One Health in Epidemiology

Regional Training in **Animal and Human Health Epidemiology in South Asia**

India One Health Symposium

26th November, 2013, New Delhi

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Preface

For four years, a team of epidemiologists from Massey University and its international partners worked with national institutions across South Asia to implement the Regional Training Programme in Animal and Human Health Epidemiology. Funded by Avian and Human Influenza Trust Fund and administered through World Bank, it was implemented in beneficiary countries of Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka by Massey University.

The programme assisted participating countries in operationalising the One Health concept. Intersectoral collaboration which is the key element of this approach aimed to control infectious diseases that can be transmitted between animals and humans. Achieving effective, cross-sectoral collaborations rely upon existence of an underlying and functional network of trusted relationships. The programme helped establish One Health networks within and between participating countries in numerous ways, including provision of Master's level training in epidemiology and biosecurity through Masters of Veterinary Medicine and Masters of Public Health in Biosecurity, supporting implementation of cross-sectoral Collaborative Investigation Projects and creating Hubnet — a web-based communication and collaboration tool.

Over 200 staff and consultants were engaged in implementing the programme and Massey is proud of the outcomes it achieved. Eleven CIP projects were completed across the region on important zoonoses (anthrax, rabies, CCHF, brucellosis and leptospirosis) in addition to a large number of One Health related activities that occurred outside the programme.

The India One Health Symposium is one of seven Symposiums that were held in each of the participating countries over the last few months. These had shared common objectives, including highlighting ongoing One Health activities in each country, solidifying personal and organisational relationships that are blossoming across health sectors in the region, and identifying clear actions that can be taken at the Regional One Health Consultation to further embed One Health collaborative efforts in public and private sectors.

In particular, I would like to draw attention to the Recommendations brought forward from this Symposium. They related to the need for effective support of an organisational platform such as One Health Hubs and Hubnet to support collaborative efforts that have been developed. Also, for people to remain engaged in the larger South Asia One Health Network that has been established.

I would like to recognise the joint efforts of the local steering group comprising of Drs P. Ravindran, R. Bambal and H.R. Khanna and the capable team at PHFI led by Dr. Manish Kakkar, in planning and organising the Symposium. I hope the enthusiasm for One Health shown by presenters and participants carries on into the future, perhaps even finding value in organising similar meetings on an annual basis.

Associate Professor Eric Neumann,
One Health Programme Director, Institute of Veterinary, Animal and Biomedical Sciences, Massey University

Executive Summary

To develop a robust and sustainable One Health agenda for India and South Asia region, the India One Health Symposium was one of several meetings organised in seven countries across South Asia (Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka) where Massey University had been working over the last four years.

The symposium reviewed outcomes of the World Bank-Massey University One Health Regional Training Programme (2010–2013). This included review of the 18-month long Masters-level training programme, summarising progress in implementing a One Health approach to zoonotic disease control within national institutions and assessing effectiveness of cross-sectoral collaboration. The concept and architecture of 'One Health Hub' - an online communication and collaboration network was presented. Best practices in One Health and India's current status on zoonoses were shared along with recent developments on policy and research fronts, including activities carried out with government-sector engagement in India.

The Masters-level training programme was implemented in two phases, following a blended learning model, enrolling 70 students with post-graduate degrees in medicine/veterinary/health. The online programme had eight modules and was delivered in 16 months through a Moodle platform, which is an open source software. Phase II (2011-13) focused on collaborative disease investigation projects (CIPs) for applied training in the seven countries. This entailed looking at priority diseases in each of the partner nations where multidisciplinary teams implemented these CIPs for applied training. Specialised epidemiology training workshops were organised along with strengthening of professional networks.

The creation and implementation of the One Health Hub was discussed by the national stakeholders. These Hubs have been designed to function effectively across human and animal health sectors in support of One Health initiatives operating through and with engagement of national governments. The seven country Hubs are currently at different stages of development including securing endorsement from individual country governments, which will be critical for sustaining them. Further, these country Hubs will be connected to form a SAR OH network with participating countries free to formulate their own rules. Focal points/gate keepers, drawn from human/animal health side will control and monitor membership Hubs and administrators in each country (they are in the process of being identified) will assist in controlling technical aspects of the system.

