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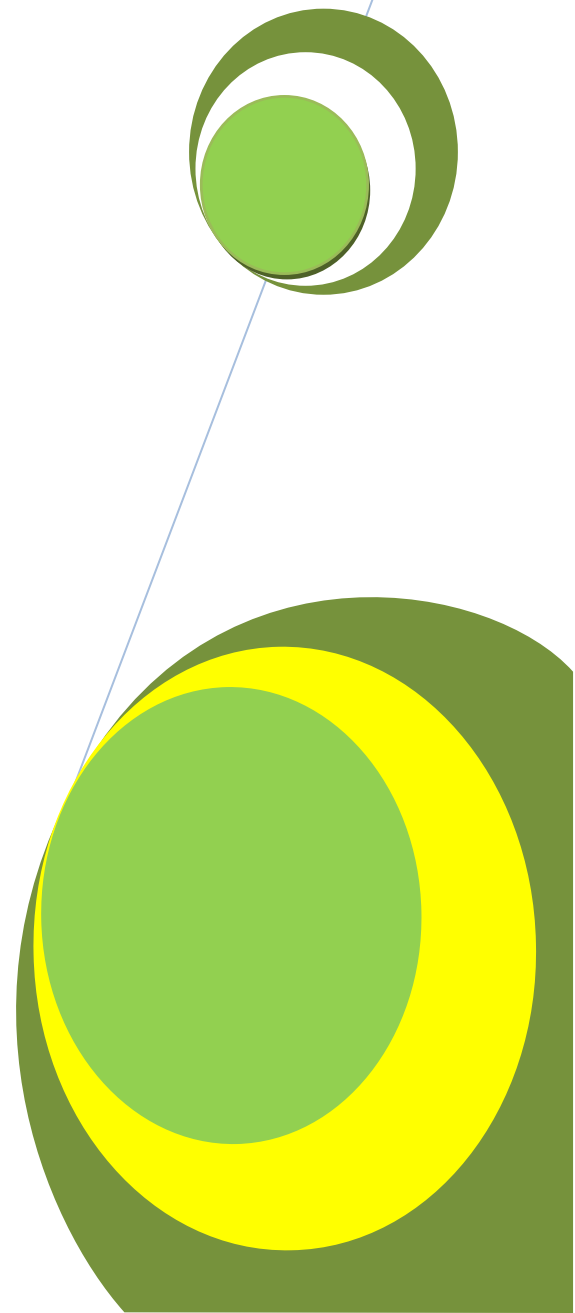
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Occurrence of *Cysticercus bovis* and *Faciola* species in Cattle Slaughtered at the Jos abattoir

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ABSTRACT

The study was conducted to investigate the prevalence of *Cysticercus bovis* in slaughtered cattle in Jos abattoir between 2007 and 2012 using the record in Jos abattoir, Plateau state, Nigeria. The objective of the study was to determine the prevalence of *Cysticercus bovis* in slaughtered cattle. A total of 2281 carcasses were examined during the period of the study. Record of various years was collected in the abattoir. The high prevalence of *Cysticercus bovis* was recorded in 2008(91.5%) followed by 2007(76.5%) and the lowest prevalence of 13.5% in 2010 and 2012. The major factors related to the high prevalence of *Cysticercus* are as a result of illiteracy, poor management system, lack of veterinary services and sanitary condition. the following percentage was recorded for the years 2008(91.5%) 2007(76.5%) 2011(6.5%) 2010(13.5%) and 2012(13.5%) the difference was statistically significant ($P > 0.05$) The result of this study have shown the existence of *Cysticercus bovis* in beef carcasses processed at the Jos abattoir which is a possible public health risk in the study area.

Keywords: *Cysticercus bovis*, *Faciola*, Cattle, Jos, abattoir.

INTRODUCTION

Tapeworms are intestinal parasite found all over the world, which have infected human beings for thousands of years. There are three identified species of *Taeniasis*, caused by *Taenia Saginata*, *T. solium* and *T. asiatica*. Both infestations are indirect, as human beings acquire them by ingesting beef or pork infected with parasites. Human beings are the definitive hosts and the cows and pigs are intermediate hosts (Assaya *et al.*, 2009, Abhay *et al.*, 2009, Walther and Koske 1980.). *Taeniasis* is the intestinal infection of humans with the adult stage of tapeworm of the genus *Taenia Saginata* known as beef tapeworm, beef is the main source of infection and it has a cosmopolitan distribution and it causes anorexia, loss of weight, abdominal pain and digestive upset (Beneson, 1990).

