# Occupational Health Hazards Among Abattoir Workers In Abeokuta

**T.A. Banjo[1], A.A. Onilude 6, A.O.J. Amoo[1], A. Busari[1], O.A. Ogundahunsi[2], W.E. Olooto[2], O.B. Familoni[3], A.A. Amballi[2], A.A.A. Oyelekan4, O.A. Abiodun 5

[1]Department of Medical Microbiology & Parasitology, OACHS, Olabisi Onabanjo University, Sagamu
[2]Department of Chemical Pathology & Immunology, OACHS, Olabisi Onabanjo University, Sagamu
[3]Department of Medicine, OACHS, Olabisi Onabanjo University, Sagamu
4. Department of Surgery, OACHS, Olabisi Onabanjo University, Sagamu
5. Department of Community Medicine, OOUTH, Sagamu
6. Department of Botany & Microbiology, University of Ibadan. Ibadan
E-mail: sirby2k@yahoo.com

**ABSTRACT:** Abattoir employees working in close contact with animals/animal waste products were investigated for various job-related physical and biological hazards/challenges linked to age, gender, job specializations and duration with associated risks.122 herdsmen, butchers, cleaners and 98 residents (control) whose ages ranged between 14 and 81 years participated in the study. A structured questionnaire was administered to obtain demographic data while blood samples were obtained in code-labeled sterile plain/EDTA bottles using standard laboratory procedures for microbial isolation, morphological and biochemical analysis. Statistical analysis of data obtained thereof were processed using SPSS – version 15.The ages, marital status, types of accommodation, religious affiliations and job specialization of the participants' --89 (73%) men and 33 (27%) women--had no effect on the types of occupation hazards. However, there was a significant difference in physical and biological hazards($X^2$=2.06; $p<0.05$) between abattoir workers and control: Butchers were mostly predisposed to physical hazards (89% knife cuts) compared to enhance biological hazards among the herdsmen (64.7%). Blood-borne infections (29.5%) were higher in the abattoir workers compared to the control (8.2%). The patterns of blood-borne-infections ($X^2$=10.39; $p<0.05$) and job specializations among abattoir workers increased with years of exposure. Abattoir occupational hazards sequel to iatrogenic or transmissible agents increase with job-related exposure to risks factors though majorly under reported. Most of these identified physical injuries and zoonotic infections are preventable by health monitoring, identification of hazards, Exposure Control Plan, a combination of good occupational, environmental hygiene and design; and control of microbial contaminations.
[T.A. Banjo, A.A. Onilude, A.O.J. Amoo, A. Busari, O.A. Ogundahunsi, W.E. Olooto , O.B. Familoni, A.A. Amballi**,** A.A.A. Oyelekan and O.A. Abiodun. **Occupational Health Hazards Among Abattoir Workers In Abeokuta.** *Academ Arena* 2013;5(10):29-36] (ISSN 1553-992X). http://www.sciencepub.net/academia. 5

**Keywords:** Occupation, hazards, abattoir, workers, blood-borne.

## 1.0 INTRODUCTION

Occupational health remains a neglected "issue" in many developing and transitioning countries of the world mostly due to competing economic, social, and political needs. These countries often focus on the provision of clinical care and treatment while placing less emphasis on the appropriate preventive measures (Kolvic, 2006). In countries where meat industry are significant as commerce and employers of labour, and consequently more meat products being consumed per capital than all other protein sources combined, there are bound to be enhanced occupational hazards due to possible physical, hazardous chemical, biological and/or ergonomic agents even in model abattoirs where meat safety is the ultimate goal. Occupational exposure remains the reasonable predictable contact through physical or biological agents resulting from the performance of a worker's duties.

According to the World Health Organization (WHO, 2006), the complex relationship between people and microbes has been evolving for tens of thousand of years. And the aetiological factors that have long been associated with occupational biohazards are not limited to virus, bacterial, fungi and parasites but also to agents exerting allergic and toxic effects which are directly responsible for the development of various diseases in many occupational groups.