The Symposium concluded with a set of recommendations

I. Create implementation platform in support of One Health initiatives in India

i. Graduate from conceptual clarity and understanding of One Health approach to

formulate strategy and workable model for implementing One Health activities

ii. Build business case to adopt One Health approach to zoonoses and seek buy-in from ministries/sectors.

iii. Strengthen intersectoral collaboration for zoonoses from human/animal/environmental health and extend it beyond disease-specific programmes and responses to cover all zoonotic diseases of public health importance

iv. Utilise existing mechanisms to promote One Health approach to zoonoses through National Standing Committee on Zoonoses, State Committees on Zoonoses, IDSP and NADRES, among others.

v. Collate and compile available data and literature on zoonoses to estimate disease burden and prioritisation of zoonotic diseases

vi. Develop online platform to exchange information, ideas and experiences of prevention and control of zoonoses

II. Strengthen One Health network in South Asian regional context

i. Create evidence-based policy framework to estimate disease burden, strengthen intersectoral approach and generate evidence at micro/macro levels. Use existing data to conduct systematic reviews of available information on priority zoonoses, generate available information for formulating policy recommendations, collate data for priority diseases to inform decision making and build national and sub-national One health capacity in multiple areas

ii. Create advocacy to promote awareness on One Health and generate material on risk communication through 'whole of society' approach

iii. Strengthen networking and provide forum to share information, knowledge and experiences on interface between animal/human/environmental health; establish strategic research agenda for One health; develop web portal to share information/collaborate for zoonoses; and introduce Hubnet as viable option

The National One Health Symposium was organised by Public Health Foundation of India (PHFI) in New Delhi on 26th November, 2013 in collaboration with Massey University, New Zealand, under the guidance of a steering group, comprising senior technical leaders from ministries of health and agriculture. The regional capacity building initiative has been funded by the European Commission through the Avian and Human Influenza Trust Fund administered by the World Bank and implemented by Massey University.

Acknowledgements

Capacity building of public health professionals is an important mandate of Public Health Foundation of India (PHFI) and Roadmap to Combat Zoonoses Initiative (RCZI) in India. The opportunity to partner with Massey University in furthering the region's One Health agenda will go a long way in strengthening RCZI's work in zoonoses prevention and control.

At the South Asia regional level, this extremely meaningful collaboration has shown promise to turn into a One Health movement. In the context of India, PHFI had the good fortune to be part of the establishment and operationalisation of the India One Health Hub. The support received by the Ministries of Health and Agriculture and the strategic direction provided, especially by Drs. P. Ravinderan, Director, Emergency Medical Relief, Directorate General of Health Services, Rajendra Bambal, Assistant Commissioner, Ministry of Agriculture and Hans Raj Khanna, Assistant Commissioner, Ministry of Agriculture, amongst others, helped in smooth implementation of the Hubnet.

Many of our concerns, be it about intersectorality, bringing animal and human health together or using technology to share resources and enhance a culture of experiential learning, were addressed through the One Health Regional Training Programme that was imparted to seven countries, including India. It provided an impetus to Indian public health by giving a push to the One health agenda in the South Asia region, helping build core capacities essential for institutionalising the concept. Leadership provided by Massey University will continue to guide the initiative in the three years it has committed itself to, before handing over reins to respective countries.

The India One Health Symposium successfully presented needs, priorities and strategies for the One Health initiative. It also tied in with PHFI/ RCZI's efforts that aim to move away from silo-based approaches while embracing a culture of collaboration. I would like to thank the chairmen, panelists and speakers who participated in the consultation on 26th November, contributing to drafting recommendations that will be presented at the Regional One Health consultation in Bhutan. These will help shape country specific zoonoses control and prevention efforts.

My special thanks to organisations that supported the endeavour - International Livestock Research Institute, WHO Country Office for India, Ministry of Health & Family Welfare, Department of Animal Husbandry, Dairying and Fisheries of Ministry of Agriculture, National Centre for Disease Control, Indian Council for Medical Research, Wildlife Institute of India, Indian Veterinary Research Institute, International Food Policy Research Institute and Guru Angad Dev Veterinary and Animal Sciences University.

