“One health”: The potential of closer cooperation between human and animal health in Africa

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Abstract

Emerging zoonoses affect livestock and humans, which calls for closer cooperation between animal and public health. Conceptually ideal, such cooperation is difficult to achieve and the causative agents of outbreaks are often confused. A lack of awareness may very likely be due to limited capacity and resources for available for diagnosis and surveillance of zoonoses, but also owing to the clinical perspective that focuses on the patients and much less on their surroundings. Consequently governments often neglect zoonotic diseases, reflecting the separation between human and veterinary medicine. The present paper explores the concept of closer cooperation initially coined as “one medicine” and presents examples of its application and future potential emphasising the African context. Zoonoses are certainly the most prominent example of a compulsory interaction between human and animal health. The interaction of humans and animals in Africa is inextricably linked and hence needs a thorough rethinking of institutions, legislation, communication and funding of both sectors. There is a large untapped potential for new institutional and operational models to provide joint health services to remote populations; this is particularly relevant with regard to ongoing health sector reforms and the human resource crisis. Further, there is a potential for innovative, cost-effective approaches to the control of zoonoses. Pan-African networks would be the best justification for setting up a global fund for zoonoses, similar to and/or linked to the Global Fund to fight HIV/AIDS, Tuberculosis and Malaria. . [*Ethiop.J.Health Dev.* 2008;22(Special Issue):105-108]

Introduction

Human and veterinary medicine still appear as well separated sectors and entities in most countries. Veterinarians are generally not allowed by law to treat humans and physicians only rarely treat animals. However, there are many overlapping issues, mostly in the realms of public health and in the control of diseases transmissible between animals and humans (zoonoses). In such cases cooperation between both sectors becomes crucial, e.g. ranging from informing each other on the emergence of new diseases to long term perspectives on integrated control.

The cooperation between two well structured entities is not very easily achieved as by the examplehuman Rift Valley fever outbreaks in Mauritania that where mistakenly identified as Yellow fever. The correct diagnosis only occurred after contacts with the livestock services, who had observed abortions in livestock due to Rift Valley fever (1). In sub-Saharan Africa, clinicians attribute most fever to malaria, even though an estimated 50-80% of fevers result from other causes (2). In a case study on fever related diseases in Mali, physicians paid attention to potential zoonotic diseases only after veterinarians identified risk factors for transmission(3). A lack of awareness may very likely be due to limited capacity and resources for diagnosis and surveillance of zoonoses, and - equally importantly - the focus of the clinician on the patients and not on their surroundings. Consequently, governments often neglect zoonotic diseases. Here we will explore the concepts of closer cooperation between human and animal health initially coined as “one medicine”, and present examples of its application and future potential emphasising the African context.

From “one medicine” to “one health” a brief historical background

Ancient healers were priests and cared for both humans and animals (4). They gained anatomical and pathological skills from slaughtering sacrificial animals and deciding on their purity for sacrifice (Leviticus 1,3). Human medicine was integrated into the medieval universities, whereas veterinary medicine remained largely in the hands of equerries until the 18th century (5). Claude Bourgelat, the founder of the first veterinary school in Lyon (1762) was heavily criticised when he recommended human clinical training for the veterinary curriculum (6). However, in the 19th century, the advent of cellular pathology encouraged the pioneers of the microbiological revolution to (e.g. Rudolf Virchow cited in (7)) develop a strong interest in linking human and veterinary medicine as a form of comparative medicine based on discovering similar disease processes in humans and animals. In the 20th century, both sciences specialised to such an extent that their association was hardly visible and less often practiced. It was Calvin Schwabes’ thorough rethinking of the concept of “one medicine” in 1976, that fully recognized the close systemic interaction of humans and animals for nutrition, livelihood and health (4). Today, the earliest forms of healing of humans and animals are still widely practised in traditional pastoral societies. It is thus not surprising that the “one medicine” idea is actually of African origin. It was conceived and conceptually consolidated during Calvin Schwabe’s work with Dinka Pastoralists(8) . It basically means that there is no difference of paradigm between human and veterinary medicine. Both sciences share a common body of knowledge in anatomy, physiology, pathology, and on the origins of diseases in all species (4). Later, international organizations such as the WHO and the Food and Agriculture Organization (FAO) institutionalized it partly

