Short Communication

COMBATING ZOONOTIC DISEASES: EXPECTED SYNERGY BETWEEN MEDICAL AND VETERINARY PRACTITIONERS IN SOUTHWESTERN NIGERIA.

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Greetings

Appreciation to NMA Osun State Branch.

Background

The concept of epidemiological triad recognized the importance of the host and environmental factors in transmission of diseases caused by specific microorganisms. These agents may have to domicile itself in an ecological niche upon which the organism depends for survival. Such reservoirs could be in a living or non-living things. When the reservoir of infection is in animals, the term zoonosis is being used to describe such category of diseases. Of the nearly 1,500 pathogens known to infect humans, about 61% had their reservoirs in animals (Taylor, Latham and Woolhouse, 2001). Animals and man have co-existed right from the time of creation and their contact appear inevitable. Yet, possible collaboration seems to have eluded the carers of each group of mammals over time, and this had remained an important subject of discussions.

Coined from two Greek words “zoon "meaning animal and “nosos meaning sickness, zoonosis are infectious diseases of animals (usually vertebrates) that can naturally be transmitted to humans (WHO, 2016), either directly or indirectly; the reverse transmission is also true. So when humans infect animals, it is called reverse zoonosis or anthroponosis(Messenger, Barnes andGray, 2014). Most human diseases be itviruses, bacteria, fungi and parasites or their likes originated in animals(Marx, Apteral and Drucker, 2004).Increasing evidence from DNA and RNAsequencing, that measles, smallpox, influenza, HIV, and diphtheriacould have animal origin in their natural history of infection. Highly mobile animals such as bats, rats, and poultry among others may present a greater risk

of zoonotic transmission than other animals due to the ease with which they can move into areas of human habitation. The high magnitude of this problem called for urgent declaration at the 2006 Berlin conference urging urgent collaborative action and vigilance between governments' and the public [5, 6].A list of zoonoses could be found in Table 1.

Zoonosis, a problem?

There are over 150 zoonotic diseases known to man according to WHO/FAO in 1967(FAO/OIE, 2016).These are diseases of public health importance causing mortality and morbidity with potentials for both epidemics and epizoonoses. In developing countries, the poor surveillance system could explain the non - availability of ready-made data that could have showcased the magnitude of the problem of zoonotic infections. An emerging threat are those of zoonosis that arebeing newly recognized or newly evolving, or that has occurred previously but shows an increase in incidence or expansion in geographical, host or vector range. More than three-quarter of the new emerging and re-emerging zoonotics in 21st century are caused by pathogens originating from animals/products.

About 75% of the new diseases that have affected humans over the past 10 years have been caused by pathogens originating from an animal or from products of animal origin(Graham, Leibler and Price, 2008). These diseases mostly affect the poorest segment of the human population causing significant mortality and morbidity. A major factor contributing to the appearance of zoonotic pathogens in human populations is increased contact between humans and wildlife(Meerburg, Singleton and Kijlstra, 2009; Daszak, Cunningham and Hyatt, 2001).This can be caused either by encroachment of human activity, hunting, deforestation, as well as movement of wild animals into areas of human activity. An example of this is the outbreak of Nipah virus in peninsular Malaysia in 1999, when intensive pig farming began on the habitat of infected fruit bats.

Unidentified infection of the pigs amplified the force of infection, eventually transmitting the virus to farmers and causing 105 human deaths (Field et al., 2001). Similarly, in recent timesavian influenza, Lassa fever, Ebola virus disease have spilled over into human populations probably due to interactions between the carrier host and domestic animals. For effective control and prevention strategies to be formulated and implemented, care workers and other stakeholders need to scale up surveillance activities, promote interpectoral collaboration, ensure that international health regulations are strictly followed , ensure emergency preparedness and response, effective community education and evidence based research.

Baseline study on medical and veterinary science collaboration.

A descriptive qualitative cross sectional study to assess attitude of medical and veterinary care workers towards encouraging synergy in their practices in Nigeria was carried out in May 2016(Adebimpe, 2016).

Three Focus Group Discussions were carried out, each consisting of 8 participants. The first group consist of 8 medical doctors out of which 4 are in Government and 4 in private practice. The second group contains 8 veterinary medical practitioners, 4 working in private and 4 in Government services. The 3rd group of participants consist of 8 practitioners 4 of whom are medical doctors and 4 in veterinary medical practice. Data was collected using a self-designedbut validated and pretested focus group discussion guide. Responses were recorded on an audio tape, in the presence of a moderator and an assistant. Data collected was analysed using simple content analysis.

