

1 **Tuberculin screening of some selected Fulani lactating cows in north-central Nigeria.**

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16
17 **Abstract**
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19 The prevalence of mycobacterial infection among lactating Fulani cows was investigated in
20 the Federal Capital Territory (FCT), Abuja and Kaduna State of Nigeria. Tuberculin testing
21 using single comparative intradermal tuberculin test (SCITT) showed a 14.6% positive, 4%
22 doubtful and 81.4% negative reactors. Mycobacterial infection was found to be present in the
23 nomadic (constantly moving) and semi-nomadic (limited movement) management systems
24 studied but management showed no significant effect on the prevalence of the disease.
25 However, the prevalence was significantly higher in older age groups than the younger ones
26 ($P < 0.05$).

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28 **Keywords:** Fulani; Pastoral systems; Bovine tuberculosis; Mycobacterial infection;
29 Lactating cows; Tuberculin test

31 **1. Introduction**

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33 The re-emergence of tuberculosis (TB) has been observed in both developing and
34 developed countries in recent years. Tuberculosis is responsible for 2 to 3 million human
35 deaths annually and also causes great economic loss in the animal industry (Jalava et al.
36 2007). In cattle the disease is caused mainly by *Mycobacterium bovis* (*M. bovis*). Nearly 85%
37 of cattle and 82% of the human population in Africa live in areas where the disease is
38 prevalent or only partially controlled (Ayele et al. 2004).

39 Though developed countries have adopted many strategies to detect and control
40 bovine tuberculosis, most of these strategies are not transferable to developing
41 countries, especially countries in sub-Saharan Africa like Nigeria, mostly due to
42 political, social and economic reasons. For instance, the traditional ‘test and slaughter’
43 approach to control bovine tuberculosis is economically not viable and socially
44 unacceptable by the herdsmen in many African countries (Ayele et al. 2004).

45 Nigeria with a population of over 120 million people and cattle population of about 20
46 million has been ranked 4th among the world’s countries with a high TB burden (Abubakar et
47 al. 2008). Few of the studies conducted in Nigeria have also shown that bovine tuberculosis is
48 prevalent in most parts of the country and an increase in prevalence over the years has been
49 observed (Cadmus et al. 2004, 2007). This study was designed to determine the prevalence of
50 infection among lactating Fulani cows, which are the main source of milk and milk products
51 to the public.

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53 **2. Materials and Methods**

54 The study was carried out in the Federal Capital Territory (FCT) and Kaduna State of
55 Nigeria. Abuja is the new capital city of Nigeria and has witnessed a high influx of

56 people and animals from all states of the federation. The predominant breed of cattle found in
57 the study area is mainly the Zebu, which constitutes about 90% of the total national herd.
58 Animals sampled in the study received little or no veterinary attention, were not usually
59 supplemented and were owned mainly by the Fulani pastoralists. They were kept on a free-
60 range grazing system either constantly moving (nomadic) or with limited movement (semi-
61 nomadic), and using communal grazing grounds and watering points. Only lactating cows
62 grouped into four age groups (2-3yrs, 3-4yrs, 4-5yrs and >5yrs) whose milk was meant for
63 human consumption were included in the study. Herds were randomly selected from all the
64 area councils or local governments of the FCT and Kaduna State respectively. Animals were
65 sampled from both the nomadic and the semi-nomadic systems and cows were identified by
66 their names and/or colour markings. A total of 967 cows from 57 herds were tested with 676
67 and 291 cows from the nomadic and the semi-nomadic pastoral systems respectively.
68 Sensitization/advocacy system was used through the cattle rearers' association (Miyetti Allah
69 Cattle Rearers Association) and members consented to participate in the study.
70 Epidemiological data was also collected from each animal sampled, as well as the herd
71 owner, in the form of questionnaires to help to investigate and determine risk factors.
72 Tuberculin testing was conducted using purified protein derivative (PPD) obtained from the
73 Veterinary Laboratory Agency (VLA) UK, to screen cows for tuberculosis using the single
74 intra-dermal comparative tuberculin test (SICTT) (Shirima 2003).
75 The data in this study are non parametric categorical. In order to compare classes of
76 this sort of data, chi-square test (χ^2) test of significance with their appropriate degrees of
77 freedom (df) was adopted, assuming a null hypothesis to calculate the expected values. The
78 calculated chi-square was compared with the tabulated chi-square values to specify the level
79 of significance or association. Comparison between observed and expected values was used

80 to reflect on any association or discrepancy. All statistical analysis was carried according to
81 Bland (2003).

