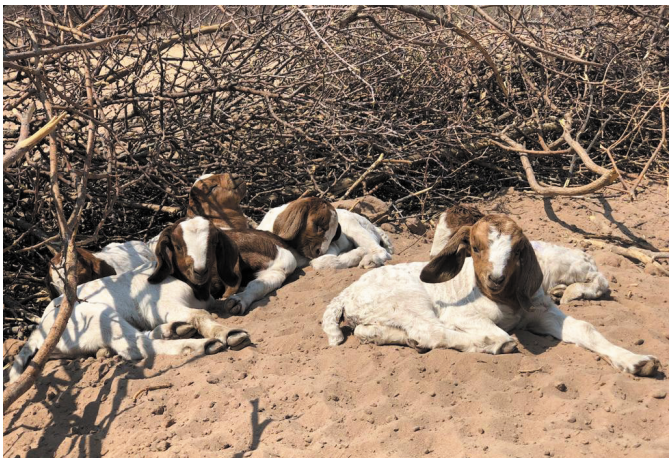
PEER REVIEWED

One Health: Professional Stakeholder Engagement Key to Tackling Zoonotic Disease

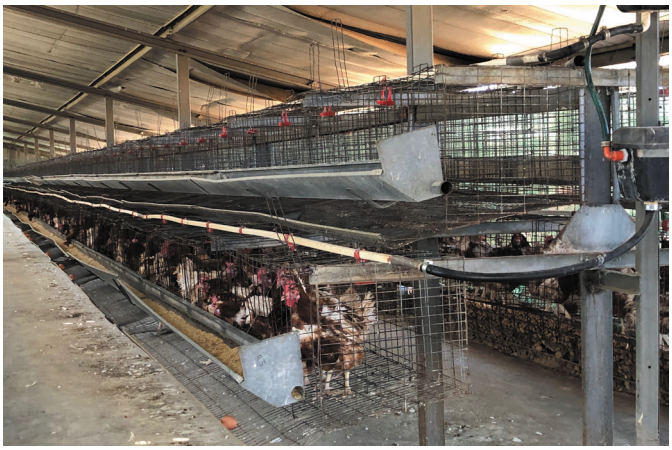
Introduction
Globally, endemic and emergent disease risks persist as significant challenges to human and animal health. Rural livestock farming communities in low- and middle-income countries (LMICs) are disproportionately affected by zoonoses and animal diseases due to poverty and concomitant poorly-available health and veterinary services. In countries heavily reliant on animal production for socio-economic stability, the impact of zoonotic disease is devastating. A One Health approach to tackling zoonosis is now broadly advocated and a successful strategy requires sector stakeholder recognition, inclusion, and engagement to ensure a holistic response to a complex problem.

Agriculture and Poverty
Livestock farming is essential to the livelihoods of many rural Africans[1], with lives immersed in animal production for self-sufficiency, and increasingly robust home and export markets. Pastoralist systems are prevalent in arid regions where inconsistent rainfall prohibits effective crop production, promoting animal farming as a dependable source of income[2]. As 66% of Africa's land expanse is used to graze animals, pastoralism is a vital part of the African economy. Animals also fulfil a spiritual and cultural role in rural populations through ritualised practices which enhance self-knowledge and identity. Livestock production contributes to almost half of the global agricultural gross domestic product (GDP)[3], yet poverty in the Sub-Saharan African farmer community is widespread and persistent.



Boar goat production on a commercial farm in the Omaheke Region (Namibia)

Livestock Sector and Production
In some regions, the international meat export markets have surged, with growing demand from the EU and Norway for meat products from Botswana, Namibia, Swaziland, and South Africa. After almost twenty years of lobbying and successful introduction of strict biosecurity measures, in 2020, the Namibian state-owned Meat Corporation of Namibia (MeatCo) entered the American meat market, with an initial shipment of 25 tonnes of beef to Philadelphia. The approval will enable MeatCo to deliver 860 tonnes in the first trading year,



Poultry unit on the outskirts of Windhoek

with a target annual delivery of 5,000 tonnes. The Kenyan Meat Commission routinely exports to the Middle East and North Africa (MENA) region, confirming globalisation of the animal products export market. This sector makes an increasingly important contribution to the national economy of many Sub-Saharan African nations, but in districts where commercial and subsistence farming systems run in close proximity, and disease risks from wildlife persist, then securing livestock health is challenging. Low livestock productivity is attributed to weak production systems and poor animal health[4,5], often linked to restricted access to comprehensive animal health services.