Bovine *Cysticercosis* is an infection caused by the larval stage, *Cysticercus bovis* of the human intestinal *Cestode*, *Taenia Saginata*. The parasite is universally distributed in developing as well as developed countries (Cabaret *et al.*, 2002, Abunna *et al.*, 2008) as per estimate, 50 million cases of such infestation occur worldwide with 50,000 people dying from this problem annually (Clifton and Atlanta, 2010, Duncan, 1984). *Bovine Cysticercosis*, refers to the infection of cattle with *Metacestode* of the tapeworm, *T. Saginata*. Mature tapeworm *Proglottids* typically contain thousands of eggs, which are passed in the feces of infected individuals and under unsanitary condition can lead to pasture or water contamination and infection of cattle ingestion egg develop into *Cysticerci*, which can be detected during meat inspection at the routinely inspected localization sites of parasite, including heart, skeletal muscles, diaphragm and esophagus (Cabaret *et al.*, 2002, Kebede, 2008).

Bovine Cysticercosis is common where hygienic conditions are poor and inhabitants traditionally eat raw or insufficiently cooked or sun-cured meat (Minozzo *et al.*, 2002, Nappi *et al.*, 2002). Inadequate health education and low availability of *Taeniocides* are the major obstacles for the control of such infection (Oladele *et al.*, 2009, Pawlowsky, 1969). Due to these reasons, *Taeniasis* is more common in developing countries where meat is an important component of human diet and traditionally it is consumed raw on several occasions. About 45 % meat consumption comes from cattle, but this is being affected due to various unimproved animal health problems, among which are *T. Saginata* / *C. bovis* (Castoldi, 1992).

The study will help determine the record of *Cysticercus* and other parasites in Jos abattoir of slaughtered cattle and tissues which are about to be sold for consumption. Economic significance of *Cysticercus bovis* on the

livestock industry will also be considered especially in developing countries that lead to downgrading and condemnation of the carcasses which lead to substantial loss in livestock industry.

GENERAL OUTLOOK

Researchers believe that about 2million years ago, African hominids (our early ancestors), who scavenged for food or preyed on antelope and other *bovids*, were exposed to tapeworm colonization (Duncan, 1984). These worms were using hyena and large cat as definitive hosts and *bovids* as intermediate hosts. These occurred before the origin of modern humans and substantially earlier than the domestication of swine and cattle and the development of agriculture. The conclusion was referred from an examination of host and parasites evolutionary histories and from evidence for the rate of molecular evolution between species of *Taenia* rather than humans acquiring *Taenia* from cattle and pigs, researchers believed man gave tapeworms to these domestic animals, since the association between *Taenia* and hominids was established before the domestication of these food animals. It was not until about 10,000 years ago, with the development of agriculture, that cattle, swine, and companion carnivores became intermediate hosts. DNA analysis of the worms also suggests that pre-humans acquire these tapeworms before cattle and swine (Warren and Kenneth, 1993). Although there are many species of worm parasites harbored in the gastrointestinal and respiratory tracts of cattle, only a few target species are clinically and economically important. These include the brown stomach worm *Ostertagia*, the coccidia *Eimeria bovis* and the lungworm *Dictyocaulus*. These are of great significance throughout the United States and worldwide, with *Ostertagia* considered the single most important parasite of cattle. And this is true for native Missourian cattle as well as for cattle imported into Missouri. *Taeniasis* and *Cysticercosis* is a disease resulting from an infection with parasitic tapeworms belonging to *Taenia* species. Approximately 45 species of *Taenia* have been identified; however, the two most commonly responsible for human infections are the pork tapeworm's *Taenia Solium* and the beef tapeworm's *Taenia Saginata* (Schantz,2002,Duncan,1992). Both species are worldwide in distribution approximately 100million cases of these cases are *T. Saginata* while the other 50 million are *T. Solium* related (Markell, *et al.*, 1999). *Taeniasis* is the intestinal infection of humans with the adult stage of tapeworm of the genus *Taenia* (Beneson, 1990). The occurrence of the larval of *Taenia Saginata* in cattle musculature causes *T. Saginata Cysticercosis* or *Bovine Cysticercosis*, while the adult worms in human small intestine causes *Taeniasis* (Pawlowski and Murrel,1990,Solusby, 1982). *Bovine Cysticercosis* (beef measles) is a *zoonotic* infection of socioeconomic importance caused by the Laval stage of *Taenia Saginata*, and intestinal *Cestodes* of humans that has cattle as intermediate hosts (Boone *et al.* 2007, Asaava *et al.*, 2009). Globally, there are 77 million human carriers of *Taenia Saginata* out of which 40% live in Africa (Megersa *et al.*, 2010). Cattle get measles from humans, or the occurrence of beef measles in cattle would be indicative of human health problems. In humans, the disease is characterized by lumps in muscles or brain depending on the type of *Taenia* causing the disease (Hall, 1994). Subsequent workers have assumed that the dissemination of the parasite occurs via the venous circulatory system (Temo,2001,Flatt *et al.*, 1975). Although *T. Saginata Cysticerci* have been shown to exist in the lymphatic vessels of the heart, skeletal muscles, and the liver (Sterba *et al.*, 1979). The actual contribution of the lymphatic circulation, if any, to the parasite's dissemination in cattle is not known. Supporting evidence for the involvement of the lymphatic system has also come from observation in other *Taenia* specie. For instance, *T. Pisiformis Oncospheres* were observed in the lymph node of a rabbit 30 days following oral inoculation with eggs (Flat and Muses, 1975).

