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https://dx.doi.org/10.4314/nvj.v39i2.7 **ORIGINAL ARTICLE**

Clinico-Haematological Features of Dermatophilosis in Indigenious Breeds of Cattle in Ibadan, Nigeria

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SUMMARY
This study evaluated the clinical-hematological profiles in bovine dermatophilosis. A total of 50 dermatophilosis infected cattle were studied clinically and 50 blood samples taken from two different locations of Akinyele cattle market and Bodija Abattoir Ibadan. Hematological parameters such as PCV, Hb, RBC,WBC,Platelets, MCV, MCH, MCHC, Lymphocyte and Neutrophils were evaluated using standard procedures .The level of severity was classified based on the extent of the surface lesions and the chronicity as observed on the animals vis a viz body condition scoring system, hematological parameters under different breeds, sexes, ages and severity of disease condition were subjected to a one way analysis of variance (ANOVA) with no level of significance established at $p < 0.05$. White Fulani was the breed with the highest cases of dematophilosis (66%), females (86%) were more infected than males. Cattle within age bracket of 2-2½ years (38%) showed clinical signs of dermatophilosis more than other age groups. Sokoto Gudali breed had the highest values for most hematological parameters, while Kuri breed had the least values for most of the hematological parameters. Females showed better values than males. Age range 3-3½ years had most of the highest values. Mild infestation showed the highest values. Therefore, this study has been able to revealed variation to dermatophilosis susceptibility, Kuri breed, adult cattle and bulls appeared to be more resistance. The hematology in generalized dermatophilosis have been elucidated by this present study and have been found to vary with age, sex, severity of infection and breed of cattle.

Key words: Clinical-Haematological, Profile, Dermatophilosis, Cattle, Nigeria

INTRODUCTION
Dermatophilosis is a contagious zoonotic skin disease caused by *"Dermatophilus congolensis"* members of aerobic actinomycete (Dalis *et al*., 2010). The disease was first reported by von-soceghem (1915) in cattle in the Belgian Congo (Jafari shoorijeh *et al*., 2008). Even though the disease affects a wide variety of animals and occasionally humans, the disease is commonly seen in in cattle, sheep and horses and rarely in dogs and cats, where it is commonly called cutaneous streptotrichosis, mycotic dermatitis and rain scald in cattle, sheep and horses respectively, although other local names exist including senkobo skin disease in Central Africa, kirchi in Nigeria, and Saria in Malawi. Dermatophilosis is the name common to the disease in all species (Radostits *et al*., 2007).

The disease is non-pruritic, and is characterized by exudative, proliferative or hyperkeratotic dermatitis, accompanied by the production of crusts and follicullitis. In tropical and sub-tropical regions, the disease has been reported to be more severe in ruminants (Andrew *et al.*, 2003). Some factors favored the pathogenesis of Dermatophilosis are immunosuppression, tick infestation, excessive rainfall and humidity, mechanical injury to the skin and concurrent diseases (Gebreyohannes and Gebresselassie, 2013). The general opinion was that heavy rainfall with its associated effect on the skin barriers, high relative humidity has a great influence on survival, motility and maturation of the zoospores and it has been claimed to be a major risk factor in the spread of Dermatophilosis (Yeruham *et al.*, 2003). The disease is transmitted by direct contact with infected animals or indirectly via contaminated objects or flies, shearing, trimming and tagging (Quinn *et al*., 2002). Humans can acquire the infection of Dermatophilosis through exposure to infected animals.

