



Contents lists available at [ScienceDirect](#)

Safety and Health at Work

journal homepage: www.e-shaw.org



Original Article

Status of Laboratory Biosafety and Biosecurity in Veterinary Research Facilities in Nigeria

Ismail Ayoade Odetokun^{1,*}, Afusat Toyin Jagun-Jubril², Bernard A. Onoja³, Yiltawe Simwal Wungak⁴, Ibrahim Adisa Raufu⁵, Jessica Corron Chen⁶

¹ Department of Veterinary Public Health and Preventive Medicine, University of Ilorin, Ilorin, Nigeria

² Department of Veterinary Pathology, University of Ibadan, Ibadan, Nigeria

³ Department of Virology, University of Ibadan, Ibadan, Nigeria

⁴ Viral Research Division, National Veterinary Research Institute, Vom, Nigeria

⁵ Department of Veterinary Microbiology, University of Ilorin, Nigeria

⁶ Food, Nutrition and Health Program, Faculty of Land and Food Systems, University of British Columbia, Vancouver, Canada

ARTICLE INFO

Article history:

Received 17 February 2016

Received in revised form

5 July 2016

Accepted 9 August 2016

Available online xxx

Keywords:

biosafety
facilities
Nigeria
research
veterinary

ABSTRACT

Background: This study determined current status of laboratory biosafety in Nigerian veterinary research facilities.

Methods: A questionnaire was developed to obtain information from researchers across Nigeria from July 2014 to July 2015. Information regarding demographics, knowledge of laboratory biosafety, availability and proper use of personal protective equipment (PPE), any priority pathogens researched, attitude on and use of standard laboratory practices, and biosafety awareness was obtained using a numeric scoring system. Data were analyzed with descriptive statistics, and univariate and multivariate logistic regression.

Results: A total of 74 participants from 19 facilities completed the questionnaire. General knowledge scores ranged from 3 to 28 (out of 28 possible points), with 94.6% of respondents receiving low scores (scores < mean + 1 standard deviation). Very few (17.6%) reported availability or use PPE. Many participants (63.5%) reported no access to biosafety level (BSL)-1–3 facilities. None reported availability of a BSL-4 facility. Knowledge scores pertaining to biosafety management practices ranged from 0 to 14 (out of 14 possible points) with 47.3% of respondents receiving good scores (scores > mean + 1 standard deviation). Only 16.2% of respondents (from four facilities) reported having biosafety officers. Rabies virus was the most researched pathogen (31.1% of respondents). The majority (71.6%) were unaware of laws guiding biosafety. Researchers [odds ratio (OR) = 18.0; 95% confidence interval (CI): 1.63, 198.5; $p = 0.023$], especially in BSL-2 (OR = 258.5; 95% CI: 12.71, 5256; $p < 0.001$) facility of research institute (OR = 25.0; 95% CI: 5.18, 120.6; $p < 0.001$), are more likely to have adequate access to and properly utilize biosafety devices and PPE.

Conclusions: Current knowledge of laboratory biosafety is limited except among a few researchers.

© 2016, Occupational Safety and Health Research Institute. Published by Elsevier. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Biosafety is a discipline that focuses on the safe handling and containment of infectious microorganisms and hazardous biological materials. Recently, research on infectious pathogens has been on the rise due to the emergence of new and re-emergence of previously identified infectious agents and diseases, some of which could

be used as weapons of bioterrorism [1–3]. Laboratory researchers, including those working in veterinary facilities, are at risk of being exposed to infectious zoonotic agents. Zoonoses account for up to 61% of all contagious diseases affecting humans worldwide and also make up 75% of emerging human diseases [4]. Most infectious and zoonotic diseases usually start as anthroponoses—transmitted from lower vertebrates (primary sources) to humans. Anthroponoses,

* Corresponding author. Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, P.M.B. 1515, University of Ilorin, Ilorin, Nigeria. Tel.: +234 8030886018.

E-mail addresses: odetokun.ia@unilorin.edu.ng; ismail23us@gmail.com (I.A. Odetokun).

such as those involving the highly pathogenic avian influenza viruses, Lassa fever virus, *Brucella* spp., pathogenic *Mycobacterium* spp., *Bacillus anthracis*, *Escherichia coli* O157:H7, *Salmonella* spp., and rabies virus [5–12], typically cause serious health hazards among vast animal populations worldwide with the attendant economic and public health consequences being enormous [13]. The majority of these pathogens are on the Centers for Disease Control and Prevention (CDC) bioterrorism agents list [14].

Growing attention is being given to laboratory biosafety and containment of infectious agents [15] as most diseases caused by zoonotic agents are well-known and preventable. Laboratory biosafety and biosecurity are important in order to ensure researchers' safety, especially from laboratory acquired infections (LAIs), and to protect the public from accidental or intentional exposure to infectious pathogens [16]. These risks have raised a serious concern for the training of laboratory researchers [17]. Despite extensive documentation of the occurrence of LAIs causing disease and mortality among researchers [18] these infections still remain a problem. Due to scarce reports on LAIs in Nigerian veterinary research facilities, the magnitude of this problem remains largely unknown, thus hindering the ability to determine the best course of action to control the occurrence of LAIs.