PREVALENCE OF BOVINE CYSTICERCOSIS

In developing countries, *Taeniasis/Bovine Cysticercosis* constitutes a serious, but less recognized public health problem (Minozzo *et al.*, 2002). Due to the habit of eating raw or undercooked beef *Taeniasis* dishes such as in human is common. A high (89.41%) prevalence of human infection in different agro-climatic zones of the country has been reported (Tembo, 2001). Low availability of *Taenicides* is a constraint and the use of herbal drugs do not eliminate this parasite from human population and the *Proglotids* are passed out with the fecal matter resulting in *Cysticercosis* in the cattle (Shibru Tedda, 1986).

MODE OF TRANSMISSION

In humans, it is the ingestion of under-cooked beef (*T. Saginata*) containing the larval cyst. Intermediate host, such as cows and pigs, are infected with the tapeworm when they come in contact with the worm's eggs located in the feces of infected humans (Townes and knohn, 2004). Human *Cysticercosis* occurs when a person ingests *T.Saginata* eggs that are passed in the feces of a human tapeworm carrier. Tapeworm eggs are spread through food, water or surfaces contaminated with feces. This can happen by drinking contaminated water or food or by putting a contaminated finger into your mouth. Importantly a human tapeworm carrier can infect him or herself with

tapeworm eggs, resulting in *Cysticercosis* (autoinfection), and can contaminate others in the family (Clifton and Atlanta, 2010). In the central nervous system or the eye rather than when develop in voluntary muscles (Townes and Knohn, 2004).

PREVENTION, CONTROL AND TREATMENT

The most effective means of prevention is to ensure that meat is cooked thoroughly prior to consumption. Good hygiene and sanitation are highly effective in decreasing the risk of infection associated with fecal-oral transmission. The cause associated with chemotherapy and other medical resources, as well as losses in production enormous efforts to prevent and/or eliminate disease have been a primary concern for public health system in endemic countries for a long time. More recently, an increase in the number of imported *Cysticercosis* in developed countries has made the eradication of the disease a primary health concern worldwide (Gredagh *et al.*, 2011)

Improvement in sanitation and public health care is essential for preventing the further spread of the disease. Altering the infrastructure to keep cows from roaming freely and contacting human feces will help reduce human-cow-transmission. Effective measures to control and regulate meat inspection at slaughter houses has been extremely effective in Europe and North America, however programs to ensure proper compensation for the infected livestock must be developed in order to discourage the underground trafficking of livestock by local farmers in endemic regions.

