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Tick Infestation and Gastrointestinal Helminthiasis in Cattle at Selected Abattoirs in Anambra State, Nigeria

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ABSTRACT: *Cattle are the major source of animal protein, flexible income, employment, farm energy and manure. Among the problems that affect cattle production is parasitic infections which predisposes them to other more serious health conditions and subsequently reduce their productivity, marketability and economic values. In this study, a total of 300 cattle from Awka, Amansea and Nkwor-Ogidi abattoirs in Anambra State were subjected to gastrointestinal and ectoparasitic examinations from the months of April to June, 2021. 150 cattle each were examined differently for the presence of ticks and another 150 cattle were examined for intestinal helminthes. A total of 394 ticks were collected with the aid of forceps and identified using a hand lens and stereo microscope. Tick examination result revealed that 114/150 (76%) of the cattle examined were infested. Five (5) genera of ticks were collected during the study and the genera with the highest prevalence of infestation was Amblyomma 73/150 (49%), while Hyalomma 27/150 (18%) had the least infestation. Statistical analysis showed that there was no significant difference in the prevalence of tick species in the cattle ($p > 0.05$). The Prevalence of ticks by attachment site, showed that there was a significant difference ($p=0.00$) in the number of ticks collected from different attachment sites with udder/scrotum having the highest percentage prevalence of 100/394 (25.5%), whereas the ear 28/394 (6.6%) was the least infected body part ($p=0.013$). Prevalence with respect to cattle breeds and sex of the cattle showed no significant difference ($p > 0.05$) which indicates that tick infestation is not dependent on the sex and breed of the cattle. Furthermore, faecal samples were collected from the 150 cattle and examined for the presence of intestinal parasites using direct smear and formol-ether concentration methods which were subsequently viewed under the microscope. The results revealed that (78%) of the total cattle examined were positive to intestinal parasites. The result also showed the presence of six (6) different intestinal parasite species in which the trematode group (Fasciola gigantica and Schistosoma bovis) recorded the highest prevalence of (57.3%), while the nematode (Ascaris spp and Strongyloides*

spp) had the least prevalence of (14.6%). Statistical analysis showed that there was a significant difference in the prevalence of intestinal parasite in the cattle (p=0.002). The high prevalence of gastrointestinal helminthes and tick infestation from the study can pose a serious health risk to the animal and also to the human population. Periodic application of acaricides, mixed grazing and regular deworming with the use of chemotherapeutic anthelmintic are strongly recommended.
KEYWORDS: Ticks; Infestation; Gastrointestinal Helminthiasis; Cattle; Anambra State

INTRODUCTION

Ticks are external, temporary and obligate parasites of vertebrate animals (birds, mammals and reptiles), which need to feed on blood in order to live. The hot and humid climates favour their survival, while the low temperatures inhibit their development (1). Ticks belong to two main families, Ixodidae and Argasidae. The most important is the Ixodidae which is also called hard ticks, due to the presence of a rigid chitinous shield, which covers the entire dorsal surface of the adult male. In the adult female, larva and the nymph, the chitinous shield extends only by a small area, which allows the abdomen to swell after feeding. The other family is the Argasidae or soft ticks, so called because of the lack of a shield (2). There is a third family (*Nuttalliellidae*) to which only one species belongs (3). Other genera of veterinary importance include; *Dermacentor, Haemaphysalis*, *Rhipicephalus* (which now includes the genus synonym *Boophilus*), *Hyalomma* and *Amblyomma* (genus synonym *Aponomma*) (2). On the other hand, the most important soft ticks belong to the genera *Ornithodoros*, *Argas* and *Otobius* (3). Ticks are one of the biggest public health and veterinary problems in the world (2). These ectoparasites can impact the production of meat and milk, and health of the animals, either directly by the effect of their bites or by the infectious agents they transmit (1), which include viruses, bacteria, rickettsiae and protozoa (2). Ticks and the pathogens they transmit have co-evolved in equilibrium with wild animals that serve as hosts, and reservoirs at the same time. Normally situations of instability only occur when these reservoirs come into contact with domestic animals, either by the introduction of uninfested animals to infested regions, or by the movement of infested animals to non-infested regions (4). Gastrointestinal helminth come in three major classifications namely Cestodes (tapeworm), Nematodes (roundworms), and Trematodes (flukes) (5). The helminth infection are mostly caused by nematodes (such as *Ostertagia ostertagi, Capillaria bovis, Trichuris discolor, Strongyloides papillosus*), Cestodes (such as *Moniezia benedeni, Taenia saginata*) and Trematodes (such as *Fasciola gigantica, Amphistomes*) (6). These parasites are parasites that infect intestinal tracts of cattle. These parasites impact significantly on the production efficiency of cattle herds, causing disease, reducing growth rates and sometimes causing death (7). The burden associated with the parasite on cattle includes disrupting the host nutrient absorption, causing reduced weight gain, reduced food conversion, abortion, infertility, reduced meat and milk production, weakness and diseases (8). Transmission of Gastro-intestinal (GIT) parasites is fairly direct in most cases; the infective eggs or oocyst are passed with the faeces when the animal defecates, the next animal would be infected if they graze in the contaminated areas (9). In heavy infections there is drastic decrease in the economic returns from

