Parasitic and Bacteriological Contamination of Soil from Livestock's Roaming in Lafia, Nasarawa State, Nigeria.

Alaku, A.I., Galadima, A.A. & Audu Mohammed
Department of Basic Sciences,
College of Agriculture, Lafia,
Nasarawa State,
Nigeria
nuhuaku@yahoo.com

ABSTRACT
Soil pollution resulting from humans with domestic and farm animals were investigated in Lafia using multiple tubes fermentation to discover faecal indicator bacteria and test tube floatation techniques for the parasites analysis of soil samples respectively. Of the 182 soil samples examined 111 (60.9%) were positive for eggs of helminthes parasites. There was significant difference in the spread of eggs in the four location sampled (X^2 = 0.056, df = 2, p>0.05). Ascaris species were the dominant parasite ova seen. 177 (7.25%) of soil samples indicates colonial growth of faecal bacteria (Escherichia coli, Aerobacter species). Soil sample contamination was significant using (t = 4.10, df = 5, P<0.05). This study established the high prevalence rate of intestinal parasite and bacterial in the soil sampled in Lafia and obviously is a major means by which resident are at risk of parasitic diseases. Enforcement of existing rules on roaming animals in urban areas and community, health education is being recommended as urgent intervention practices.

***Keyword**: Animal faeces, soil, residential premises, Lafia, Intestinal parasites*

INTRODUCTION

Most families in urban areas now engage in livestock breeding to meet the ever increasing demand for animal protein and to generate additional income. It is important to note that the practice of breeding cows, sheep poultry and pigs in and around human dwelling has increased man-animal contact with serious zoonotic implications (Omudu *et al*, 2007) observed that this association has made it possible for parasites and pathogens naturally harboured by these livestock are now commonly infecting man.

The prevalence and incidence of zoonotic infections has been on the increase especially in developing regions (WHO, 1981) Zoonotic helminths affecting humans in Africa are those with domestic and or peridomestic cycle and reservoirs in pigs, dogs, goats and cattle. There are report of serious contamination of urban settlement with animal faeces in Wurukum, Wadata and North bank of Makurdi respectively (Omudu, *et al*, 2007). The geohelminthes includes Ascaris lumbricoides, Trichuris trichiura, hookworm, strongle loides stercoralis, etc.

Children in developing countries become the most important vulnerable group to these infections since they usually play within the grounds (Patel *et al*, 2004). Faecal examination is the most simple and reliable method of detecting parasitic infection and that is the reason many epidemiological studies on parasitic infection have been done on faeces (Ogbolu *et al*., 2009). Many morbidity surveys including faecal examination for intestinal parasites have been performed among people who live in rural and urban areas in developing countries revealing high infection rates of human intestinal parasites (Scolari *et al*, 2000).

The eggs in soil can be transferred unto vegetables, when the soil becomes contaminated, then onto the hands and transferred directly into the month or ingested by eating raw

vegetables (Mustafa *et al*, 2001). Animal breeders, occupants of the residence where animals are being raised and abattoir personnel are most at risk (Nwoke, B.E.B. 2001). This study therefore, investigate the environmental and public health implications of urban and rural livestock farming and asses knowledge, attitude and practice of residents cohabiting with domestic and farm animals.

Materials and Methods

This research was carried out in Lafia, the Capital city of Nasarawa State, Nigeria. Lafia is located at the southern part of the state on the latitude 8° 31°N and longitude 7° 31°E. Its location on the regional road confers on its good linkage with Makurdi (Capital of Benue State). The mean monthly temperature in this area ranges between 30°C in March and 25°C in December. The mean annual rainfall is about 1270 – 1540mm received over seven to eight, months (April to October) of rainy season, with four months of dry season. The main socio-economic activities of the people are farming, trading and some are in public services. The dominant ethnic group is Eggon, Alago, Migili and Housa-Fulani. The infleux of commercial and developmental activities that resulted from urbanization has sidelined many indigenous people and migrants, as a result, the populations of poorer residential areas such as Tudun-gwandara, Bukan sidi, Shinge and Tudun Kauri are beginning to increase.

