Parasites Associated With Cyclorrhaphan Flies Caught in Selected Abattoirs in Awka North and Awka South Local Government Areas, Anambra State, South Eastern Nigeria

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Abstract-A study was conducted to determine the species of Cyclorrhaphan flies as carriers of parasites from Abattoirs in Awka (Kwatta) and Amansea (Chisom and Nwakanwa) from June to July 2016. A total of 184 flies, comprising of three species were collected and examined for parasites using the formal–ether concentration method. The fly species were *Chrysomya megacephala* 83(45.1%), *Lucilia cuprina* 62(33.7%) and *Musca domestica* 39(21.2%). Four intestinal helminthes, *Hookworm*ova 7(41.2%), *Ascaris lumbricoides* ova 4(23.6%), *Trichuris trichiura*ova 1(5.9%) and *Strongyloides stercoralis* larvae1(5.9%) and a protozoan parasite (*Entamoeba histolytica* cyst4(23.6%)), were isolated from the external body surfaces of the flies. Of these parasites, *Hookworm* was the dominant parasite detected. Among the flies, *M. domestica* was the highest carrier of the helminthes and protozoan parasites. Cyclorrhaphan flies especially the non-biting flies are mechanical transmitter of parasitic infection and so contribute to the spread of disease among the meat sellers and food sellers in and around the Abattoirs, therefore there is a great need to put them in check.

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1. Introduction

For centuries, flies have been constant companions of human, albeit, with both positive and negative impacts (Harrison, 1978). Cyclorrhaphan flies are commonly associated with human surroundings such as food courts, markets, village sundry shops (Nurita *et al*., 2007, 2008, Chaiwong *et al.,* 2012, Nurita and Abu Hassan, 2013, Khoso *et al.*, 2015) and even in Abattoirs. They are capable of carrying diseases of public health importance mostly mechanical (Harwood and James, 1989; Gabre and Abouzied 2003; Forster *et al*., 2009) and cause myiasis too. Examples of these flies are house flies, blow flies and flesh flies. Consequently, they bridge the bio-network of spread of human intestinal parasite in unsanitized developing countries (Ogunniyi *et al.,* 2015). This is because these flies frequently traverse faecal contaminated and filthy sites (Parrish and Ryan, 2014; Mahfouz *et al*., 1997).

Although other routes of transmission such as contaminated water, human carriers and unhygienic food handling are possible links. The appendages of these flies contain sensory cells which help them to detect decomposing organic material (Tan *et al.,* 1997). The easy access of these flies to animal manure, trash, human excrement and other decomposing materials has exposed them to disease causing organisms which often attach to their mouth parts, body hairs and the sticky pads of their feet, stomach, faeces and vomit (Graczyk *et al.,* 1999).

Previous studies have shown that these flies are involved in transmission of pathogens such as helminthes and protozoan parasites (Getachew *et al.,* 2007). The members of the genus *Chrysomya, Sarcophaga* and *Musca* are reported to carry the egg of *Ascaris lumbricoides, Trichuris trichiura and Necator americanus* (Sulaiman *et al.,* 1988, Fetenea and Workub, 2009). Cyst of *Entamoeba histolytica* and eggs of cestodes and nematodes as well have been found with these flies (Kettle, 1990). Incidentally Doiz *et al.,* (2004) implicated housefly as proficient vectors of eggs of *Enterobius vermicularis*, *strongyloides stercoralis, Toxocara canis*. Carriage of cyst and trophozoites of *Entamoeba coli, Giardia* and *Trichomonas species* were also recorded.

Cyclorrhaphan fly- borne infections affect public health mainly in the developing countries where control and prevention strategies are often impaired by socio-economic constraints (Otranto *et al.,* 2009, Rosennthal, 2009). Cyclorrhaphan flies distributed in abattoirs can be of great danger to consumers especially if meat is not properly inspected and if there is no good personal hygiene practice in the slaughter house. If meat bought is poorly cooked, some heat

resistant parasite eggs will establish when consumed (Bala and Sule 2012). The increasing deleterious effect this has on health and potential routes to human, especially in unsanitary environment like the abattoir is worrisome. The aim of this research is to study the distribution of Cyclorrhaphan flies and parasites attached to these flies in selected abattoirs in Awka and Amansea, Anambra state.

