ABSTRACT BOOK

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AFRICA CDC'S INAUGURAL ONE HEALTH CONFERENCE

Increasing globalization, urban density, ease of travel, animal movement, environmental changes and habitat overlap between humans and animals, all provide opportunities for the emergence and spread of diseases that adversely impact both human and animal health, prosperity, and food security. COVID-19 and Ebola virus disease are two recent examples of how these various factors have directly impacted Africa. To combat these current outbreaks and get ahead of the next, a One Health approach must be taken.

One Health is a collaborative, multisectoral and transdisciplinary approach used to attain optimal health outcomes for people, animals, plants, and their shared environment. Practically, One Health involves the collaboration between human, animal, and environmental health sectors as well as other relevant stakeholders, in the design and implementation of programmes, policies, legislation, and research intended to achieve better health outcomes for all.

To celebrate and share the various One Health work taking place on the continent, the Africa Centres for Disease Control and Prevention (Africa CDC)[1] hosted a 3-day virtual **One Health Conference from 1-3 November 2021**. The conference sought to:

- Share best practices and experiences from Member States and partners.
- Showcase continental One Health research focusing on zoonotic disease surveillance and outbreak response, antimicrobial resistance, food safety, environmental health, and operational research through scientific presentations.
- Highlight operational tools and guidance documents developed by African Union organs and technical partners like the World Health Organization (WHO), World Organisation for Animal Health (OIE) and Food and Agriculture Organization of the United Nations (FAO).
- Exhibit opportunities for collaboration or One Health implementation support.
- Strengthen One Health advocacy and capacity across the African Union Member States and Regional networks.

This abstract book outlines the program for the conference and lists the abstracts reviewed by the Conference Scientific Committee and selected by the Conference Organising Committee for either oral or poster presentation during the scheduled scientific sessions.

[1]ABOUT AFRICA CDC: The Africa Centres for Disease Control and Prevention (Africa CDC) is a specialised technical agency of the African Union (AU). Africa CDC's mission is to strengthen Africa's public health institutions' capacities, capabilities and partnerships to detect and respond quickly and effectively to disease threats and outbreaks based on science, policy, and data-driven interventions and programs. Africa CDC realises that a One Health approach is critical for the accelerated implementation of the International Health Regulations (IHR 2005) to safeguard the socioeconomic and political integration of the continent and to achieve the AU Agenda 2063: The Africa We Want.

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TABLE OF CONTENTS

ABSTRACT BOOK 1
AFRICA CDC'S INAUGURAL ONE HEALTH CONFERENCE 1
TABLE OF CONTENTS 3
OPENING SESSIONS 4
PANEL SESSIONS 5
Panel Session 1: Partner Tools 5
Panel Session 2: Advancing One Health 7
Panel Session 3: Next Steps for One Health - Wildlife and Environment 9
Panel Session 4: One Health Partnerships 11
CLOSING SESSION 12
SCIENTIFIC SESSIONS 12
Hot Topic Presentations 12
Zoonotic Disease Surveillance and Outbreak Response Presentations 14
One Health Operational Research Presentations 17
Food Safety and Antimicrobial Resistance Presentations 21
Environmental Health Presentations 23
POSTER SESSIONS 26
Food Safety and Antimicrobial Resistance 26
Environmental Health 28
Operational Research 31
Zoonotic Disease Surveillance and Outbreak Investigations 34
COVID-19 and One Health 38
Rabies and One Health 41

OPENING SESSIONS

Chaired by: Dr Abdulaziz Mohammed, Head of Division, Disease Control and Prevention | Ag Head of Division, Surveillance, Africa CDC; Dr Wessam Mankoula, Incident Manager for COVID-19 and Lead of Emergency Operations Center, Africa CDC; and Dr Lul Riek, Regional Coordinator, Southern Africa Regional Collaborating Centre

O-1
OPENING REMARKS BY AFRICA CENTRES FOR DISEASE CONTROL AND PREVENTION
Speaker: Dr. Ahmed Ogwell, Deputy Director, Africa CDC

O-2
OPENING REMARKS BY THE AFRICAN UNION INTERAFRICAN BUREAU FOR ANIMAL RESOURCES AND PAN AFRICAN VETERINARY VACCINE CENTRE
Speaker: Dr. Nick Nwankpa, Director, AU-IBAR and PANVAC

O-3
THE DEVELOPMENT AND IMPLEMENTATION OF AFRICA CDC'S ONE HEALTH FRAMEWORK FOR NPHIS
Speakers: Dr. Wande Alimi, AMR and One Health Programme Coordinator and Dr. Stephanie Salyer, Technical Advisor, Africa CDC

O-4
AU-IBAR ONE HEALTH UPDATE
Speaker: Dr. Hiver Boussini, Senior Animal Health Officer, African Union InterAfrican Bureau for Animal Resources (AU-IBAR)

O-5
PANVAC ONE HEALTH UPDATE
Speaker: Ms. Ethel Chitsungo, Head, Vaccine Quality Control, AU-PANVAC

O-6
ONE HEALTH APPROACHES TO COVID-19 IN SOUTH AFRICA
Speaker: Dr. Misheck Mulumba, Senior Manager Research, ARC Onderstepoort Veterinary Research Institute

Among African countries, South Africa has recorded the highest number of cases while also having conducted the highest number of tests. The higher case numbers reported may be a function of the higher testing capacity compared to other African countries. Initially testing capacity was inadequate necessitating the need to co-opt in the National Veterinary Institute at Onderstepoort to cope with the testing requirements. This was a practical demonstration of the One Health approach to handling COVID-19. It is shown how the country has ably managed the disease in humans from testing right through to vaccination. The few occurrences of SARs-CoV-2 infections in animals are also reported. Apart from searching for and discovering new variants of both interest and concern, a number of research focus areas have also been identified.

O-7
WEST AFRICAN HEALTH ORGANIZATION'S ONE HEALTH DATA PLATFORM
Speaker: Dr. Virgil Lokossou, Head of Division - Emergency Preparedness and Response/ECOWAS Regional Center for Surveillance and Disease Control, West African Health Organisation

O-8
EAST AFRICAN COMMUNITY'S REGIONAL ONE HEALTH STRATEGY
Speaker: Mr. Timothy Wesonga, Pandemic Preparedness and One Health Advisor, EAC-GIZ

O-9
SOUTHERN AFRICAN DEVELOPMENT COMMUNITY'S AMR ACTIVITIES
Speaker: Dr. Gaolathe Thobokwe, Program Officer Livestock, SADC Secretariat

PANEL SESSIONS

Panel Session 1: Partner Tools

This session focused on operational tools and guidance documents developed by the following technical partners: WHO, FAO, GARC, Mission Rabies, and US CDC.
Chaired by: DrRaji Tajudeen, Head of Public Health Institutes and Research Division, Africa CDC

PS1-1
MULTISECTORAL, ONE HEALTH, COORDINATION MECHANISM OPERATIONAL TOOL, AN OPERATIONAL TOOL OF THE TRIPARTITE ZOONOSES GUIDE
Speaker: Dr. Stephane de La Rocque and Dr. Kaylee Myhre Errecaborde, Technical Advisor / Head of the Human-Animal Interface Team; Technical Officer, WHO Emergency Program, World Health Organisation

This Multisectoral, One Health, Coordination Mechanism Operational Tool (MCM OT) supports national authorities to improve their management of zoonotic diseases by establishing or strengthening a government One Health mechanism (sometimes referred to as a One Health taskforce or platform). These collaborative platforms allow ministries (or agencies) to interact on a regular basis to support improved preparedness and response for One Health challenges. The MCM OT uses 18 strategic technical elements to support the development of sustainable and effective collaboration and is based on the principles presented in the Tripartite Zoonoses Guide. Through the 10-step process, countries will address leadership and technical functions to improve collaboration, communication, and coordination across sectors to achieve better health outcomes at the human-animal-environmental interface.

PS1-2
JOINT RISK ASSESSMENT (JRA) OPERATIONAL TOOL AND LESSONS LEARNT ON ITS OPERATIONALISATION
Speaker: Dr. Sophie von Dobschuetz, Global Surveillance Coordinator, Food and Agriculture Organization of the United Nations (FAO)

To adequately address risks arising at environment, animal and human interface, such as zoonotic diseases, pathogen and epidemiologic information must be considered and assessed jointly by animal, public, and environmental health sectors. Because individual sectors have distinct objectives in conducting their own, sector-specific risk assessments, the Tripartite (FAO-OIE-WHO) developed a standard guidance and operational tool for qualitative, multi-sectoral, joint risk assessments (JRA)

focusing on the animal-human-environment interface. JRA outputs provide a scientific basis for decision making and shape policies for zoonotic disease prevention and control that are consistent across participating sectors. Sustainable operationalization of the JRA is implemented by setting up the JRA process within established government structures, (e.g. National One Health Platforms).

In 2019/2020, 16 countries piloted the JRA, applying it to their national priority zoonotic diseases, e.g. avian influenza, rabies, anthrax, Rift Valley fever, and leptospirosis. The final version of the tool was published in December 2020 in English, French, and Spanish, and will soon be translated into Arabic, Chinese, and Russian. Countries found JRA useful, feasible, and applicable at national and subnational levels. Evidence-based decision making for zoonotic disease preparedness, prevention and control, agreed and coordinated between sectors, was identified as a key outcome.

PS1-3

THE POWER OF COLLABORATION: APPLYING A ONE HEALTH APPROACH TO PRIORITIZE ZOONOTIC DISEASES

Speaker: Dr. Casey Barton Behravesh, Director, One Health Office, U.S. Centers for Disease Control and Prevention

Prioritizing zoonotic diseases requires a multisectoral, One Health approach and provides an opportunity to improve coordination, communication, and collaboration among One Health partners. The One Health Zoonotic Disease Prioritization (OHZDP) process brings together representatives from human, animal, and environmental health sectors, as well as other relevant partners, to prioritize zoonotic diseases of greatest concern for One Health collaboration in a country, region, or other area. This process uses a transparent approach and incorporates equal input from all represented One Health sectors working at the human-animal-environment interface. The goals of the OHZDP process are to use a multisectoral, One Health approach to (1) prioritize zoonotic diseases of greatest concern and (2) develop next steps and action plans to address the priority zoonotic diseases in collaboration with One Health partners. The process is adaptable to local context and scalable for use at the subnational, national, and regional levels. During the workshop, participants prioritize zoonotic diseases using equal input from all represented One Health sectors through a transparent and collaborative process. Workshop participation helps strengthen One Health collaborations by connecting representatives from human, animal, and environmental health sectors and other relevant partners. The workshop outcomes help participants focus limited resources to build capacity and collaboratively address the priority zoonotic diseases, and informs assessments, planning efforts, and strategy development relevant to One Health. More information is available: www.cdc.gov/onehealth/what-we-do/zoonotic-disease-prioritization/index

PS1-4

SURVEILLANCE AND INFORMATION SHARING OPERATIONAL TOOL (SISOT)

Speaker: Dr. Willington Bessong Ojong, Country Team Leader, Emergency Centre for Transboundary Animal Diseases, (ECTAD), UGANDA, Food and Agriculture Organisation of the United Nations

PS1-5

SUPPORTIVE TOOLS FOR RABIES ELIMINATION: DIGITAL TOOLS FOR DOG VACCINATION

Speaker: Dr. Terence Scott, Technical Lead, Global Alliance for Rabies Control and Dr. Andy Gibson, Director of Strategy & Research, Mission Rabies

As the global goal of zero dog-mediated human rabies deaths by 2030 draws closer, dog rabies endemic countries are encouraged through to drive rabies elimination efforts. In support, the global rabies community – coalesced through the United Against Rabies Forum – has developed tools and resources to support these country-centric efforts. These tools aim to facilitate efforts by improving efficiency and reducing costs to eliminate rabies.
Innovations in mobile digital devices offer opportunities to enhance dog vaccination campaign coordination and monitoring. Offline capture of GPS, time, date and dog demography data through smart phones or other logging devices enables a far richer database of dog vaccinations to be efficiently collected and centralised than is possible with paper-based methods. The immediate digital entry of vaccination data at the field-level saves human resources in data collection and provides detailed insight into the geographic and temporal distribution of vaccination effort. Individual dog vaccination point GPS data enables enhanced monitoring efficiency and evaluation of the homogeneity of vaccination effort, enabling rapid strategy adjustments for targeted implementation and resource allocation to yield greatest impact. Here we provide examples of two widely implemented tools used for mass dog vaccination tracking and demonstrate their efficacy towards success.