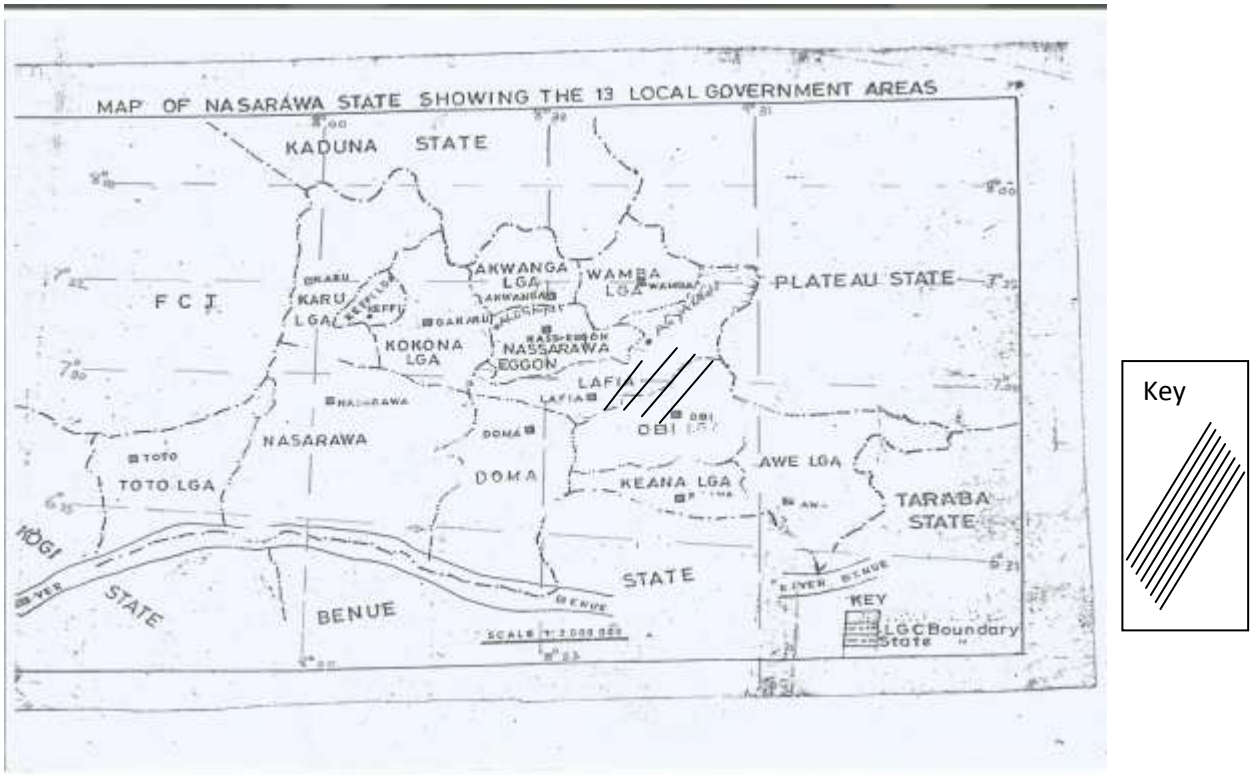

Fig. 1: Map of Nasarawa State showing the study area

Parasitological Examination of Soil for Eggs of Helminthes

Test tube floatation method was used (Fashuyi, S.A., 1983, Amuta, *et al*., 2004). 5 grams of the soil was mixed thoroughly with distilled water. The suspension was strained through net mesh to remove course particles. The filtrate was centrifuge for three minutes and supernatant decanted. The resultant sediment was further broken-up by shaking and tapping the tube. The sediment was mixed with zinc sulphate ZnSo4 solution (specific gravity of 1.2). This was added to the brim of the test tube and allowed to stand for a few minutes with a cover slip to

collect any floating egg. The cover slip was then removed and examined under the microscope.

