INCIDENCE AND PREVALENCE OF PARASITES IN EXOTIC SUIS-LARGE WHITE (SUIDAE) SLAUGHTERED IN A TROPICAL URBAN ABATTOIR

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Abstract- Parasitic investigation was carried out to determine the incidence and prevalence of the parasites of exotic Suis (large white) slaughtered for meat in Nsukka, Nigeria. All the 180 large white examined were infected with either or both ecto- and endoparasites. The ectoparasites were Sarcoptes suis and Haematopinus suis and endoparasites were Strongyloides ransomi, Eimeria sp and Ascaris suum. Among the endoparasites, Eimeria sp. had the highest prevalence (51.70%), followed by S. ransomi (41.10 %) and A. suum (31.10 %). S. suis (35.50%) was more prevalent than H. suis (6.60%). Incidence of the endoparasites was high being 142.60% of S. ransomi, 1350% of Eimeria sp. and 104.30% of A. suum. Incidence of S. suis was 146.40% and that of H. suis was 38.7%. The prevalence of haemoparasites encountered during the survey were Trypanosoma brucei (10.00%) T. congolense, (13.30%) Babesia trautmanni (42.77%) and Babesia perroncticoi (33.89%) and the incidences of these parasites were 31.40, 45.00, 127.79 and 95.78%, respectively. Age groups 7-9 months were mostly affected by various ectoparasites except in the infection of H. suis which was recorded mostly in the young stock 4-6 months of age. Age groups 7-9 months were mostly affected by haemoparasites followed by above 9 months and lastly 4-6 months old pigs.

Keywords- Pig, Suis, Parasites, Haemoparasites, Prevalence, Incidence, Gender, Age

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Introduction
Incidence and prevalence of parasites in pigs have been studied in; Plateau and Rivers States, Nigeria [1], Jos, Nigeria [2-5], Ibadan, Nigeria [6,7], Owerri, Nigeria [8], Ghana [9], Botswana [10], Zimbabwe [11], Kenya [12], south Georgia, USA [13], Nordic countries [14] and China [15,16] among others. Suis generally are of religious, agricultural, pharmaceutical, industrial and medical uses for various products including insulin production, xenotransplantation, reservoir hosts to some human diseases (Balantidiasis, Cysticercosis and Trichinosis) and provision of meat, hair, blood, skin etc [4,5,17-19]. The importance of local pig breeds in the rural economy of Nigeria, which ranks them in number next to goats (excluding poultry) in the Western and Eastern States has been reported [17]. However, these local breeds have been gradually replaced by exotic breeds which receive relatively better care from farmers. In the Eastern part of Nigeria, inadequate information on the parasites associated with these exotic species as a template for piggery management, prevention of zoonoses and related general public health concerns exists. In this regard, some published works on both breeds in some parts of Nigeria have been recorded [1,6,7,17]. The present study was carried out to look at the prevalence and incidence of ecto- and endoparasites of slaughtered exotic pig breed (large white) in Ikpa Market abattoir, Nsukka.

Materials and Methods
Study area
Ikpa Market abattoir is located in Nsukka metropolis (6° 51″ 23′ N; 7° 23″ 44′ E), Enugu State, in southeast geopolitical zone of Nigeria. It is a centre of palm oil trade blessed with the first Nigerian University, the University of Nigeria, commercial banks, hospitals, schools and network of transportation and communication systems. The town has an estimated population of 167,086 and is blessed with beautiful vegetation dotted with several soft green hills and a cool temperate-like weather. Pigs are supplied to the market from the University piggery as well as small scale farmers in the city. Pork is the meat of choice during traditional festivals.

Sampling
One hundred and eighty (180) pigs slaughtered at Nsukka abattoir between 1st July and 31st August 2012 were all examined for ectoparasites, endoparasites and blood parasites. Sex and age differences in parasite distribution were noted. The intestinal and skin parasites were collected from three groups according to their ages [6,7]. Animals in Group I were between the ages of 4 and 6 months, Group II 6 to 9 months and Group III over 9 months. Age and sex were assessed on the basis of dentition and teat, respectively. Prior to slaughtering, external parts of each pig (ear, tail, trunk and limbs)
were examined for ectoparasites. Ectoparasites assayed were preserved in 2% formol-alcohol, examined under a stereo microscope and identified [20,21]. From each animal, thick and thin blood smears were made, fixed in methyl alcohol and stained in 10% Giemsa. Slides were observed at x100 magnification and blood parasites identified [6,7]. Fecal samples from all the pigs were examined for gastrointestinal helminths using filtration and sedimentation method. All recovered helminths were processed and identified [1,21-23]. Percentage incidence and prevalence were calculated using the following formulae: % Incidence = x/n x 100 (x is the number of pigs infected per given age or sex) and % Prevalence = y/n x 100 (y is the number of pigs infected and n is the total number of pigs sampled within the particular age or sex).