the animals like reduced milk yield in cattle and buffaloes due to parasites which also interfere with the digestion by mal-absorption of essential minerals like calcium and vitamins for the milk production in the mammary glands (10). The most important predisposing factors of helminth infection are grazing habits (feeding on contaminated pastures and feeding or drinking from contaminated water source), climate, nutritional deficiency, pasture management, immunological status, vector or presence of intermediate host and the number of infective larval and egg in the environment (11). The need to control intestinal parasites will exist as long as cattle are grazing pastures because grazing on pastures by cattle exposes to different helminth infection due to ingesting of pasture containing metacercariae of helminths (12). Prevention and control of parasitism is based on knowledge of factors that affects both the survival of parasites in the environment and transmission to the host. Completely eliminating parasites is difficult using present method of treatment and management. However, one can reduce the severe effects of cattle parasites by deworming. It is possible to prevent the occurrence of most parasitic diseases of cattle and to prevent their spread by taking prompt precautionary and prevention measures such as, advanced prophylactic vaccinations and strict hygiene measures (13).

Material and Methods

Study Area

The study was carried out in Awka, Amansea and Nkwor-Ogidi in Anambra state. Awka (Igbo: Oka) is the capital city of Anambra state, Nigeria (1). Awka has a latitude of 6 12’25’’N and longitude of 7 04’ 04’’E and it is sited in a tropical valley but most of the original rainforest has been hot due to clearing for farming and human settlement. The town is in the tropical rainforest zone of Nigeria and the occupation of Awka people includes farmers, skilled iron workers, civil servants and traders (14). Amansea is located in Awka North Local Government Area of Anambra State. It is within the Awka capital territory and is bounded to the South by Awka town, to the north by Mamu River, Ebenebe town, to the west by Mgbakwu and to the East by Ezinato/Ubibia stream. The town is within the rainforest region of Nigeria with an annual rainfall of 1000-1500mm and it has a latitude of 6° 26’ 32’’N and a longitude of 7° 12’ 64’’E. The town population is estimated to be 15,000 to 20,000 (15). Ogidi is an Igbo village which is the headquarters of Idemili North Local Government area, Anambra State, Nigeria. It has an estimated population of 70,000 and its neigbouring towns are Abatete, Nkpor, Umunnachi, Umuoji, Ogbunike and Umudioka (15). The area is characterized by two seasons, wet season from April to October and dry season from November to March. Its area geographical coordinates are 6° 9' 0"N and 6° 52' 0"E (14).

