



## ONE MEDICINE APPROACH TO EMERGING ZONOTIC DISEASES: A REVIEW

BABALABI, O. O.

Department of Veterinary Public Health and Preventive Medicine, University of Ibadan, Nigeria, U. I. P.O Box 4150, Ibadan, NIGERIA.

Tel. +234 (0) 805 530 1991; E-mail: oo.babalobi@mail.ui.edu.ng ; tayohabalobi@yahoo.com

### SUMMARY

Reportedly first espoused by a Physician Sir William Osler, founder of the medical teaching concept at Johns Hopkins University, in the 1800s who wrote that "Veterinary medicine and human medicine complement each other and should be considered as one medicine", the term "One Medicine," which seeks to promote a unified medical and veterinary medical strategy against zoonotic diseases, was re-echoed in the 1960s by Dr. Calvin W. Schwabe, the late Veterinary epidemiologist and parasitologist at the University of California, Davis. In the face of recent surge in emerging zoonotic disease outbreaks including the Nipah virus, Severe Acute Respiratory Syndrome (SARS) and Avian Influenza (A) H5N1, that are spreading across Asia, Africa, and Europe; and the attendant danger to human health, the concept is now being re-echoed and promoted worldwide. Various referred to as "One World, One Medicine", "One World, One Health" or simply "One Health" concept, the "One Medicine" approach, which combines the resources of public health, veterinary medicine (more specifically zoonoses), and environmental epidemiology (epizootiology), has been recognized as the major approach to meeting the challenge of emerging zoonotic diseases- diseases transmitted to humans from animals. This paper reviews the "One Medicine" concept in the face of the urgent necessity to adequately and effectively tackle the scourge of emerging infectious diseases of humans, about 65% of which are zoonotic. It supports the call for collaborative research between veterinarians and physicians and highlights the mission and vision of the "One Health" movement, which is gaining membership worldwide, including Nigeria.

Key words: One medicine, Emerging zoonotic diseases, Review.

### INTRODUCTION

Various referred to as the "One World, One Health, One Medicine", "One World, One Medicine", "One World, One Health" or simply "One Health" concept, the "One Medicine" is an initiative that calls for all health sciences professionals, the health sciences colleges and schools including veterinary schools and human medical colleges health sciences associations, government agencies and related industries to coordinate efforts on a global basis to combat disease and promote health. (1, 2). "Animal health is truly at a crossroads," Dr. Mahr, the President of the American Veterinary Medical Association AVMA said recently. "Its convergence with human and ecosystem health dictates that the 'One World, One Health, One Medicine' concept must be

embraced. We need our colleagues in human medicine, public health, and the environmental health sciences.

In his address to AVMA delegates, Dr. Mahr explained that the "One Medicine" concept is not new. Physician Sir William Osler, founder of the medical teaching hospital concept at Johns Hopkins University, in the 1800s wrote that "Veterinary Medicine and Human Medicine complement each other and should be considered as one medicine (7). Already being actively promoted by some individuals (including the author) and professional organizations in the U.S., Australia, Bangladesh, Belgium, Bosnia and Herzegovina, Brazil, Canada, China, Costa Rica, Croatia, France, Germany, Israel, The



Netherlands, Nigeria, Puerto Rico, South Africa, Thailand, United Kingdom, Uruguay, and Switzerland (10), this paper seeks to further promote the concept in Nigeria, in view of the recent outbreak of the zoonotic Avian Influenza in Nigeria (17).

### **THE ENVIRONMENT, ANIMAL HEALTH AND HUMAN HEALTH**

The concept that animal health and the environment influence human health has been around since ancient times. In the 18th century, Pope Clement XI instructed a physician, Dr. Giovanni Maria Lancisi, to devise disease control measures to combat Rinderpest, a highly lethal viral disease of cattle that was devastating the human food supply. Lancisi recommended that ill and suspect animals be destroyed. In order to put Lancisi's principles into effect, the first veterinary medical school in the world was established in Lyon, France. (16). In the late 19th and early 20th centuries, leaders in medicine such as Drs. Rudolf Virchow and William Osler embraced the concept that human health and animal health were inextricably linked (11). As the 20th century progressed, collaboration between medicine and veterinary medicine waned. In the 21st century, the emergence of deadly zoonotic diseases, such as the Nipah virus, Severe Acute Respiratory Syndrome (SARS) and West Nile virus, presented the urgent need that these professions renew and increase collaborative efforts (10)

### **EMERGING ZOOONOTIC DISEASES**

The WHO/FAO/OIE joint consultation on emerging zoonotic diseases held in Geneva, 3-5 May 2004, defined Emerging Zoonoses as "a zoonosis that is newly recognized or newly evolved, or that has occurred previously but shows an increase in incidence or expansion in geographical, host or vector range (6).