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83 **3. Results and Discussion**

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85 A total of 57 herdsmen whose herds were part of this study were interviewed by way
86 of questionnaire and the data obtained showed that all of them have been herding for
87 over 10 years. Forty six (80.7%) out of the 57 herdsmen did not boil their milk before
88 selling it to the public, while all herdsmen and their families consumed the milk from their
89 cows as a staple food. Over 90% of the herders claimed that they were able to recognize an
90 animal with tuberculosis out of which 93% of them reported that they sold milk from these
91 TB suspected cows. Of the 967 lactating cows tested from 57 herds from the nomadic and
92 semi-nomadic pastoral systems, 20 cows were recorded as missed due to inability to take a
93 reading 72hrs after testing. Out of the remaining 947 cows, 139 (14.6%) tested positive, 37
94 (4%) were inconclusive while 771 (81.4%) were negative reactors. The 14.6% tuberculin
95 reactor rate observed among lactating cows especially in a society where milk and milk
96 products are consumed unpasteurized as a local delicacy ('Fura da nono' and 'man shanu') is
97 of great epidemiological and public health significance. This is exemplified by the life of the
98 Fulani herdsmen, who live their entire lives with their animals and also consume their
99 unpasteurized milk as staple food. This offers ample opportunity for zoonotic transmission of
100 infection. There is also a risk for those working and/or living on farms with infected cattle.
101 *M. bovis* infection has been recognized as potential occupational risk for farm and abattoir
102 workers (Ayele et al. 2004).

103 The results of tuberculin tests obtained in this study (14.6% positive) are similar to that
104 recorded in studies conducted in other parts of the country (Cadmus et al. 2004), but are

105 slightly higher than the prevalence recorded in similar studies (Cadmus et al. 2010, Ibrahim et
106 al. 2010 and Okaiyeto et al 2008). The differences could be due to the fact that we only
107 included female lactating cows in our study and it could also be due to the size of the herd. It
108 has been shown previously that as the herd size increased there was increased risk of cattle
109 reacting positively (Ameni and Erhikun 2005). However, our study and the other studies
110 indicate that mycobacterial infection is prevalent in all parts of Nigeria, which might be
111 attributed to management practices such as migration of nomads between the northern and
112 southern regions of the country in search of greener pasture during the dry and raining
113 seasons and the presence of mycobacterial infections in the environment. It could also be as a
114 result of indiscriminate introduction of animals of unknown health status into herds.

115 Of the 663 cows in the nomadic system, 104 (15.7%) were positive, 26 (4%) were
116 inconclusive while 533(80.3%) were negative reactors. Of the 284 cows tested from the semi-
117 nomadic system, 35 (12.3%) were positive, 11 (3.9%) were inconclusive/doubtful reactors
118 while 238 (83.8%) were negative reactors. The prevalence of infection in the two
119 management systems reflected no significant effect ($P>0.05$).

120 In order to establish whether there was an age effect, the chi-square test of significance with 6
121 degrees of freedom was used to compare the prevalence of the disease among the four
122 different age groups. The chi-square with 6 degrees of freedom was 13.78 giving a
123 probability level of significance of less than 0.05. The number of positive reactors (7 and 27
124 respectively) observed for age group 2-3 and 3-4 yrs was less than the expected value of
125 12.18 and 36.99 using chi-square test while that of the >5 years old was higher than the
126 expected value (51.96), which could be due to chronic nature of the disease and the fact that
127 adult animals are more at risk of getting infected (Table 1).

128 This study has shown a statistically significant effect of age on the prevalence of

129 mycobacterial infection in cows as reflected by PPD. Infection was found to be more
130 prevalent among cows of older age (>5years) where over 19% prevalence rate was
131 observed. Faye et al (2005) reported high tuberculin positive reactors among cattle of older
132 age group. This finding has both epidemiological and public health importance because
133 Fulani herdsmen normally sell old less productive cows to other livestock owners for
134 fattening and subsequent slaughter. The implication of this is the spread of the disease
135 to other herds both at the cattle market and on introduction into new herds. If sold for
136 slaughter in abattoirs or private slaughter, the risk of transmission to meat handlers
137 is possible, especially where butchers and meat inspectors process and inspect meat, offal and
138 meat products with bare hands and minimal protective clothing.

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205 Table 1: Chi-Square table of comparison of the prevalence of Mycobacterial infection
 206 among different age groups based on tuberculin test in the Federal Capital Territory
 207 and Kaduna State of Nigeria (2004-2005)

Age (Years)	No Positive	No. Inconclusive	No. Negative	Total
2-3 O:	7	5	71	83
E:	12.18	3.24	67.57	
3-4 O:	27	8	217	252
E:	36.99	9.85	205.17	
4-5 O:	36	10	212	258
E:	37.87	10.08	210.05	
>5 O:	69	14	271	354
E:	51.96	13.83	288.21	
Total	139	37	771	947

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 209 O: Observed values, E: Expected values

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 211 χ^2 with 6 df = 13.78, P<0.05

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