The Centre of Disease Control (CDC) findings as reported by Susonic *et al.,* (2007) confirmed that occupational hazards have continued to rise in the past decades, resulting in increasing rates of occupational exposure to blood – borne illnesses and other communicable diseases mostly in the developing and transitioning countries. Certain

occupations are accompanied by a higher risk of contracting job-related infection because of the nature of vocation and work environment; some are related to certain work groups with varying degrees of risks within groups. At times, certain risk of infection may not be directly related to the occupation (Kissling *et al.,* 2005).

Out of the over 1,400 species of infectious microbes of human pathogens, 617 are zoonotic viruses and bacteria, the most likely to be considered "emerging" (Environmental Health Perspective, 2004). While occupational infections mostly contracted during the course of employment, (Ann *et al.,* 2006) may be caused iatrogenically or by transmissible agents including viruses, bacteria, fungi, and parasites and/ or by the toxins produced by these organisms, Kamur *et al.,* (2003), categorized occupational hazards / infections into physical (Cuts, aberrations); biological (tuberculosis, HBV, Brucellosis); and Chemicals (Poison). And abattoir workers face such job-related risks that cause substantial illness and occasional death.

Kamul *et al.* (2006) asserted that many microbes are essential to our health while quite a small number of bacteria, many viruses, fungi and protozoa can cause infectious diseases. Even as specific job-related ailments are not commonly investigated, certain imperative systemic infections easily go undiagnosed. This would require the demand for careful assessment of patient's occupational history to assist the diagnosis of an unusual illness. On the other hand, superficial infections which are less serious, nevertheless, may be transmitted to others (Barbuddhe, *et al.,* 2000).

In humans, disease transmission has been established by personal contact with infected animals, transmission from person to person, within an infected family. And this is often peculiar to slaughterhouses' workers handling food while on the job---a risky condition that should be taken into consideration as contributors to the infections by zoonotic microorganisms (Hernandez *et al.,* 2009).

Furthermore, Starkman *et al.,* 2003 and Makuwa *et al.,* 2006 established that most microbial infections are well known to be sustained by certain reservoirs, especially viral agents such as hepatitis B viruses (HBV) that have been found in gorillas, chimpanzees and cow. They emphasized four main sources of infection in most abattoir workplace to include Blood and other body fluids (obtainable in human bodies, animal carcasses and raw meat); human or animal waste products such as faeces, urine and vomit; respiratory discharges such as coughs and sneezes; and skin – direct contact.

The disease burden is more profound in the developing countries due to lack of effective public health measures, domestic animals health programs and appropriate diagnostic facilities. The situation is compounded by the possible resemblance of the disease with other diseases leading to incorrect diagnosis and under-reporting of the disease (Thakur *et al.,* 2002).

In event of any identifiable disease or health effect that is related to the occupational exposure, a 'Health monitoring' would be required in-order to determine if appropriate precautions taken to protect workers from job related hazards are adequate and effective. However, where the risk of occupational hazards prevails, Exposure Control Plan (ECP) by employers is expected to be implemented. This may include risk identification, assessment of workers at risk, risk control, workers education/ training and implementation of safe work procedures.

But despite the various recognized risks, no country has a system in place to track vital occupationally acquired infections in their entity. The number of occupational infections that occur each year is largely unknown as there is a gross under-reporting. Although Britain reported an annual incidence of 1100 cases of occupational infections in 2003 she admitted that this is gross under estimation (Occupational Health Statistics Bulletin, 2003/2004). Similar data from developing countries are largely unavailable (Kamul *et al.,* 2006). Consequent to the employees' close contact with animals/animal products and a peculiar working environment, this study seeks to investigate occupationally acquired physical and biological health hazards among butchers, cleaners and Herdsmen in an Abeokuta abattoir.