Previous studies have focused on laboratory biosafety and biosecurity as it relates to laboratory technicians [19,20], clinical microbiology laboratories [20–22] medical diagnostic laboratories [23,24], and pharmaceutical and biotechnology laboratories [23] that work with human pathogens. Detailed studies on laboratory biosafety and biosecurity in Africa are uncommon [23,25]. In Nigeria, no study to date has assessed the state of biosafety and biosecurity in the few available veterinary research facilities. Despite reported outbreaks of highly infectious zoonotic pathogens [26–28] current information on the laboratory biosafety capabilities of existing veterinary research facilities working with these pathogens is unavailable. In this study, we surveyed researchers' knowledge of laboratory biosafety, the availability and proper use of biosafety equipment, the name and category of hazardous pathogens being studied, personal attitudes on and use of standard laboratory practices, and the level of biosafety awareness in veterinary facilities across Nigeria.

2. Materials and methods

2.1. Study design

A cross-sectional biosafety survey was carried out from July 2014 to July 2015. The target population included graduate students, academics, laboratory technologists, research officers, and veterinary clinicians working in veterinary research facilities across the six geopolitical zones of Nigeria. The sample size formula ($n = Z^2 p (1 - p) / d^2$) for field study according to Thrusfield [29], where n is the computed sample size, Z is the degree of confidence (1.96 in this study), p is the expected proportion, and d is the desired absolute precision at the 95% confidence level (10% in this study), was used to obtain the target sample size. For this study, as we had no prior data regarding the proportion of researchers in veterinary facilities having a good laboratory knowledge score (defined as greater than one standard deviation above the mean), therefore, we set p at 50%. This gave a minimum sample size (n) of 96 respondents. To increase precision, 160 questionnaires were administered to respondents through a snowballing technique. This technique is a chain referral process in which respondents in veterinary facilities from the six geopolitical zones were asked to recommend other researchers until the desired sample size is met.

2.2. Questionnaire design and implementation

The questionnaire was comprised of two parts: demographic questions and general biosafety and biosecurity questions. Questions raised in our questionnaire were based on standards stipulated in international laboratory biosafety manuals such as the Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th Edition and the Laboratory Biosafety Manual (3rd Edition) developed by the World Health Organization (2014). In this study, questions indicative of respondents' general knowledge of laboratory biosafety, including issues such as biosecurity, biocontainment, decontamination protocols, biosafety levels and cabinets, standard operating procedures (SOPs), personal protective equipment (PPE), biohazard transport and disposal, and pest control, were asked. Also, respondents were asked about the availability and use of biosafety devices (such as facilities with the appropriate biosafety level and biosafety cabinets) and PPE. On PPE, we asked the respondents to list up to five of the basic PPE (such as lab coat, hand gloves, nose mask, hair net, face mask/safety goggles) they use when working with pathogens. If a respondent lists three to five PPE correctly, this is scored as good usage/availability. A list of two or fewer PPE is scored as poor usage/availability.

Respondents were further asked about their awareness of national laws regulating biosafety and select agents, as well as biosafety and biosecurity-related terms and regulatory associations both in Nigeria and globally. The questionnaire was pre-tested on five veterinary researchers from two veterinary faculties in the southwest and northcentral geopolitical regions of Nigeria.

The questionnaires were purposively administered to lecturers and laboratory technologists (irrespective of rank) carrying out research in Nigerian universities and colleges with veterinary faculties or units, veterinary research officers and technologists in various research laboratories at the National Veterinary Research Institute, veterinary clinicians with their own laboratories, and graduate students performing research in these facilities. Graduate students were typically enrolled in a PhD or Master's veterinary program and had at least 1 year's experience of conducting research in a veterinary research facility. Participating laboratories/respondents were purposively sampled based on their availability, veterinary research activity and/or presence of a veterinary research facility/laboratory. Consent was given by all participants and by the appropriate administrative personnel for all facilities where the questionnaire was distributed. Respondents were allowed to withdraw from the survey without penalty at any time. All supplied information was maintained confidential by the personnel administering the questionnaire and tabulating the results. The six Nigerian geopolitical zones from which researchers were enlisted were the northwest, northeast, northcentral, southwest, southeast, and south-south.

2.3. Data management and statistical analysis

Data were summarized using Microsoft Excel 2013 and analyzed using Open Source Epidemiologic Statistics for Public Health (OpenEpi), version 3.03a (http://www.openepi.com/Menu/OE_Menu.htm, updated 2015/05/04). A dependent/outcome variable was created for the following specific objectives that were used to determine the status of biosafety and biosecurity in Nigerian veterinary research facilities: (1) general knowledge of laboratory biosafety and biosecurity; (2) availability and proper use of biosafety devices and PPE; (3) management knowledge of biological safety; (4) breakdown of laboratory biosecurity; (5) attitude

Download English Version:

<https://daneshyari.com/en/article/7527771>

Download Persian Version:

<https://daneshyari.com/article/7527771>

[Daneshyari.com](https://daneshyari.com)