Vaccines aimed at preventing infection in cows may play a role in efforts to control the spread of the disease. Due to their typical short life span (approximately one year). Cows do not require a long time immunity, therefore vaccines which provide only short term resistance may be sufficient to prevent the spread of infection to humans. Additionally, the vaccination, rather than the confiscations of cow is often a more favorable alternative to local farmers.

To date, the most effective vaccines have involved the expression of recombinant *Oncosphere* antigen TSOL18 and TSOL45 in *E. coli*, TSOL18 appears to be more effective, inducing greater than 99% protection in the vaccine trials undertaken this far. Current efforts are focused on developing the method necessary to make the vaccine widely available and successful on a practical scale. The use of recombinant vaccine in cows combined with anti *Cysticercal* chemotherapy in and appears to have potential to control and eradicate the disease (Gredagh *et al.*, 2011).

TREATMENT

Praziquantel and albandazole are the two anti *Cysticercal* drugs used to treat patients diagnosed with *Cysticercosis* in the brain and skeletal muscles. Treatment with praziquantel (50-100mg/kg/dx30d) and albandazole (400mg bid for 8-30d) has been shown to completely eliminate cysts in 80% of treated patients with an additional 10% of patients experiencing a significant reduction in the number of cysts present. Some investigations recommend 10mg/kg/d in 3 divided doses x1 day and then 50mg/kg/d in 3 doses for 29 days of praziquantel. Neither drug is toxic, however a percentage of patients undergoing therapy experience advance side effects such as headache, nausea, vomiting, dizziness and increased pressure on the brain. These effects are most likely a result of the host immune response resulting from the massive destruction of parasites and therefore, treatment with either praziquantel or albandazole is often administered concomitantly with corticosteroids in order to prevent excessive inflammation. Dexamethazone is the steroid most often administered in conjunction with either praziquantel or albandazole. Prednisone may be used as replacement in patients when long term therapy is required. Antiepileptic drugs may be necessary adjunct for treatment of seizures in patients being treated for *Neurocysticercosis*. Surgical removal of cyst from infected tissues is possible and, period to the development of *Anticysticercosis* drugs was the primary means of treatment. However, the invasiveness and high risk of complications associated with surgery makes this method less favorable for treatment with chemotherapeutic agent (*Nigatu*, 2004).

MATERIALS AND METHOD

STUDY AREA

The study was carried out in Jos south local government of Plateau state, the place from which the records were collected in the local government area is the Jos abattoir. Plateau derives its name from the landscape that predominates in this part of the country which is often referred to as "Jos-Plateau ". It is formed on the basement complex of rocks, which have produced the characteristic iceberg landscape. The plateau highlands stand on average height of 1200 meters above the sea level. The highland is slightly undulating and rises from the escarpment

of the river side plains of the river Benue. Located in the middle belt zone of the country, Jos, Plateau state is thus situated in the Northeast area of north central Nigeria. It lies between latitude 9°55'N and longitude 8°E of the mostly rocky formations. Its Temperate climate is nearly equivalent to the temperate climate in Europe and America. Temperature range from a maximum of 28°C, to 30°C, to a minimum of 11°C, the annual rainfall is about 150cm, the rain lasting between 6 and 7 months. The months of December through February are particularly cold due to the dry harmattan winds. These peculiar climates of Jos has endeared it to people of different ethno geographical cultures, so that the population of Jos and environs is an assemblage of good representative sample of Nigeria, and European population

METHOD OF DATA COLLECTION AND STATISTICAL ANALYSIS.

A record figure on report cases of cattle presented in the abattoir in files/registered in those seven years was summarized based on sex. The occurrences of the diseases were analyzed using simple percentage and Chi-square method.

The significant difference between the prevalence of the disease in the abattoir from (2007-2012) was determined using Chi-square.

The hypotheses to be tested are:

H₀; there is significant difference between the prevalence of the disease from 2007-2012.

H₁; there is significant difference between the prevalence of the disease from 2007-2012.

RESULT AND DISCUSSION

RESULT

Table 1: prevalence of *Cysticercosis bovis* in slaughtered cattle in Jos abattoir from 2007-2012.