Bacteriological Examination of soil for Faecal Contamination

1.0 gram of the same soil samples used for the parasitological analysis was washed in 10ml distilled water, 1ml each of the washing was inoculated into five tubes containing 5ml sterile single strength (ss) macconkey broth to which brocresol purple indicator had been added. Durham tube is placed in inverted position in each test tube. This is to help collect the gas that might produce if fermentation occurs. The test tube is then incubated aerobically at 37^{o}C for 48 hours. At the end, all the tubes showing acid and gas production were recorded as positive. The most probable number of Coliform bacilli per 10ml soil distilled water is then determined from the probability table of Macrody (1918) as amended by Swaroop (1931) in (Mizgajska, H. 1993).

The content of coliform presumptive positive tubes was mixed by shaking. Then five sets of test tube as in the coliform count exercise were again prepared using presumptive positive tubes as inoculums. The tubes were incubated at 44^{o}C for 24 hours to determine whether *Esherichia* coli were present in the soil sample. The presence of E. coli showed acid and gas production after 24 hours of incubation.

Samples from the presumptive positive, tube were streaked on Eosine methylene blue (EMB) agar plate and incubated for 24 hourse at 37^{o}C. Plates with colonies showing shining metallic green color are E. coli, pink colonies with dark centres are Enterobacter aerogenes.

To distinguish E. coli from other coliforms, colonies were further inoculated into peptone water and incubated at 44^{o}C for 24 hours. At the end of 24 hours 0.3ml kovac's reagents added and shaken gently. If the mixture showed a deep red colour in the upper layer of the culture as a result of indole production, it means the coliform is E. coli.

Result

Of the 182 soil samples collected from various locations where livestock farming is practiced, III (60.9%) were positive for one or more parasite ova, cyst or larvae. Ascaris species were most frequently encountered with A. suum (15.38%) A. bovis (15.38%), Toxocara canis (30.7%) Toxocaracati (11.53%) respectively (Table 1). Soil samples collected from various locations reveal high contamination. However, there was no significant difference in the prevalence of ova in the soil and level of contamination in the four areas sampled ($X2 = 0.052$, $df = 2$, $P>0.05$).

More locations in Shinge however, recorded higher percentage (70%) eggs of parasites. Larvae of nematodes were discovered but could not be identified. Faeces from animal was treated as other house hold refuse, locations visited had no special provision for dumping of animal faeces.

Results of bacterial analysis in Table 2 shows high level of contamination with faecal indicator bacteria. 177 (97.25%) reveal bacterial growth with Esherichia coli being most predominant, followed by Aerobacter aerogenes and enterobacter species respectively. Analysis using t-test showed significant contamination with faecal bacteria ($t = 4.12$, $df = 5$, $P<0.05$). In the whole studied locations.

Soils sampled from refuse dumps site were the most contaminated with 13 (27.65) soil sample contaminated with parasites. The total number of parasites recovered was 47, as some soil samples recorded more than one parasite. The least contaminated soil sample was vegetable farm (7.5%). Vicinity of houses had (21.05%) incidence of parasite contamination. Others included; school play ground (13.79%), Abattoirs (10.7%) (Table 3).

Table 1: Prevalence and types of intestinal parasite ova in soil samples

Areas	No of compound sampled	No with parasite ova (%)	Ascaris suum	Ascaris bovis	Toxocara canis	Toxocara cati	Trichuris vulpis Toxocara cati	Strongy loides species	Larvae of undentified nematode
Tudun-gwandara	45	28(62.22) 13	13	8	15	4	5	6	4
Bukan Sidi	45	26(57.77)	14	8	16	6	-	7	5
Tudun Kauri	42	22(52.38)	9	3	7	4	1	4	6
Shinge	50	35(70)	17	9	18	7	-	6	5
Total	182	111(60.9)	53(15.38)	28(5.38)	56(30.7)		21(11.53)	23	20