In the 1960s, Dr. Calvin W. Schwabe, the late veterinary epidemiologist and parasitologist at the University of California, Davis, coined the term "One Medicine," which promoted a unified medical and veterinary medical approach against zoonotic diseases. This strategy is important because there have been recent emerging zoonotic disease outbreaks, including the Nipah virus,

Ebola Hemorrhagic Fever, Severe Acute Respiratory Syndrome (SARS) and avian influenza (A) H5N1, that are spreading across Asia, Africa, and Europe. Reasons for the emergence of these zoonotic diseases include: intensive agricultural practices, global trade in exotic animals, consumption of "bush meat," human population pressures, habitat degradation, pollution, invasive alien species, and global climate change (4, 9).

The rise of emerging and resurging infectious diseases threatens not only humans (and their food supplies and economies), but also the fauna and flora comprising the critically needed biodiversity that supports the living infrastructures of our world. (9). Only by breaking down the barriers among agencies, individuals, specialties and sectors can we unleash the innovation and expertise needed to meet the many serious challenges to the health of people, domestic animals, and wildlife and to the integrity of ecosystems. We are in an era of "One World, One Health" and we must devise adaptive, forward-looking and multidisciplinary solutions to the challenges that undoubtedly lay ahead (4)

### **THE ONE MEDICINE APPROACH**

The "One Health" concept arose from the realization that human health and animal health are inextricably linked and that a holistic approach is needed to understand, to protect, and to promote the health of all species. Whether it is emerging infections diseases, antibiotic resistance, globalization, natural disasters, or climate change, human and veterinary medical communities must work together to successfully combat the serious health threats of the 21st century. "One Health" seeks to improve communication and encourage collaboration between veterinarians, physicians, environmental scientists and public health professionals to find multidisciplinary solutions to these shared challenges (9).



## Mission and Vision of the 'One Health' movement

### Vision Statement:

"One Health" (also called "One Medicine") is dedicated to improving the lives of all species human and animal through the integration of medicine and veterinary medicine.

### Mission Statement:

Recognizing that human and animal health and mental health (via the human-animal bond phenomenon) are inextricably linked, One Health seeks to promote, improve, and defend the health and well-being of all species by enhancing cooperation and collaboration between physicians and veterinarians, and by promoting strengths in leadership and management to achieve these goals.

One Health shall be achieved through:

1. Joint educational efforts between human medical, veterinary medical schools, and schools of public health;
2. Joint communication efforts in journals, at conferences, and via allied health networks;
3. Joint efforts in clinical care through the assessment, treatment and prevention of cross-species disease transmission;
4. Joint cross-species disease surveillance and control efforts in public health;
5. Joint efforts in better understanding of cross-species disease transmission through comparative medicine research;
6. Joint efforts in the development and evaluation of new diagnostic methods, medicines and vaccines for the prevention and control of diseases across species and;
7. Joint efforts to inform and educate political leaders and the public sector through accurate media publications.

As at March 08, 2008, the following Organizations have enlisted as "One Health/One Medicine" supporters- the American Veterinary Medical Association, American Medical Association, Society for Tropical Veterinary Medicine, Croatian Society for Infectious Diseases, American Society

of Tropical Medicine and Hygiene, World Association of Veterinary Laboratory Diagnosticians, American Association of Veterinary Laboratory Diagnosticians, Association of American Veterinary Medical Colleges, Association of Schools of Public Health and American Phytopathological Society; as well as 411 individuals in the U.S., Australia, Bangladesh, Belgium, Bosnia and Herzegovina, Brazil, Canada, China, Costa Rica, Croatia, France, Germany, Israel, The Netherlands, Nigeria, Puerto Rico, South Africa, Thailand, United Kingdom, Uruguay, and Switzerland (10).