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as Veterinary Public Health (VPH). More recently "ecosystem health" has emerged, seeing sustainable development expressed as the mutualism of the health of humans, animals and the ecosystems in which they co-exist (9) and extending the concept of "one health" to that of the whole ecosystem including wildlife (10-12). Conservationists have recognized, what is known as the "Manhattan principles"(13), that the health and sustainable maintenance of wildlife in natural reserves is mutually interdependent with the health of communities and the livestock surrounding them (14). Finally, many of the causing agents with bioterrorist potential are zoonoses and hence require mutual animal and public health vigilance for rapid detection (15). The "one medicine" hence evolves towards a "one health" concept which reflects the contemporary thinking on health and ecosystems and their relevance for global health development (16).

What does "one health" really mean

While it is accepted that human and animal health should be much more closely interlinked, the operational strategies still require a substantial re-thinking. To fully exploit synergistic benefits between human and animal health, closer cooperation is required at all levels ranging from international organizations, governments, research and technology, health systems and education.

Governments and international organizations

WHO, FAO and OIE (World Organization for Animal Health) are the focus of discussion. While they cooperate on zoonotic diseases with transboundary importance such as Avian Influenza (AI), their respective roles and responsibilities are still not fully clarified or based on pragmatic considerations of the most effective approaches for surveillance and control. Achieving this closer cooperation would provide a strong signal to national governments and all institutions concerned. For example, following the recent outbreaks of AI and RVF in East Africa, many governments, including Ethiopia, have created *ad hoc* task forces between the concerned ministries of agriculture, livestock production and health. Such cooperation between sectors should be formalized and its mode of operation and responsibilities clarified to make it effective not only in response to crises but even much more as a tool for risk analysis, prevention and coordinated, integrated control (16). Many other zoonoses like Q-fever(17), Anthrax and rabies (18) would benefit from such cooperations and interlinkages, which should finally also strengthen links within and between African countries (19).

Research, technology and health systems

In many countries zoonotic diseases are not considered as important simply because the diagnostic capacity to detect them hardly exists. For example, bovine tuberculosis in Chad was not considered important until the first tuberculosis laboratory in the country was able to demonstrate it (20). Joint human and animal surveillance and research on zoonoses accelerates time to detection and the identification of reservoirs (15). Under resource constraints diagnostic facilities could easily be shared (21). Governments often consider the control of zoonoses as too expensive. However, combined societal economic assessments show that their control may actually be highly cost-effective if intervention costs are shared between sectors (22,23). Observations of higher vaccination coverage in cattle than in children in nomadic pastoralists in Chad have led to joint livestock and human vaccination campaigns by cooperation between the expanded programme of immunisation (EPI) and the veterinary services in Chad (24). Veterinarians are often the only health person in remote rural areas and would be competent – after some training - to sell a limited set of essential human drugs under conditions where pharmacists and pharmacies are lacking (25). Such cross-sector arrangements are certainly more effective and also more ethical than leaving the rural population at the mercy of illegal drug sellers and drug peddlers. Moreover, novel models of integrated social services exploiting links between education, public health, animal health, and the environment (26) could make veterinary services profitable in areas where they can hardly make a living under the current privatised schemes, and would therefore significantly contribute to improved rural health service coverage. Veterinarians could also be instrumental in organizing joint animal–human vaccination services (25). Accepting these approaches implies rethinking institutional and operational models of joint health services provision, which is of particular relevance in view of the current human resource crisis in the health sector (27). Community based surveillance of animal diseases as proposed by OIE at the N'Djamena conference in February 2006 (28) could be extended to public health to accelerate detection of new outbreaks. Current academic and technical curricula should be revised to provide medical doctors with more knowledge of the ecology of zoonoses, and veterinarians with better knowledge of public health and health systems. In conclusion, the major challenge in achieving these inter-linkages lies in effectively combining public health, animal health and ecosystem health under a common umbrella for comprehensive public health action.