Zoonotic Disease
Millions of lives are affected on a global basis daily by zoonotic disease. The outbreak of COVID-19 brings a stark reminder of the ongoing risk to human health, and modelling of worldwide disease outbreaks indicates that around three-quarters of emergent human disease is zoonotic in origin[3]. Endemic zoonoses have a devastating effect on human health and livelihoods; as well as animal health, welfare, and production. Rural communities in LMICs are the most vulnerable to zoonotic disease[6] due to the close residence of people with animals and dependence on livestock farming, traditional food consumption practices, and limited access to human and animal health services[3,7]. Endemic zoonotic disease outbreaks continue to be problematic and since 2000, a number of epidemic zoonoses not previously known have been widely reported (Table 1).

One Health in the Animal Health Sector
The World Health Organisation (WHO) defines One Health as "*an approach to designing and implementing programmes, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcomes*". Central to the success of a One Health approach is the engagement and collaboration of sector expertise and stakeholders working together for shared objectives. For the animal health sector, this can encompass a broad range of professionals and paraprofessionals, all of whom make a valid contribution.

Farmer Access to Veterinary Services
Despite the recognised socio-economic importance and

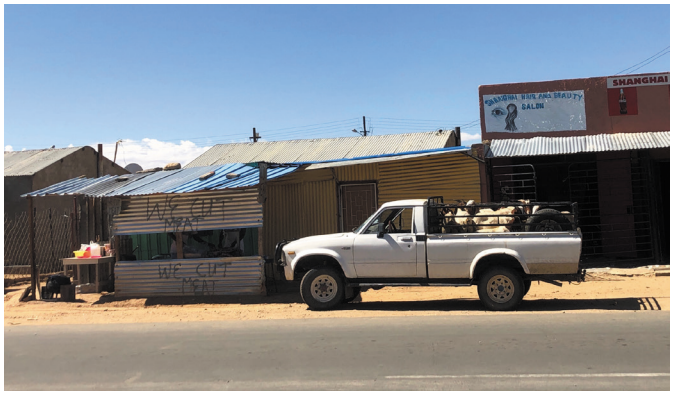
Endemic Zoonotic Disease Risks	Epidemic zoonoses not previously known before 2000
Anthrax	Severe Acute Respiratory Syndrome (SARS)
Brucellosis	Middle-East Respiratory Syndrome (MERS)
Echinococcosis/ hydatidosis	COVID-19
Mycobacterium tuberculosis	Avian flu (H5N1)
Rabies	Swine flu (H1N1)
Rift Valley Fever	
Campylobacteriosis	
Porcine cysticercosis	
Q fever	
Salmonellosis	
Trypanosomiasis	
West Nile Fever	

Table 1. Current Global Endemic and Emergent Zoonotic Diseases Risks

widespread use of livestock farming in rural Sub-Saharan Africa, farmer access to veterinary services and medicines is often inadequate. The critical risks to the livestock farming sector are recognised as follows: failing animal health status; non-compliance of infrastructure; lack of preventative support and advice on matters of animal health, and the subsequent decline in animal production[8]. Risk factors are compounded as pastoralist farming communities are typically poor and have limited access to animal health resources including education and medicines[6,8].

Low numbers of veterinarians and veterinary para-professionals (with practitioners often required to cover a broad geographical expanse), declining animal health services (due to reduced government capacity), and limited farmer access to agri-merchant retail outlets all severely impact farmer ability to source veterinary services, veterinary advice and guidance, and safe veterinary medicinal products. In the absence of professional animal health advice, rural farmers will draw on their previous experiences, ethno-veterinary practice or tacit knowledge. Such findings are reflected in livestock farming practice in Tanzania, Ghana, Kenya, Zambia and Zimbabwe[9,10]. Insufficiencies in the availability of education and advice to farmers is known to be associated with poor access to veterinarians. Limitations to animal health services are known to heighten the risk from zoonotic disease[7] and potentially the development of emergent zoonoses. Informed and educated farmers are better placed to recognise disease in their livestock and to understand the risk from zoonoses. Consequently, farmers who are able to access veterinary guidance and safe veterinary medicinal products are better positioned to initiate measures to enhance food security and concurrently veterinary public health. Simultaneously, they improve animal health/welfare and production to secure their own livelihoods. Farmers would be better equipped to reduce the risk of zoonosis and to safeguard public health in the broader sense, such as slowing the development of antimicrobial resistance. Linking animal health service providers to agricultural merchants can increase farmer access to animal health services, helping to reduce animal mortality, and enhance production and farming profitability. Importantly, maintenance of animal health has concurrent positive effects of minimising the risk of zoonotic disease transfer. Unfortunately, training for veterinary medicine stockists in Sub-Saharan African rural farming regions has been found to be variable[10,11] and employees can be under pressure to stock and sell certain products.