The RCZI team associated with the project deserves special mention. Dr. Syed Abbas, Neha Sharma and Nidhi Arora provided able support while PHFI Admin Team led by Geetha Ramesh and Sunita Ramesh along with Neelima Sehgal from the Finance Team helped at different stages of the project.

Dr. Manish Kakkar, Senior Public Health Specialist, PHFI and Member Secretary, RCZI

Abbreviations

AH	Animal Health
AES	Acute Encephalitis Syndrome
AI	Avian Influenza
ASCAD	Assistance to States for Control of Animal Diseases
AWBI	Animal Welfare Board of India
BSL	Biosafety Level
CCHF	Crimean–Congo Hemorrhagic Fever
CDC	Centers for Disease Control and Prevention
CDC-HSS	Center for Disease Control-Health System Strengthening
CIP	Collaborative Disease Investigation Project
CSIR	Council of Scientific and Industrial Research
DADF	Department of Animal Husbandry, Dairying & Fisheries
DBT	Department of Bio-technology
DFID	Department for International Development
EH	EcoHealth
EID	Emerging Infectious Disease
EMR	Emergency Medical Relief
FAO	Food and Agriculture Organization
HSADL	High Security Animal Disease Laboratory
GADVASU	Guru Angad Dev Veterinary and Animal Sciences University
GDD	Global Disease Detection
GDP	Gross Domestic Product
HPAI	Highly Pathogenic Avian Influenza
ICAR	Indian Council of Agricultural Research
ICMR	Indian Council for Medical Research
IDSP	Integrated Disease Surveillance Project
IEC	Information, Education and Communication
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
IVRI	Indian Veterinary Research Institute
JE	Japanese Encephalitis

JMG	Joint Monitoring Group
LH	Livestock Health
MPH	Master of Public Health
MVH	Master in Veterinary Health
MVM	Master of Veterinary Medicine (Biosecurity)
NADRS	National Animal Disease Reporting System
NCDC	National Centre for Disease Control
NGO	Nongovernmental Organisation
NICD	National Institute of Communicable Diseases
NIV	National Institute of Virology
NVBDCP	National Vector Borne Disease Control Programme
OH	One Health
OHHP	One Health Hub Pakistan
OIE	World Organisation for Animal Health
PH	Public Health
PHFI	Public Health Foundation of India
PPE	Personal Protective Equipment
PPP	Public Private Partnership
RCZI	Roadmap to Combat Zoonoses in India Initiative
RDDL	Regional Disease Diagnostic Laboratories
RRT	Rapid Response Team
SAR	South Asia Region
SAR OH	One Health Network in the South Asia Region
SARS	Sudden Acute Respiratory Syndrome
SBL	Scenario Based Learning
SEARO	South East Asia Regional Office
SSU	State Surveillance Unit
USA	United States of America
USD	United States Dollar
WHO	World Health Organization
WII	Wildlife Institute of India

1 Overview

Recent studies have pointed out the threats posed to the Indian subcontinent by emerging as well as endemic and neglected zoonoses. The national symposium held on 26th November, 2013, in New Delhi, assessed the experience of institutional capacity building in One Health competencies implemented by Massey University over the last few years.

The National One Health Symposium was organised by the Public Health Foundation of India (PHFI) in New Delhi on 26th November, 2013 in collaboration with Massey University, New Zealand, under the guidance of a steering group that comprised of senior technical leaders from the Ministry of Health and the Department of Animal Husbandry, Dairying and Fisheries (DADF). PHFI was represented by the Zoonoses team that coordinates the Roadmap to Combat Zoonoses in India (RCZI) Initiative (http://zoonoses.phfi.org), set up under the aegis of PHFI. A national initiative, it was set up in 2009 with its focus and ideology rooted in the 'One World One Health' concept. RCZI is leading the intersectoral collaboration by bringing together a range of human, veterinary and wildlife health sectors to work in the areas of collaborative research, capacity building and advocacy/communication on zoonoses. PHFI is a public private initiative that has collaboratively evolved through consultations with multiple constituencies including Indian and international academia, state and central governments, multi and bilateral agencies and civil society groups. It is also involved with academic programmes, training and capacity building, research and communication.

The symposium reviewed outcomes of the 18-month long Regional Training Programme, summarising progress in implementing a One Health approach to zoonotic disease control within national institutions and assessing

effectiveness of cross-sectoral collaboration. The Symposium aimed to formulate proposals for actions that would contribute to developing a robust and sustainable One Health agenda.