PS1-6
ONE HEALTH MONITORING AND EVALUATION TOOL
Speaker: Dr. Serge Nzietchueng, One Health Coordinator, Food and Agriculture Organization of United Nations (FAO)

Panel Session 2: Advancing One Health

This session focused on operational tools, technical and policy documents developed by African Union technical organisations (e.g. Africa CDC and AU-IBAR) and AFROHUN.
Chaired by: Dr Athman Mwatondo, Co-Head, Zoonotic Disease Unit, Ministry of Health, Kenya

PS2-1
EVENT-BASED SURVEILLANCE FRAMEWORK
Speaker: Ms. Kyeng Mercy Tetuh, Event-Based Surveillance Coordinator, African Union

The Africa Centres for Disease Control and Prevention (Africa CDC), has developed an event-based surveillance (EBS) Framework that serves as an outline to guide the Public Health Institutes in the African Union Member States interested in implementing EBS. AU MS are currently adapting this framework to guide the operationalisation of EBS using the One Health approach.
PS2-2
BIOSAFETY AND BIOSECURITY FRAMEWORK
Speaker: Dr. Talkmore Maruta, Senior Biosafety and Biosecurity Officer, Africa Centres for Disease Control and Prevention

Between 2016-2019, the World Health Organization (WHO) conducted a Joint External Evaluation (JEE) among Member states and they indicated limited capacity on biosafety and biosecurity among Member

States. In April 2019, Africa CDC conducted Regional Consultative Workshop through its five (5) Regional Collaborating Centres (RCC) in which Member States highlighted lack of on inadequate and fragmented legislation, regulations and policy frameworks relevant to biosafety and biosecurity as key to lack of prioritization and improvement of biosafety and biosecurity among Member States. To address these challenges and assist Member States in building capacity to comply with international requirements and regulations, Africa CDC in collaboration with its RCCS, international partners and Member States coordinated the development of a legal framework for biosafety and biosecurity that can be adopted and endorsed by Member States.

PS2-3

AU AMR FRAMEWORK/FOOD SAFETY

Speaker: Mr. John Oppong-Otoo, Food Safety Officer, AFRICAN UNION INTERAFRICAN BUREAU FOR ANIMAL RESOURCES

The presentation focuses on the African Union Commission's engagement with the AU Member States and Partners in developing a continental framework for intervening on AMR issues in Africa. It also highlights the coordination mechanisms established to enhance the complementary implementation of AMR activities and key areas on food safety where focused interventions are needed to improve AMR control.

PS2-4

ONE HEALTH WORKFORCE DEVELOPMENT: AFROHUN'S APPROACH; LESSONS LEARNED AND OPPORTUNITIES

Speaker: Dr. Irene Naigaga, Regional Program Manager, Africa One Health University Network

Workforce Development is a deliberate multi-step process aimed at ensuring availability of competent and effective human capital to implement institutional or national programs. A fundamental component of the Global Health Security Agenda strategy is building the capacity of the global health workforce to prevent, detect, and respond to emerging and re-emerging complex health challenges, such as infectious diseases and antimicrobial resistance. One Health Workforce requires sector-specific technical competencies that meet international standards and requirements, multi-sectoral functional competencies that give personnel the knowledge, skills, and attitudes to work across sectors effectively and the operational capacity within institutions and organizations to support multi-sectoral work. The Africa One Health University Network (AFROHUN), formerly One Health Central and Eastern Africa (OHCEA), has been contributing to the achievement of such workforce transformation on the African continent for 12 years. AFROHUN is an international multistakeholder network aimed at strengthening training and educational programs in the 19 member universities to create a health workforce with One Health skills and competencies. AFROHUN member universities are located in 10 countries in east, central and west Africa, namely, Cameroon, Côte d'Ivoire, Democratic Republic of Congo, Ethiopia, Kenya, Liberia, Rwanda, Senegal, Tanzania and Uganda. Universities are key drivers of One Health change as they educate the future and in-service One Health workforce and forge partnerships with governments and communities to support workforce

strengthening and decision-making through action research, and service work.

AFROHUN's approach to this work is multi-pronged; 1) strengthens the capacity of member universities to develop and deliver appropriate programs, 2) design new and review existing programs with One Health competency, 3) provide opportunities for multi-disciplinary hands-on practical field-based training and research, 4) partnership engagement for workforce assessment, planning and policy. Lessons have been learned at all these levels. In addition, lessons have also been drawn at every stage of the workforce development cycle. Some of the lessons learned include but not limited to 1) Impactful One Health Workforce development should be evidence-informed and needs driven; 2) One Health Workforce development relies on strategic partnership engagement, including universities, government, alumni, the private sectors, and donors 3) Faculty-government engagement, while critical to workforce development, it's still a challenge for many universities. 4) competency-based education, although important in skilling the workforce, is not well appreciated in many African universities 5) Standardization of the One Health credential is key to streamlining One Health education. These lessons offer several opportunities including, 1) collaboration in workforce development - workforce assessment, planning, capacity development and sustenance; 2) knowledge transfer to players outside the network including, products and process development from the network experience and expertise; 3) co-hosting international conferences – AFROHUN bi-annual international One Health conference 4) collaboration on multi-disciplinary research.

PS2-5
AFRICA PATHOGEN GENOMICS INITIATIVE
Speaker: Dr. Sofonias Tessema, Program Lead, Africa Pathogen Genomics Initiative, Africa CDC Institute for Pathogen Genomics

Panel Session 3: Next Steps for One Health - Wildlife and Environment

This session highlights the importance of wildlife and environment health sectors as key stakeholders for operationalising One Health. The session focused on operational tools and guidance documents developed by the following technical partners: FAO, OIE, EcoHealth Alliance and UNEP.
Chaired by: Dr Gladys Kalema-Zikusoka, Founder & CEO, Conservation Through Public Health

PS3-1
EMERGING ENVIRONMENTAL ISSUES THAT NEED A ONE HEALTH APPROACH
Speaker: Mr. Levis Kavagi, Africa Coordinator, Ecosystems and Biodiversity, United Nations Environment Programme (UNEP)

One-Health comprises three pillars: human health, animal health and environment. Over the years advances have been made in addressing the human health and animal health pillars of One-Health. The environment pillar tends to lag behind; however, the environment plays a critical role in ensuring we attain the One Health goal. The increase in zoonotic diseases is a clear signal that we have reached the tipping point

beyond which we risk losing the environmental protection that prevents diseases from crossing over from the wild to human beings.

PS3-2

HARMFUL ALGAL BLOOMS

Speaker: Mrs. Esther Garrido Gamarro, Fishery Officer, Food and Agriculture Organization of the United Nations

Harmful algal blooms (HABs) are natural phenomena that have occurred throughout recorded history. Even non-toxic algal blooms can have devastating impacts when they lead to kills of fish and invertebrates by generating anoxic conditions. Some algal species, although non-toxic to humans, can produce exudates that can cause damage to the delicate gill tissues of fish. Aquaculture stocks (fish, molluscs and crustaceans) kept in holding units such as cages, pens, ropes, ponds are trapped and, thus, can suffer devastating mortalities, which could lead to economic and food losses, and eventually become a food security problem.

Of greatest concern to humans are algal species that produce potent neurotoxins that can find their way through shellfish and fish to human consumers, where they cause a variety of gastrointestinal and neurological illnesses (paralytic shellfish poisoning, amnesic shellfish poisoning, diarrhetic shellfish poisoning, neurotoxic shellfish poisoning, azaspiracid shellfish poisoning and ciguatera poisoning). Worldwide, ciguatoxins are estimated to cause around 50 000 cases of ciguatera fish poisoning annually; neurological effects may last for weeks or even years and one percent of these cases are fatal (FAO/WHO, 2020).

If HABs are not controlled, the economic damage through declines in both local consumption and the export of seafood products can be considerable. In addition, due to climate change and coastal water nutrient over-enrichment, HABs have become more frequent, more intense, more widespread, and less predictable in the past decades, which poses both a food security and a food safety threat and can have a devastating impact in the economy and society (FAO/WHO, 2020).

FAO and WHO (2020) Report of the Expert Meeting on Ciguatera Poisoning. Rome, 19–23 November 2018. Food Safety and Quality No. 9. Rome. https://doi.org/10.4060/ca8817en

PS3-3

WILDLIFE HEALTH FRAMEWORK

Speaker: Dr. Chadia Wannous, Regional One Health Officer for Africa, World Organization for Animal Health (OIE)

In response to the increased global trends in disease emergence and biodiversity loss, and the need to better manage risks from emerging diseases at the human-animal-ecosystems interface, there is recognition of an urgent necessity to strengthen the wildlife component of One Health.

The World Organisation for Animal Health's (OIE's) mandate as the leading international organisation on animal Health, and in representing the interests of National Veterinary Services in 182 Member Countries, recognises that animal health, balanced ecosystems, and biodiversity contribute to achieving One Health.

The OIE Wildlife Health Framework's overall goal is to 'protect wildlife health worldwide to achieve One Health'. The framework will improve the ability of OIE Members to manage the risk of pathogen emergence and transmission at the human-animal-ecosystem interface - whilst at the same time ensuring the protection of wildlife. It will also improve and strengthen surveillance systems, early detection,

notification, and management of wildlife diseases. This will be achieved through better intersectoral coordination, collaboration, and capacity building, a fostered political, policy and scientific environment, and a better awareness of risks pathways and sharing of best practices.

PS3-4
WILDLIFE SECTOR EVALUATION TOOL
Speaker: Dr. Catherine Machalaba, Senior Policy Advisor, EcoHealth Alliance

Strengthening wildlife and broader environmental health capacity is critical for building back better and greener in COVID-19 recovery efforts. However, no standard capacity assessment tool exists for wildlife or environmental health services, resulting in poor understanding of necessary functions and a low recognition of gaps in implementation and financing. In many cases, wildlife and environmental health is fragmented across mandates and sectors, with critical gaps that leave countries vulnerable to health security threats. In a review of Joint External Evaluations (JEE) and Performance of Veterinary Services (PVS) evaluation reports from 107 countries, the majority did not show evidence of a functional wildlife health surveillance system. The limited focus to date on wildlife health hinders implementation capacity for biodiversity and ecosystem-specific objectives, while also missing critical opportunities to contribute to human and domestic animal health outcomes. Encouragingly, recent efforts to support countries in strengthening wildlife health capacity indicate practical entry points for more equitable inclusion of wildlife and environment sector partners in One Health implementation efforts. Key findings and lessons learned will be provided from pilot missions to test draft capacity and needs assessment tools for wildlife and environmental health.

Panel Session 4: One Health Partnerships

This panel session focused on One Health opportunities and support available to AU Member States from the following technical and development partners: Fleming Fund, Gavi, GIZ, UKHSA,USAID, and the World Bank.
Chaired by: Dr Wande Alimi, AMR and One Health Programme Coordinator, Africa CDC

Panelists included:
Ms. Adjo Mfodwo, Fleming Fund: Regional Coordinator West Africa, Mott MacDonald
Dr. Lee Hampton, Senior Specialist, Gavi, the Vaccine Alliance
Dr. Inge Baumgarten, Director, Liaison Office to the African Union, GIZ - Deutsche Gesellschaft fuer Internationale Zusammenarbeit (German Agency for International Cooperation)
Prof. Dilys Morgan, Consultant Global Public Health, UK Health Security Agency
Dr. Tracey Goldstein, Division Chief, Emerging Threats Division, Bureau for Global Health, USAID
Dr. Franck Berthe, Senior Livestock Specialist, World Bank

CLOSING SESSION

CLOSING REMARKS
Speaker: Ahmed Ogwell, Deputy Director, Africa CDC

SCIENTIFIC SESSIONS

Hot Topic Presentations

This session aims to showcase continental One Health research with a spotlight on three outstanding research projects from Rwanda, Tanzania and DRC.
Chaired by Dr. Ebere Okereke, Honorary Senior Public Health Adviser to the Director Africa CDC | Senior Technical Adviser, Tony Blair Institute for Global Change | Consultant in Global Public Health UK Health Security Agency

SS-1
CHARACTERIZATION OF BUNYAMWERA, BATAI, AND NGARI VIRUSES: UNRECOGNIZED ARBOVIRUSES OF ONE HEALTH IMPORTANCE IN RWANDA
Speaker: Dr. Marie Fausta Dutuze, Faculty/ One Health Thread Coordinator, Rwanda Institute for Conservation Agriculture
Contributing Authors: Marie Fausta Dutuze, Rwanda Institute for Conservation Agriculture and Rebecca C. Christofferson, Louisiana State University, Baton Rouge

Bunyamwera (BUNV), Batai (BATV), and Ngari (NRIV) are zoonotic mosquito-borne Bunyaviruses. NRIV is a natural reassortant of BUNV and BATV. In livestock, infection with these viruses is associated with abortions, while humans may present a mild febrile illness or severe disease such as hemorrhagic fever. In East Africa, BUNV, BATV, and NRIV co-circulate and present similar clinical manifestation with Rift Valley Fever virus (RVFV), another Bunyavirus of critical importance in this region as it is associated with massive economic losses in livestock production and cases of human death. In Rwanda, although RVFV is known to circulate in livestock, whether these other Bunyaviruses co-circulate remains to be determined.
The overall goal of this research is to describe and compare the in vitro and in vivo characteristics of BUNV, BATV, and NRIV. To achieve this objective, we a) comparatively characterized in vitro infection kinetics in Vero cells, b) comparatively characterized in vivo infection kinetics in C57BL/6 mouse model and quantified potential cross-neutralization of resulting antibody, and c) developed a disease progression model for BUNV infection in IRF3/7-/--/- mice. Further, we hypothesized that these Orthobunyaviruses circulate in Rwanda and cause infections that are misclassified as RVFV cases. We found: 1) the three viruses are stable in extracellular conditions up to 30 days but inactivation by a commonly used detergent is successful; 2) C57BL/6 mouse infection is not a robust infection model; 3) there are varying degrees of cross-neutralization among the viruses; 4) BUNV infection in IRF3/7-/--/- mice may provide hemorrhagic fever infection model; and 5) these viruses co-circulate with RVFV in Rwanda. This study is the second report of BATV in Africa, the first to detect these viruses in Rwanda, and the first report of co-infection with BUNV and BATV, providing

insight into the provenance of the reassortant NRIV.