## 2.0 MATERIALS AND METHOD:

The slaughter house in Abeokuta engages 122 abattoir workers committed to divers' routine/daily abattoir activities as herdsmen, butchers (slaughtering, processing animals & meat sellers), cleaners; and with 98 residents (control) in its neighborhoods, all of whom had their informed consents sought, and obtained following ethical approval obtained from the state hospital management ethical committee, participated in the study which spanned through May, 2009 to July, 2010. The participants' ages ranged between 14 and 81 years. Structures questionnaires in local language(s) each individual best understood were administered in order to obtain leading demographic data. Physical and biological (blood-borne infections) hazards were investigated by basic assessment of bodily injuries, close routine observation of abattoir activities, work environment and analysis of blood samples of the studied population.

Labeled plain/EDTA bottles were used to collect venous blood samples obtained by venepuncture from the volunteered participants. The blood samples were analyzed at the National Blood Transfusion centre, Iberekodo, Abeokuta. After centrifugation of each of the blood samples in the centrifuge at 4000rpm for 5 minutes, the sera were analysed for Brucella using Brucella test kit; Hepatitis B surface antigen (HBs Ag) by enzyme linked immunosorbent assay method (ELISA), using monolisa ® HBsAg ULTRA kit; Hepatitis C virus (HCV) by ELISA method using Dia. Prodiagnostic Bioprobes® kit (WHO,2004) and Treponema–VDRL kit (Portnoy, 1957; Wilcox,1966; Fieldsteel,1981; Kraus and Larsen,1990) using standard laboratory procedures for the isolation, morphological and biochemical analysis of microbial agents implicated (Cheesborough, 2005). Statistical analysis of data obtained was processed using SPSS – version 15.

## 3.0 RESULTS:

122 active abattoir workers --herdsmen, butchers and cleaners –whose ages ranged between 14 years and 81 years were averagely educated. They were comprised of 33 (27%) females and 89 (73%) male abattoir workers. But 23 (19 %) of them were single individuals living in one-room apartments while 99 (81%) were married, living in multi-rooms self contained (flat) apartments. Interestingly, 41(33.6%) AWs claimed to have attended routine Medicare whilst 81(66.4%) hardly visited any health care facility.

Physical hazards investigated among the workers were comprised of 109 (89%) knife cuts, six (5%) punctured wounds; six (5%) head injury and one (1%) rashes, all mostly common to the butchers. And the various risky behavioural practices observed among all the categories of abattoir workers included persistent unhygienic practice habits; exposure to smoke from the burnings of hides & skins and other related animal stuffs; contamination of water sources (wells & river banks) with animal wastes, cleaning process of tools); poor effluents disposal methods; offensive stench / odour; noise pollutions; cuts on hands and sharing of razors during meat processing activities. It was statistically significant ($p< 0.05$) as compared to the control populations (figure 1). Also, blood-borne biological hazards (viral & bacterial isolates) were investigated from the blood samples obtained for screening. Seropositive 21(17%) hepatitis B virus (HBV), 6 (4.9%) brucella, 6(2.5%) treponema and 3 (2.5%) hepatitis C virus (HCV) were diagnosed. A total of 29.5% blood-borne infections from abattoir workers compared with 8.2% from control individuals ($X^2= 2.06$; $P <0.05$) gave a significant statistical differences (figure 2). And these were established only in age groups 21-60 (table 1).

Comparative findings based on job specifications reveals 58.8% herdsmen with the highest value of blood related infections, 41.2% cleaners while butchers were least with 21.6% and were statistically significant ($X^2 = 10.89$; $P < 0.05$) (table 2).

