To be effective inactivated vaccines must be the right subtype for the particular situation (H5 will not protect against H7 and vice versa). In outbreaks a regime of slaughter, correct disposal of carcases, cleaning, disinfection, isolation, 21-day interval to re-stocking should be followed. Survivors can be expected to have a high degree of immunity but may harbour virulent virus.

Respiratory Adenovirus Infection, 'Mild Respiratory Disease'

Introduction

An adenovirus infection of chickens with a morbidity of 1-10% and a mortality of 1-10%; at least 12 sero-types have been described and these may be isolated from healthy chickens. Infected birds may remain carriers for a few weeks. Transmission may be vertical and lateral, and by fomites. The virus is generally resistant to disinfectants (ether, chloroform, pH), temperature, formaldehyde and iodides work better. Opinions vary as to whether adenovirus can be characterised as a primary respiratory pathogen. It may occur as an exacerbating factor in other types of respiratory disease.

Signs

- Mild snick and cough without mortality.

Post-mortem lesions

- Mild catarrhal tracheitis.

Diagnosis

History, lesions, intranuclear inclusions in liver. The virus grows well in tissue culture (CE kidney, CE liver).

Treatment

None.

Prevention

Quarantine and good sanitary precautions, prevention of immunosuppression.

Infectious Bronchitis, IB Egg-layers

Introduction

A Coronavirus infection of chickens, with much antigenic variation. The condition has a morbidity of 10-100% and mortality of 0-1%. Infection is via the conjunctiva or upper respiratory tract. There is rapid spread by contact, fomites or aerosol. A few birds are carriers up to 49 days post infection.

The virus is moderately resistant and may survive 4 weeks in premises. Poor ventilation and high density are predisposing factors.

Signs

- Drop in egg production (20-50%).
- Soft-shelled eggs.
- Rough shells.
- Loss of internal egg quality.
- Coughing, sneezing.
- Rales may or may not be present.

Post-mortem lesions

- Follicles flaccid.
- Yolk in peritoneal cavity (non-specific).

Diagnosis

3-5 passages in CE, HA-, typical lesions, FA. Serology: HI, SN, Elisa, DID. Differentiate from Egg Drop Syndrome, EDS76.

Treatment

Sodium salicylate 1gm/litre (acute phase) where permitted - antibiotics to control secondary colibacillosis (q.v.).

Prevention

Live vaccines of appropriate sero-type and attenuation, although reactions can occur depending on prior immunity, virulence, particle size (if sprayed) and general health status. Maternal immunity provides protection for 2-3 weeks. Humoral immunity appears 10-14 days post vaccination. Local immunity is the first line of defence. Cell-mediated immunity may also be important.

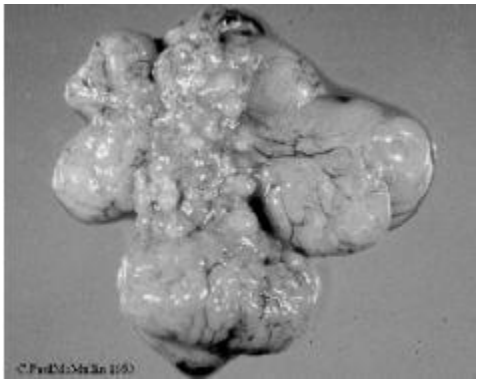


Figure 22. Flaccid ovarian follicles in a broiler parent chicken undergoing challenge with Infectious Bronchitis virus.

Infectious Bronchitis, IB

Introduction

This infection, probably the commonest respiratory disease of chickens, was first described in the USA (N. Dakota, 1931). Its affects vary with: the virulence of the virus; the age of the bird; prior vaccination; maternal immunity (young birds); and complicating infections (*Mycoplasma*,

E. coli, Newcastle disease).

Morbidity may vary 50-100% and mortality 0-25%, depending on secondary infections. The cause is a Coronavirus that is antigenically highly variable; new sero-types continue to emerge. About eight sero-groups are recognised by sero-neutralization. Typing by haemagglutination-inhibition is also used. These differences are due to structural differences in the spike proteins (S1 fraction).

Infection is via the conjunctiva or upper respiratory tract with an incubation period of 18-36 hours. The infection is highly contagious and spreads rapidly by contact, fomites or aerosol. Some birds/viral strains can be carriers to 1 year. The virus, which may survive 4 weeks in premises, is sensitive to solvents, heat (56°C for 15 mins), alkalis, disinfectants (Formal 1% for 3 mins). Poor ventilation and high density are predisposing factors.

Signs

- Depression.
- Huddling.
- Loss of appetite.
- Coughing, gasping, dyspnoea.
- Wet litter.
- Diarrhoea.
- Diuresis.

Post-mortem lesions

- Mild to moderate respiratory tract inflammation.
- Tracheal oedema.
- Tracheitis.
- Airsacculitis.
- Caseous plugs in bronchi.
- Kidneys and bronchi may be swollen and they and the ureters may have urates.

Diagnosis

Tentative diagnosis is based on clinical sgns, lesions and serology. Definitive diagnosis is based on viral isolation after 3-5 passages in chick embryo, HA negative, with typical lesions, flourescent antibody positive and ciliostasis in tracheal organ culture.

Serology: HI, Elisa (both group specific), SN (type specific), DID (poor sensitivity, short duration, group specific).

Differentiate from Newcastle disease (lentogenic and mesogenic forms), mycoplasmosis, vaccinal reactions, Avian Influenza and Laryngotracheitis.

Treatment

Sodium salicylate 1gm/litre (acute phase) where permitted - antibiotics to control secondary colibacillosis (q.v.).

Prevention

Live vaccines of appropriate sero-type and attenuation, possible reactions depending on virulence and particle size. Maternal immunity provides protection for 2-3 weeks. Humoral immunity appears 10-14 days post vaccination. Local immunity is first line of defence. Cell-mediated immunity may also be important.