SS-2

INTEGRATED BITE CASE MANAGEMENT (IBCM): THE BEST WAY TO STRENGTHEN COLLABORATION BETWEEN HEALTH AND VETERINARY SECTORS, INCREASE RABIES CASE DETECTION AND SAVE MORE LIVES

Speaker: Mr. Kennedy Lushasi, Research Scientist, Ifakara Health Institute
Contributing Authors: Kennedy Lushasi, Ifakara Health Institute, Tanzania; Rachel Steenson, University of Glasgow, UK; Joel Changalucha, Ifakara Health Institute, Tanzania; Nicodem Govella, Ifakara Health Institute, Tanzania; Daniel Haydon, University of Glasgow, UK; Husna Hoffu, Ifakara Health Institute, Tanzania; Felix Lankester, Washington State University, USA; Frank Magoti, Ifakara Health Institute, Tanzania; Emmanuel Mpolya, Nelson Mandela African Institution of Science and Technology, Tanzania; Zacharia Mtema, Ifakara Health Institute, Tanzania; Hesron Nonga, Ministry of Livestock Development and Fisheries, Tanzania; and Katie Hampson, University of Glasgow, UK

Rabies is a neglected zoonotic disease that causes an estimated 59,000 human deaths worldwide annually, mostly in Africa and Asia. A target of zero human deaths from dog-mediated rabies has been set for 2030, and large-scale control programs are now advocated. However, in most low-income endemic countries surveillance to guide rabies control is weak and few cases of rabies are recorded. There is an urgent need to enhance surveillance to improve timely case detection and inform rabies control and prevention, by operationalizing a 'One Health' approach. Here we present data from a study piloting Integrated Bite Case Management (IBCM) to support intersectoral collaboration between health and veterinary workers in Tanzania.

We trained government staff to implement IBCM, comprising risk assessments of bite patients by health workers, investigations by livestock field officers to diagnose rabid animals, and use of a mobile phone application to support integration. IBCM was introduced across 20 districts in 4 regions of Tanzania and results reported after 3 years of implementation.

Reports of bites by suspected rabid dogs more than doubled in all regions, and a large proportion of biting animals were identified as probable rabies cases when tracked down and investigated. Over 2500 high-risk investigations were carried out, with 62% assessed as probable dog rabies cases based on clinical signs, animal outcome, and rapid diagnostic testing. Shortages of PEP were frequent and 22 human rabies deaths corresponding to 2.8/100,000 persons per year occurred in the regions.

Overall, our study provides evidence that IBCM is a practical approach that can improve rabies detection in endemic countries, and be used to monitor the impact of mass dog vaccinations, including potential to verify rabies freedom. IBCM dramatically improved case detection and communication between sectors, we recommend further implementation research to establish best practice and applicability to other settings.

SS-3

RESISTANT E. COLI IN ENVIRONMENTAL WASTEWATER IN KINSHASA

Speaker: Dr. Marc Yambayamba, Lecturer in the Department of Epidemiology and Biostatistics, Kinshasa School of Public Health (KSPH)

Contributing Authors: Marc Yambayamba, Africa One Health University Network (AFROHUN), DRC; Godefroid Musema, Kinshasa School of Public Health, DRC; and Guillaume Kiyombo, Kinshasa School of Public Health, DRC

Introduction: Antimicrobial resistance (AMR) is a serious public health threat with consequences on health, wellbeing, and economies. It's one of the top ten of WHO of priority diseases in 2021. When wastewater released in the environment is not treated and in the context of open defecation, E. Coli is one of the markers of AMR at the environmental level. It's known for causing sepsis, urinary tract infections and diarrhea mostly in children. The objective of this study was to assess E. coli susceptibility to commonly used antibiotics using environmental wastewater collected from rivers and lagoons.
Methods: Wastewater samples from rivers and lagoons of the city of Kinshasa were collected. Ten data collection sites were identified including all the rivers (8) and lagoons (abattoir and hospital). A total of 20 samples collected from May to June 2021 twice per site. E. Coli was isolated and tested for susceptibility to 6 antibiotics using CLSI disk diffusion susceptibility testing methods. The following commonly used antibiotics and most available in pharmacies were tested: amoxycillin, ampicillin, norfloxacin, ceftriaxone, gentamycin, and tetracycline.
Conclusion: This study found a high level of E. Coli resistance to commonly used antibiotics such as tetracycline, amoxicillin, and ampicillin. This calls for urgent measures of wastewater treatment before release in the community.

Zoonotic Disease Surveillance and Outbreak Response Presentations

This session focused on zoonotic disease surveillance and outbreak response in Africa.
Chaired by: Ms. Akhona Tshangela, AG Principal Program Officer, Office of the Director, Africa CDC

SS-4

HIGH PREVALENCE OF LASSA VIRUS IN RODENTS RESERVOIRS IN LASSA FEVER ENDEMIC COMMUNITIES IN SOUTHERN NIGERIA: IMPLICATIONS FOR LASSA VIRUS TRANSMISSION

Speaker: Dr. Anise Happi, Veterinary Pathologist, Head Zoonotic research and surveillance, African Center of Excellence of Infectious Diseases, Redeemer's University
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Ondo, Nigeria; Mr Oluwafemi Ojo, Federal Medical Centre, Owo, Ondo, Nigeria; Ms Chiamaka Nwuba, Redeemer's University, Nigeria; Prof Jonathan Heeney, University of Cambridge, Cambridge, UK; and Prof Christian Happi,- Redeemer's University, Nigeria

The low prevalence of Lassa Virus (LASV) in rodents frequently reported does not correlate with evidence that most Lassa Fever (LF) cases are sustained by multiple spillovers from the rodent reservoirs to humans. It became imperative to improve LASV diagnosis in rodents while updating their prevalence in two LF endemic regions in Nigeria. A total of 942 rodents were trapped in Ondo (531) and Ebonyi (411) States for LASV detection by RT-qPCR using blood and tissues. Overall, LASV prevalence in captured rodents was 53.6%. Ondo State had three- and two-times higher capture success and LASV prevalence respectively than Ebonyi State. All rodents (Mastomys spp, Rattus spp, Crocidura spp, Mus spp, and Tatera spp) genuses captured in both states showed slightly variable LASV positivity, with Rattus spp being the most predominantly infected (77.3%) rodents in Ondo State versus Mastomys spp (41.6%) in Ebonyi. LASV was found in all tissues tested with the spleen (55.7%), kidney (53.9%) and testes (51.8%) in Ondo State being the most LASV positive tissues. In Ebonyi State, testes (33.7%), embryo (28.9 %), kidney (24.2%), and spleen (21.1%) showed the most LASV positivity. Plasma in both states expectedly had the lowest frequency of LASV detected. The finding of a relatively high LASV prevalence in all small rodent genuses captured emphasizes the complexity of the infection dynamics with interspecies transmission that maintains the relatively high risk of zoonotic spill-over events in high-risk communities. It may also serve as triggers of LF epidemics with high seasonal incidences. Furthermore, the possibility of transmission through coitus, vertical and horizontal transmission may fuel epizootic rodent outbreaks in communities where the disease is endemic in Nigeria.

SS-5

SEROLOGICAL EVIDENCE OF RIFT VALLEY FEVER INFECTIONS AMONG OUTPATIENTS IN NORTHERN KWAZULU-NATAL, SOUTH AFRICA

Speaker: Dr. Orienka Hellferscee, Medical Scientist, National Institute for Communicable Diseases
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Background: Geographic expansion of Rift Valley fever virus (RVFV) outside its traditional endemic boundaries in the last four decades has resulted in significant health and socio-economic losses, with potential for its further international spread. This is a major veterinary and public health concern worldwide. A study was conducted to

investigate the possibility of undetected RVFV infections among outpatients in the northern, tropical part of KwaZulu-Natal province (KZN) of South Africa from April 2018 to August 2019.
Methods: This study included outpatients meeting the case definition of acute fever or fever ≤7 days or had two of the following symptoms: rash, headache, myalgia, arthralgia, conjunctivitis. Serum were tested with inhibition RVFV ELISA, and positive samples were tested with RVFV IgG sandwich and IgM capture ELISA. Real-time reverse transcription PCR (RT-PCR) was used to test all IgM positive sera. Seropositivity (the percentage positive for RVFV antibodies) were compared between the six health care facilities using STATA.
Results: The average age of participants was 35 years, with women accounting >70% of the total. This study detected 2.8% (95%CI: 1.5%-5.3%) overall IgG/M seropositivity adjusted for facility clustering, with significant difference between facilities (P=0.03). IgM (0.8%) antibodies to RVFV in human serum samples, confirmed recent exposure and indicated circulation of RVFV in the tropical coastal plain of northern KZN in South Africa. None of the IgM seropositive individuals tested positive by RT-PCR.
Conclusion: The under-diagnosis of RVF infections in patients highlights the need for improved diagnosis and awareness of RVF and other arboviral diseases in this part of South Africa. Our findings underscore the importance of implementing active arbovirus surveillance in humans, wildlife, livestock and mosquito vectors as part of a One Health approach in order to better understand RVFV transmission and mitigate risk associated with it in KZN.

SS-6
CONTRIBUTION OF THE MERS-COV RESEARCH TO ONE HEALTH OPERATIONALIZATION IN ETHIOPIA AND KENYA

Speaker: Dr. Stella Kiambi, Deputy Country Team Leader, Emergency Centre for Transboundary Animal Diseases, FAO, Kenya, Food and Agriculture Organization (FAO) of the United Nations, Kenya
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Background: Middle East Respiratory Syndrome Coronavirus (MERS-CoV) is a zoonotic virus transmitted to humans from infected dromedary camels. Coordinated by The Food and Agriculture Organization (FAO), Ethiopia and Kenya have ongoing MERS-CoV surveillance studies in camels. The 5-year project combines research and capacity development, with the aim to improve understanding of the epidemiology of the virus in camels and contribute to the global efforts to reduce zoonotic transmission of MERS-CoV. Key development outcomes of the project include important contributions to One Health operationalization in Ethiopia and Kenya.
Methods: Since 2016, cross-sectional and longitudinal studies have been implemented to address evolving objectives, including virus detection and prevalence estimates, identifying risk factors for exposure, understanding antibody kinetics, and

phylogenetic and phenotypic characteristics of circulating virus.
Results: Results revealed that over 60% of camels from Kenya and over 70% of camels from Ethiopia demonstrate exposure to MERS-CoV, while viral RNA was detected in 0.23% of camels in Kenya and 1.08% of camels in Ethiopia. Viruses isolated from both countries were genetically grouped in Clade C2 with MERS-CoV strains found elsewhere in Africa. Phenotypic characteristics of these isolates suggest that MERS-CoV circulating in Africa poses a lower zoonotic risk than clades A and B of the virus circulating in the Arabian Peninsula. These findings have contributed to a better understanding of MERS-CoV transmission risks that will ultimately inform policy directions on risk mitigation.
Conclusion: The project has contributed towards the establishment of multi-sectoral Emerging Pandemic Threats Technical Working Group (EPT-TWG) and MERS-CoV TWG in Ethiopia and Kenya, respectively. With the emergence of COVID-19, future directions of MERS-CoV work will focus on applied research of risk mitigation interventions, and institutional capacity building on surveillance for early detection of mutations and possible genetic recombination of MERS-CoV with other zoonotic coronaviruses.