Results: All participants except 3 from the 1st group and one from the second group agreed to the need for the synergy. Reasons given by these consenting voices were that the clients are different and their care should be separated along this line. However all agreed to the feasibility of the synergy. About one quarter are aware of the 'One health' strategy and its contents, while majority said that there has been local efforts towards collaboration. About half of respondents could identify areas of collaboration such as joint research into vaccine and new drugs production, joint conferences, joint pertaking in health education against zoonoses outbreak and making counter referrals of clients being attended to in matters of zoonoses after proper risk assessment.

However majority of participants in group A felt no need for joint consultations or clinical rounds while about a third of group B felt the same way. All however believed that potential collaboration would strongly benefit the health system and reduce incidence of zoonotic diseases to a level that it would no longer be a problem of public health significance. The death of literatures on this topic could not allow for proper discussions of findings. It was concluded that collaboration is feasible, however attitudinal change by individual care providers and government leading synergy initiatives through correct policy decision could be a good starting point.

Table 1: List of Common Zoonoses
Source: WHO in 2014 (WHO, 2014).

Disease	**Pathogen(s)**	**Animals involved**	**Mode of transmission**
African sleeping sickness	Trypanosoma bruceirhodesiense	range of wild animals and domestic livestock	transmitted by the bite of the tsetse fly
Anthrax	Bacillus anthracis	commonly grazing herbivores such as cattle, sheep, goats, camels, horses, and pigs	by ingestion, inhalation or skin contact of spores
Brucellosis	Brucella spp.	cattle, goats	infected milk or meat
Cysticercosis&Taeniasis	Taeniasolium, Taeniasaginata	commonly - pigs and cattle	consuming water or food contaminated with the tapeworm eggs

			(cysticercosis) or raw or undercooked pork contaminated with the cysticerci (taeniasis)
Ebola virus disease	Ebolavirusspp.	chimpanzees, gorillas, fruit bats, monkeys, forest antelope and porcupines	through body fluids, organs
Influenza	Influenza A virus	horses, pigs, domestic/ wild birds, wild aquatic mammals such as seals, minks, whales, farmed carnivores	droplets transmitted through air
Leptospirosis	Leptospirainterrogans	rats, mice, dogs	direct or indirect contact with urine of infected animals
Rabies	Rabies virus	commonly - dogs, bats, monkeys, raccoons, foxes, skunks, cattle, wolves, coyotes, mongooses and cats	through saliva by biting, or through scratches from an infected animal
Tuberculosis	Mycobacterium bovis	infected cattle, deer, llamas, pigs, domestic cats, wild carnivores (foxes, coyotes) and omnivores (possums, mustelids and rodents)	milk, exhaled air, sputum, urine, faeces and pus from infected animals
Trichinosis	Trichinella spiralis, Trichinellabritovi	rodents, pigs, horses, bears, walruses	eating infected meat
Chagas disease	Trypanosoma cruzi	armadillos, Triatominae (kissing bug)	Bite
Toxocariasis	Toxocaracanis and Toxocara cati	dogs, cats	exposure to feces
Toxoplasmosis	Toxoplasma gondii	cats, livestock, poultry	exposure to cat feces, and undercooked meat

Rationale for the synergy

The magnitude of the problem of zoonoses illustrates why the efforts of medicine and veterinary medicineprofessionals should overlap in order to assist public health. Situation with zoonosis is not in any way getting better because factors that facilitate transmission persists most especially increased contacts with animals. Contacts are facilitated by

microbiological adaptation, mechanization and globalization of agriculture, expanding agro-economics including food production and trading of wildlife, non-regulation of meat and milk product markets most especially in urban centres and rapid urbanization and desert encroachment. Animals are being slaughtered at abattoirs without regular inspection for diseases while meat and meat products are sold openly in the markets. Also, travels fears and relationships with animals in cases where men now get married or have sex with animals as a choice. There are man-animal formal brothels now in some countries.

Research to establish a causal link between human and animal disease is scarce in Nigeria. Humans are mammals, belonging to the same class in biological classification. Though obvious differences exists between humans and other species of animals, they share a lot in common. Organs and their location are identical such as the heart, and the liver in both man and cow for example. In addition, both humans and animals are afflicted with similar diseases such as diabetes heart failure, stroke, and arthritis among others. Not only that symptoms of these disease are similar in both, the feeling of unwell when sick and illness behaviour are similar between animals and man. Because of anatomical similarities, many procedures during treatments such as surgery, pleural and pericardial fluid drainage are similar.