Vision for the future

Zoonoses and their control are certainly the most prominent example of the need to combine human and animal health. The interaction of humans and animals in Africa is much closer and directly visible e.g. by the breakdown of livestock production due to the HIV epidemic (29) or the livelihood consequences of animal diseases (30). Moreover, we should not forget the past disaster of Rinderpest imported to Ethiopia during colonial rule (4). These inextricable links show the need for a thorough rethinking of institutions, legislations, communication and funding of both sectors. There is a

large untapped potential for new institutional and operational models to provide health services jointly to remote and/or neglected populations, which is highly relevant to ongoing health sector reform programs and the human resource crisis. Limited laboratory capacity and infrastructure can easily be shared between sectors, and needs no further justification as the pathogens dealt with are the same for humans and animals. The populations concerned in rural and urban areas have specific knowledge about diseases in their surrounding which can be better used for community based surveillance, but also to define priorities for action and the translation of evidence into policy, comparable to the East African REACH consortium with their activities to link research outcomes with political and strategic decision makers (31). These examples certainly enhance the urgent need to improve communication between sectors and will also allow much better use to be made of non-Western knowledge from "integrated" pastoral societies, with their own pragmatic solutions for problem-solving (4).

In conclusion, there is potential for innovative, cost-effective approaches to national zoonoses control (23), this cooperation between the human and animal health sectors should be extended internationally, as exemplified by the concerted approach to rabies control in South America (19). Pan-African networks for zoonoses control would be the best justification for a global fund for zoonoses similar to and/or linked to the Global Fund to fight HIV/AIDS, Tuberculosis and Malaria.