One Health Operational Research Presentations

This session aims to showcase One Health operational research in Africa.
Chaired by: Dr. Achamyelesh Kifle Debela, Coordinator, Eastern Africa Regional Collaborating Center

SS-7

SOCIETAL BENEFITS FROM BUILDING A CRITICAL MASS OF ONE HEALTH IMPLEMENTORS IN AFRICA

Speaker: Prof. Bassirou Bonfoh, Director Afrique One-ASPIRE, Centre Suisse de Recherches Scientifiques (CSRS), Côte d'Ivoire
Contributing Authors: Prof Karim Ouattara, CSRS, Côte d'Ivoire; Dr Kathrin Tokpa, CSRS, Côte d'Ivoire; Dr Katharina Kreppel, NM-AIST, Tanzania; and Dr Gilbert Fokou, CSRS, Côte d'Ivoire

With the present rapid and complex changes in climate and human behaviour, the so-called 4th industrial revolution, Africa faces critical new health challenges with a growing burden of infectious diseases (endemic and emerging) now exacerbated by an increasing threat from non-infectious diseases. Improving the capacity of existing health systems to effectively tackle profound epidemiological shifts is addressed in the SDGs and AU agenda 2063 but remains limited. While the value of One Health is globally recognised, there is an imperative to translate advances in One Health into implementation to improve health, wellbeing, lives and livelihoods. But how do researchers and practitioners value transformative knowledge and increase engagement to close the health system capacity gaps in Africa using the potential of the One Health concept?
In the last decades, two major continuous programmes led by African scientists, supported by a consortium of funders, have raised the leadership of 15 research and academic institutions and continuously trained 108 scientists and practitioners to

better target interventions at the human-animal-environment interface in collaboration with national control programmes.
Research was supported at both individual institutional, academic and non-academic levels to critically address and close the current capacity, language and geographic collaboration gaps. With a cohort of 38 fellows in the first phase (2009-2015) and 70 in the second (2016-2021), Afrique One has uniquely built a critical mass of capacity of African leaders to develop and test the incremental benefits of One Health interventions adapted to African socio-ecological contexts (8 countries).
The operational research considered pathways to intervention and elimination on selected disease models (rabies, brucellosis, environmental and foodborne diseases) and started with (i) stakeholder engagement with common priority setting, perceived problems, knowledge co-production and co-designing interventions for change; (ii) informing decisions and (iii) monitoring, evaluation and learning from cases. Afrique One champions are among the most active One Health scholars to address future African challenges of global concerns. We want to share the lessons learnt throughout the journey, that allow us with the MOOCs on One Health to strengthen the independence of African led research and its contribution to the dialog between science and the society for change.

SS-8

CHALLENGES TO OPERATIONALIZING ONE HEALTH ON THE GROUND: EVIDENCE FROM EAST-AFRICA

Speaker: Dr. Tabitha Kimani, Regional Socio-economist and AMR Coordinator,Eastern Africa, FAO

Contributing Authors: Orsolya Mikecz, FAO, Italy; Stephen Gikonyo, FAO, Kenya; Joy Kiplamai, FAO, Kenya; Tadele Mirkena, FAO, Ethiopia; Frank Mubiru, FAO, Uganda; Gerald Nizeyimana, FAO, Uganda; Ugo Pica-Ciamarra, FAO, Italy; Charles Bebay FAO, Kenya; and Jeffrey Gilbert, FAO, Italy

While the importance of One Health is increasingly recognized by national governments, there is little systematic evidence on whether local governments, which are mandated to implement national policies, have sufficient capacity to adopt the One Health approach. To investigate this issue, we examined the One Health legal framework of Ethiopia, Kenya and Uganda and interviewed 209 or 87% of all field animal health officers operating in six sub-regions – including Ada'a and Sululta districts in Ethiopia, Nairobi City and Kiambu counties in Kenya, and Mukono and Wakiso districts in Uganda – on their knowledge on One Health and related policies, and availability of resources and incentives to provide services on the ground. We found that: (i) the current legal framework adequately addresses animal health issues, but it is relatively weak on One Health provisions, as few laws support cross-sectoral cooperation. (ii) Only 42 percent of field animal health officers have ever heard of One Health, though 57 and 48 percent cooperate with human health and environmental officers at least occasionally. (iii) Field animal health officers have limited resources to operate on the ground. On average, one field officer should look after around 3,600 cattle, 3,300 sheep or goats, 1,500 pigs and 40,000 poultry, while the average animal health budget is 56 cents/year per tropical livestock unit. (iv) Field animal health officers have little incentives to perform well: the majority consider their

salary incommensurate to their level of responsibility and one in four feels that good performance does not result in any career progression. Results suggest that operationalizing One Health requires bold actions at local level, which should go beyond the establishment of One Health platforms, to ensure that the animal health sector can effectively play its One Health role. Policy dialogues between public and private sector actors can help overcome some of the existing challenges.

SS-9

COST-EFFECTIVENESS OF DIFFERENT OPTIONS FOR VACCINATION OF LIVESTOCK AGAINST ANTHRAX IN UGANDA

Speaker: Mr. Amanya Geofrey, Field Epidemiologist, Fellow, Cohort 2020, Uganda Public Health Fellowship Programme, NIPH Ministry of Health Uganda
Contributing Authors: Lawrence Mwenge, Institute of Medical Research & Training (IMRet), Lusaka Zambia; Abidemi Fasanmi, Data Impact Programme, Bloomberg Data for Health Initiative, CDC Foundation, USA; Paul Okello, Uganda National Institute of Public Health (UNIPH); Richard Migisha, UNIPH; Fred Mwonje, National Animal Disease Diagnostic and Epidemiology Center, Kampala, Uganda; Esther Kisaakye, UNIPH; Daniel Kadobera, UNIPH; Julie Harris, Division of Global Health Protection, US Centers for Disease Control and Prevention, USA; Alex Riolexus Ario, UNIPH

Introduction: Anthrax is a zoonotic disease caused by Bacillus anthracis and is transmitted to humans through handling or eating meat from infected animal carcasses or by breathing in spores. Anthrax among livestock presents as an acute septicemia with a very high case fatality rate. Uganda has had an average of 3 to 5 outbreaks investigated per year, mostly in Eastern and Western Uganda, and most involving humans. When an outbreak crosses over to humans, the government loses approximately $140 per person in the management of complex anthrax cases in humans. Currently, the vaccination coverage livestock (for large and small ruminants) for anthrax in high at-risk areas in Uganda is <10%, falling short of the WHO recommendation for 80% coverage. Presently, anthrax is classified as a “private good disease” which means that, unlike other animal diseases like foot and mouth, contagious bovine pleuropneumonia, and rabies, which are state-controlled diseases, the management and control of anthrax in Uganda is done by farmers (Status quo), Reclassifying anthrax as a public good disease (financially supported by the government) would improve control and management of anthrax.
Methods: A multiple decision criteria using incremental cost-effectiveness ratios (ICERs) expressed as US$ per additional anthrax case averted to compare the cost-effectiveness of different anthrax vaccination strategies.
Results: At a prevalence of 0.13% for Anthrax infection among the livestock, a total of 22,460,483 for Option 1, 47,101 for Option 2 and infected animals die from Anthrax in one Horizon to be 2,246,048 for Option 1, 9,420 for Option 2 and 116,336 for Option 3. A total of 4,492,097 infected Human Infections would be identified for Option 1, 9,420 for Option 2 and 116,336 for Option 3. However, implementation costs for these interventions would cost Option 2 ($22.3 million USD) an ICER of $473 per case averted, for Option 3 and an ICER of $445 per case averted ($21.4 million USD) for Option 3 Anthrax Infection prevalence had a major impact on the ICER, even at at higher prevalence of animals infected.

Conclusion: While compared to status quo both vaccination Options 2(%100 vaccination) and Option 3(80% vaccination), indicate better alternatives to control of Anthrax from animals to humans, over a ten-year period.

Food Safety and Antimicrobial Resistance Presentations

This session aims to showcase continental One Health research focusing on antimicrobial resistance and food safety.
Chaired by: Dr. Jay Varma, Professor of Population Health Sciences, Weill Cornell Medical College

SS-10

OCCURRENCE OF MULTIDRUG-RESISTANT ESCHERICHIA COLI IN CHICKENS, HUMANS, RODENTS AND HOUSEHOLD SOIL IN KARATU, NORTHERN TANZANIA

Speaker: Mr. Valery Sonola, PhD Student, Sokoine University of Agriculture (SUA)
Contributing Authors: Abdul Suleiman Katakweba; Gerald Misinzo; and Mecky Isaac Matee

We investigated antibiotic resistance profiles of Escherichia coli among 960 samples obtained from chickens (236), humans (243), rodents (101) and soil (290). E. coli was isolated from 650 (67.7%) samples. Isolation frequency varied significantly between chickens, humans, rodents and soil samples being 81.6 %, 86.5 %, 79.2 % and 31.0 %, respectively (P<0.001). Resistance rates were particularly higher against imipenem (79.8 %), cefotaxime (79.7 %), tetracycline (73.7 %), and moderate against amoxicillin-clavulanate (49.4 %). Overall, 78.8% of the isolates were multidrug-resistant (MDR) among which, 38.8 %, 25.1 %, 12.9 % and 2.5 % exhibited resistance to three, four, five and six different classes of antibiotics, respectively. Multidrug-resistant E. coli were observed in 27.7 %, 30.3 %, 10.8 % and 10.0 % of the isolates from chickens, humans, rodents and soil samples, respectively. Our results show high levels of antimicrobial resistance including MDR in E. coli isolated from chickens, humans, rodents and soil samples in Karatu, Northern Tanzania. Comprehensive interventions, using a one health approach are needed and should include improving: i) awareness of the community on judicious use of antimicrobial agents in humans and animals, ii) house conditions and waste management and iii) rodent control measures.

SS-11

PESTICIDE RESIDUE TRENDS IN FRUITS AND VEGETABLES FROM FARM TO FORK IN KAMPALA METROPOLITAN AREA, UGANDA – A MIXED METHODS STUDY

Speaker: Mr. Charles Ssemugabo, Research Associate, Makerere University
Contributing Authors: David Guwatudde; John C. Ssempebwa; and Asa Bradman

Background: Improper agricultural use of pesticides in Uganda results in elevated residues in fruits and vegetables. To ensure food hygiene and safety, stakeholders use different handling and processing methods between farms and consumers (farm to fork). This study examined pesticide residue trends in produce and handling and processing practices for fruits and vegetables from farm to fork in the Kampala Metropolitan area in Uganda.
Methods: We used mixed methods including laboratory measurements of pesticide residues in produce, semi-structured questionnaires, and in-depth interview data collected from stakeholders along the farm to fork chain. We present descriptive summaries of quantitative data and also tested trends to evaluate pesticide residue changes along the farm to fork chain.

Qualitative data was inductively coded and analysed using conventional content analysis for sub and overarching themes.
Results: Statistically significant decreasing pesticide residue trends were observed for dioxacarb and increasing trends were observed for methidathion and quinalphos from farm to fork. Out of the 50 farmers visited, 34(68%) sold their fruit and vegetables to transporters, 11(22%) to market vendors, and 4(8%) directly to homes and restaurants. The majority 42(93.3%) of the consumers (home/restaurant) purchased their fruits and vegetables from market vendors and transporters. Washing with water or chemicals, wiping with cloth, peeling the outer layer, blending and cooking were post-harvesting processing methods used by stakeholders along the supply chain. Some farmers and market vendors reported spraying fruits and vegetables with pesticides either prior- or post-harvest to increase their shelf life or meet consumers' preference.
Conclusion: Overall, several pesticides (dioxacarb, methidathion, and quinalphos) moved along the farm to fork chain in fruits and vegetables, resulting in exposures to consumers that may impact health. Some pesticide residues decreased along the chain, while others increased. These changes are attributed to processing measures including washing, peeling, cooking, blending, wiping or applications of pesticides. Education is needed to promote practices that minimize pesticide use and exposures through diet while maintaining food integrity.