Just to mention a few, the influenza pandemic of 1918-1919 that killed millions of people worldwide was isolated from a variety of animals, including humans, pigs, horses, wild and domestic birds, and sea mammals. The avian influenza (HPAI H5N1) epidemic that began in Hong Kong in 1997 led to thousands of mortality and culling of millions of birds.

The growing threat of Zoonotic Tropical Disease threat showed that these diseases which usually affects poor vulnerable populations was characterised by poor knowledge, attitude and self-risk perception among the general population.This may have necessitated the May

2013 World Health Assembly draft resolution listing Neglected Zoonotic Diseases to list of NTDs.

Zoonoses constitutes occupational risks for exposure to farmers and pet shop employees who work with animals, yet animals and pet owners are treated differently by different physicians. Eventually little emphasis is laid on zoonotic transmission of diseases, the necessary referrals are not made across the 2 sets of physicians and comprehensive information elude both clients.

Poor risk-benefit ratios assessmentexist between the two sets of physicians when they operate parallel for the management of an ongoing animal exposure. Both sets of disease and practice requires disease reporting yet separate Disease Surveillance and Notification mechanisms exists in Nigeria despite the poor veterinary resources existing in Nigeria compared to the human medical.

Authors hold the opinion supporting a reported finding that human physicians are generally not comfortable discussing the role of animals in the transmission of zoonoses and would prefer that veterinarians play a role (Meerburg, Singleton and Kijlstra, 2009). On the other side, pet owners may not regard the veterinary physicians as being a source of information and therapy as regards his own health even in matters of zoonoses. Collaboration could prevent these unwarranted occurrences.

Laboratory animals such as mice are being used routinely basic clinical experimentsin institutions and even in clinical trials. With the growing frustration about the inefficiency of using the rodent model in laboratory research, because it often fails to translate to human subjects, the dire need to use higher animals (such as dogs, horses, sheep, and pigs) is being contemplated. In the same vein, a search for efficacious vaccines against many microbial infections, unending search for newer drugs arising from drug resistance is a cut crossing

issue among animals and man health system, and would require collaboration between veterinary and medical physicians through joint research and information sharing.

Mechanism of the synergy

In 2004, the Wildlife Conservation Society formulated the 'One World', 'One Health' approach as a veritable mechanism for the desired synergy between medical and veterinary sciences. 'One World' in terms of location, 'One Health' in terms of concepts and determinant of health and disease. This approach was well promoted in the nineteen century and now, though it suffered some acceptability setbacks in the early 20th century. Earlier proponents in 19th century include French *r*evolutionist Louis-René Villerme (1782–1863), Alexandre Parent-Duchâtelet(1790–1835) and a German physician, Rudolf Virchow (1821–1902). Under the 'One Health" concept, m multiple disciplines need to put in collaborative efforts towards strengthening the health system to provide curative, promotive, preventive and rehabilitative health care. For man and animal within the same environment as suggested in the table below

Table 2: Model for One Health Initiative in Nigeria

One Health, One World, One Medicine		
Clinical	Public Health	Research
Risk assessment	Control	New vaccines
Treatment	Prevention	New drugs
Joint rounds	Joint conferences	Drugs resistance

Referrals	Referrals	Biodiversity
Medical schools	Joint surveillance	Outbreak investigations
Medical associations	Common reporting	Joint publication
Changing attitude	Coordinating mechanism	Changing attitude

Several initiatives have responded to the 'One Health' concepts in recent times with far reaching gains to the health system. Collaborations is already existing at international level most especially in developed countries. Examples of such responses at international level include:

1. FAO, WHO, World Organization for Animal Health (OIE) developed a strategic framework, a tripartite agreement, to work more closely together to address the animal-human-ecosystem interface.
2. The World Veterinary Association (WVA) joined with the World Medical Association (WMA) and the Global Alliance for Rabies Control (GARC) during activities marking the 2014 World Rabies Day, called for more synergy towards controlling zoonotic infections.
3. Zoobiquity conference in New York City with veterinary physicians and The Gorilla Doctors initiative welcoming field veterinarians into their operations.
4. Veterinarians reportedly going on joint clinical rounds at human hospitals for patients with confirmed zoonoses- in developed countries,

In most developing countries, such collaboration are either weak or non-existent. It is thus important for stakeholders in animal and human care to start to work locally but think globally towards a strong collaboration that would benefit the health system.