### COLLABORATIVE RESEARCH

For many years, scientists have recognized the overrepresentation of zoonoses among emerging and re-emerging human diseases. Many factors affect the likelihood that a pathogen will emerge (the broad definition of an emerging infectious pathogen used by the US Centers for Disease Control and Prevention is one 'whose incidence in humans has increased within the past two decades or threatens to increase in the near future' (12). It was suggested over 10 years ago that emerging pathogens were very frequently zoonotic (15). More recent work has confirmed that as many as 60% of the more than 1400 recognized human pathogens jump between species (19). Researchers from the Zoological Society of London (ZSL), and the US-based University of Georgia and Columbia University's Earth Institute analyzed 335 Emerging Infectious Diseases EID from 1940 to 2004. The researchers found that 60% of EID events were caused by "non-human animal" sources. They add that 71% of these outbreaks were "caused by pathogens with a wildlife source" (8). By analyzing 335 incidents of previous disease emergence beginning in 1940, the study has determined that zoonoses diseases that originate in animals are the current and most important threat in causing new diseases to emerge. And most of these, including SARS and the Ebola virus, originated in wildlife. Antibiotic drug resistance has been cited as another culprit, leading to diseases such as extremely drug-resistant tuberculosis (XDR TB).



Despite this knowledge, and many dramatic recent examples such as Ebola virus, Lyme disease and SARS, the worlds of veterinary and human health, including public health, remain quite separate. Schools and other training institutions, healthcare facilities, NGOs, public health agencies at all administrative levels, professional and scientific organizations, and journals nearly all remain segregated by their interests in either human or veterinary health. One of the rare examples that deals with both is ProMED-mail (the Program for Monitoring Emerging Diseases, <http://www.promedmail.org>), an internet-based service devoted to the early detection of infectious disease outbreaks around the world, which has explicitly included animal diseases as part of its purview. ProMED reports on both plants and livestock animal diseases, human diseases, zoonotic diseases and diseases that affect sources of human nutrition (3, 5 and 14). Cooperation between animal and human health sectors is key to the detection, surveillance, and control of emerging disease (13). Collaborative research efforts between schools of medicine and veterinary medicine could be done under the auspices of comparative medicine. Comparative medicine, a field of study that exemplifies the "One Medicine" concept, involves the study of host-pathologic agent interactions in infectious diseases and their pathogenesis, which is critical to our understanding of zoonotic agents (9).

In 1893, a physician and veterinarian research team, Drs. Theobald Smith and F. L. Kilbourne, respectively, discovered that the cause of cattle fever, *Babesia bigemina*, was transmitted by an arthropod vector (ticks). Their work helped set the stage for the discovery by Walter Reed and his

colleagues of the transmission of yellow fever (18). Drs. Rolf Zinkernagel and Peter C. Doherty, a physician and veterinarian respectively, discovered how the immune system distinguishes normal cells from virus-infected cells. They received the 1996 Nobel Prize in physiology or medicine (20). Together, medicine and veterinary medicine can generate new scientific insights across species, which is exactly what is needed to meet today's challenges. Schools of medicine, veterinary medicine, and public health should embrace the "One Health" concept and prepare their students to meet the challenges of the future (11), as is already being promoted in the USA.

## CONCLUSION

In Nigeria, which is already affected by the rampaging zoonotic diseases threat typified by the Avian Influenza worldwide outbreak, veterinary authorities are poised to respond to the challenge of recurrent and emerging zoonoses. The National Council on Agriculture recently approved the resuscitation of the National Zoonoses Center NZC, which had been approved at the 23<sup>rd</sup> National Livestock Development Committee NLDC meeting held in Oguta Imo State between 12th and 13th August 1982 and for which the University of Ibadan constructed a one storey building. The One Medicine collaborative approach with relevant health disciplines will be a basic strategy. In addition, a Medical/Veterinary Non-Governmental Organization, - Community Animal and Human Health Development Initiative CAHDI-NIGERIA, (email: [cadhi\\_nigeria@yahoo.com](mailto:cadhi_nigeria@yahoo.com)), chaired by renowned Nigerian World Health Organization Virologist Professor Oyewale Tomori (Vice-Chancellor Redeemer's University), has been put up. One of its three missions is to "promote the adoption of the collaborative 'One World, One Medicine Approach' to the management of emerging zoonotic and public health diseases in Nigeria and beyond". Interested physicians, veterinarians, environmental health ecologists,



public health practitioners and other allied health scientists are invited to join either or both the Nigerian and the International "One Medicine, One Health" Initiative for the benefit of all-the environment, animals and man. Any physician or veterinarian may be added to the International "One Medicine, One Health" Movement by contacting [bkapdvm@verizon.net](mailto:bkapdvm@verizon.net) and including curriculum vitae or brief biography, title, degree(s), affiliation, and address.