SS-12

WHOLE-GENOME SEQUENCING OF HUMAN AND PORCINE ESCHERICHIA COLI ISOLATES FROM A COMMERCIAL PIG FARM IN SOUTH AFRICA

Speaker: Miss Wilhelmina Strasheim, Medical Scientist, Centre for Healthcare-Associated Infections, Antimicrobial Resistance and Mycoses, National Institute for Communicable Diseases
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Introduction: The aim of the study was to describe human and porcine E. coli isolates obtained from a commercial pig farm in South Africa using whole-genome sequencing (WGS), as this bacterium is used as an indicator organism in One Health antibiotic resistance (AR) surveillance.
Methods: A total of 113 pig faecal droppings and 64 rectal swabs from farm workers were collected. E. coli was isolated using standard microbiological techniques. Antimicrobial susceptibility testing was done using two

commercial broth microdilution systems. WGS was performed using Illumina NextSeq technology. Bioinformatics analysis of WGS data was performed using the JEKESA pipeline (https://github.com/stanikae/jekesa). ResFinder (https://cge.cbs.dtu.dk/services/ResFinder/) was used to investigate the presence of AR determinants. The core genome multilocus sequencing typing (cgMLST) tools hosted on EnteroBase (http://enterobase.warwick.ac.uk/species/index/ecoli) were used to investigate phylogeny. Results: A total of 169 (humans: 63 isolates from 49 rectal swabs vs. pigs: 106 isolates from 100 droppings) E. coli isolates were obtained. High levels of resistance were observed for penicillins (71.60%, 121/169) and tetracyclines (65.09%, 110/169). Resistance rates were proportionally higher for all antibiotics tested in porcine E. coli isolates, except for trimethoprim-sulfamethoxazole where human E. coli isolates were more resistant. Tetracycline resistance were mainly conferred by tetA (33.14%, 56/169) and tetB genes (26.63%, 45/169), whereas penicillin resistance were conferred by the blaTEM-1B (63.9%, 108/169) gene. Most isolates (86.39%, 146/169) had a minimum inhibitory concentration of 1 µg/mℓ for colistin and the mcr genes were not detected. Sequence type (ST) complex 10 (34.32%, 58/169) and phylogroup A (61.54%, 104/169) were predominant. Phylogenetic analysis using cgMLST showed that human and porcine E. coli isolates were genetically very diverse, with no clonal clustering of isolates.
Conclusion: Porcine E. coli isolates showed higher levels of AR as compared to human E. coli isolates, potentially due to antibiotic usage practices on the farm.

Environmental Health Presentations

This session aims to showcase continental One Health research focusing on environmental health.
Chaired by: Dr. Merawi Aragaw Tegegne, AG Head of Division for Emergency Preparedness and Response, Africa CDC

SS-13

HYSACAM DUMP SITES COLLECTION POINTS: HUMAN HEALTH THREATS AWARENESS IN THE CITY OF YAOUNDE, CAMEROON

Speaker: Dr. Nkengazong Lucia, Senior Research Officer, Institute of Medical Research and Medicinal Plants Study of the Ministry of Scientific Research and Innovation (MINRESI)
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The anarchic urbanism of Yaoundé has led to an increase in the rate of household wastes that constitute a favourable environment for the development of human pathogens, posing an important public health problem. This study was aimed at determining the impact of household refuse collection points on the development and spread of pathogens resistant forms in the neighbourhood population in the city of Yaoundé. From March to August 2019, pathogens forms were put into evidence using the Kato katz and formol ether technics in stool collected from

humans population around the Hysacam dumpsites, while the Zinc sulphate, formol ether and saline solution methods were used to analyze waste samples (soil/water) collected. Overall, 82.9% of participants living around the Hysacam dump sites were diagnosed positive for intestinal pathogens including Ascaris lumbricoides (12.3%), Trichirus trichiura (3.2%), hookworms (5.5%), Entamoeba histolytica/E. dispar (11.5%), E. coli (13.5%) and fungi, Candida spp (76.1%). With an overall prevalence of 51.7%, 5 helminths species were identified in the waste samples analysed: A. lumbricoides (38.3%), T. trichiura (18.3%), hookworms (18.3%); Fasciola hepatica (1.8%) and Schistosoma intercalatum (1.8%). The number of parasitic forms detected by the Ritchie technique were statistically high compared to other techniques (P = 0.003).
These results show that the Hysacam dump sites constitute a favorable environment for the development and propagation of human pathogens with the surrounding human population being at high risk of contamination. These results could serve as baseline information for the government and the HYSACAM Company in developing better management strategies that could ensure prompt regular evacuation of the wastes to avoid the spread of infectious agents in the neighbourhoods.

SS-14

FACTEURS ANTHROPIQUES ET ENTOMOLOGIQUES INFLUENÇANT LA TRANSMISSION DE LA THA AU CONGO

Speaker: Ms. Irina Anne Emmanuelle Bemba, Université Marien NGOUABI
Contributing Authors: Ms Bemba Irina, Université Marien NGOUABI | Institut de Recherche de Yaoundé (IRY), Organisation de Coordination pour la lutte contre les Endémies en Afrique Centrale (OCEAC), Cameroun; Prof Lenga Arsene, Université Marien, République du Congo.
Dr Awono-Ambene Parfait, IRY, OCEAC, Cameroun; and Dr Antonio-Nkondjio Christophe, Vector Group, Liverpool School of Tropical Medicine (LSTM) | IRY, OCEAC, Cameroun

Introduction: La situation de la maladie du sommeil est peu connue en République du Congo. Entre 1960 et 1990, de nombreux travaux ont été menés. Malheureusement depuis plus de 15 ans, des enquêtes entomologiques n'ont pas été effectués dans les différents foyers qui sont encore actifs. L'objectif de ces travaux est de déterminer la diversité glossinienne ainsi que d'évaluer le niveau de connaissance des populations sur la maladie.
Méthode: Des enquêtes entomologiques et de ménage ont été menées dans trois foyers endémiques du pays, à savoir Mpouya, Ngabé et Loudima. Les glossines collectées ont été toute identifiées morphologiquement puis s'en est suivi une confirmation par des analyses PCR. Les personnes vivant dans les différents lieux d'étude ont été soumis à un questionnaire.
Résultats: Trois espèces de glossines ont été principalement capturées dans ces différents foyers. Sur un total de 652 glossines, 118 Glossina fuscipes quazensis et une seule Glossina fusca congolensis ont été capturées dans les foyers de Mpouya et Ngabé, tandis que 533 Glossina palpalis palpalis ont été capturées à Loudima. Cette dernière a été d'ailleurs la seule espèce retrouvée dans ce foyer. Les ténérales étaient représentées à hauteur de 3% du nombre total de glossines et les densités apparentes étaient de l'ordre de 0.13, 1.78 et 5.43 glossines/piège respectivement à Mpouya, Ngabé et Loudima. Dans ces foyers, l'activité principale était l'agriculture. Sur 160 ménages interviewés, 35 ont déclaré avoir

déjà eu un cas de maladie. Parmi ces derniers, 15 ménages ont déclaré avoir eu au moins un membre de leur famille atteint de la trypanosomiase ces dix dernières années. La reconnaissance du vecteur en image s'est faite par 53% des ménages interviewés.
Conclusion: Notre étude a indiqué qu'il existerait un risque de transmission de la maladie surtout avec la présence des mouches ténérales dans les sites.

SS-15

HISTOPATHOLOGICAL EFFECTS AND MICRONUCLEUS ASSAY OF GLYPHOSATE-BASED HERBICIDES ON CULTURED AFRICAN CATFISH (CLARIAS GARIEPINUS, BURCHELL 1822)

Speaker: Dr. Selim Alarape, Fish and Wildlife Unit, Department of Veterinary Public Health and Preventive Medicine, University of Ibadan, Ibadan, Nigeria
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Glyphosate, a brand of agricultural herbicides which intensive use has led to widespread contamination of different ecosystems. This study was designed to determine both organotoxicity and genotoxicity of glyphosate on African Catfish (Clarias gariepinus) exposed to different concentrations for 96 hours.
Questionnaires were administered (physically and online) to determine the type of glyphosate-based herbicides mostly used by fish farmers. Seventy-five apparently healthy adult Clarias gariepinus (300g) were sourced from a local farmer, transported in a plastic keg to Fish and Wildlife Laboratory at the Department of Veterinary Public Health and Preventive medicine for two (2) weeks of acclimatization. After acclimatization, they were further divided into four (4) groups (T0 (Control), T1 (0.003ml/L), T2 (0.0045ml/L) and T3 (0.006ml/L)) by simple randomization and each group replicated into three (3) treatments. At the expiration of 96 hours of exposure, blood samples and organs (Gills, Kidney, and Liver) were collected for mononuclear assay and histopathological lesions respectively.
Exposed groups showed erratic swimming, splashing, and restlessness. Mortalities rate was dose-dependent (two (2) mortalities at 0.0045ml/L concentration (T2) and five (5) mortalities 0.006ml/L concentration (T3)). Observed histopathological lesions occurred at higher dose treatment (0.0045ml/L (T2) and (0.006ml/L) T3)) concentrations. The gills showed diffuse stunted and eroded secondary lamellae and severe congestion of the blood channel at the core of the primary lamellae. Lesions in the Liver include severe diffuse vacuolation of the hepatocytes, moderate to severe portal congestion and mild diffuse vacuolation of hepatocytes and moderate diffuse vacuolation of hepatocytes, and severe portal congestion. In the kidney, there was mild to moderate congestion of the interstitium and focus of interstitial oedema within the parenchyma. There was presence of micronucleus in the fish nucleated red blood cells at higher dose concentrations.
This study showed that Glyphosate-based herbicides are highly toxic to Clarias gariepinus, therefore their use near the fish farm or in areas close to the aquatic environment should be discouraged. The agricultural community should also be conscious of the potentially adverse effects of pesticides. This is to prevent the water body from the residue of herbicides that would have washed down to the water

POSTER SESSIONS

Food Safety and Antimicrobial Resistance

PP-1

USING COMPUTATIONAL MODELING AND ENGINEERING ANALYSIS TO ENHANCE ONE HEALTH APPROACH IN IMPROVING AMR OUTCOMES IN URBAN SLUMS AND REFUGEE CAMPS

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Antimicrobial resistance (AMR) is a growing global threat to public health with a disproportionate effect on low- and middle-income countries, that is further exacerbated in communities living in urban informal settlements and refugee camps including those in Africa. As a result, there is a heightened urgency to understand how current antibiotic use is driving the spread of drug resistance in communities with high population density and those that are in proximity to wastewater settings and environmentally contaminated surroundings. A One Health approach can potentially address these issues by integrating human, animal, and environmental health into interventional approaches. These approaches have seen success in LMICs in other infectious disease challenges. One Health is particularly relevant in Africa, where refugee and displaced communities are closely tied with livestock populations and environmental threats. Specifically, when considering health in refugee populations, environmental concerns such as contamination in sewage and wastewater have been understudied. This is troubling as wastewater and sewage can host dangerous pathogenic bacteria, leading to disease in surrounding communities. Furthermore, it has been shown that wastewater is a major reservoir for antimicrobial resistance which can lead to deadly outbreaks due to the collection of antibiotic waste from humans and animals. Our studies combining quantitative experimental methods (using technology such as the eVOLVER system) and computational modelling have shown that low levels of antibiotic pollution can lead to the development of large antimicrobial resistant bacterial populations. These models can be used to simulate preventative measures such as wastewater treatment strategies or antibiotic stewardship plans. In partnership with public health experts on the ground, our work can help identify potential avenues for mitigation and impact policy. Targeted interventions such as these are critical in preventing future outbreaks of antimicrobial resistant infections in the communities surrounding wastewater settings.

PP-2

FACTORS ASSOCIATED WITH INAPPROPRIATE USE OF ANTIBIOTICS AMONG ANIMAL HEALTH PROFESSIONALS IN FIVE DISTRICTS, RWANDA, 2021

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Background: Antibiotic resistance (ABR) is a global health security concern. Transmission of ABR from animals to humans occurs either directly from animals to humans or through the food chain and the environment. Misuse of antibiotics is the leading factor in the development of antibiotic resistant pathogens. This study aimed to determine the factors associated with inappropriate use of antibiotics among animal health professionals in Rwanda.
Methods: This cross-sectional study enrolled animal health field professionals from five districts randomly selected from each province. Structured questions were used during face-to-face interviews. Inappropriate use of antibiotics was defined as the use of antibiotics (ATB) for any reason other than treatment, non-completion of required courses and/or use of high dose (overdose) of antibiotics. Data collected included socio-demographic of respondents, elementary knowledge and perceptions on veterinary antibiotics and antibiotic resistance. Logistic regression was used to identify the factors independently associated with inappropriate use of antibiotics.
Results: Among 256 respondents, 174 (68%) used ATB inappropriately. Males were 198 (77%) and age ranged from 21 to 56 years old (median of 32 years). Statistical analysis found that factors associated with inappropriate use were: being aged of 24 years and below (OR=5.05; 95% CI=1.47, 17.38; P=0,017); low trust to veterinary antibiotics available in the local market (OR=8.87; 95% CI= 4.53, 17.35; P<0.01), insufficient knowledge (OR=2.37; CI=1.19-4.71, P=0.02) and not acquiring any continuous education related to adequate use of antibiotics (OR=2.17; 95% CI=1.15, 4.12; P<0,01).
Conclusions: This study identified high levels of inappropriate antibiotic use among animal health professionals. There is a need for continuous education among animal health professionals and expanded focus to reflect on the impact of their practice on One Health and public health security.
Key words: antibiotic resistance, public health, animal health professionals.