Year	Number of carcasses examined	Number +ve	Number -ve	% +ve	% -ve
2007	239	153	86	64.0	36.0
2008	218	183	35	83.9	16.1
2009	102	62	40	60.8	40.2
2010	136	27	109	19.9	80.1
2011	129	33	96	25.6	74.4
2012	121	27	94	22.3	77.7

Significant differences exist in the prevalence of *Cysticercus bovis* ($X^2_{cal}=172.1, >X^2_{0.05}=11.7$).

The result in the table above shows prevalence of *Cysticercus bovis* for the following years 2007(76.50%), 2008(91.50%), 2009(31%), 2010(13.50%), 2011(16.50%), 2012(13.50%) and 2013(12.50%). In which there is high prevalence recorded in 2008 followed by 2007 and less in 2013 because the record was collected from January to July.

Table 2: To determine the prevalence of fasciola species in Slaughtered cattle in Jos abattoir from 2007-2012.

Year	Number of carcasses examined	Number +ve	Number -ve	% +ve	% -ve
2007	300	284	16	94.67	5.33
2008	275	250	25	90.91	9.09
2009	158	144	14	91.14	8.86
2010	213	188	25	88.26	11.73
2011	209	189	20	90.43	9.57
2012	181	170	11	93.92	6.08

Significant differences exist in the prevalence of *Cysticercus bovis* ($X^2_{cal}=67 >X^2_{0.05}=11.7$).

The result in the table above shows prevalence of *Fasciola* specie for the years as follows: 2007 (76.50%), 2008 (91.50%), 2009 (31%), 2010 (13.50%), 2011 (16.50%), 2012 (13.50%) and 2013 (12.50%). There was high prevalence recorded in 2008(91.50%) followed by 2007(76.50%) and the least was in 2013 because the record was collected from January to July.

DISCUSSION

This study was carried out to show the prevalence of *Cysticercus bovis* in slaughtered cattle in Jos abattoir. Records on *Cysticercus bovis* was collected from the abattoir for the period of 2007 – 2012. The result is shown as follows: 2007 (76.5%), 2008 (91.5%), 2009 (31%), 2010 (13.5%), 2011 (16.5%) and 2013 (12.5%) in which 2008 has the highest prevalence of *Cysticercus bovis*, followed by 2007. The incidence of *Cysticercus bovis* in 2008 can be attributed to the fact that cattle are highly susceptible to this parasite (Minozzo *et al.*, 2002). Out of the records collected, 2008 has the highest positive value of 91.5% parasite. We also collected records on parasite like *Fasciola* for a period of 2007 – 2012. The result shows as follows: 2007 (94.67%), 2008 (90.91%), 2009 (91.14%), 2010 (88.26%), 2011 (90.43%) and 2012(93.92%) in which 2007 has the highest prevalence of *fasciola*, followed by 2012.

The higher infection rate recorded in 2008 when compared to other years may not be unconnected with the higher number of cattle examined during this year. Meat inspection is a skill that improves with time following continuous practices. Also the higher infection rate observed in 2007 may be due to reason related to their large number inspected and possibly because they stayed longer in the herd.

This could also be due to the reason that cattle are raised under nomadic systems of management and also increase in the consuming pasture contaminated with faeces unlike what is commonly observed in sedentary systems where the cattle are confined within organized grazing areas.

The higher infection rate observed in *Fasciola* species in 2007 may be explained by the availability of grazing pasture that brings cattle together during grazing, thereby exposing them to the infection. Rainfall washes large land areas that might have been contaminated with human and animal waste to grazing land thus contaminating the grazing areas. This may be another possible explanation for the higher prevalence observed in 2007 and other periods of the rainy season. The prevalence noted can be attributed to insufficient veterinary surveillance.

CONCLUSION

This research work has shown the prevalence of *Cysticercus bovis* in cattle slaughtered in Jos South L.G.A of Plateau State. This was due to poor management system, lack of veterinary service and sanitary condition. Most of the farmers adopted extensive system in the management of cattle and no de-worming schedule. Public enlightenment in respect to the management, hygienic practices and de-worming of cattle should be intensified for improved production of cattle. Free veterinary examination and possible mass treatment of parasites in cattle should be entrenched and implemented/enforced in cattle management programmes.

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