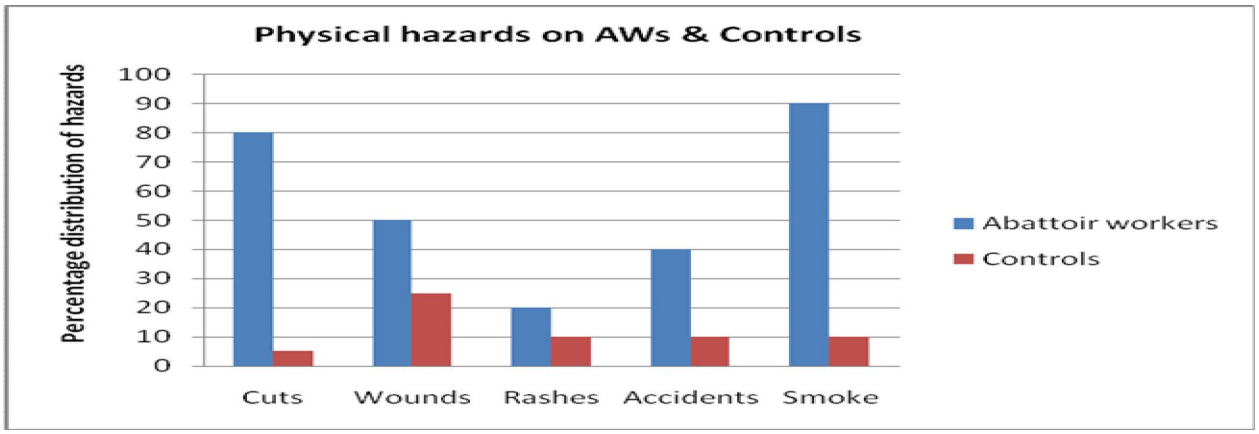


**Figure 1: Types and pattern of physical hazards encountered by AWs & Controls.**

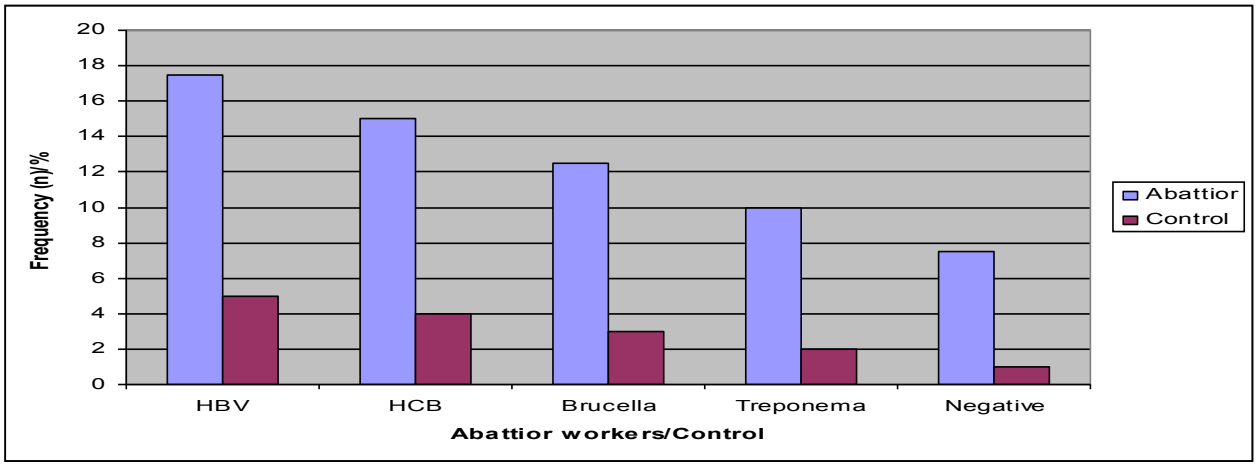


**FIGURE 2: Frequency distribution of blood-borne infections among the abattoir workers and controls.**

**TABLE 1: DISTRIBUTIONS OF BLOODBORNE INFECTION BY AGE**

| | Age (years) | | | |
|---|---|---|---|---|
| **Blood borne Infections** | **21 – 40 n (%)** | **41 – 60 n (%)** | **61 - 80 n (%)** | **Total** |
| Positive | 21(32.8) | 15(28.3) | 0(0) | 36 |
| Negative | 43(67.2) | 38(71.7) | 5(100.0) | 86 |
| **Total** | **64(100.00)** | **53(100.0)** | **5(100.0)** | **122** |