PP-3

IMPACT OF ONE HEALTH IN THE DAIRY SECTOR IN CÔTE D'IVOIRE: CONTRIBUTION OF MICROBIOLOGY AND TECHNOLOGY

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Northern Côte d'Ivoire is an important area for production and consumption of milk. Beside modern lactic ferments, Streptococcus infantarius bacteria (Sii), a local germ, are playing a pivotal role in the milk fermentation in Korhogo, Côte d'Ivoire. Since 2015, a One Health-based study in the local dairy chain has integrated knowledge from researchers, NGOs and dairy stakeholders to assess processing technologies of Sii and ensure that they are

not harmful and can be recommended in the milk development process as they inhibit the growth of certain pathogenic bacteria in milk. A total of 652 samples collected from human n=28, animal n=227, milk n=243 and environment n=154 have been analysed through microbiological and molecular techniques alongside production surveys and participatory workshops. Sii prevalence is 38.8% in unfermented milk and 62.8% in fermented milk, when cell counts varied from 3.1 Log 10 CFU/mL. to 7.1 Log 10 CFU/mL. Molecular analysis highlighted the co-existence of evolving 95.8% dairy adapted Sii with 4.2% Sii being closed to potentially pathogenic clades. This shows that Sii are acquiring adaptation lacS/lacZ genes from native milk bacteria and progressively losing their pathogenicity. The description of the milk value chain shows that women (vendors) make more profit (€268/month) than men (producers, collectors). Sociocultural practices and environmental conditions affect product properties, confirming the environmental origin of Sii and the non-compliance of processing practices with basic hygiene standards. The transdisciplinary approach based on the experiences of over 20 years in Mali led to the creation of five cooperatives, basic investments (pasteurizer, milk kiosks, cans renewal), transformative hygiene practices and the production of supplementary food for cows. Three Masters, one medical thesis, an ongoing PhD and two open-access papers are the other deliverables showcased during conferences and on social media. These outcomes are a key basis to guide scientists and decision-makers on defining interventions in the dairy value chain in Korhogo, Côte d'Ivoire.

Environmental Health

PP-4

THE PREVALENCE OF INTESTINAL PARASITES AND ASSOCIATED RISK FACTORS IN SCHOOL-GOING CHILDREN FROM INFORMAL SETTLEMENTS IN NAKURU TOWN, KENYA

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Intestinal parasites (IPs) are a major public health problem in the developing world and have attracted increasing levels of interest from health researchers over the past decade. Epidemiology-based studies have shown that the prevalence of IPs is high, and frequently recur in regions with poor sanitation and inadequate sewerage facilities. This determined the prevalence of intestinal parasites, their egg intensities per sample, and associated risk factors in an informal settlement.

After consenting to participate in the study, pupils from three randomly selected public primary schools located in the informal settlements of Nakuru town were sampled. A total of 248 stool samples were screened, using the Kato Katz technique, for infections caused by soil-transmitted helminths (STH). A random subset of stool samples (n=96) was

also screened by polymerase chain reaction (PCR) to detect intestinal protozoa. Socio-demographic variables were collected using a pre-tested structured questionnaire; these data were analysed to identify risk factors for infection.
The overall prevalence of IPs was 17.3% (43/248 pupils). The overall prevalence of STH was 1.2% and that of intestinal protozoan parasites 41.7%. The prevalence of individual STHs was 1.2%, 0.4%, 0.4% for Trichuris trichiura, hookworm and Ascaris lumbricoides respectively. Intestinal protozoan parasites prevalence ranged from 0% to 38.5% and included Entamoeba histolytica, Entamoeba hartmanni, Entamoeba dispar, Giardia intestinalis, and Entamoeba coli. All STH infections were light, with an egg intensity <5000. Multiple infections for intestinal protozoan parasites, was 5.2% (n=5) and 0.4% (n=1) for STH. Significant risk factors for IPs infections, goat rearing (p=0.046), size, population density (p=0.022) and type of household floor (p=0.035), and source of food (p=0.016).
The low prevalence of IPs could be attributed to improvements in sanitation, hygiene, and good health practices. However, Nakuru town informal residents could significantly benefit from intensive hygienic education and programs that support poverty eradication.

PP-5

THE TOXIC EFFECTS OF SPENT CRANKCASE OIL EXPOSURES; SYSTEMATIC REVIEW AND META-ANALYSIS

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The study sought to execute a systematic review and meta-analysis to describe the toxicological implications associated with exposures of humans and laboratory animals to Spent Crankcase Oil (SCO). Databases like PubMed, Scopus, Science Direct, Google Scholar, Web of Science, and PlosOne were searched systematically for all data that assessed the effects of SCO on humans and animals. For each parameter involved in the meta-analysis (those with extractable data), mean, standard deviation, the sample size was extracted for both exposure groups and control. This was then used to compute the standardized mean difference (SMD). Statistical analysis and forest plots were done with RevMan 5.3 software. Twenty-eight (28) studies fulfilled the pre-specified criteria for eligibility. Fourteen (14) of the studies were used for the meta-analysis, which included a total of 1243 subjects from different human epidemiological occupational exposure studies and animal experimental studies. The meta-analysis revealed that SCO exposure caused a significant reduction in the body weight of animals (n=5, SMD; -1.2; 95% CI; (-1.78, -0.67), p=0.0001, I2= 22%), and in the red blood cell count (n=5, SMD; -1.28; 95% CI; (-2.18, -0.38, p=0.02); I2 =78%) in animal models. While there was a significant elevation of the aspartate amino transferase (AST) (n=6, SMD; 0.76; 95%CI; (0.41, 1.11), p=0.0001, I2=89%), alkaline phosphatase (ALP) (n=5, SMD; 1.92; 95% CI; (0.02, 3.83), p=0.05, I2= 92%), and creatinine (n=4, SMD=1.56; 95% CI; (0.05, 3.07), p=0.04, I2=90%) concentrations in comparison to the control. On the other hand, there was a non-significant effect on the alanine amino transferase (ALT) (n=5, SMD; 1.13; 95% CI; (-0.37, 2.62); p=0.14;

I2=92%), urea (n=4, SMD; 1.23; 95% CI; (-1.18, 3.65), p=0.32, I2=94%), packed cell volume (PCV) (n=5, SMD; 0.10; 95% CI; (-0.36, 0.56), p=0.67; I2=47%); and the haemoglobin (n=6; SMD; -0.74; 95% CI; (-1.73, 0.26), p=0.15; I2=89%) concentrations. Oxidative stress, heavy metals bioaccumulation, immunotoxic, genotoxic, and carcinogenic effects were also in the list of findings. The toxicological implications associated with SCO exposure points to the need for immediate establishment of policies that regulate the disposal of spent crankcase oil in the environment.

PP-6

THE PRESENCE OF SNAKES IN CROPLANDS: A SERIOUS CONFLICT THREAT TO THE LOCAL FARMERS IN BERTOUA MUNICIPALITY, EASTERN REGION, CAMEROON

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Human historical experience with venomous snakes has probably shaped our responses to them. In the African continent, where venomous snakes are common, most people consider all snake species to possess deadly venom and should be avoided. However, the focus of this survey was to examine the presence of snakes in Bertoua municipality. The research data collection was done by the use of check-sheets for a period of one month from 7:30am-5:30pm each day at the peripheral zone of the municipality. A random spot observation of 444 snakes was made on 6 species, black cobras (Naja melanoleuca), green mambas (Dendroaspis viridis), vipers (Bitis gabonica), green-tree snakes (Dendrelaphis punctulatus), small brown snakes (Dendrelaphis shokan), and python (Python regius). Ecological factors such as weather condition, vegetation, landscape, location, and day-period were also taken into account. The results of this study revealed that vegetation of the study area and weather condition have an association, χ 2 = 6.789 df=4, P<0.05. Additionally, vegetation showed a significant relationship on the snake species χ 2 = 13.158 df=10, P<0.05. Also, vegetation showed an association on the snake location, χ 2 = 6.910 df=2, P<0.05. Furthermore, vegetation revealed a significant relationship on day-periods, χ2 = 12.221 df=4, P=0.016. Human encroachment into wildlife habitat due to population increase has been the main reason for human-wildlife conflict in Cameroon. Unsustainable crop-farming in most parts of Cameroon due to poverty resulting in shifting cultivation, a longstanding farming tradition believed to have destroyed the rainforest most. The presence of snakes in farmlands in Bertoua municipality might be partly due to a high snake population in the area, or the cropland harboring a high population of rodents, birds and amphibians preyed upon by snakes. Conflicts of this nature are expected to take a much heavier death toll on the snake population, either through direct killing or pesticides used on insect pests. The wildlife conservation stakeholders in Cameroon would need to educate local crop-farmers in Cameroon, especially in the Eastern Region on the management strategies of this kind of wildlife conflict.

PP-7

PRELIMINARY SURVEY OF THE IMPLICATIONS OF FUEL SOURCES IN TRADITIONAL FISH SMOKING ON

ONE HEALTH IN SELECTED COASTAL COMMUNITIES OF LAGOS, NIGERIA.

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Past and present studies show that potential health hazards associated with smoked foods are caused by carcinogenic components of firewood smoke – mainly polycyclic aromatic (PAHs) and derivatives of PAH. This is further aggravated by the use of some local kilns that allows for direct contact between the smoke and the fishes being smoked which are prevalent in many of these coastal communities in Nigeria. Secondly, the country consumes over 50 million metric tons of fuel wood annually and fuel wood extraction rate is estimated to be about 3.85 times the rate of re-growth or afforestation with consequences of serious environmental impacts. The two scenarios portend highly complex and interwoven problems but the dimensions and convolutions are often loosely described. Therefore, this paper presents a preliminary investigation of traditional fish smoking in coastal communities of Lagos on one health. More specifically, the work investigated the prevalent fuel sources and assessed the effects of smoking fish on the environment, the animal and human health.

Primary data was obtained from administering computer assisted surveys to 412 women fish processors in some coastal communities of Lagos to identify and characterize the frequency of fuel sources used. Descriptive analysis was used to analyse the primary data while secondary data were also used to make inferences on the implications of fuel sources on the environment, animal and human health. The findings are discussed in view of high dependence on trees including mangroves (Rhizophora spp.) mango (Mangifera spp.), kolanut (Cola spp.), teak (Tectona grandis) and guava (Psidium spp.) among others as sources of fuel, and the uniqueness of major fuel sources highlighted. Finally, the results of this survey are further deliberated to recommend policies and practices in one health to solve complex and diverse problems linked to the energy crisis of wood fuel.

Operational Research

PP-8

STRENGTHENING MULTISECTORAL COORDINATION TO ADDRESS PRIORITY ZOONOTIC DISEASES: A REVIEW OF DISEASE SURVEILLANCE SYSTEMS IN UGANDA

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Background: Uganda is prone to outbreaks of zoonoses that threaten lives and livelihoods.

Integration of surveillance activities across relevant sectors enhances prevention, detection, and response to Priority Zoonotic Diseases (PZDs). Despite the 2017 World Health Organization (WHO) Joint External Evaluation recommendation to improve multisectoral integration of surveillance activities, existing surveillance systems are largely sector specific. The USAID Infectious Disease Detection and Surveillance (IDDS) project in collaboration with National One Health Platform membership reviewed existing surveillance systems as part of developing a National Strategy for Coordinated Surveillance of PZDs to operationalize data sharing across the sectors.
Methods: From November 2020 to March 2021, a series of multisectoral and multidisciplinary stakeholder meetings were held to review existing surveillance systems. Panel and group discussions including participants from human, animal, and environmental sectors, WHO, Food and Agriculture Organization (FAO) and other key stakeholders, identified mechanisms for integrating surveillance of PZDS using a One Health approach and drafted a strategy for coordinated surveillance of PZDs.
Findings: Several electronic surveillance systems exist in the human, animal, and environment sectors but are not connected. The human health sector utilizes the District Health Information System 2 (DHIS2) platform for indicator-based surveillance (IBS), and the Electronic Integrated Disease Surveillance and Response for event-based surveillance (EBS). The animal health sector utilizes a paper-based tool for IBS, Open Data Kit (ODK), and the FAO-developed Event Mobile Application for EBS. The environment sector uses geographic information systems and remote sensing, ODK, AVENZA, and other paper-based tools. Although some tools in human health capture some aspects of zoonotic disease surveillance, they are neither accessible nor utilized by the other sectors.
Conclusion: Multisectoral coordination of surveillance of PZDs requires interconnected electronic surveillance systems. Migrating the existing surveillance systems in human, animal, and environment sectors into one platform like DHIS2 will ease interconnection and interoperability.