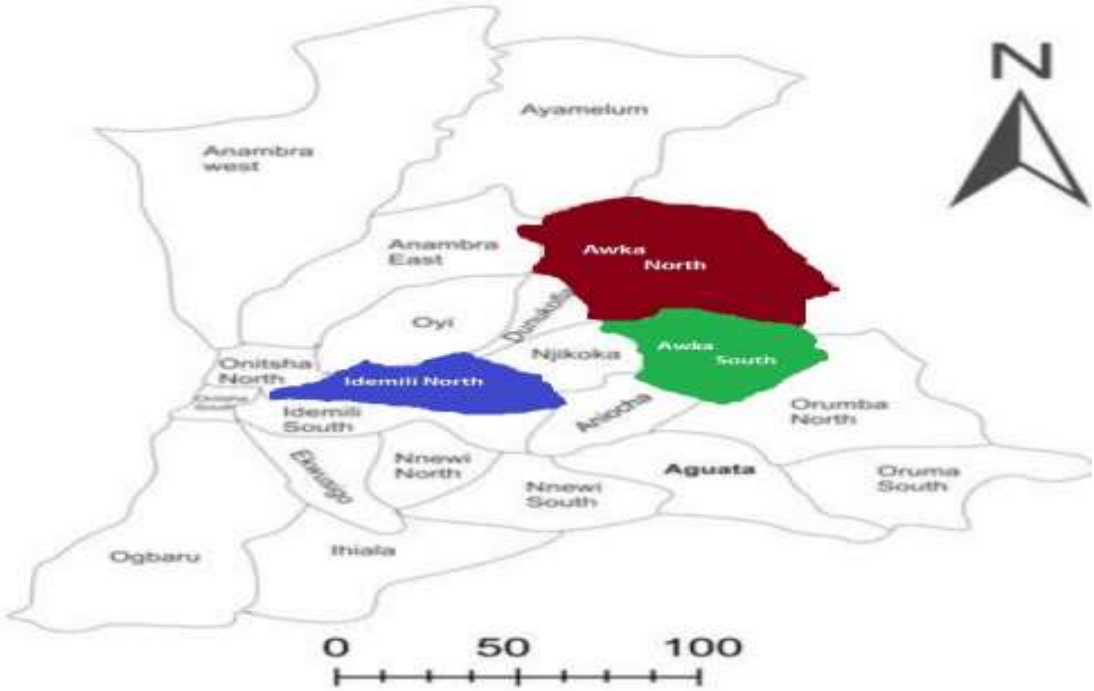

Figure 1: Map of Anambra State showing the study areas of the selected abattoirs, Source (Wikipedia, 2020) accessed 5th January, 2022.

Sample Size Determination

Cattle used in the study was selected through simple random sampling technique. The sample size was determined using the equations given by (16). $n = \frac{Z^2 - PQ}{e^2}$

Where Q= 1 − P,

Z = 1.96,

e = precision error (0.05), and

P = expected prevalence of about 50%.

Therefore, n = $1.96^2 \times (0.5)\ (1 - 0.5)/\ (0.05^2) = 384$

Study Design and Sample Collection

Ticks were randomly collected from the cattle at the abattoirs, while faecal samples were collected from the slaughtered cattle between the month of May and June 2021. A total of 150 faecal samples were collected while a total of 150 cattle were examined for the presence of ticks. The samples collected for each cattle were stored in a specimen bottle and labelled. Notes were also taken on the gender and breed of each cattle examined.

Ticks Collection and Identification

The entire body surface of the cattle was inspected for the presence of ticks. After fully restraining the animals, all visible adult tick species were removed by hands and using forceps holding the basis capitulum, so as not to lose the mouth parts of the ticks as described by (17). Ticks from each animal were collected and placed in separate prelabeled universal bottles containing 70% ethanol and transported to the Laboratory of the Department of Parasitology and Entomology of Nnamdi Azikiwe University Awka, Anambra State for identification. The preserved ticks were dried on filter paper before examination under hand lens and stereo microscope. They were classified into their respective genera level using the standard identification keys of morphological characteristics; i.e. size of mouth, colour of the body, leg colour, presence and absence of the eye, shape of ventral plates as described by (18).

Collection and Examination of Faecal Material

The collection of the faecal samples was carried out between 6:00am and 8:00am when animals are usually taken to the abattoirs for slaughter. Following the slaughtering of cattle, fresh faecal samples were randomly collected from both male and female cattle at Awka, Amansea and Nkwor-Ogidi abattoirs. The intestine of the cattle was dissected after slaughtering to expose the faeces, thereby allowing fresh faecal samples to be collected from the rectum using a pair of hand gloves. Each of these specimen was collected in different, clean sterile universal containers and labelled appropriately indicating the sex, breed, time, date and place of collection and was transported to the laboratory of the Department of Parasitology and Entomology, Nnamdi Azikiwe University, Awka where they were examined for the presence of helminthes eggs and adult worms. Intestinal parasites were identified using direct smear method and formol-ether concentration as described by (19).