International and national organisations from government, public-private sector, NGO, pioneers in public health, veterinary sector, wildlife and environment participated in the Symposium. These organisations represented varied functions like research, policy, programme, academia, surveillance and laboratory, to name a few. Specifically, there was participation from Massey University, International Livestock Research Institute (ILRI), WHO Country Office for India, Ministry of Health & Family Welfare, Department of Animal Husbandry, Dairying and Fisheries of the Ministry of Agriculture, National Centre for Disease Control (NCDC), Indian Council of Agricultural Research (ICAR), Indian Council for Medical Research (ICMR), Wildlife Institute of India (WII), Indian Veterinary Research Institute (IVRI), International Food Policy Research Institute (IFPRI), Guru Angad Dev Veterinary and Animal Sciences University (GADVASU) and PHFI *(For detailed list see Annexure 1*).

1.1 Objectives of the One Health Symposium

The national One Health Symposium was organised with the following objectives:

- To summarise progress and achievements in implementing a One Health approach to zoonotic disease control and effectiveness of intersectoral collaboration in India.
- To report outcomes of the One Health Regional Training Programme implemented by Massey University from 2010–2013 and to share information on other One Health activities which are being carried out with government sector engagement in India.
- To report on progress towards implementation or adoption of an appropriate agency or organisational structure that can work effectively across the human and animal health sectors with government engagement and standing in the field of zoonoses control that can function as a 'One Health Hub' in India in support of One Health initiatives operating through or with engagement of the government sector.
- To propose national-level outcomes and plans of action that will contribute to sustainability of the One Health approach in India and the South Asia region. These were taken forward to the Regional One Health Symposium in Bhutan, December 2 to 6, 2013.

1.2 Intended Outcomes

- Contribution and outcomes of the One Health Regional Training Programme implemented by Massey University presented in the context of other government-sector and public-private partnership initiatives and activities to stimulate intersectoral collaboration and implementation of a One Health approach to zoonotic disease control in India.
- Improved understanding of One Health activities being carried out by key stakeholders in India, and the potential for synergies, coordination and support.
- Progress towards implementation or adoption of an appropriate agency or organisational structure to function as a 'One Health Hub' in India in support of One Health initiatives operating through or with engagement of the government sector.
- Summary of activities proposed that will contribute to a sustainable One Health approach to zoonotic disease control in India and recommendations made for implementing these for taking them forward to the regional level at the South Asia Regional One Health Symposium in Bhutan from 2–6 December 2013.

The deliberations helped finalise a roadmap for the future scaling-up of One Health related activities in the subcontinent, including establishment of a national One Health Hub. This report captures the proceedings of the day-long consultation and synthesises the discussions and recommendations that emerged.

2 Consultation Proceedings

To ensure vibrant discussions and encourage experience sharing, the symposium was categorised into two sections.

Session 1 focused on best practices in One Health, the World Bank-Massey University capacity building project and the current status of zoonoses in India. An overview of One Health developments globally was provided, drawing relevant lessons for India, reporting outcomes of the One Health Regional Training Programme implemented by Massey University from 2010–2013, helping the national One Health community in India to summarise progress and outline achievements in implementing a One Health approach to zoonotic disease control. The discussions also helped review recent developments on policy and research fronts, including activities carried out with government-sector engagement in India.

Session 2 focused on Hubnet, the online communication and collaboration network and the next steps of the SAR Regional One Health network. The concept and architecture of the 'One Health Hub' was shared with the One Health community in India. The primary objective of the exercise was to deliberate with national stakeholders the contours of the implementation platform. This was designed primarily to function effectively across human and animal health sectors in support of One Health initiatives operating through and with the engagement of the government.

"The consultation marks the culmination of Massey University's One Health capacity building initiatives in South Asia. Experience sharing by members of MPH community in India and more importantly Massey, will help build core capacities essential for institutionalising One Health in the region."