PP-9

ONE HEALTH AT THE PROJECT LEVEL: REDUCING THE THREAT OF RIFT VALLEY FEVER THROUGH ECOLOGY, EPIDEMIOLOGY AND SOCIO-ECONOMICS

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Background: One Health (OH) frameworks are a powerful tool for changing the narrative in national responses to zoonoses. Research can be a leading force in cross-sectoral collaborations by increasing inter-sectoral dialogue, driving the development of synergistic partnerships and supporting the prioritization of interconnected approaches to human, animal and environmental threats, we showcase OH research at the project level, focusing on zoonotic disease surveillance and

outbreak investigations of Rift Valley fever virus (RVFV).
Methods: Our approach utilizes a OH framework highlighting outcomes of an ongoing 7-year, multi-sectoral and transdisciplinary project on 275 farms in the Central Free State province of South Africa. OH, workforce development is critical for project implementation and long-term sustainability. The value of public-private collaboration across health sectors and disciplines to increase capacity for preparedness and response to Rift Valley fever (RVF) outbreaks.
Results: We found that sharing information, resources, and frequent communication resulted in improved field data collection on weather and climate, soil, vegetation, vector abundance and succession. This contributed to the development of disease risk models that can enhance capacities for RVF prediction and control strategies. We demonstrated increased resource efficiency of joint human-animal-environmental studies and identified broader socio-economic impacts of RVFV, not previously captured in livestock-specific estimates alone. Altogether, our findings validated several benefits of OH, including improved knowledge, skills, and data quality, allowing for prioritization of potential intervention points.
Conclusions: Here, we have produced an example of a OH approach in order to provide evidence and support for wider roll-out of OH frameworks. Utilization of the framework can help realize more effective disease control efforts across differing levels and sectors. Strengthening capacity within the OH Framework to respond to a few high priority local disease threats can contribute to the overall ability to reduce disease burden.

PP-10

LETHAL AND SUBLETHAL EFFECTS OF IVERMECTIN ON *ANOPHELES ARABIENSIS* UNDER LABORATORY CONDITION: AN APPROACH FOR MALARIA ELIMINATION

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Introduction: Ivermectin is the safest drug for humans and animals; and used in mass drug administration to reduce the burden of onchocerciasis and lymphatic filariasis in Africa and is also active against different species of mosquitoes. Malaria is a serious health problem throughout the tropics, about million cases, and deaths worldwide. The success of current control tools in combating malaria vectors is well established. However, the sustained residual transmission of Plasmodium parasites persists because a vector feeding upon animals when humans are not available, and escapes this promising approach.
Objective: To evaluate the lethal and sublethal effect of Ivermectin treated cattle blood on *Anopheles arabiensis* under laboratory conditions from Apr- June 2020.
Methods: Under laboratory condition adult *An. arabiensis* were allowed to feed on the cattle blood that contained different concentrations of Ivermectin (0, 5, 10, 20, 40, and 80ng/ml) using artificial membrane feeders. Then the numbers of dead mosquitoes were recorded daily after 24 hrs. post blood feeding (PBF) for 9 days. The numbers of an egg laid were recorded from 3-5days PBF and the developmental stages were followed for 14 days. LC50, LC95 and LC99 were determined by probit analysis and the Survivorship of mosquitoes was analyzed

using Kaplan–Meier survival curves. Analysis of variance was used to compare mean mortality and egg production, between treatment and control groups
Results: The Ivermectin treated cattle blood induced high mortality in treatment groups compared to control at all test groups ($p \leq 0.001$).The mortality rate significantly increased with increasing concentration. The LC50, 95 and 99 were 16.46, 75.7 and 141.8 ng/ml respectively. There was no egg production at the concentration of >10ng/ml Ivermectin. A significant difference in the eggs produced at 5ng/ml and 10ng/ml was shown between the treatment and control group ($p=0.019$ and 0.001 respectively). Among eggs produced from surviving *An. arabiensis*; the hatchability, pupae and adult emergence were lower in the treatment group compared to control. The mean survival time was 8, 7.5, 6.8, 5.7, 4.9 days for *An. arabiensis* those ingested 5, 10, 20, 40, and 80ng/ml respectively and it was significantly shorter compared to control ($p<0.001$). The median survival time is also statistically shorter among treatment groups compared to control ($p<0.001$).
Conclusion: Ivermectin has lethal and sub lethal effects on *An. arabiensis*. Further study is recommended on wild *An. arabiensis* to use Ivermectin as strategy to eliminate malaria.

Zoonotic Disease Surveillance and Outbreak Investigations

PP-11

SURVEILLANCE STUDIES FOR INFLUENZA A VIRUSES AT THE HUMAN-ANIMAL INTERFACE IN SOUTH AFRICA

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Rapid growth of South Africa's animal production industries has the potential to increase zoonotic pathogen emergence. As sparse surveillance has been conducted, we partnered with animal production industries and wildlife biologists in conducting this

study in South Africa through a One Health approach to obtain evidence that influenza A viruses (IAV) may cross the species barrier between animals and man. Samples (n=1,311) were collected from swine (51 oral secretions), swine workers (84 nasal washes and 78 sera), chicken and geese (119 swabs), waterfowl (550 swabs) other avian species (381 swabs from non-waterfowl and 48 swabs from raptors) in these pilots during 2017 and 2018 from different locations in South Africa. All animal samples and human nasal washes were screened for the presence of influenza A viruses using qRT-PCR, virus isolation, and nucleotide sequencing. Human sera were screened for influenza virus antibodies using microneutralization assays against two swine influenza viruses. Among 84 human nasal washes and 51 swine oral secretion specimens, 44 (52.4%) and 6 (11.8%) had molecular evidence of influenza A virus. Microneutralization assays with enrolled workers' sera against swine H1N1 and H3N2 viruses revealed a high prevalence of elevated antibodies. Multivariate risk factor analysis showed that male workers from the age-group quartile 23–32 years, who self-reported a recent history of exposure to someone with influenza disease and seldom use of personal protective equipment were at highest risk of molecular detection of influenza A virus. A total of 14 samples from 11 birds of prey (45.8% of all sampled birds) were IAV positive. Five out of 24 birds (20.8%) were positive for IAV RNA. Among raptor samples, three out of 24 birds (12.5%) were positive for IAVs with viral RNA detected in both cloacal and oropharyngeal swabs. One IAV-positive sample was also positive for H5 subtype (4.1%); all other samples were H5, H7 and H9 negative. These pilot study data suggest that IAV are likely prevalent in South African swine farms and that avian IAV are also present in the South African wild migratory bird population, emphasizing the need for more extensive surveillance studies. The present findings are of scientific importance and these will contribute to our better understanding of the ecology and mobility of influenza viruses and other pathogens among different animal hosts and humans

PP-12

IMPACT OF ONE HEALTH APPROACH IN MANAGEMENT OF MONKEYPOX OUTBREAKS IN NIGERIA FROM SEPTEMBER 2017 TO AUGUST 2021

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Background: Monkeypox in Nigeria was first reported to Nigeria Centre for Disease Control (NCDC) on 22nd of September 2017. The outbreak was reported from a family residing in Yenagoa Local Government Area of Bayelsa State, with sudden onset of fever followed by vesiculopustular rashes. History taken revealed exposure to monkeys about a month earlier to onset. Considering that Monkeypox is a zoonotic disease of public health importance, it becomes both national and international public health concern necessitating adoption of One Health Approach to prevent, detect, respond and control monkeypox outbreak in Nigeria.

Methods: Secondary data analysis of Nigerian monkeypox database of cases over a period of 4 years between September 2017 to August 2021 obtained from Nigeria Centre

for Disease Control, Monkeypox outbreak situation reports were analyzed using Microsoft excel 2016 and line graph. A multisectoral, international outbreak investigation was undertaken to identify sources and risk factors, establish surveillance, and enhance preparedness in collaboration among human, animal, and environmental health institutions towards management of monkeypox outbreaks in Nigeria, A multiagency interdisciplinary emergency operations center (EOC) was activated on October 9, 2017; the EOC facilitated joint epidemiologic investigations, targeted risk communication, and developed laboratory diagnostic capacity for human and animal specimens. An incident action plan and interim national guidelines were developed, and a protocol for active monkeypox surveillance in animals was developed, targeting high-risk areas at the human-animal interface, such as markets that sell bush meat, wildlife parks, zoos, and farms.

Results: From September 2017 to August 31, 2021, a total of 493 suspected monkeypox cases were reported from 31 states in the country. 215 (43.6%) cases were confirmed in 20 states and a total of eight deaths were recorded (CFR= 3.7%) in six states within the 4-year period. Out of the 493 suspected cases, 79 were reported in 2021 along with 23 confirmed cases from 8 states and no deaths. For a three year consecutive period, case fatality rates of zero were noted - 2019, 2020 and 2021.

Conclusion: The One Health collaborative approach adopted by Nigeria in management of monkeypox within the reporting period has made significant impact, which might account for the decline of CFR to zero for: 2019, 2020 and 2021. Therefore, strengthening of One Health structures is critical in Nigeria and every other country.

PP-13

WIDESPREAD OUTBREAK OF MIDDLE EAST RESPIRATORY SYNDROME CORONAVIRUS IN A CAMEL COHORT AND ASSOCIATED SPILLOVER TO HUMANS IN KENYA

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Background: Middle East respiratory syndrome coronavirus (MERS-CoV) is an emerging coronavirus that is endemic in dromedary camels. Kenya's >3 million camels have high seroprevalence of antibodies against MERS-CoV, with scant evidence of human infection, possibly due to a lower zoonotic potential of Clade C viruses, predominantly found in African camels.
Methods: Between April 2018- March 2020, we followed camels aged 0-24 months from 33 camel-keeping homesteads within 50Km of Marsabit town through collecting deep nasal swabs and documenting signs of illness in camels every two weeks. Swabs were screened for MERS-CoV by reverse transcriptase (RT)-polymerase chain reaction (PCR) testing and virus isolation performed on PCR positive samples with cycle threshold (CT) <20. Both the isolates and swab samples (CT <30) were subjected to whole genome sequencing. Human camel handlers were also swabbed and screened for symptoms monthly and samples tested for MERS-CoV by RT-PCR.
Results: Among 243 calves, 68 illnesses were recorded in 58 camels (53.9%); 50/68 (73.5%) of illnesses were recorded in 2019, and 39 (57.3%) were respiratory symptoms (nasal discharge, hyperlacrimation and coughing). A total of 124/4,702 camel swabs (2.6%) from 83 (34.2%) calves in 15 (45.5%) enrolled compounds were positive for MERS-CoV RNA. Cases were detected between May-September 2019 with three infection peaks, a similar period when three (1.1%) human PCR-positive but asymptomatic cases were detected among 262 persons handling these herds. Sequencing of camel specimens revealed a Clade C2 virus with identical 12 nucleotide deletion at the 3' end of OFR3 region and one nucleotide insertion at the 5' region but lacked the signature ORF4b deletions of other Clade C viruses.
Interpretation: We found high levels of transmission of distinct Clade C MERS-CoV among camels in Northern Kenya, with likely spillover infection to humans. These findings update our understanding of MERS-CoV epidemiology in this region.

PP-14

LOW LASSA FEVER CASE COUNT AND THE COVID-19 RESPONSE IN NIGERIA: A CURSORY REVIEW OF THE 2021 COVID-19 AND LASSA FEVER SURVEILLANCE DATA FROM JANUARY TO MAY 2021

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Background: In the last five years, more than 72% of annual Lassa fever cases in Nigeria occurred between January and May, commonly referred to as LF high transmission season. However, 281 LF cases were reported within this period in 2021, significantly lower than 1027 cases reported in 2020. It is generally proposed that the low LF cases may be due to the ongoing COVID-

19 pandemic. This study aims to determine possible relationship between Lassa fever and COVID-19 surveillance in Nigeria between January and May 2021
Methods: The 2020 and 2021 data for LF and COVID-19 January to May were analyzed (2017-2021). Case counts were compared across states reporting confirmed cases for both diseases. Number of suspected cases and test positivity rate were used as a proxy for suspicion. Relationship between suspected and confirmed COVID-19 and LF cases in the 14 states that reported confirmed LF cases between January and May 2021 was determined using Spearman correlation coefficient and test of significance was conducted
Results: There was a 42.8% reduction in the number of suspected LF cases in 2021 compared to 2020 in the 14 states that reported confirmed cases in 2021. However, a test positivity rate of 22.3% was recorded in 2020 compared to 15.1% recorded in 2021. There was a moderate positive correlation (r =0.473, p value = 0.103) between number of suspected LF and COVID-19 cases in the 14 states, but almost no correction (r=0.017, p value = 0.957) between number of confirmed LF and COVID-19 cases.
Conclusion: Suspicion for LF seems to increase with increasing suspicion for COVID-19 although cumulate cases were lower than previous years. The low positivity rate for LF in 2021 suggests lower LF transmission in 2021 compared to 2020. The low number of suspected and confirmed cases may be reflective of reality and LF surveillance may not have been adversely affected by COVID-19 pandemic. Hence, the need to explore the factors responsible for the reduction in 2021 LF cases.