2. Material and Methods

Study Area

This study was carried out in Nwakanwa and Chisom Abattoirs located at Amansea in Awka North Local Government Area (LGA) and Kwatta Abattoir located in Awka, Awka South LGA both of Anambra State. Awka is the capital of Anambra state. Awka is within the rainforest zone of Nigeria and has marked wet and dry season. In the past, the people of Awka South LGA were well known for blacksmithing. Today they are respected among the Igbo people of Nigeria for their technical and business skills. Awka has a population of 189,049 (NPC. 2006) and its geographical Coordinates is 6º10'N 7º04'E/ 6.167ºN 7.067ºE. Amansea on the other hand, has the geographical Coordinates of 6º15'N 7º10'E/6.250ºN 7.167ºE.

Informed consent

A letter of Introduction was obtained from the Department of Parasitology and Entomology, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. This was presented to the directors of the Abattoirs for easy accessibility into the Abattiors.

Collection of flies

Adult flies were caught using fine insect sweep net. The net was swept over the surface where flies visit, such as the meat, the meat table and the surroundings in each of the Abattoirs. The collection was carried out between the hours of 8.00 and 10.00am, twice a week, from June to July 2016. The caught flies were placed into a labelled universal container and were anaesthetized with cotton wool soaked with ethyl acetate and transported to the laboratory of the Department of Parasitology and Entomology, Nnamdi Azikiwe University, Awka for identification. The flies were identified into various species and groups based on their gross morphological features as described by (Service 1980).

Isolation of parasites from the Cyclorrphaphan flies

This was done using formal-ether concentration technique according to Cheesbrough (2006).

Statistical Analysis

Analysis of variance (ANOVA) to check the differences in the distribution of flies and their corresponding parasites in the abattoir and flies respectively.

3. Results

A total of 184 Cyclorrhaphan flies made up of three species were collected in the study. They collected flies include; *Musca domestica* 39 (21.2%), *Lucilia cuprina* 62 (33.7%) and *Chrysomya megacephala* 83 (45.1%). The highest collection was from Chisom Abattoir 94(51.1%) while the least was recorded in Nwakanwa Abattoir 37(20.1%). The distribution of flies in different abattoirs was significant (P<0.05) [Table 1]. The highest parasite observed from the external body surfaces of the flies was hookworm ova 7(41.2%) while the least were *S. stercoralis* 1(5.9%) larva and *T. trichuira* egg 1(5.9%). The highest prevalence of parasites was observed from Chisom Abattoir 10(58.8%) and it harboured all the five species of parasites encountered while the least was from Nwakanwa Abattoir 3(17.7%). The distribution of parasites in different flies was significant (P<0.05) [Table 2]. The highest number of parasites were retrieved from *M. domestica* in all the abattoirs given Kwatta abattoir 3(75.0%), Chisom abattoir 7(70.0%) and Nwakanwa abattoir 3(100.0%) although the distribution of the parasites in different cyclorrhaphan flies was not significant (P>0.05) [Table 3].

Table 1: Distribution of Cyclorrhaphan flies in the selected study sites (Abattoirs).

Species of flies	Kwatta (%)	Chisom (%)	Nwakanwa (%)	Total (%)
Musca domestica	11(6.0)	14(7.6)	14(7.6)	39(21.2)
Lucilia cuprina	16(8.7)	30(16.3)	16(8.7)	62(33.7)
Chrysomyia megacephala	26(14.1)	50(27.2)	7 (3.8)	83(45.1)
Total	53(28.8)	94(51.1)	37(20.1)	184(100)

$F_{cal} = 2.13$, $F_{tab} = 5.14$, df $= f_6^2$, $F_{cal} < F_{tab}$ ∴P > 0.05

Table 2: Parasites species retrieved from Cyclorrhaphan flies in the Abattoirs.