Table 2: Faecal bacteria identified in soil sample

Areas	No of compound sampled	No with indicator/index bacterial (%)	Escherichia coli	No of colonies	Aerobacter aerogenes	No of colonies	Enterobacter species	No of colonies
Tudun-gwandara	45	45(100)	+	760	+	171	+	105
Bukan Sidi	45	43(95)	+	509	+	77	-	-
Tudun Kauri	42	40(95.23)	+	501	+	49	-	-
Shinge	50	49 (98)	+	308	+	51	-	-
Total	182	177(97.25)	-	-	-	-	-	-

Table 3: Prevalence of parasite from source of samples

Sources	No of sample	Samples with parasite	Ascaris suum	Ascaris bovis	Entamoeba hitolytica	Ascaris lumbricoides	Trichuris vulpls	S. stercoralis
Refuse dump	47	13(27.65)	4(8.51)	3(8.51)	3(6.38)	2(4.25)	4(8.51)	4(8.51)
Vegetable farm	40	3(7.5)	2(5)	2(5)	2(5)	3(7.5)	2(5)	1(2.5)
Vicinity of house	38	8(21.05)	2(5.28)	3(7.89)	1(2.63)	1(2.63)	2(5.28)	2(5.28)
School play group	29	4(13.79)	1(3.44)	1(3.44)	1(3.44)	1(3.44)	2(6.89)	1(3.44)
Abattoir	28	3(10.71)	2(7.14)	1(3.57)	1(3.57)	1(3.57)	1(3.57)	2(7.14)
Total	182	31	11	10	7	10	10	10

Discussion

Soil contamination with eggs, cyst and larvae of animal halminths, parasites observed in this research is epidemiologically significant. This finding collaborates with other studies reported in other countries (Uga, *et al*., 1996, Gyorkos *et al.*, 1999) and in Nigeria (Ajayi, *et al*., 1998). The prevalence of helminth parasites in home environment shows the risk of human infection. The presence of these parasites ova in different environmental conditions is subject to transmission of zoonotic diseases. The large concentration of roaming farm animals within residential environment reduces hygienic standards and increases the risk of acquiring zoonotic diseases (Omudu, *et al*., 2007). Epidemiological studies in other developing countries reported high number of visceral larvae migrans cases in children, which was attributed to the tendency of children to swallow soil while playing and soil contamination with helminthes of domestic animals (Petithory, *et al.*, 1993). An inspite of risk resulting from accidental ingestion of contaminated soil, handling of these animals predispose humans to infections (Omudu, *et al.*, 2007). Serological survey in Djibouti concluded that abattoir personnel and livestock's breeder carried more zoonotic infections which are transmitted by contact with animals than other population groups (Chantal, *et al*., 1996).

Livestock farming in urban areas will no doubt cause the environment and the public health problems being experienced in many urban areas in the developing world. These days you see cows, sheep, goat and pigs roaming around houses searching for food. In the course of feeding, they drop their faeces indiscriminately seeding residential areas with excreta-borne pathogens (Omudu, *et al*, 2003 and Gyorkos, *et al*, 1999).

Soil sample collected from refuse dump, vegetable farm and vicinity of house in many countries such as Argentina, Zimbabwe, Japan revealed presence of Toxocara eggs (Alonso, et al, 2001, Mukaratirwa and Taravinga 1999); showed that the soil in these countries are contaminated with pet faeces. The study in Makurdi; Benue State, Nigeria, where prevalence of zoonotic diseases has been a major problem, the soil samples taken revealed the presence of Taxocara eggs, Ascaris eggs, Ancylostoma caninum, Trichuris vulpis and strogyloides species (Amuta, *et al* 2004). All these are animal intestinal parasites, a clear indication of soil contamination with animal faeces. It is important to note that geohelminthic zoonoses affecting human is becoming a major health problems in developing countries with domestic and peridomestic cycles and reservoirs in pigs and cattle. The major problem in the effective control of major helminth zoonoses in Africa are the diversity of social, cultural, administrative structures, lack of education of population, and lack of availability of safe antihelminthics against zoonotic infections (Powlowski, 1996). The prohibition on stray and roaming animals in cities or urban areas will help in preventing environmental pollution. This research thus established high risk of intestinal parasites in the soil in Lafia town and obviously is a major ways by which residents are at risk of parasitic diseases and also possible means of vegetable contamination.