IBADAN UNIVERSITY LIBRARY



## REFERENCES

1. AVMA Press Release (2007). AVMA Celebrates Unity among Health Professions on World Veterinary Day March 30 2007. [http://www.avma.org/press/releases/070330\\_worldveterinaryday.asp](http://www.avma.org/press/releases/070330_worldveterinaryday.asp)
2. Babalobi O. O. (2008). Emerging Zoonoses: The Public Health Role of Veterinarians. *Nigeria Veterinary Journal*, 29: No. 3 (In Press).
3. Babalobi O. O. and Cowen P. (2005): "ProMED – mail: An electronic mail disease-reporting forum". *Nigerian Veterinary Journal*. 25 (2): 63-67
4. Cook R. A., Karesh W. B., and Osofsky S. A. (2005) About "One World, One Health" <http://www.oneworldonehealth.org/index.html>. In <[promed-ahead@promedmail.org](mailto:promed-ahead@promedmail.org)> PRO/AH> Announcements 2005 (03): One World, One Health symposium <<http://www.oneworldonehealth.org>> Tuesday, April 12, 2005 3:30 AM
5. Cowen P, Garland T, Hugh-Jones M.E., Shimshony A., Handysides S., Kaye D., Madoff L. C., Pollack M.P., Woodall J.(2006). Evaluation of ProMED-mail as an electronic early warning system for emerging animal diseases: 1996 to 2004. *Journal of the American Veterinary Medical Association*, 229: 1090-1099.
6. <http://www.who.int/entity/zoonoses/en>. Accessed 26<sup>th</sup> February 2008.
7. JAVMA NEWS (2006). Mahr calls for 'One Health' initiative. September 1, 2006 <http://www.avma.org/onlnews/default.asp>
8. Jones E. Kate., Patel N. G., Levy M. A., Storeygard A., Balk Deborah, Gittleman J. L. & Daszak P. (2008) Global trends in emerging infectious diseases, *Nature*, 451: 990-993. doi:10.1038/nature06536;
9. Kahn L.H., Kaplan B., Monath T. P and Steele J. H. (2008). Teaching "One Medicine, One Health". *The American Journal of Medicine*, 121: 169–170 doi:10.1016/j.amjmed.2007.09.023
10. Kahn L.H., Kaplan B., Monath T. P. (2008) 1. One Health Newsletter...ICEID 2008 and more Publications. Received March 8 2008
11. Kahn LH, Kaplan B, Steele JH. 2007; Confronting zoonoses through closer collaboration between medicine and veterinary medicine (as 'one medicine'). *Veterinaria Italiana* 43: 5-19.
12. Lederberg J., Shope R.E., Oaks, J.R., SE (eds.); (1992). Committee on Emerging Microbial Threats to Health, Institute of Medicine. Emerging Infections: Microbial Threats to Health in the United States. Washington D.C.: Institute of Medicine of the National Academies
13. Madoff L. (2006) Cooperation between animal and human health sectors is key to the detection, surveillance, and control of emerging disease: IMED 2007 meeting in Vienna, February 2007 *Eurosurveillance*. 11, Issue 12: 21.dec.06. <http://www.eurosurveillance.org/ew/2006/061221.asp>
14. Madoff L. C., Woodall J. P. (2005).The internet and the global monitoring of emerging diseases: lessons from the first 10 years of ProMED-mail. *Archives of Medical Research*, 36: 724-730.
15. Morse S. S. (1995). Factors in the emergence of infectious diseases. 1: *Emerging Infectious Diseases*,; 1:7-15. (<http://www.cdc.gov/ncidod/eid/vol1no1/morse.htm>)
16. Palmarini M. (2007). A Veterinary twist on pathogen biology. *PLoS Pathogens*, 3(2):e12. Available at: <http://dx.doi.org/10.1371/journal.ppat.0030012>.
17. ProMED-AHEAD (2008) PRO/AH/EDR> Avian influenza (33): Nigeria 11-FEB-08
18. Wilkinson L. (1992). Animals and disease. An Introduction to the History of Comparative Medicine. Cambridge University Press; Cambridge, UK:
19. Woolhouse M.E., Gowtage-Sequeria S. (2005). Host range and emerging and reemerging pathogens. *Emerging Infectious Diseases*, Available at: (<http://www.cdc.gov/ncidod/EID/vol11no12/05-0997.htm>)
20. Zinkernagel R.M., Doherty P.C. (1974) Immunological surveillance against altered self components by sensitized T lymphocytes in lymphocytic choriomeningitis. *Nature*. 251: 547-548.