Dr. Eric Neumann, Massey University

2.1 Session 1

2.1.1 Context Setting

The National One Health Symposium was one of several meetings organised in seven countries across South Asia, namely, Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka where Massey University had been working in the last four years. The recommendations of the consultation were to be presented at the

regional consultation in Bhutan, scheduled for December, 2013. One of the main objectives of the regional consultation was to carry forward and present the needs, priorities and strategies for One Health initiative of various countries at the regional level so that regionally useful strategies could be developed for participants to take back and apply within the context of their countries.

The project was supported by the European Commission through the Avian and Human Influenza Trust and managed by the World Bank. Massey University was the implementing agency and in India, it partnered with the PHFI to facilitate setting up communication and collaboration amongst a regional network of professionals working in One Health through Hubnet.

2.1.2 Panel Discussion I

Session 1 was chaired by Dr. JP Narain, GDD Centre, India and Prof. Ramanan Laxminarayan, Vice President, PHFI and had Delia Grace, ILRI, Dr. Eric Neumann, Massey University, Dr. Veena Mittal, NCDC and Dr. Hans Raj Khanna, DADF as panelists.

One Health Approaches: Genesis, Implementation and Best Practices

Delia Grace, ILRI shared some of her experiences of One Health (OH) and EcoHealth (EH). According to her, both human and animal health in the 21st century were under a great deal of pressure, bearing as they did, a high and unacceptable burden of disease. Corroborating her point, she pointed out that in 2011, for the first time, the world population had crossed the staggering 7 billion mark.

Human health: Out of this phenomenal number, as many as one billion were hungry, two billion were experiencing hidden hunger (not getting

"There is growing consensus on the need to build capacities of health professionals early into their career, especially those in human, environmental and veterinary health sectors. The Massey University initiatives will help in building capacity, moving away from silo-based approaches and promoting culture of collaboration between these sectors."

Dr. Manish Kakkar, RCZI/PHFI

"One Health is a critical concept, especially in context of new and emerging infections. South Asia is fast emerging as a hot spot for new infections with increased vulnerability to transmission of infections and their impact due to intense animal and human interface. Rapid detection and prompt response to new infections requires intersectoral or whole-of-society approach where human and animal sectors develop one plan and common strategy to bring relevant sectors under One Health. This strategy must be based on assessment and management of risk and vulnerability."

Dr. JP Narain,
GDD Centre, India

micro nutrients vitamins and minerals like Iron, zinc to achieve their full growth and potential and animal source foods such as milk, egg, fish which are particularly good sources of micro nutrients) and 1.5 billion are overweight/ obese. At the same time people are countering dietary transition.

In 2011, nearly 55 million people died; 18 million due to infections (one in three deaths due to infection). According to estimates, as many as 7 million deaths were amongst under fives and one in four deaths in under five children were taking place in India.

Animal health: The economic cost of animal endemic disease can run up to billions of dollars annually, both in terms of animal loss and their produce including meat, milk, animals and eggs. According to an estimate shared by the Bill and Melinda Gates Foundation with regard to losses accruing due to animal deaths, Africa had the highest burden of human and animal diseases but it was South Asia that constituted a major proportion of these losses. Out of a 24 billion livestock population globally, 19 billion were found in developing countries. Also, nearly 1 billion poor people depended on livestock with 600,000 in South Asia alone. About 5 billion die each year (~25%) which is a staggering figure. In Africa, 50% of the deaths were due to infectious diseases and the remaining on account of malnutrition.

The One Health Approach

The One Health approach (Figure 1) encourages collaborative efforts of multiple disciplines working locally, nationally and globally, to attain optimal health for people, animals and environment. It focuses on the health of humans, animals and ecosystems in a way that is not

independent of one another but intertwined, bringing together sectors and collaborations that can help bring about better health outcomes.

What is currently lacking in the One Health domain is the absence of a standardised definition of One Health that would be relevant and applicable across geographies. Research on One Health that was being done in Africa, Asia and South East Asia revealed variations in the acceptance of One Health. For instance, in some countries One Health was centre stage and integral to zoonotic disease control while in others it was an interesting idea and was one among many initiatives that were being followed. India fell in the latter category.

One Health has been endorsed and accepted by all major international organisations such as FAO, WHO, OIE and CDC. However, at national level, even though most countries have created One Health groups and initiatives, these are yet to be standardised.