REFERENCES

Ajayi, O.O. and Duhlinska, D.D. (1998). Distribution of toxocara eggs in different soil types in Jos and Dutse Kura, Plateau State, Nigeria. Journal of Pure and Applied Sciences 1(1): 31-37.

Alonso J.M., Stein M. Chamorro MC and Bojanich M.V. (2001). Contamination of soils with eggs of Toxocara in a subtropical city in Argentina, J. Helminthol; 75:165 -168.

Amuta, E.U, Omudu E.A and Ahamed A.S (2004). Bacteriological and parasitological evidence of soil contamination in relation to sanitary facilities in selected schools in Makurdi, Nigeria, Journal of Post, Disease and vector management; 5:337-347.

Chantal, J., Bessiere, M.H. Guuenno, B. and Dorchies, P. (1996). A serological survey of some zoonotic diseases among abattoir personnel in Djibouti. Bulletin da la societe de pathologie Exotigue 85(5): 353-357.

Fashuyi, S.A. (1983). Prevalence of helminth eggs in human faeces deposited on the streets of Lagos, Nigeria. West African Journal 2: 155-138.

Gyorkos, T.W., Nelson, E., Maclean, J.O. and Soto, J.C. (1999). Parasite contamination and soil from daycare sandboxes and play areas. Canadian Journal of Infectious Diseases, 5 (1): 17-20.

Mizgajska, H. (1993). The distribution and survival of eggs of Ascaris in six different natural soil profiles Acta parasitological 38: 170-174.

Mukaratirwa S. and Taruvinga, M. (1999). A survey on environmental contamination of suburban parks and playgrounds in Harare, Zimbabwe, with canine helminthes of zoonotics significance, JS Afr. Vet Assoc; 70: 119-121.

Mustafa U, Adnan S, Gonul A, Hatice O. and Suleyman A (2001). Environmental pollution with soil-transmitted Helminths in Sanliurfa, Turkey. Mem Inst Oswaldo Cruz, Rio de Janeiro; 96 (7): 903-909.

Ogbolu, D. Olusoga, Terry Alli O.A, Ogunleye V.F, Olusoga-Ogbolu F.F. and Olaosun II (2009). The presence of intestinal parasites in selected vegetables from open markets in south western Nigeria. Afr. J. Med & Med Sci; 38:319 – 324.

Omudu, E.A., Amuta, E. and Ikyange, T. (2007). Bacteriological and parasitological evidence of soil contamination from livestock farming in Makurdi, Nigeria. Nigeria Journal of parasitology ISSN – 11174145 Vol. 28 (1), 2007 20 – 24.

Omudu, E.A., Amuta, E.U. Unoqur, L. B. and Okoye, L.A. (2003). Prevalence of Toxocara canis ova in dog faeces and soil samples collected from public parks in Makurdi, Nigerian Journal of Parasitology 24: 137-142.

Pawlowski, Z.S. (1996). Helminthic zoonoses affecting humans in Africa. In: Veterinary Medicine: Impacts on human health and Nutrition (edited by Lindberg, R.) Uppsala, Sweden. Pp 41 – 50.

Petihory, J.C., Loye, J. and Beddok, A. (1993). Epidemiological data on the visceral larva migrant syndrome: Paraitology Today 11(2):209-216.

Scolari, C. Torti, C. Beltrame A. (2000). Prevalence and distribution of soil-transmitted helminth (STH) infections in urban and indigenous school children in Ortigueira, State of Parana, Brasil: implications for control, Trop Med Int, Health; 5:302-307.

Uga, S., Oikawa, H., Lee, C.C. and Ral, S.K. (1996). Contamination of soil with parasite eggs and oocyts in and around Kuala Lumpur, Malaysia. Japanese Journal: Medicine and Hygien 24 (2): 12-127.