Results
Nine different parasites were recovered from the examined pigs. These included the ectoparasites: Sarcoptes suis and Haematopinus suis, and the endoparasites: Strongyloides ransomi, Eimeria sp and Ascaris suum. Haemoparasites recorded were Trypanosoma brucei, T. congolense, Babesia trautmanni and B. perniciosi. The overall incidence rate of endoparasites was characteristically high. Strongyloides ransomi had the highest incidence rate (142.60%) followed by Eimeria sp (104.30%) whereas Ascaris suum had the least (33.60%) [Table 1]. The age incidence of endoparasites indicated that 4-6 months old pigs had 100% S. suis incidence while 7-9 months pigs had 99.70% S. suis and above 9 months old pigs had 12.50% S. suis [Table 1]. Comparatively, H. suis incidences were low for all age groups being 30% in 4-6; 3.60% in 7-9 and 4.2% in above 9 months aged pigs. The overall age prevalence rate of endoparasites was higher for S. suis (35.50%) than H. suis (6.60%) [Table 1]. In all the age groups, S. suis was more prevalent than H. suis in all the age groups of pigs [Table 1].

The male pigs had higher incidence for A. suum (34.3%), while females had higher incidence of S. ransomi (40.9%) and Eimeria sp (33.60%). All the studied endoparasites were more prevalent in the female pigs thus; S. ransomi (25.00%), Eimeria sp (20.50%) and A. suum (15.50%) than in males pigs; S. ransomi (13.3%), A. suum (13.30%) and Eimeria sp (12.20%) [Table 2]. Furthermore, the gender incidence of ectoparasites showed that the female pigs had more S. suis (90.9%) than male pigs (42.3%). On the other hand, male pigs had more of H. suis (25.70%) than female pigs (9.10%). Similar patterns were demonstrated in the gender prevalence of these ectoparasites [Table 2]. Out of 180 large white pigs examined for parasites, 143 were infected. In all S. ransomi had the highest prevalence 20.4 % whereas H. suis (3.40%) had the least infection [Table 2].

Table 1 - Incidence and prevalence of endo- and ectoparasites by age of pigs slaughtered at Nsukka abattoir

| Age Group (Months) | No. | S. ransomi | A. suum | Prevalence of Parasites by Age of Pigs | S. suis | E. suis | H. suis |
|-------------------|-----|------------|---------|--------------------------------------|--------|--------|--------|
|                   | A   | Inc | Pre | B   | Inc | Pre | C   | Inc | Pre | D   | Inc | Pre | E   | Inc | Pre |
| 04-Jun            | 20  | 14  | 70  | 7.8 | 8   | 40  | 4.4 | 12  | 60  | 6.7 | 20  | 100 | 11.1 | 6   | 30  | 3.3 |
| 07-Sep            | 112 | 44  | 39.3| 24.4| 30  | 26.8| 16.7| 56  | 50  | 31.1| 38  | 33.9| 21.1 | 4   | 3.6 | 2.2 |
| Above 9           | 48  | 16  | 33.3| 8.9 | 18  | 37.5| 10  | 12  | 25  | 13.9| 6   | 12.5| 3.3  | 2   | 4.2 | 1.1 |
| Total             | 180 | 74  | 142.6| 41.1| 56  | 104.3| 31.1| 40  | 135 | 51.7| 64  | 146.4| 35.5| 12  | 38.7| 6.6 |

Key: A-E = number of pigs infected per parasite for a given age; Inc = % incidence

Table 2 - Incidence and prevalence of endo- and ectoparasites in relation to sex of pigs slaughtered in Nsukka abattoir between July and August, 2012

| Parasites         | Sex            | Male (n=70) | Female (n=110) | Total (n=180) | A          | Inc | Pre | B          | Inc | Pre | C          | Inc | Pre | E          | Inc | Pre |
|-------------------|----------------|------------|----------------|---------------|------------|-----|-----|------------|-----|-----|------------|-----|-----|------------|-----|-----|
| Endoparasites     |                |            |                |               |            |     |     |            |     |     |            |     |     |            |     |     |
| Strongyloides ransomi |               | 24        | 34.3           | 13.33         | 45         | 40.9| 25  | 69         | 75.2| 38.33|
| Ascaris suum      |                | 24        | 34.3           | 13.33         | 26         | 25.5| 15.56| 52         | 59.8| 28.89|
| Eimeria sp.       |                | 22        | 31.4           | 12.22         | 37         | 33.6| 20.56| 59         | 65  | 32.78|
| Ectoparasites     |                |            |                |               |            |     |     |            |     |     |            |     |     |            |     |     |
| Sarcoptes suis    |                | 52        | 42.3           | 28.9          | 100        | 90.9| 55.6| 152        | 133.2| 84.5 |
| Haematopinus suis |                | 18        | 25.7           | 10            | 10         | 9.1 | 5.6  | 28         | 34.8 | 15.6 |