Data Analysis

The data collected were stored in the Microsoft Excel Spreadsheet and analyzed using Statistical Package of Social Science (SPSS). Chi-square statistics were used to test the association between variables and to determine the level of significance of *P* value.

Results

The result shows that out of the 300 cattle sampled, 150 cattle were examined for tick infestation and 150 for gastro-intestinal helminthes parasites. Out of the 150 cattle examined for tick infestation, 114/150 (76%) was infested with different genera of tick. Whereas out of the 150 samples screened for gastro-intestinal helminthes, 118/150 (78%) of the total cattle examined were positive to helminthes parasites.

Table 1: Prevalence of Tick Infestation by Different Genera in the Selected Abattoirs in Anambra State

The result shows that five (5) tick genera were observed consisting of *Amblyomma* (49%), *Haemaphysalis* (46%), *Boophilus* (21.3%), *Rhipicephalus* (32%), and *Hyalomma* (18%). The genera with the highest prevalence was *Amblyomma* (49%), while the genera with the lowest

prevalence was *Hyalomma* (18%). The statistical analysis showed that there was no significance difference in the prevalence of infestation by different tick genera.

Tick Genus	Number of cattle infested	Percentage of Infestation (%)
Amblyomma	73	49.0
Haemaphysalis	69	46.0
Boophilus	32	21.3
Rhipicephalus	48	32.0
Hyalomma	27	18.0

X^2 (16) = 20, p=0.220 (p > 0.05)

Table 2: Number of Ticks Recovered from Attachment Sites in the Selected Abattoirs in Anambra State

The result shows the number of ticks from predilection sites on the cattle examined. The site on the body mostly attached by ticks was the udder/scrotum (25.5%), while the ear (6.6%) has the least prevalence of tick. The analysis shows that there is statistical significance in the prevalence based on the attachment sites (p = 0.00).

Attachment Sites of ticks	Frequency of Attachment	Percentage Frequency %
Udder/Scrotum	100	25.5
Ear	28	6.6
Head	41	10.5
Neck	40	10.2
Shoulder	49	12.5
Back	26	6.9
Belly	63	16.1
Side	47	11.7
Total	**394**	**100**

X^2 (7) = 5.364, p=0.00, (p < 0.05)

Table 3: Prevalence of Ticks and Frequency of Attachment Sites in the Selected Abattoirs in Anambra State

The result shows that *Amblyomma* has more attachment of 120 (30.6%), while *Hyalomma* has the least attachment site of 47 (12%). The statistical analysis shows that there is statistical significance which shows that it is dependent on the attachment site (p = 0.013).

Tick Genus	Frequency	Percentage Frequency %
Amblyomma	120	30.6
Haemaphysalis	97	24.7
Boophilus	69	17.1
Rhipicephalus	61	15.6

Hyalomma	47	12.0
Total	**394**	**100%**

F (4) = 3.706, p=0.013, (p < 0.05)

Table 4: Prevalence of Tick Infestation in Cattle Breeds in Selected Abattoirs in Anambra State

Three (3) breeds of cattle was recorded in the study where White Fulani had the highest prevalence of infestation with (77%), while the breed with the least prevalence was Red Fulani (73.8%). Chi-square analysis shows no statistical significance in the prevalence based on cattle breed (p = 0.199).

Breeds of Cattle	**Number Examined**	**Number Infested**	**Percentage of Infestation %**
White Fulani	78	60	77
Red Fulani	42	31	73.8
Azawak	30	23	76.7
Total	**150**	**114**	**76**

X^2 (4) = 6, p= 0.199 (p > 0.05)

Table 5: Prevalence of Tick Infestation in Relation to Sex of Cattle in the Selected Abattoirs in Anambra State

The result shows that out of 150 cattle examined, the population infested were (88) males and (26) female cattle. The male had a higher prevalence of (77.8%) and the female had (70.2%) prevalence. Chi-square analysis based on sex/gender of the cattle showed no statistical significance in prevalence (p = 0.157).