The routine examination of blood is performed as a screening procedure to assess general health and the body's ability to fight infection. The complete blood count is an important and powerful diagnostic tool; it can be used to monitor the body's response to therapy, guage severity of an illness, or form a list of differential diagnosis (Aengwanich *et al.*, 2009). Iliyasu *et al*. (2015) had previously reported the effect of chronic dermatophilosis on the haematology and serum quality of a Friesian bull in Multipurpose Farm in Zaria, Nigeria, their findings revealed normal values of some haematological indices with increased in white blood cell (WBC) prior to treatment. The clinical assessment of the haematological profile of animals is of immense diagnostic value. Since blood is the major transport system of the body, both input and output substances of almost all the body's metabolic processes and deviations from normal caused by invasion of the body by pathogens, other forms of injury, deprivation and stress are commonly reflected by changes in the blood picture (Schalm *et al*.,1975). The haematology of indigenous cattle and other livestock species has also been previously well investigated in healthy animals (Oladele *et al*., 2001). Similarly, the haematology of some of these species has been investigated in important livestock diseases such as trypanosomosis. The importance and values of haematological parameters in the diagnosis, prognosis, treatment and prophylaxis of many livestock diseases have been widely reported but scattered (Zvorc *et al*., 2006; Klinkon and Zadnik, 1999). The haematological parameters of utmost importance include the erythrocyte count, packed cell volume (PCV), haemoglobin concentration (HBC), mean corpuscular values, total leukocyte count, differential leucocyte count, and erythrocyte sedimentation rate (ESR) (Schalm *et al*., 1975; Coles, 1986). The erythrocyte parameters (erythrocyte count, PCV, HBC, MCV, and ESR) are a set of haematological indices used to evaluate the state of the erythron and thus determine whether an animal is anaemic, normal, or polycythemic (Etim, 2015). These evaluations are thus important in arriving at a diagnosis, assessment of the efficacy of therapy, toxicity of drugs and chemical substances, and making a prognosis.

There is little or no information on haematological changes associated with dermatophilosis of indigenous cattle in Nigeria. Where basic information is present, there have not been reasonable updates to accommodate or take care of possible changes in pathogenicity and virulence of infectious organisms across time as animals are being treated for the skin condition. We therefore investigate and correlate the clinical presentations of dermatophilosis among different breeds, sex, age groups and levels of severity with their haematological profile.

MATERIALS AND METHODS

A total of 50 cattle with various degree of severity of dermatophilosis were sampled clinically from Akinyele cattle market and

Bodija municipal cattle market, both in Ibadan, Oyo state, Nigeria from June to December 2015. The naturally infected animals were clinically examined and identified appropriately, the breeds of cattle include: White Fulani, Sokoto Gudali, Red Bororo and Kuri of both sexes. The cattle were physically examined for clinical signs of dermatophilosis such as external surface, lesions characterized by loss of hair, scab formation, thickening of the skin, nodular formation and exudation were suspected to be infected with *Dermatophilus congolensis* and were recorded appropriately and blood samples were collected .Each animal breed was identified based on characteristic and morphological appearance of the animals, nature of the horn, body conformation, coat coloration, height, dew lap, nature of the hump. Sex was identified based on morpholological appearance of reproductive organs, scrotum in males and mammary glands and vagina in females. The age of each of the cattle was estimated using the eruption pattern of the dentition as earlier described by Lasisi *et al.* (2002). The severity of the infection was classified as mild,moderate and severe based on the type,distribution, extent or appearance of the external lesions on the animals body and attitude as described previously (Wenz *et al*., 2001a). Dermatophilosis was confirmed by direct microscopical examination and cultural isolation of *Dermatophilus congolensis* from the scabs.

Blood sample collection

Blood was collected from the external jugular vein using needles and syringes, blood samples for hematology were collected into plastic tubes containing ethylene diamine tetracetic acid (EDTA),this was immediately transported on ice packs to the General laboratory of the Department of Veterinary Medicine, University of Ibadan for haematological analysis. The haematological indices of the collected blood samples were analysed adopting standard procedure. The packed cell volume (PCV) was determined using the microhaematocrit centrifuge technique. Haemoglobin (HB) concentration was determined using the cyanomethaemoglobin method. The total erythrocyte and leucocytes (RBC and WBC) counts were carried out using an improved Neubaeur haemocytometer . Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin Concentration (MCHC) and Mean Corpuscular Haemoglobin (MCH) were calculated from PCV, HB and RBC values. These were done manually following the standard procedure described by Jain (1986).

Data analysis

Data generated from the study were subjected to appropriate statistics using SPSS
statistical package (version 16.0). Hypothesis testing was conducted using Chi-Square Tests to establish severity of dermatophilosis under different breeds, ages and sexes and significance was determined at $p < 0.05$. The haematological parameters under different breeds, sexes, ages and level of severity were subjected to a one-way analysis of variance (ANOVA) with the level of significance established at $p < 0.05$.

RESULT

Variation in susceptibility to dermatophilosis among different breeds of cattle.