Key: A-C = number of pigs infected per parasite for a given age; Inc = % incidence

The age incidence of haemoparasites indicated that B. trautmanni were more in the above 9 months pigs (45.83%), while B. perniciosi were more in the 7-9 months pigs (36.61%). Furthermore, the age incidence of haemoparasites equally indicated that T. brucei (12.50 %) was more in above 9 months pigs, while T. congolense (20.00%) was high in 4-6 months old pigs. T. congolense was more prevalent in age group 7-9 months pigs (7.80%) than in above 9 months pigs (3.30%) and 4-6 months pigs (2.20%) [Table 3].

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The points of attachments of the ectoparasites were alleged to be ulcerated; usually these points serve as entry points for bacteria and viruses. Also it affects the marketability of pigs and its acceptance as a source of protein. *Eimeria* sp is an intracellular coccidian parasite which causes coccidiosis i.e. harmful damage to the epithelial cells of pigs’ intestine [29,30]. Parasites have been associated with pigs in many parts of Nigeria and the world at large. Some of the studies showed similarities in the types of parasites recovered [1,7,25,31], high prevalence to infection [6,14,32] and intensity [10,11,16,33]. Generally in Nigerian piggery management systems, pigs are often semi-intensively managed and this dangerously exposes them to parasitic infections. Older pigs (above 9 months) were less infected than younger ones (4-7 months). This could arise from acquisition of immunity due pre-exposure to these parasites and molecular associations unlike younger ones during the course of their lives. Gastrointestinal parasites are acquired through trophic relationships as a result of poor environmental conditions [34].

For instance, *A. suum* is the most common parasite in modern piggy operations with approximately 70-80 % of pigs infected. A single female can lay up to one million eggs per day. These eggs can remain viable in the environment for up to thirty years. This parasite is also the largest one measuring in length more than eight inches during the adult form. The adult inhabits the small intestine where it swims against the flow of the intestinal contents. They sometimes migrate into the pigs’ stomach where they cause the host to vomit both the feed and worms. In the host intestine, these worms compete for nutrients which leads to diminished growth, disease and economic losses [25,35]. Due to lack of circular muscles in nematodes, conventional contraction and relaxation of muscles is not achieved so resultant thrusting movements of these worms cause damages to the internal organs. This causes white scar lesions which predispose the hosts to infectious agents such as mycoplasmal bacterial and viral infections.

**Discussion**

Although *Haematopinus suis* was recovered, the major haemoparasite that it transmits-*Eperythrozoon* sp was not found in the blood of the pigs.

The infection would spread if there is introduction of reservoir hosts by whatever means in Nsukka area. Age group 7-9 months was mostly affected by the various parasites except in the infection of *H. suis* which had most infection among those between 4-6 months. High prevalence of infection in all except in *H. suis* indicates poor environmental conditions and treatments. Most commercial and subsistence farms pay inadequate attention to hygiene. Obvious ulcerated skins should have been eliminated by applying drugs of choice and general treatments of the wounds to avoid probable secondary infection of bacteria, mycoplasmal and viruses [24,25].

Ectoparasites such as *H. suis* and *S. suis* among other things cause irritation and itching, making the animal restless and not feeding properly thus leading to weight loss [20,26]. Also, *T. brucei* and *T. congolense* which have been reported in pigs from other parts of Nigeria and African countries were found in Nsukka pigs because *paalpilis* group of *Glossina* i.e. *Glossina tachinoides* and *Glossina palpalis*, the usual vectors are found in Nsukka area [27]. Furthermore, earlier study from Nigeria had reported the prevalence of both *B. truattmanni* and *B. perroncitoi* in pigs [5]. The high prevalence of Babesia haemoparasites in this study is in agreement with Kahn [28] who reported that Babesia truattmanni has been recorded as causing severe disease in pigs in Europe and Africa. He further reported that another species Babesia perroncitoi is of similar pathogenicity but apparently has a limited distribution in areas mentioned above. The points of attachments of the ectoparasites were
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their pigs and maintain high management practices like raising pig in insect free/screen stall, regular veterinary screening of pigs for parasites and treatment of infected pigs. Furthermore, since this is of a public health concern, meat inspectors should ensure that infected pigs are not sold to consumers.

Author’s Contribution

JEE conceived the study and developed the study protocols. PCE, BCO, CIA and NI supported field operations and data collection. FNE, CDN and GCO performed literature search and data analysis. JEE and USO wrote the drafted the manuscript. The final manuscript has been read and approved for publication by all the authors.

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