Outreach, farmer education, and enhanced communication from animal health services are all recognised as key success factors; but without readily available access to veterinarians and services, how may this be achieved?



Traditional meat market selling

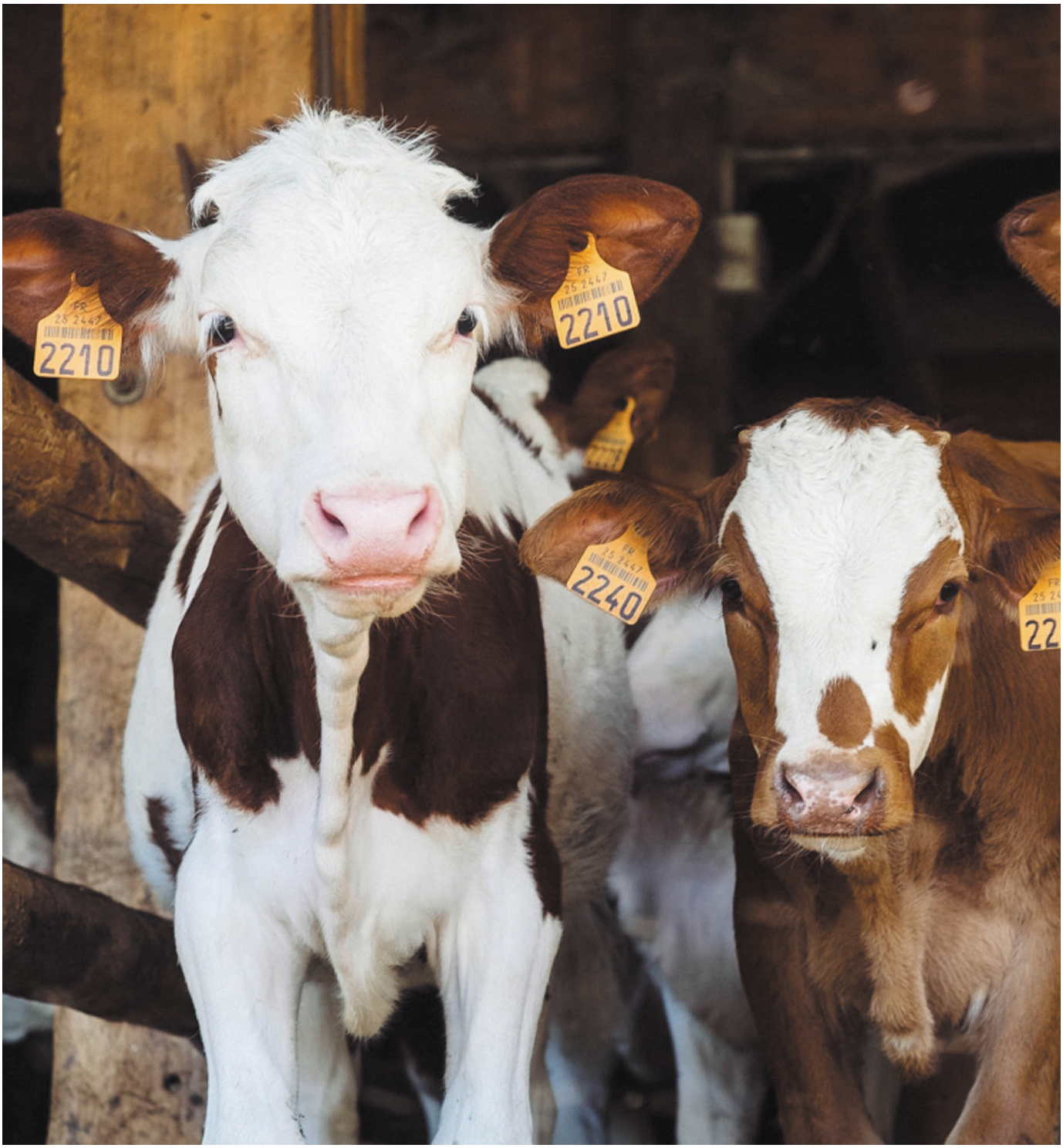
One Health Approach to Tackling Zoonotic Disease