Among the four major breeds of cattle sampled at both Akinyele cattle market and Bodija Abattoir Ibadan. White Fulani breed had the highest clinical cases of dermatophilosis with 33 (66%) out of 50, Sokoto Gudali had 8(16%), Red Bororo had 7 (14%) clinical cases with Kuri breed having the least clinical dermatophilosis of 2 (4%) out of the total of 50 (100%) clinically diagnosed with the condition. Out of the 33 clinically infested White Fulani breed, 15 (45.5%) were mildly infested, 13 (39.4%) moderately infested and 5 (15.2%) were severely infested. Among the 8 Sokoto

Gudali, 1(12.5%) was mildly infested, 6 (75%) with moderate infestation and 1 was severely infested. The severity of the condition among 7 Red Bororo indicates 2 (28.6%) mild infection, 4 (57.1%) moderate infection and 1 (14.1%) severe infection. In general, 7 (14%) have severe infection, 23(46%) have moderate infection, 20 (40%) with mild infection. The severity of the condition is more in Sokoto Gudali with 75% moderate and 12.5% severe infection, while severity was lowest in Kuri breed of cattle with just mild infection (TABLE I).

Variation in susceptibility to dermatophilosis among different sexes with different level of severity.

Out of 50 animals that were clinically diagnosed with generalized dermatophilosis, 43 (86%) were females and 7 (14%) were males. Among the 43(100%) females, the severity of the condition reveals 16(37.2%) mild infection, 21(48.4%) moderate infection and 6 (14%) severe infection. The severity of the condition among the 7 (100%) males indicates 4(57.1%) mild infection, 2 (28.6%) moderate infection and 1 (14.3%) severe infection. In general, female cattle were more infected with generalized dermatophilosis when compared to males, Also with severity of infection, female animals seem to be much more severely infested when compared to males as shown in this study (TABLE II).

Variation in susceptibility to dermatophilosis among different age group with different level of severity.

Out of 50 animals with clinical dermatophilosis, those less than 2 years old were 2 animals (4%), adult were 12 (24%), 3-3.5years old were 17 (34%) and animals within age range 2-2.5 years old were 19 animals (38%). Among the two animals that were less than 2 years of age, 1 (50%) was mildly infected, while 1 (50%) was severely infected. Among the 12 adult animals, 2 (16.7%) were mildly infected, 7 (58.3%) were moderately infected, while 3 (25%) were severely infected. Among the 17 that were within age group 3-3.5 years, 6 (35.3%) were mildly infected, 9 (52.9%) animals with moderate infection and 2(11.8%) with severe infection. Out of total of 19 animals within age group 2-2.5 years, 11 (57.9%) were mildly infected, 7(36.8%) moderately infected and 1 (5.3%) was severely infected (TABLE III).

TABLE I: Variation in susceptibility to dermatophilosis among different breeds of cattle

Breed	Susceptibility			
Cattle Breed	Mild	Moderate	Severe	Total
White Fulani	15(45.5)	13(39.4)	5(15.2)	33(100)
Sokoto Gudali	1(12.5)	6(75)	1(12.5)	8(100)
Kuri	2(100)	0(0)	0(0)	2(100)
Red Bororo	2(28.6)	4(57.1)	1(14.3)	7(100)
Total	20(40)	23(46)	7(14)	50(100)

TABLE II: Variation in susceptibility to dermatophilosis among different sexes with different level of severity

Sex	Susceptibility			
	Mild	Moderate	Severe	Total
Male	4(57.1)	2(28.6)	1(14.3)	7(100)
Female	16(37.2)	21(48.8)	6(14)	43(100)
Total	20(40)	23(46)	7(14)	50(100)

TABLE III: Variation in susceptibility to dermatophilosis among different age group with different level of severity

	Susceptibility			
Age	Mild	Moderate	Severe	Total
Less than 2years	1(50)	0(0)	1(50)	2(100)
2 - $\mathbf{2/\frac{1}{2}}$	11(57.9)	7(36.8)	1(5.3)	19(100)
3 - $\mathbf{3/\frac{1}{2}}$	6(35.3)	9(52.9)	2(11.8)	17(100)
Adult	2(16.7)	7(58.3)	3(25)	12(100)
Total	20(40)	23(46)	7(14)	50(100)