Sex/Gender	**Total Population**	**Population Infested**	**Percentage of Population Infested %**
Male	113	88	77.8
Female	37	26	70.2
Total	**150**	**114**	

X^2 (1) = 2, p= 0.157 (p > 0.05)

Table 6: Prevalence of Gastrointestinal Parasites According to Species in the Selected Abattoirs in Anambra State

The result shows that six (6) species of intestinal parasites were prevalent in Awka, Amansea and Nkwor-Ogidi abattoir. *Fasciola gigantica* has the highest prevalence of (36.5%), while *Moniezia expansa* and *Strongyloides spp* has the least prevalence of (3.1%). Statistical analysis showed that there is statistical significance in the prevalence based on the species of the parasitic helminthes (p = 0.002).

Parasites species	Frequency	Percentage Prevalence %
Schistosoma bovis	20	20.8
Fasciola gigantica	35	36.5
Taenia saginata	24	25.0
Moniezia expansa	3	3.1
Ascaris spp	11	11.5
Strongyloides spp	3	3.1
Total	**96**	**100**

X^2 (5) = 7.309, p=0.002, (p < 0.05)

Table 7: Prevalence of Gastrointestinal Parasites According to Abattoirs

The result shows the prevalence of intestinal helminthiasis in the selected abattoirs in Anambra state. The statistical analysis showed that there is no significance difference and the prevalence of intestinal parasites was not dependent on the selected abattoirs (p = 0.275).

Location	Frequency	Percentage Prevalence %
Awka	45	46.9
Amansea	32	33.3
Nkwor-Ogidi	19	19.8
Total	**96**	**100**

F (2) = 1.410, p=0.275, (p > 0.05)

Table 8: Prevalence of Gastrointestinal Helminthes in Relation to the Breeds of Cattle in Selected Abattoirs in Anambra State

On the prevalence of breed of cattle, it was found that White Fulani breed had the highest prevalence of (66.0%), while N'dama breed had the least prevalence of (10.4%). The statistical analysis showed that there is no statistical difference/significance which means the intestinal parasite is not dependent on the breed (p = 0.199).

Breed of Cattle	Total Examined	Number Positive	Percentage Positive %
White Fulani	92	76	66.0
Red Bororo	38	27	23.4
N'dama	20	12	10.4
Total	**150**	**115**	**100**

X^2 (4) = 6, p=0.199, (p > 0.05)

Table 9: Prevalence of Gastrointestinal Helminthes in Relation to Gender/Sex of the Cattle in Selected Abattoirs in Anambra State

The result shows that the male cattle had more infection of 48 (64.4%) than the female with 42 (35.5%). Chi-square analysis showed that the distribution of helminthes based on sex/gender is not statistically significant (p = 0.157).

Gender of Cattle	Total Number Examined	Number Positive	Percentage Positive %
Male	98	76	64.4
Female	52	42	35.5
Total	**150**	**118**	**100**

X^2 (1) = 2, p=0.157, (p > 0.05)

DISCUSSION

A total of 150 cattle were examined for tick infestation and 114 (76%) were found to be infested with one or more tick genera in the study. This result is in accordance with (20) and (21) who reported a prevalence of (88.49%) and (63.4%) in Nsukka and Maiduguri respectively but contrasts with the report of (22) who reported (59.6%) prevalence in Harri region, Ethiopia. This might be due to the difference in area coverage of the study area and agroecology. It might also be due to variation in acaricide application and access to acaricide (23) as chemical is the main weapon for the control of ticks. The most prevalent tick genera in the study was *Ablyomma* (49%). This report is in contrast with (24) and (25) who recorded *Hyalomma* (32.5%) and (34.84%) as the most prevalent tick genera in different parts of Nigeria which includes Plateau State, Enugu and Anambra state. The genera with the least prevalence was *Hyalomma* (18%). This could be due to the difference of favorable weather conditions that help increase their rate of survival, although the study also showed no significant difference in the prevalence of infestation by different genera of ticks. According to breeds of cattle, the prevalence of tick was slightly higher in White Fulani breed (77%), Azawak (76.6%) and Red Fulani (73.8%) as compared with (21) who had a higher prevalence in Wadara (66.1%) and Kuri (66.7%) in Maiduguri. This suggests that none of these breeds are completely resistant to tick infestation as all the breeds are infested in varying levels. From this study, there is no significant in the prevalence of tick infestation in relation to different breeds. Most of the ticks were gotten from different attachment sites which includes the udder/scrotum (25.5%), belly (16.1%), back (6.9%), side (11.7%), neck (10.2%), shoulder (12.5%), head (10.5%) and ear (6.6%). The predilection site with the highest number of ticks attached to it is the udder/scrotum (25.5%), while the ear (6.6%) has the least number of ticks attached to it. This further confirms that there is significant difference in the prevalence of tick infestation in attachment sites ($p < 0.05$). Attachment of genera of ticks on cattle was highly dependent on the preferred sites on the cattle as reported by (26). It is observed that male cattle (77.8%) have a slightly infestation rate than that of female cattle (70.2%). This result is in line with (27) who reported that males are more infested with ticks than the female cattle because most of the male cattle are mainly used for farming activities and moved from one place to another in