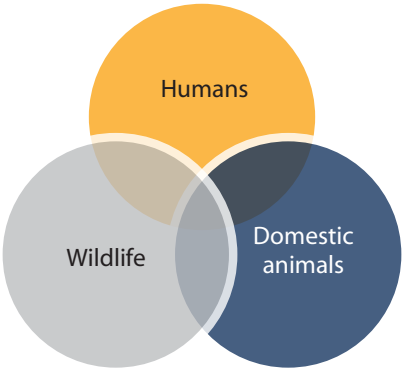

Figure 1: One Health Approach

Genesis of One Health

Traditionally, villages and communities viewed all health as one health. People did not make rigid distinctions between human and animal health. But as medicine developed, sectoral disciplines emerged. Influential scientists like Robert Virchow in the 19th century, endorsed the concept of One Health. In the 20th century, as medicine rapidly evolved, both human and veterinary health silos deepened with less communication taking place on and between the two sides. An interesting exception was the work done by Calvin Schwabe in Southern Sudan, who introduced the concept of One Medicine, proposing a unified human and veterinary approach to zoonoses in his 1964 book 'Veterinary Medicine and Human Health'. There was already some ongoing work on One Health at the Swiss Tropical Public Health Group under the veterinary public health paradigm with an attempt to study zoonoses as the cause of human diseases and within this, human health zoonoses were considered a small subset. The emergence of pandemics from animals including SARS and Avian Influenza changed this, leading to the realisation that these diseases could not be managed by one sector alone. This integrative approach showed how various health sides interlocked with each other. Initially the understanding was that human health and animal health were important. But this was before veterinary public health came into the picture. The concept of One Health came into being in the 1990s. Later the concept of EcoHealth, which was an even more integrative concept, took shape, laying emphasis on the environment, culture and governance aspects (Figure: 2).

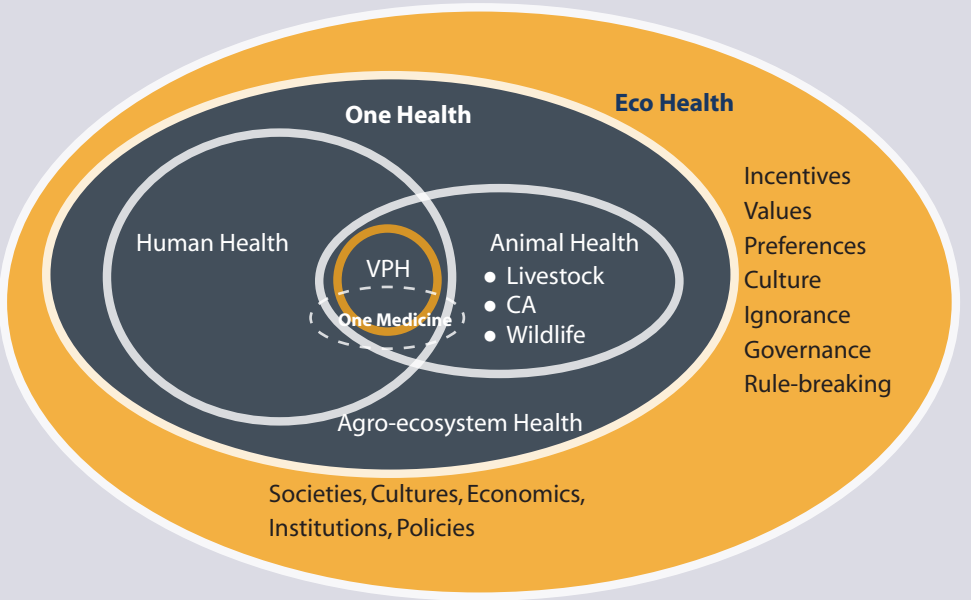

Figure 2: Integrative Approaches

Challenges: An Unfinished Agenda

There have been a fair number of good examples that have been generated in linking human and animal health as also environmental health but these have been in specific communities/ locations. They have been around specific events/outbreaks and (like HPAI) have been carried out at pilot intervention scale. Capacities of key stakeholders have been more responsive than preventive, with most agencies stepping in to respond to a pandemic crisis rather than setting in place effective and robust preventive mechanisms.