Haematological profile of dermatophilosis based on breed of cattle

Sokoto Gudali had the highest PCV (26.8±1.4) %, Hb (8.8±0.5) gm% and platelet (8±0.7) $x10^{9/L}$ among the breeds, followed by White Fulani, Red Bororo with Kuri having the lowest of PCV (24.5±2.5) %, Hb (8.1±0.9) gm% and Platelet (7±1) $x10^{9/L}$. However, White Fulani had the highest values for MCV (41.9±4.3) FL and MCH (13.4±1.4) Pg, followed by Red Bororo, Sokoto Gudali with Kuri having the least of MCV (30±3) FL and MCH (9.5±1.5) Pg. Kuri had the highest values for RBC (8.0±0)$x10^{12/L}$, WBC (23.6±6) $x10^{9/L}$ and MCHC (32±2) % (TABLE IV).

Haematological profile of dermatophilosis based on sex of cattle.

The mean ±standard error of PCV of male cattle with dermatophilosis is 26.3±2.1%, while that of female is 26.6±1%. Haemoglobin concentration of male is 8.6±0.7gm% while that of female is 8.7±0.3gm%. In general female dermatophilosis infected animals have greater values for PCV, Hb Conc, RBC, Platelets count, MCHC and Neutrophils count when compared to male animals. Whereas male animals with generalized dermatophilosis have greater values for WBC, MCV, MCH, and Lymphocytes counts compared to female animals (TABLE V).

Haematological profile of dermatophilosis based on age of cattle.

The best haematological parameters in generalized dermatophilosis was detected in animals with age range 3-3.5 years, PCV was highest with 27.9±1.4 (%), Hb highest with 9.2±0.5(gm%), RBC, Platelet, MCV, MCH and Neutrophils were second to the highest with 7.7±0.5($x10^{12/L}$), 8.1±0.5($x10^{9/L}$), 37.7±2.6 (FL), 12.1±0.8(Pg) and 63.5±2.5(%) respectively and lowest in animals less than 2 years ; PCV was 27±4(%), Hb was 8.9±1.4(gm%), RBC was 9.6±2($x10^{12/L}$),Platelet was 7.5±2.5($x10^{9/L}$),MCV was 34±4(FL),MCH was 8.5±0.5(Pg), 50±16(%) , whereas WBC, MCHC and Lymphocytes were highest in this age group of less than 2 years with 11.6±4.4($x10^{9/L}$), 32.5±0.5(%) and 49±16(%) respectively (TABLE VI).

Haematological profile of dermatophilosis based on severity of disease.

The haematological parameters generally decline with severity of the condition, under mild levels of infection, the PCV was 26.9±1.5(%) compared to 26±2.9(%) under severe infection, HB was 8.9±0.5(gm%) in mild infection and 8.5±1(gm%)with severe infection, RBC was 7.5±0.6($x10^{12/L}$) in mild and 6.8±1($x10^{12/L}$) with severe infection, WBC was 11.9±1.4($x10^{9/L}$) in mild and 15.3±2.1with severe infection, platelets was 8±0.5 in mild and 7.9±1 with severe infection, MCV was 42±6.5(FL) in mild and 42.6±5.4(FL) in severe infection, MCH was 13.5±2.2 (Pg)in mild and 12.9±1.9(Pg) in severe infection, MCHC was 31.6±0.3(%) in mild and 32.1±0.4(%) in severe infection, lymphocytes was 36.5±2.5(%) in mild and 37.1±4.2(%) in severe infection, the values of neutrophils was 63.4±2.6(%) in mild and

TABLE IV: Hematological profile of dermatophilosis based on breed of cattle

Haematological parameters	White Fulani (N=33)	Sokoto Gudali (N=8)	Kuri (N=2)	Red Bororo (N=7)
	Mean ± Std. err	Mean ± Std. err	Mean ± Std. err	Mean ± Std. err
PCV (%)	26.7±1.2	26.8±1.4	24.5±2.5	26.4±2.5
HB (gm%)	8.8±0.4	8.8±0.5	8.1±0.9	8.7±0.8
RBC ($10^{12/L}$)	7.2±0.4	7.9±0.8	8±0	7.5±0.9
WBC ($10^{9/L}$)	11.8±1	11.6±1.4	23.6±6	14.5±2.1
Platelets ($x10^{9/L}$)	8±0.4	8±0.7	7±1	7.6±0.9
MCV (Fl)	41.9±4.3	36.6±3.1	30±3	37.6±5.3
MCH (Pg)	13.4±1.4	11.4±1.2	9.5±1.5	11.9±1.7
MCHC (%)	31.7±0.2	31±0.3	32±2	32±0.3
Lym (%)	35.2±1.5	31.8±2	35±1	42.3±7.3
NEUT (%)	64.6±1.6	67.3±2	64±1	56.9±7.2