search of food and in the process get infected with ticks while the females are confined for breeding purposes and less exposed to tick infestation. Although in the study, there was no significant difference between the two sexes ($p > 0.05$) which shows that there is no gender preference in relation to tick infestation.

In the gastrointestinal helminthes study, report shows that out of 150 slaughtered cattle screened for intestinal parasites, 118 (78%) were positively infected with intestinal helminthes. This prevalence is supported by (28) who reported a prevalence of (75%) in Yola. (29) reported a prevalence of (41.6%) in the Ibadan, South-Western Nigeria and (8) also reported a prevalence of (44.2%) in Anambra State. The differences observed might be due to variation in the periods or season in which the studies were conducted. High prevalence of intestinal parasites reported in this study could be due to the difference in management systems as also documented by (30). In the present study, there was no significant difference at Awka, Amansea and Nkwor-Ogidi abattoirs ($p > 0.05$) even though Awka abattoir had the highest prevalence of (46.9%). The study report also showed that six (6) intestinal parasites were identified based on their morphological features. The parasites found include; *Fasciola gigantica, Schistosoma bovis, Taenia saginata, Moniezia expansa, Ascaris spp,* and *Strongyloides spp.* The highest prevalent specie was the *Fasciola gigantica (36.5%),* while the *Moniezia expansa* and *Strongiloides spp* had the least prevalence of (3.1%). In this report, the trematode group recorded the highest prevalence of (57.3%), while the nematode recorded a prevalence rate of (14.6%). This result is comparable to the (60.4%) by (31) and (52.5%), and (17). This variation could be associated with differences in geographical, ecological and climatic conditions since the presence of trematode infection is dependent on the availability of the intermediate host. Although the result shows no significant difference in the prevalence based on species of parasitic helminthes ($p > 0.05$). The study also showed that male cattle had a higher prevalence of gastrointestinal helminthes (64.4%) compared to the female (35.5%). This report is similar with (32) who also reported a higher prevalence rate of gastrointestinal helminthes in male (60%) than in female cattle (27.9%). This might be due to the fact that males are more exposed to grazing areas than females. However, there was no statistical significance among male and female cattle ($p > 0.05$) in the present study.

Recommendations and Conclusion

The study shows a high burden of tick infestation and gastro-intestinal helminthes in the study area which indicates the high prevalence of parasitic diseases. The intensity of these parasites to cattle leads to the decline in quality of meat, milk and economic loss. Most of these parasites are zoonotic and can infect man through the consumption of meat that is not properly cooked. Adequate control measures should be implemented and these involve the use of variety of control strategies in order to manage these parasites. The study recommends that tick control programs like the application of acaricides should be intensified with an increased frequency especially during wet seasons, proper pasture management in grazing areas will be appropriate. Hand picking of ticks from the body of the cattle should be done regularly. The cattle breeders should be enlightened on the importance of proper sanitation in the abattoirs. Cattle owners should be educated on the use of anthelminthic drugs. Veterinary service delivery system should be appropriated for the diagnosis and treatment of parasitic diseases. This study indicated that there is a high burden of tick

infestation and also the cattle slaughtered harbours a variety of intestinal helminthes parasites. The overall prevalence of the different types of parasites recorded is high enough to cause a major health issues in the cattle and low cattle productivity thereby leading to economic loss. This high prevalence of parasitic infection also pose a serious risk to the human population. Further extensive research should be carried out in the study area so as to come up with proper control measure programs in addition to what was recommended above.

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Conflict of Interest: The authors declare that they do not have any conflicts of interest.

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