**($P > 0.05$, $\chi^2 = 0.99$)**

**TABLE: 2 DISTRIBUTIONS OF BLOOD-BORNE INFECTIONS BY JOB SPECIALIZATION**

| **Blood borne Infection** | **Butchers** | **Cleaners** | **Herdsmen** | **Total** |
|---|---|---|---|---|
| | **n (%)** | **n (%)** | **n (%)** | **N** |
| Positive | 19(21.6) | 7(41.2) | 10(58.8) | 36 |
| Negative | 69(78.4) | 10(58.8) | 7(41.2) | 86 |
| **Total** | **88(100.00)** | **17(100.0)** | **17(100.0)** | **122** |

**($X^2 = 10.89$; $P < 0.05$)**

Statistically, blood related infections were significantly higher (53.3%) among individuals working for seven day/week compared to those (25.9%) working at least six days a week ($X^2 = 4.75$; $P<0.05$). However, no significant difference ($X^2=0.99$; $P > 0.05$) was observed regarding age distributions among abattoir workers though 32.8% blood infections was within the age group 21-40; 28.3% in age group 41-60 and none in 61-80 (table 3). Increasing work experience (years) on the slaughter slabs correlates with possible lower risk of blood-borne infections. Those with about one to ten years of work experience recorded the highest seropositive 11(33.3%);workers with 11 – 25 years were 16(32.7%) exposed to blood infections while those above 26 years hands on the job were 9 (22.5%) exposed, although, it has no significant effect ($X^2 = 1.41$; $P > 0.05$) (table 4). Although, there were no significant difference ($X^2 = 0.14$; $P > 0.05$) within each category despite more seropositive females 11(33.3%) compared to 25 (28.1%) males; Married workforce (30.3%) were more seropositive compared to bachelors/spinsters (26.1%); whereas 31 (31.3%) workers living in flats outnumbered 5 (21.7%) residents in single rooms. Interestingly, there was no effect of religious affiliations on the distributions of blood related infections.

**TABLE 3: DISTRIBUTIONS OF BLOOD-BORNE INFECTIONS BY THE WORKING PERIOD (DAYS/WEEK)**

| | Working period (days/week) | | | |
|---|---|---|---|---|
| **Blood borne infections** | **1** | **6** | **7** | **Total** |
| | **n (%)** | **n (%)** | **n (%)** | **N** |
| Positive | 0(0) | 28(26.9) | 8(53.3) | 36 |
| Negative | 3(100.0) | 76(73.1) | 7(46.7) | 86 |
| **Total** | **3(100.00)** | **104(100.0)** | **15(100.0)** | **122** |

**($X^2 = 4.75$; $P<0.05$)**

**TABLE 4: DISTRIBUTIONS OF BLOOD-BORNE INFECTIONS & WORK EXPERIENCE (YEARS)**

| | Working experience (yrs) | | | |
|---|---|---|---|---|
| **Blood borne** | **1 – 10** | **11 – 25** | **≥ 26** | |
| **Infections** | **n (%)** | **n (%)** | **n (%)** | **Total** |
| Positive | 11(33.3) | 16(32.7) | 9(22.5) | 36 |
| Negative | 22(66.7) | 33(67.9) | 31(77.5) | 86 |
| **Total** | **33(100.0)** | **49(100.00)** | **40(100.0)** | **122** |

**($X^2 = 1.41$; $P > 0.05$)**

## 4.0 DISCUSSIONS:

Abattoir workers are exposed to remarkable work-related physical and biological hazards which may invariably jeopardize their health status if left unchecked. Such diverse physical hazards ranges from scalds, cuts, wounds, to accidents, rashes and smokes while associated risk factors such as polluted working premises, slippery floor and animal contact prevailed. The slaughterhouse workers are more prone to blood-borne infections as compared to other occupations because they are exposed to carcasses and viscera of infected animals and get infected through cuts and wound and splashing of infected blood and other fluid into their conjunctiva (Ramos *et al.,* 2008). Wound injury was the most evident physical hazards among the control population though implicated in the AWs too. Many occupationally acquired infections by abattoir workers are promoted by human behavior such as repeated contact with infected animals, building of dams that favour the proliferation of mosquitoes, trade of live / wild animals and bush-meat hunting (Environmental Health, 2004).