TABLE V: Hematological profile of dermatophilosis based on sex of cattle

Haematological parameters	MALE(N=7)	FEMALE(N=43)
	Mean ±Std. Error	Mean ±Std. Error
PCV (%)	26.3 ±2.1	26.6±1
HB (gm%)	8.6 ±0.7	8.7±0.3
RBC ($10^{12/L}$)	6.7 ±0.8	7.5±0.4
WBC ($10^{9/L}$)	12.9 ±3	12.6±0.9
Pletelets ($10^{9/L}$)	7.4 ±0.8	8±0.3
MCV (Fl)	47.6 ±12.6	38.8±2.8
MCH (Pg)	15.3 ±4.1	12.3±0.9
MCHC (%)	31.3 ±0.4	31.7±0.2
Lym (%)	37 ±4.8	35.4±1.6
NEUT (%)	62 ±4.8	64.3±1.6

TABLE VI: Hematological profile of dermatophilosis based on age of cattle

Haematological parameters	Less than 2years (n=1)	2 - $\mathbf{2/\frac{1}{2}}$ (n=19)	3 - $\mathbf{3/\frac{1}{2}}$ (n=17)	Adult (n=12)
	Mean ±S.D	Mean ±S.D	Mean ±S.D	Mean ±S.D
PCV (%)	27±4	24.9±1.4	27.9±1.4	27.2±2.2
HB (gm%)	8.9±1.4	8.2±0.5	9.2±0.5	8.9±0.7
RBC ($10^{12/L}$)	9.6±2	6.8±0.6	7.7±0.5	7.5±0.6
WBC ($10^{9/L}$)	11.6±4.4	12.3±1.3	10.9±1.4	15.7±1.8
Pletelets ($10^{9/L}$)	7.5±2.5	7.5±0.5	8.1±0.5	8.3±0.7
MCV (Fl)	34±4	44.2±7	37.7±2.6	37.7±4.3
MCH (Pg)	8.5±0.5	14.2±2.3	12.1±0.8	12±1.5
MCHC (%)	32.5±0.5	31.8±0.3	31.3±0.3	31.8±0.4
Lym (%)	49±16	33.8±2.2	35.5±2.5	36.3±2.7
NEUT (%)	50±16	66.3±2.3	63.5±2.5	63.2±2.7

TABLE VII: Haematological profile of dermatophilosis based on severity of disease

Haematological parameters	Mild (n=20)	Moderate (n=23)	Severe (n=7)
	Mean±Std. Error	Mean±Std. Error	Mean±Std. Error
PCV (%)	26.9±1.5	26.4±1.2	26±2.9
HB (gm%)	8.9±0.5	8.7±0.4	8.5±1
RBC ($10^{12/L}$)	7.5±0.6	7.4±0.4	6.8±1
WBC ($10^{9/L}$)	11.9±1.4	12.5±1.2	15.3±2.1
Pletelets ($10^{9/L}$)	8±0.5	7.8±0.4	7.9±1
MCV (Fl)	42±6.5	37.5±2.7	42.6±5.4
MCH (Pg)	13.5±2.2	12±0.9	12.9±1.9
MCHC (%)	31.6±0.3	31.5±0.3	32.1±0.4
Lym (%)	36.5±2.5	34.4±2.1	37.1±4.2
NEUT (%)	63.4±2.6	65.1±2.1	61.9±4.2

61.9±4.2(%) in severe infection (TABLE VII).