Abattoirs	*E.histolytica*	*Hookworm*	*S.stercoralis*	*A.lumbricoides*	*T.trichiura*	Total
Kwatta	1(5.9)	2(11.8)	0(0.0)	1(5.9)	0(0.0)	4(23.5)
Chisom	2(11.8)	4(23.5)	1(5.9)	2(11.8)	1(5.9)	10(58.8)
Nwakanwa	1(5.9)	1(5.9)	0(0.0)	1(5.9)	0(0.0)	3(17.7)
Total	4(23.6)	7(41.2)	1(5.9)	4(23.6)	1(5.9)	17(100)

$F_{tab} = 3.89$; $F_{cal} = 6.5$, df= $f_1^2{}_2$ $F_{cal} > F_{tab}$, ∴P< 0.05

Table 3: Distribution of parasites in the Cyclorrhaphan flies from different abattoirs

Parasites	Kwatta abattoir			Chisom abattoir			Nwakanwa abattoir		
	M. Domestic	*L. cuprina*	*C. megacephala*	*M. Domestica*	*L. cuprina*	*C. megacephala*	*M. domestica*	*L. cuprina*	*C. megacephala*
E. histolytica	1(25.0)	0.0	0.0	2(20.0)	0.0	0.0	1(33.3)	0.0	0.0
Hookworm	1(25.0)	0.0	1(25.0)	2(20.0)	1(10.0)	1(10.0)	1(33.3)	0.0	0.0
S. stercoralis	0.0	0.0	0.0	1(10.0)	0.0	0.0	0.0	0.0	0.0
A. lumbricoides	1(25.0)	0.0	0.0	1(10.0)	0.0	1(10.0)	1(33.3)	0.0	0.0
T. trichuira	0.0	0.0	0.0	1(10.0)	0.0	0.0	0.0	0.0	0.0
Total	3(75.0)	0.0	1(25.0)	7(70.0)	1(10.0)	2(20.0)	3(100.0)	0.0	0.0

$F_{tab} = 3.89$; $F_{cal} = 2.4$, df $= f_1^2{}_2$, $F_{cal} < F_{tab}$, $\therefore P > 0.05$

4. Discussion

This study was focused on the presence and abundance of different species of flies in relation to the parasites attached to their external body surfaces. The highest number of *C. megacephala* was in agreement with the previous studies (Gabre and Abouzied, 2003; Chaiwong *et al*., 2012; Khoso *et al*., 2015); but in contrast with other studies (Winpisinger *et al.,* 2005, Goulson *et al.,* 2005; Nurita *et al*., 2008; Nurita and Abu Hassan, 2013) who reported higher number of *M. domestica*. *Lucilia cuprina* (blowfly), was the second most abundant fly species. Blowflies were seen mainly on fresh and decaying meat in the Abattoirs. Nurita and Abu Hassan, (2013) reported that blow flies (Family: Calliphoridae) are more attracted to carrion, soggy, bloody or soiled hair, fur, or wool. These flies use these resources as the platform for egg laying and protein sources for the maturation of their eggs (Mariluis *et al*., 2010). *Musca domestica*, was the third most abundant fly species and they were collected mostly from the surroundings, on meat tables and on refuse dump found in these Abattoirs. The waste produced in these Abattoirs determines the population of fly and the rate of transmission among individuals in an Abattoir.