Strengthening local response towards feasible synergies in developing countries:

Collaboration between veterinary and medical sciences and practitioners could be in the form of clinical, public health, and research.

Joint assessment of the risk and benefits of pet ownership and risk occupation and companies in cases of zoonosis most especially during outbreaks. Veterinary doctors can refer high risk pet owners with zoonoses to medical doctors after a careful risk assessment.Risk assessment of microbiological hazards to human health of animal origin including new, emerging and re-emerging zoonotic diseases and those diseases due to antimicrobial resistant bacteria.

In the field of Public health, joint surveillance for zoonotic infections, common reporting lines and systems are important in tracking and controlling zoonoses. Author strongly believe that the control of the 2014 Ebola virus disease outbreak would have been easier if veterinary practitioners had been fully carried along in public health matters.

Synergy could also be an opportunity for a collaboration between orthodox and traditional or alternative medical practices in terms of sharing information, outcome of research and prompt referral services. In a country like Nigeria, traditional veterinary practitioners exists, likewise human traditional care practitioners.

Establishment of a federal-level, centralized coordinating mechanism or agency to improve stakeholder's collaboration and cooperation.Collaborations between concerned line ministries, care institutions, and even the few NGOs working in the area of animal care. Veterinary practitioners could vaccinate children of nomadic populations

Developing policies, guidelines, operational research and strategies for the prevention and control of zoonotic and other foodborne diseases.Disseminating relevant information to experts in public health, veterinary science and other scientific disciplines, as well as to

consumer groups and the public.Countries without a National Veterinary Health policy should move towards formulation and adoption of such policy.Setting up a joint national working group for the purpose of Joint research and Joint public education.

Collaborations between the medical and veterinary medical councils and associations at country level in areas of advocacy and communication, joint networking, group participation: in prevention of occupational exposures could be achieved.

Medical and veterinary medical schools could collaborate in the area of joint publication, with emphasis on inventing new drugs, new vaccines and overcoming the problem of antimicrobial resistance, most especially in matters concerning zoonotic diseases. In addition, one set of practitioners could attend conferences organized by the other set as a way of setting such synergy in motion.

From the outcome of preliminary qualitative research reported earlier, it may take time in Nigeria before veterinarians could go on clinical rounds with medical doctors at hospitals for people with zoonoses, strengthening referral networking between the two health systems is possible, for example, veterinary doctors could refer the pet owner in a case of a pet having a zoonotic infection, and vice versa.

Possible Constraints to the synergy

Anedoctal report once described physicians as commonly dismissive towards non-medical doctors, including veterinarians.This does not portray good omen for the desired collaboration in developing countries.The number of veterinary medical schools are few in number compared to that of medical schools where doctors are being trained. In addition, zoonosis as a topic is usually being taught as 2 to 3 session course or lecture within the

academic curriculum of most medical schools, though emphasis are being laid on some individual diseases of medical importance.

In many of the most affected countries such as Nigeria, the veterinary public health infrastructureis poor coupled with poor medical-traditional collaboration. This results in a complex where many Nigerian societies do not have much affinity for animals, animal care, amidst unhygienic cultural practices against animals and disregard for veterinary doctors as a practitioner. This may not be unconnected with the observation that human physicians feels more recognized as their teaching hospitals and private health facilities are conspicuously found everywhere unlike that of the veterinary sciences and practitioners. Yet the two sets of practitioners passed through similar training in terms of number of years spent in training, the courses they offered while in schools, some of the experience they acquired, and the subspecialties they are exposed to including research. These constraints are man-made, and a change of attitude to these barriers by individual practitioners, government and institution among other stakeholders would go a long way in bringing about this strategy as well as making it work towards improving the health system.

Conclusion

The synergy between medical and veterinary medical practice, science and institutions would benefit humanity, whichincludes both man and animals, and the single integrated health system which both of them belong to.The Osun State branch of the Nigerian Medical Association held a conference in June 2016, and saw the importance of collaboration between veterinary and medical health practitioners. This synergy was described as feasible and veritable if Governments at the centre can take the lead while carrying others along. The need for attitudinal change among clinicians either as individuals or as a group is quite paramount towards the adoption of the ‘One Health’ initiative.

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