DISCUSSION

The diagnosis of Dermatophilosis was made based on the clinical signs. The exudative skin lesions seen with the thick scabs characteristic of dermatophilosis matched those described by other authors (Cattáneo *et al*., 2009). The findings from this study indicate highest occurrence of generalized dermatophilosis in white Fulani and lowest in Kuri breed of cattle. This is in agreement with other workers that have work on breeds' susceptibility who stated that occurrence of dermatophilosis varies among different breeds of cattle (Dumas *et al.*, 1971). Occurrence of dermatophilosis among male and female cattle indicates highest percentage in female compared to male, 86% in female and 14% in male with the severity more in females than in male animals. This finding is different from the findings of Nath *et al*. (2010) in Bangladesh where they reported higher occurrence in males (14.74%) than in females (13.39%). Variation in susceptibility among different age groups reveals that young animals were less susceptible in relation to adult animals, the severity of the condition was also observed to be high in young animals than in adult animals. This finding disagrees with the reports of Nath *et al*. (2010), where they reported higher occurrence of dermatophilosis in young animals than adult animals in Bangladesh, but this is in agreement with the findings of Samui and Hugh-Jones (1988) where they discovered increasing susceptibility with age.

Most of the haematological parameters revealed by this study were within the normal range of values. The erythrocytes values from this present study were similar to the findings of (Olayemi *et al*., 2007). But it seems from this present study that there is anaemia generally in bovine dermatophilosis especially when compared with the reference values as given by Mercks manual, (2012). Generally, Sokoto Gudali breed was the breed with the best haematological parameters, while White Fulani breed was the breed with the lowest haematological parameters in natural bovine dermatophilosis, though there were no significant differences in the haematological parameters of all the breeds, but there was a significant difference in the level of white blood cells count parameters in Kuri breed when compared with other breeds of cattle in Nigeria. This may justify the reasons why the incidence and even severity of dermatophilosis in Kuri breed was very low as seen in this present study. Although, there have not been any previous report of the haematological parameters in generalized bovine dermatophilosis in Nigeria breeds of

cattle, but this finding is similar to the reports of Tresamol and Saseendranath, (2015) where they reported lowered haematological parameters in natural bovine dermatophilosis in India. Similar observations were also made by Hamid and Musa (2009) in western Sudan. Significant reductions of these values clearly indicate an impact of the disease condition on the health of the animals.

The haematological indices of male and female show no significant difference but indices for cow affected with dermatophilosis appeared better than that of bull suffering from the same condition as reflected in this study. This may be due to hormonal influences as related to spermatogenesis in male animals or may be as a result of better care in the aspect of nutrition by the animal owner's due to the economic values of female animals. It may also be due to the fact that male animals usually are used for draft purposes which might have increased the chances of skin damage that may also add to the deleterious effect of Dermatophilosis. Several haematological reports involving farm animals showed no significant differences among male and female animals (Nottidge *et al*., 1999; Singh *et al.*, 2002); Chineke *et al.*, 2006).

The haematological indices seem to improve with increased age in bovine dermatophilosis as revealed by this study. This may be due to an improved immune status with increased age. The generally lower haematological indices seen in dermatophilosis infected animals less than 2 years could be related to low immune status and the habit of not providing sufficient milk and feed supplements to calves and young animals. This is also similar to the earlier reports of Nath *et al.* (2010) where they reported high incidence of dermatophilosis in young animals in Bangladesh. Chineke *et al.* (2006) also stated that age has significant influences on haemoglobin counts, white blood cells counts, and mean corpuscular haemoglobulin counts and erythrocytes sedimentation rate. Similar age effect had been reported in various animal species (Schalm *et al.*, 1975; Chineke *et al.*, 2006). As reported by Schalm *et al.* (1975) and Chineke *et al.* (2006) in horses, the MCV, MCH and MCHC consistently increased with age but WBC was highest in the youngest group. But Ologunowa *et al.* (2011) reported that age and sex had no significant effects on blood parameters. The values of haematological parameters were better in mild infection than in severe infection as the parameters declines steadily with increase severity.

CONCLUSION.

This study has been able to produced haematological parameters in bovine dermatophilosis and correlates the clinical presentations with the haematological parameters in Nigeria indigenous breeds of cattle with no significant different in all the parameters except in White blood cells count values. Also, this research work has been able to deduce probable reasons for low incidence, high tolerance to most tropical diseases associated with Kuri breed as the few affected Kuri breed in this study showed mild severity of dermatophilosis.

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