Butchers were more prone to physical hazards due to knife/ razor cuts (89%) compared to the highest biological hazards among the herdsmen (58.8%) and cleaners (41.2%). Starkman *et al.,* 2003 and Makuwa *et al.,* 2006 were convinced that butchers are generally at risk from knife-cuts and blood-letting, with the attendant risk of the transmission of blood-borne infections to colleagues. Findings in this study favoured the enhanced BBI among the herdsmen who maintained increased human-animal contact compared to the butchers at risk of blood-letting contaminants. Physical injuries due to cuts from knives, razor and other sharp objects compares favourably with the findings of Mevorach, *et al,* 1999 and Ola *et al,* 2008 who reported 81% and 89% in Israel and Bodija (Nigeria) respectively. Mevorach *et al* 1998 in his study on Hepatitis B virus reported that butchers are at high risk of infection; because of workplace exposure to HBsAg, 88% persons were reported positive with more than one hand cut per month while 8.3% of them are seropositive to HBV. In Israel, a butcher who had chronically infected three of his co-workers, in turn infected their spouses. The workers who shares knifes, by mistake may cut or puncture themselves with HBV – contaminated blood tainted knife that other butcher later used, making it possible for the infection to be transmitted from knife to persons through a break in their skin (Ann *et al.,* 1992).These might support proves of high predisposition of butchers to the risk blood related infections.

A lot of abattoir workers (29.5%) acquired more BBI compared to the controls (8.2%) inclusive of *Treponema pallidum (*a spirochete), an etiological agent of Syphilis, which was responsible for the chronic infections with various diverse clinical manifestations occurring in distinct stages. It could not be readily cultured (Fieldsteel, 1981) nor stained with simple laboratory stains (Portnoy, 1957; Wilcox, 1966). HBV and HCV are readily transmitted through per-cutaneous and pre-mucosal exposure to infectious blood and body fluids like semen, wound exudates, vaginal secretion and vagina and the sharing of contaminated sharp objects. The maximum concentrations of the viruses were found in the blood (108- 1010 virons/ml) and serum while saliva contains the lowest (WHO, 2004; Massachusetts, 2011). However, increasing job hours correlates an increasing BBI exposure—26.9% in at least six days/week and 53% in 7days/week. Interestingly, increasing years of working experience correlates increased BBI and vice-versa thus indicating that BBI were acquired on the workplace on regular basis.

In this study, the 17% HBV seropositivity doubles the prevalence of 9.4% HBV among abattoir workers in Ibadan, as documented by Ola *et al* 2008. Blood-borne viral agents—HBV and HCV--were relatively pronounced compared to zoonotic brucellosis and treponema among abattoir workers. This might possibly be due to increased human-animal-products contact of AWs with animal hides and skin and waste products in the lirage prior to animal slaughter whereas the butchers maintained contact with the relatively “clean” viscera.

Furthermore, related predisposing risk factors included the putting of contaminated hands and fingers into the mouth, nose or eyes; breathing-in of infectious aerosols/droplets from the smoky air; respiratory discharges such as coughs and sneezes, contaminated dust; splashes of blood and other body fluids into the eye and other mucous membranes and broken skin in direct contact with the micro-organism. Skin-penetrating injury was caused by contaminated needles, other sharp objects and through bites of infected animals. However, individual differences in immune response determines the eventual outcome of host, parasites and environmental interactions while any pre-existing illness, age, gender (hormonal factors) might alter the immune status of any given individual.

Age, gender, types of accommodation of the employees were not significant determinants of occupational health hazards, Workers who engaged in at least six hours/day had minimal exposure to BBI compared to those that offers to work over seven hours daily. The spread of biological hazards might

not be unconnected with individual lifestyles, environment related risks, immune status subject to routine Medicare attention but various open wounds—from knife cuts and other care-free blood-letting attitudes of butchers had not accounted for its lower blood-borne infection. Absence of BBI within the age bracket 61-80 might not be unconnected with the relative administrative and supervisory/ leadership roles of these experienced individuals thus the younger trainees/employees who work under their mentorships sequel to the reducing physical stamina of the aging and committed abattoir workers.