COVID-19 and One Health

PP-15

NEW ZOONOTIC CORONAVIRUS PANDEMIC: THE APPLICATION OF WASTEWATER-BASED EPIDEMIOLOGY (WBE) FROM THE PERSPECTIVE OF ONE HEALTH

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The new zoonotic coronavirus (SARS-CoV-2) was detected in China in late 2019 and, since then, it has spread rapidly, culminating in the pandemic. Studies show that symptomatic or asymptomatic individuals infected with SARS-CoV-2 can eliminate the virus through feces and urine, making it possible to detect viral RNA in excreta and, consequently, in wastewater. One Health is the inseparable union of animal, human and environmental health and within this concept, it is possible to use an environmental sample (wastewater) to monitor the circulation of the new coronavirus in a population, whether in companies, schools, neighborhoods, and municipalities. In this context, the present study aimed to demonstrate the successful use of WBE through a contingency plan model adopted in a company (Itaipu Hydroelectric Power Plant - IHPP) located in the city of Foz do Iguaçu, Brazil. Thus, statistical analysis and modeling were applied, using the results of weekly monitoring, between June/2020 and September/2021, of 10 representative points

of each sector of the IHPP. During 65 monitored weeks, 500 mL of samples were sent conditioned on ice to the Federal University of ABC for detection and quantification of RNA fragments of the new coronavirus by reverse transcription technique followed by quantitative polymerase chain reaction (RT-qPCR). An occurrence variation of 7.7 and 2.6 log10 copies of RNA.L-1 was observed, and it is possible to correlate with the tendency of an increase in the number of cases in the IHPP and in the city of Foz. The results demonstrated the viability of the WBE approach in monitoring the new coronavirus, being a useful tool for decision-makers with the epidemiological surveillance and the health department. This approach may also be useful in detecting outbreaks caused by other waterborne pathogens not only in the human population but also in the companion animal population.

PP-16

HARNESSING INTERPERSONAL COMMUNICATION AND TRUSTED LEADERSHIP TO INCREASE COVID-19 VACCINATION UPTAKE IN HARD-TO-REACH WILDLIFE COMMUNITIES IN UGANDA

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The COVID-19 pandemic has led to loss of lives, disruption of livelihoods, and disproportionate access to preventive messages among historically marginalized communities. In Uganda, using a mass media campaign, four preventive behaviour practices are being promoted, i.e., handwashing, mask wearing, physical distancing and vaccination. Although the campaign messages are running on mass media platforms such as television and radio, these channels may not be the best sources of information for marginalized communities such as fisherfolks, pastoralist and peasant farmers, national park residents and other communities in hard-to-reach areas.

To address this challenge, the USAID Social and Behaviour Change Activity (USAID SBCA) in partnership with Uganda Wildlife Authority (UWA) and Conservation Through Public Health (CTPH) conducted a weeklong qualitative study on May 4-8, 2021, to establish the level of knowledge, attitudes and risk perception about Covid-19 and vaccination among wildlife communities living around Queen Elizabeth National Park (QENP) in Rubirizi district, Southwestern Uganda. This was a participatory activity and included focus group discussions and structured interviews with 15 fisherfolk, pastoralist and peasant farmers, 17 rangers and 4 tour guides focusing on motivations

and barriers to adoption of preventive behaviours and how to tailor information appropriately for them.
Findings revealed several medical, political, economic, social, and religious myths and misconceptions about COVID-19. In terms of behaviour there was evidence of abandonment of preventive measures. Rituals and cultural practices still expose people to risk. Leaders modelling desired behaviour was key to uptake and establishing government trust. Communities preferred getting sensitization messages from the vaccinated or COVID-19 survivors. Both rangers and community members preferred interpersonal communication approaches such as Village Health Teams, religious leaders, local leaders and use of community sensitization meetings and community audio towers. To increase COVID-19 vaccination uptake, addressing myths & misconceptions, use of interpersonal approaches and trusted leaders is key.

PP-17

INVOLVEMENT OF THE AFRICAN VETERINARY LABORATORIES OF THE MEDILABSECURE NETWORK IN THE COVID-19 CRISIS

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MediLabSecure is an EU-funded project whose main objective is to create a framework for collaboration to promote surveillance of viral zoonoses under a One Health approach in 22 countries of the Mediterranean, Black Sea and Sahel regions. During the COVID-19 crisis the project rapidly adapted to the emergency and provided technical assistance to the beneficiary countries in terms of diagnosis and surveillance in humans and animals.
To evaluate the involvement of the veterinary laboratories of our network in the sanitary crisis and estimate the degree of intersectoral collaborations, an online survey was launched in April 2021. We received responses from 19 labs, 7 of them from African countries. Of these laboratories, 3 (Morocco, Algeria and Mauritania) were not involved in SARS-CoV-2 diagnosis despite having trained staff and all the protocols implemented. In these countries the cooperation of vet labs was not requested by the Ministry of Health despite their offer to collaborate. Nevertheless, two of these labs donated equipment and reagents to their Public Health institutions to help with the overwhelming demand of diagnostic materials. Three laboratories (Egypt, Senegal and Tunisia) were involved in SARS-CoV-2 molecular and serological diagnosis but only in animal samples (pets and animal food products). Only one veterinary laboratory (Niger) established full collaboration with the Ministry of Health and was intensively involved in the molecular diagnosis of human

samples from May to September 2020. Moreover, vet specialists from this lab were also involved in the disinfection of contaminated premises.
The results of this survey show the willingness to help veterinary labs in North Africa and Sahel regions to face a Public Health crisis caused by a zoonotic pathogen. Although the degree of intersectoral collaboration was low in most of the countries, the successful One Health experience of Niger could be a good example for future sanitary emergencies.

Rabies and One Health

PP-18

INCIDENCE AND SEROPREVALENCE OF RABIES VIRUS IN HUMANS, DOGS AND OTHER ANIMAL SPECIES IN AFRICA, A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: Rabies is transmitted to humans mainly by dogs but also by other animal species. Reliable data on the incidence of Rabies virus (RABV) in humans, dogs, and other animal species in Africa, could be essential in the implementation of a global strategic plan to eliminate the RABV by 2030 as adopted by the WHO, OIE, and FAO.
Methods: We searched the PubMed, Embase, Scopus, African Journal Online, and African Index Medicus databases for relevant studies that report data on the incidence of RABV in Africa up to February 17, 2020. Information on active and past RABV exposures in various categories of dogs, humans and other animal species were extracted. Incidence and seroprevalence estimates were pooled using a random-effect meta-analysis.
Results: We included 73 articles which provided 142 RABV incidence and seroprevalence records in 21 African countries. The estimated incidence of RABV in 222 humans, 15,600 dogs, and 12,865 other animal species was 83.4% (95% CI = 64.6-96.5), 44.1% (95% CI = 35.1-53.4), and 41.4% (95% CI = 29.6-53.8), respectively. The estimated seroprevalence of RABV in 420 humans, 3,577 dogs, and 8,55 other animal species was 33.8% (95% CI = 21.9-46.8), 19.8% (95% CI = 13.3-27.3), and 3.6% (95% CI = 0.3-9.2), respectively. The incidence of RABV in general was higher in suspected rabid dogs, other animal species of the Orders Perissodactyla, Artiodactyla and Carnivora. The incidence of RABV in humans was higher in regions of West and East Africa, in dogs in urban areas and in regions of Central and South Africa, and in animals of the order Perissodactyla in urban areas.
Conclusions: This meta-analysis demonstrated a high incidence of RABV in Africa. It is necessary to improve surveillance systems to provide reliable data on RABV in Africa, essential for the implementation of an effective control strategy.

PP-19

IMPROVING SURVEILLANCE OF HUMAN AND ANIMAL RABIES IN CENTRE REGION OF CAMEROON FROM 2019 TO 2020

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Background: Rabies is a zoonotic disease, distributed worldwide and responsible for approximately 60,000 human deaths each year. This encephalitis remains neglected in the majority of African countries, where the burden of disease is high. Discontinuous rabies data in Cameroon reported a majority of cases in the Centre region and mainly in the capital city Yaounde. Nevertheless, the existing rabies surveillance system is still weak and does not allow to assess the actual burden of this disease in Cameroon and put rabies at a priority place in disease control strategy.

Objectives: This study aimed to estimate the human and animal rabies burden from October 2019 to March 2021 in the Centre region of Cameroon considered to be the most affected based on available data.

Methods: We implemented human and canine rabies surveillance in the department of the Centre region, and in three health districts of Yaounde. We also recorded data on bite cases at the Anti-rabies Center (ARC) of Yaounde from October 2020 to March 2021. The reinforcement system consisted of the provision of sampling equipment for collection of samples of suspected rabies cases, the supplying of a communication and sample sending fee, as well as motivation cost. Rabies confirmation was performed at CPC, by fluorescent antibody test for animal rabies and SYBR green real-time RT-PCR for animal rabies confirmation and for human rabies.

Results: A total of 189, 97, and 384 bite cases were reported at the regional delegation of centre region, health districts, and ARC of CPC respectively. High rate of exposure was recorded in the department of Mfoundi at the regional level (26%, 49/189) and the ARC of Yaounde (80%, 304/380). The month of December was the most affected at the regional level (16%, 20/125) and the ARC of Yaounde (28.94%, 110/380), while the months of February 19% (11/56), August 28% (6/21) and September 20% (4/20) were the most represented respectively at the health district of Biyemassi, Cite-Verte and Efoulan. None of the two human samples sent to CPC for rabies confirmation were positive, and three of the seven analysed dog samples were confirmed positive for rabies.

Conclusion: This study highlights that the improving surveillance system allowed a better estimation of rabies's burden in the Centre region. However, many limitations should be resolved to ensure a good rabies surveillance system in other regions of Cameroon, essential for control and elimination of this disease.

PP-20

MASS DOG VACCINATION AGAINST RABIES – ITEZHI-TEZHI DISTRICT, ZAMBIA, 2021

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Background: Rabies is a 100% fatal but preventable viral zoonotic disease affecting the central nervous system; It is mostly transmitted to humans via dog bites. In Zambia, where rabies is endemic, 23 rabies deaths and over 16,000 dog bites were reported in 2018. although the true burden is estimated to be >10x that number. Itezhi-Tezhi district has in the last 5 years been recording over 100 human dog bites per year. Dog mass vaccination is the WHO recommended control strategy demonstrated to eliminate human rabies.
We evaluated a mass dog vaccination pilot campaign in Itezhi-Tezhi, Zambia, in 2021 to learn lessons that will inform subsequent campaigns.
Methods: Zambia conducted a dog rabies vaccination campaign in Kaingu Chiefdom of Itezhi-Tezhi in September 2021 for ten (10) days, with a targeted coverage of 70%. Data was entered into an online app at the point-of-service when a dog or cat were vaccinated. Vaccination coverage was calculated as the number of dogs vaccinated against the harmonised estimated district dog population (5, 500) and post vaccination survey. We report demographic characteristics, vaccination and health status and responses from owners whose dogs were not vaccinated.
Results: A total of 3,931 dogs were vaccinated achieving 71% vaccination coverage. The dogs were mostly adult 2,950/3,931 (75%), females 2353/3931 (60%), 3,921/3,931 (99.7%) that had never been vaccinated before. 3,893/3,931 (99%) were healthy. Vaccination coverage in the area was affected mainly by owners' lack of information, unavailability and failure to restrain their dogs.
Conclusion: Itezhi-tezhi conducted a successful pilot mass dog vaccination. These findings show that WHO benchmarks can be achieved through mass vaccination campaigns and be used as a template to facilitate high-number, high-coverage vaccination campaigns. Dog rabies vaccination should be rolled out to the rest of the country as one of the strategies to achieve ending dog mediated human rabies in Zambia.

PP-21

STEPWISE APPROACH TOWARDS 2030 - ELIMINATING RABIES IN TANZANIA USING ONE HEALTH APPROACH

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Rabies is a fatal but preventable viral disease with high human and animal costs. Through committed multi-sectoral and transdisciplinary collaborations, rabies can be eliminated. However, in Africa and parts of Asia, rabies remains endemic and continues to cause human deaths annually. Tanzania accounts for at least 1,500 human

deaths and significant cases of dog-mediated rabies annually. To mitigate the impact and eradicate rabies, Tanzania developed a collaborative 'National Rabies Control Strategy, 2017 – 2030', which classified the country into seven zones based on risk profiling of rabies and ongoing efforts towards rabies elimination.

FAO partnered with the government of Tanzania, and other international collaborators to 1) Implement the joint risk assessment (JRA); and 2) Prioritize animal vaccinations against rabies, risk communication and community engagement in high-risk districts. In addition, FAO also works in partnership to train future One Health Workforce. Recently, intervention strategies were undertaken in Moshi (2019) and Kisarawe (2021) to demonstrate One Health engagements. Students (n = 100) in the fields of medicine, veterinary medicine, biological sciences, environmental science and medical informatics were trained and awarded certificates. Field interventions were tracked in real time using the GARC data logger.

Over 34,885 dogs and cats have been vaccinated (>74% vaccination coverage). Over 836,353 persons were protected and nearly 49,000 students and pupils were reached. No single case of dog-mediated human rabies has been reported from these districts.

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