The general international consensus on zoonotic disease control is that a One Health approach is often required. The interlocking nature of human, animal, and environmental factors is broadly accepted as the key to health across all three spheres. Fundamentally, a successful One Health approach to livestock farming requires all core stakeholders to be informed, engaged, and active in the quest for disease prevention, management and resolution. Core stakeholders to the rural African livestock sector include veterinarians, allied animal health practitioners such as veterinary paraprofessionals, farmers themselves, and arguably the interconnecting pharmaceutical professional the veterinary pharmacist.

Stakeholder Contribution

Stakeholders may be defined as any individual or group that is or should be involved in preventing or managing a health threat at the human-animal-environment interface. It should also include those who are impacted by such a health threat, in this instance the farming community. Engagement of the identified stakeholders is a crucial component of the One Health approach and working towards successful solutions to zoonotic disease risk. Many nations advocate the development of a vet-led team approach to the provision of veterinary health services; incorporating a broad range of allied animal veterinarian-led team such as veterinary nurses and technicians, nutritionists, reproductive technologists, and animal medicine advisers. This model seeks to delegate tasks to specialist professionals under veterinary direction. In LMICs where access to veterinarians is limited, vet technicians, animal health technicians or community animal health workers (CAHWs) are a veterinarian replacement, rather than an accompaniment to a broader team effort.

In pastoral regions, services provided by CAHWs have developed in direct response to inadequate veterinary health services and veterinarians. CAHWs are deeply rooted in the community, and correspondingly are highly trusted by rural farmers[12], aiding the successful communication of advice and guidance. Yet they continue to face challenges stemming from insufficient veterinary medicine regulation (safe usage, dosage, route of administration and disposal) and inadequate staff training.



Agri-merchant outlets are commonly the core source of veterinary medicine supply. Appropriate retail staff training is proposed as a tool to encourage rational and correct medicine dispensing process and procedures. Studies corroborate training with improved quality of advice and information provided to clients during dispensing of veterinary medicines[13,14,15]. Recent NGO initiatives have clearly determined the positive impact on animal health and welfare from training and education programmes for agri-merchant retail staff[16]. This perhaps indicates a broader role for the veterinary pharmaceutical sector in facilitating effective and accessible training platforms for veterinary medicine stockists.

Interlocking Human and Animal Health Strategy

Recent years have seen the comprehensive extension and expansion of the pharmacist role into matters of broader public health incorporating the overlap between human and animal health. Indeed, the professional discipline of veterinary pharmacy is now established and generally well accepted. As public-facing and accessible professionals, pharmacists (with the appropriate training) are extremely well-placed to provide advice and guidance on veterinary medicines practice. This is not to suggest a replacement to veterinarian services but as an additional professional practitioner leveraging accessibility to support the farming community through a One Health approach. In rural regions, where a paucity of veterinarians and animal health technicians is distinctly problematic, the veterinary pharmacy role could include veterinary public health, ensuring safe supply of veterinary medicines, as well as providing advice on correct use, storage and disposal,

pharmacovigilance, and information on zoonoses prevention and control. In LMICs, the community-based cadre is well-positioned to extend veterinary pharmaceutical services to rural communities. Trained in pharmaceutics, community pharmacists are embedded within rural communities, and are recognised as established healthcare practitioners within the community. As the only health professional able to bridge both human and veterinary medicine, the veterinary pharmacist could serve to be the interlocking professional to secure interdisciplinary health.

In summary, the risks to human and animal health from endemic and emergent zoonoses will persist in the absence of accessible veterinary services, advice and guidance, and a secure supply chain for veterinary medicinal products. Risk to human health is both localised and international, as we have experienced in the recent outbreaks of SARS, MERS, and COVID-19. In regions where the demand for veterinarians outstrips supply, contributions from allied veterinary para-professionals and others, such as a veterinary pharmacy cadre, animal health technicians, and well-trained retail staff, may serve well to ameliorate insufficiencies.

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