## 5.0 RECOMMENDATION & CONCLUSION

The control of occupational acquired infections in the slaughter houses may combine good environmental hygiene and design; identification of hazards and control of microbial contaminations by breaking its link (portal(s) of entry) to various infections they elicit.

Occupational hygiene should necessitate hand-washing (and arms if necessary) before eating, drinking, smoking, using the telephone handsets, covering all new and existing cuts and bruises with waterproof dressings before starting work. If cuts occur immediate, washing with soap and running water and applying a waterproof dressing is recommended. Also, avoid contamination of meals by taking time-out for break time away from the main work area; wearing appropriate protective clothing such as waterproof/water-resistant protective clothing, plastic aprons, gloves, rubber boots/disposable overshoes to stop personal contamination and proper (safe) disposal of all contaminated waste.

Work place design and environmental hygiene should entail the use of safer equipments that are easy to clean and decontaminate; regular cleaning of all work surfaces/work areas. Water treatment systems that either have “cidal” or “static” activities on microorganisms; and the practice of regular pest (rats, insects) control within the workplace are inevitable.

Exposure Control Plan (ECP) which includes risk identification, assessment of workers at risk, risk control, workers education/ training and implementation of safe work procedures should be implemented by the authorities. Such possible risk control measures may require the regular cleaning of personal protective uniforms either by the provision of laundry facilities by abattoir authority, public-private-partnership approach or individual washings at highest temperature (separating contaminated clothing from the clean ones). The creation of emergency medical unit equipped with first aid materials and trained personnel in abattoir; use of hot water and detergents/safe quantity of bleach on work surfaces/areas to physically remove and/ or kill most micro-organisms after each days work avoiding the creation of infectious aerosols by use of low pressure water jet in cleaning large surface work area. With the run-off water into the flowing river, the use of river water for washing of animal products must be discouraged while encouraging the use of personal protective equipment—rubber boots, hands gloves, eye glasses—and abattoir workers/public visitors on the practice of standard operating procedures and risk management’s skills by means of audio-visual documentaries.

The practice of routine medical surveillance/diagnostic investigations on possible exposure to risk of occupational health hazards is the important disease control measure valuable to safe abattoir practice. Animal owners and handlers should be educated on the importance of vaccinations especially to those at risk of lacerations and cuts at their workplaces.

Surveillance should be placed more on the operational method employed by AWs for the needed changes in-order to avert possible spread of occupationally acquired zoonotic infection among abattoir employees, visitors, customers, their immediate families and the communities at large.

Enforcement of laws and orders, penalties (fines) as regulatory tools in the running of slaughterhouses should be implemented while similar studies should be encouraged in other geopolitical zones in the country /other countries in-order to enable a “workable” government policies that would help restructure and rid most abattoirs of all occupationally acquired zoonosis, hence ensuring a safe environmental friendly and healthy society

**ACKNOWLEDGEMENTS:**

All members and state executives, National Butchers Union of Nigeria, Ogun state branch, represented by Alhaji (Hon.) Ayinde Adesina (Secretary); medical laboratory scientists of the National Blood Transfusion Services, Iberekodo and Hansen Diseases Centre, Eliga: Mrs. A.A. Ogunleye, Mr. A.N. Oresanya (Head), Mrs. A.E. Sotola, Drs. N.O. Aigoro and S.B. Ola, General Hospital, Iberekodo; and Mr. M.O. Ogunkola, Director, Medical Laboratory Services, Ogun State Hospital Management Board, all in Abeokuta, were very cooperative and supportive in this study.

**CORRESPONDING AUTHOR:**

Dr Taiwo A. Banjo,
Department of Medical Microbiology & Parasitology,
Obafemi Awolowo College of Health Sciences,

Olabisi Onabanjo University,
P.M.B.2001, Sagamu. Ogun state. Nigeria.
+234-(0)-703-832-3342
E-mail: sirby2k@yahoo.com

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9/10/2013