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Reference

1. Digoutte JP. Present status of an arbovirus infection: yellow fever, its natural history of hemorrhagic fever, Rift Valley fever. *Bull. Soc. Pathol. Exot.* 1999;92(5):343-8.
2. Amexo M, Tolhurst R, Barnish G, Bates I. Malaria misdiagnosis: effects on the poor and vulnerable. *Lancet* 2004;364(9448):1896-8.
3. Steinmann P., Bonfoh B, Farah Z, Peter O, Schelling E., Traore M et al. Seroprevalence of Q-fever in febrile individuals in Mali. Tropical medicine & international health : *Trop. Med. and Intl. Health* 2005;10:612-617.
4. Schwabe CW. Veterinary medicine and human health. Baltimore (USA): Williams & Wilkins; 1984.
5. Rüegg W. A history of the University in Europe. Cambridge: Cambridge University Press; 2004.
6. Driesch A., Peters J. Geschichte der Tiermedizin. Stuttgart: Schattauer; 2003.
7. Saunders L.Z. Virchow's contributions to veterinary medicine: celebrated then, forgotten now. *Veterinary Pathology* 2000;37(3):199-207.
8. Majok AA, Schwabe CW. Development among Africas's migratory pastoralists. Westport: Greenwood Publishing Group; 1996.
9. www.euro.who.int/globalchange/Topics/20050316_4. 2005.
10. Rapport D, Böhm G., Buckinghamn D., Cairns J., Costanza, R. et al. Ecosystem health: the concept, the ISEH, and the important tasks ahead. *Ecosystem health* 1999.
11. Lebel J. Health: an ecosytem approach. Ottawa: 2002.
12. Rapport D, Costanza R., Epstein P.R., Gaudet C., Levins R., (eds.). *Ecosystem Health*. Oxford, UK: 1998.
13. www.oneworldonehealth.org/. 2005.
14. Osofsky SA, Cleaveland S, Karesh W.B., Kock M.D., Nyhus P.J., Starr L. et al. Conservation and Development Interventions at the Wildlife/Livestock Interface: Implications for Wildlife, Livestock and Human Health. IUCNed. Gland, Switzerland and Cambridge, UK: 2005.
15. Kahn LH. Confronting zoonoses, linking human and veterinary medicine. *Emerg. Infect. Dis.* 2006;12(4):556-61.
16. Zinsstag J, Schelling E., Wyss K, Bechir M. Potential of cooperation between human and animal health to strengthen health systems. *Lancet* 2005;366(9503):2142-5.
17. Schelling E, Diguimbaye C, Daoud S, Nicolet J, Boerlin P, Tanner M et al. Brucellosis and Q-fever seroprevalences of nomadic pastoralists and their livestock in Chad. *Prev. Vet. Med.* 2003;61(4):279-93.
18. Cleaveland S, Fevre EM, Kaare M, Coleman PG. Estimating human rabies mortality in the United Republic of Tanzania from dog bite injuries. *Bull. World Health Organ* 2002;80(4):304-10.
19. Hampson K, Dushoff J, Bingham J, Bruckner G, Ali YH, Dobson A. Synchronous cycles of domestic dog rabies in sub-Saharan Africa and the impact of control efforts. *Proc. Natl. Acad. Sci. USA* 2007;104(18):7717-22.
20. Diguimbaye-Djaibe C, Hilty M, Ngandolo R, Mahamat HH, Pfyffer GE, Baggi F et al. *Mycobacterium bovis* isolates from tuberculous lesions in Chadian zebu carcasses. *Emerg. Infect. Dis.* 2006;12(5):769-71.
21. Diguimbaye C, Hilty M, Ngandolo R, Mahamat HH, Pfyffer GE, Baggi F et al. Molecular characterization and drug resistance testing of *Mycobacterium tuberculosis* isolates from *Chad. J. Clin. Microbiol.* 2006;44(4):1575-7.
22. Roth F, Zinsstag J, Orkhon D, Chimed-Ochir G, Hutton G, Cosivi O et al. Human health benefits from livestock vaccination for brucellosis: case study. *Bull. World Health Organ* 2003;81(12):867-76.

23. Zinsstag J, Schelling E, Roth F, Bonfoh B., de Savigny D., Tanner M. Human Benefits of Animal Interventions for Zoonosis Control. *Emerging Infect.Dis.* 2007;13(4):527-31.
24. Schelling E, Bechir M, Ahmed MA, Wyss K, Randolph TF, Zinsstag J. Human and animal vaccination delivery to remote nomadic families, Chad. *Emerging Infect.Dis*. 2007;13(3):373-9.
25. Schelling E, Wyss K, Béchir M, Daugla D, Zinsstag J. Synergy between public health and veterinary services to deliver human and animal health interventions in rural low income settings. *BMJ* 2005.
26. Wiese M. Health-vulnerability in a complex crisis situation. [dissertation]. Saarbrücken: Verlag für Entwicklungspolitik; 2004.
27. Wyss K, Moto D, Callewaert B. Constraints to scaling-up health related interventions: the case of Chad, Central Africa. *Journal of International Development* 2003;15:87-100.
28. Anonymous. Animal Health Policies, Evaluation of veterinary services and role of livestock breeders in the surveillance of animal diseases. Paris: OIE; 2007.
29. Goe M.R., Mack S. Linkages between HIV/AIDS and the livestock sector in East and Southern Africa. Technical Workshop, Addis Ababa, Ethiopia, 8-10 March 2005ed. Rome: FAO; 2005.
30. Perry B, Randolph TF, McDermott J. Investing in Animal Health Research to Alleviate Poverty. 2002.
31. www.who.int/alliance-hpsr/evidenceinformed/reach/en/index.html. 2007