C. megacephala and *L. cuprina* harboured lesser number of parasites while *Musca domestica* was found to harbour the four soil-transmitted helminthes (STH) eggs and larvae (*Hookworm, Strongyloides stercoralis, Trichuris trichiura* and *Ascaris lumbricoides*,) and a protozoan cyst (*Entamoeba histolytica*) all on its external body surfaces. This is in line with the work of Sulaiman *et al.,* (1988), Fetenea and Workub, (2009), who observed that members of the genus *Chrysomya, Sarcophaga* and *Musca* carry the egg of *Ascaris lumbricoides, Trichuris trichiura and Necator americanus* in their various studies. It also agrees with the findings of Umeche and Mandah, (1989) and Nwangwu *et al.,* 2013, who reported *Musca domestica* as the major mechanical transmitters of soil-transmitted helminthes carrying and spreading parasites and pathogens to other places; also being able to travel up to 20 miles to unsanitary sites is an added advantage. Houseflies thrive on excrement, dead and decaying animal remains, and contaminated areas where faecal matter, large amounts of organic waste and piles of garbage are left exposed and unattended. This condition may expose the inhabitants of the area to fly-borne diseases (Sulaiman *et al.,*1989, Onyido *et al.,* 2009).

Hookworm was the most prevalent parasite retrieved from the Cyclorrhaphan flies which agrees with the findings of Sulaiman *et al*., (1988), but disagree with Ajero and Nwoke, (2007) who reported more Ascaris than other parasites. Hookworm, *A. lumbricoides* and *E. histolytica* were found in all the abattoirs. This agrees with the findings of Maipanich *et al.,* 2007 who reported these parasites in his study at Ban Nam Khem village, Thailand. The parasites recovered from this study are of great public health importance. Chronic infection with hookworm leads to iron deficiency anaemia, restlessness, pallor and general retardation of afflicted children (Ash and Orihel, 2003). In moderate and heavy infections, *A. lumbricoides* can cause malnutrition, underdevelopment and cognitive impairment in children (Levav *et al.,* 1995). It also causes intestinal blockage, insomnia, restlessness, lung damage, and peritonitis (Baird *et al.,* 1986). In moderate and heavy infections, *T. trichiura* causes dysentery, anaemia, growth retardation, finger clubbing, rectal prolapse, and adversely affects the cognitive function in children (Nokes *et al.,* 1992). Amoebiasis causes dysentery, liver abscess, perforation of the colon, bowel obstruction, intestinal ulceration and poor development (Schmidth and Roberts, 2000).

Chisom abattoir has the least level of sanitation when compared with other abattoirs. That may be the reason the highest number of flies as well as the highest prevalence of parasites were recorded there. The presence of flies can be linked to the sanitation and sanitation practices in an area (Nurita *et al*., 2007).

Flies are associated with unsanitary condition and involved in dissemination of human enteropathogens that serve as causative agents of gastro-intestinal diseases to humans, based on strong attraction of filth and human food (Otronto and Tarsitano 2003). Flies isolated in the abattoirs showed that the environment can support different species of flies leading to species diversity (Nwangwu *et al.,* 2013). The transmission of these human protozoan and helminthes parasites by Cyclorrhaphan fly is predominantly mechanical, which occurs via mechanical dislodgement from external body, faecal deposition and regurgitation via vomit (Grazyk *et al*., 2005). Synanthropic and coprophilic adult flies with access to a substrate containing parasites can transport and probably transmit them in their internal and on their external body surfaces Sulaiman *et al*., (2000).

5. Conclusion

Cyclorrhaphan flies are not only a nuisance but they also cause harm and damage to the health of people who they come in contact with. The data obtained from this study could be useful in the improvement of cleanliness in the Abattoirs. Species identified in this study have been reported as vectors of various pathogens which can infect human and animal. Cleanliness in Abattoir is necessary as to reduce the population of these flies at the same time reduce the risk of transmission of diseases among the meat consumers. The control and eradication of Cyclorrhaphan flies should be implemented to protect the meat consumers from gastrointestinal parasites. In high risk areas health education, personal and environmental hygiene should be emphasized especially among the users of abattoirs. Further studies should be conducted to investigate the presence of parasites in gut of Cyclorrhaphan flies that can be of health risk.

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