Another major constraint has been in the way systems change faster than paradigms, leading to an inconsistent pandemic management graph. Many factors have contributed to One Health being confined to a marginalised approach. It is time now to examine these reasons carefully and upscale the concept, taking it beyond the veterinary health field into the wider health community, especially the human health community.

Drawing Lessons from Case Studies

Three case studies based on ILRI's recent work provide some insights and solutions.

Case Study 1: Findings of a study commissioned by DFID and conducted by ILRI to look at what are the zoonoses that matter to the poor

The study was based on a broad literature review that was conducted to study zoonoses in different places, since the actual reporting systems in these places were flawed. The study assessed the health burden caused by the top 13 zoonoses as compared to other 46 zoonoses (Figure 3).

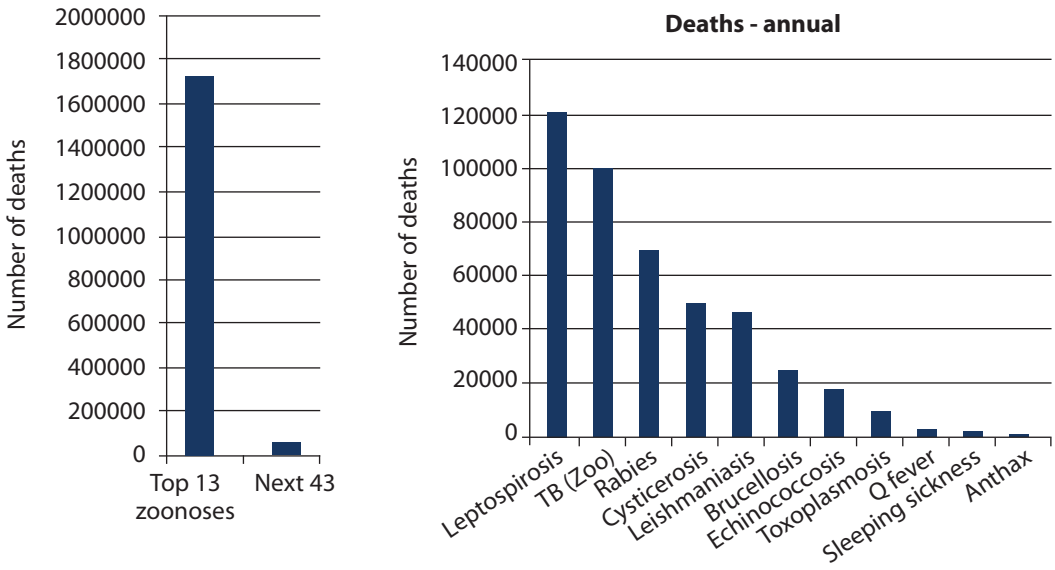

Figure 3: Burden of Diseases by Zoonoses

South Asia, hot spot for burden of disease

Poor livestock keepers: South Asia 600 m, sub-saharan Africa 300 m

Most zoonoses burden: India, Myanmar, Bangladesh, Pakistan

Emerging disease risk: West Europe, West USA

Big 6 countries for all risk factors: South Asia (India, Bangladesh, Pakistan); Africa (Ethiopia, Nigeria, Congo)

Source: Delia Grace's presentation at the consultation

Adopting One Health approach will ensure dual benefits, namely having safe food which will reduce health associated risks and improve nutrition and increased market participation of poor sections.

It was found that in many countries scarce resources were allocated to the less important 43 zoonoses instead of the 13 top zoonoses. For example in Kenya, some of the top ranked zoonotic diseases by public health and veterinary health professionals were technically important but not necessarily so from the point of view of their health burden.

The disease burden of top 13 zoonoses resulted in costing the lives of nearly 2.2 million people, making another 24 billion people sick and infecting one in seven livestock. The traditional way of looking at the zoonoses burden included the WHO approach that focused on human health and OIE that focused on animal health. However, when the combined burden of zoonotic disease on human and animal health was looked at, it appeared to be a major public health problem.

The study found that approximately 1 billion people depended on 19 million livestock with four countries constituting 44% of poor livestock, including India. A large percentage of livestock was seen in rural areas although a significant number existed in urban areas too. Livestock contributes greatly to the income and protein of the poor and in many cases, when people migrate from rural areas they bring their animal as well.

Gaps were also noticed in perception of actual priority zoonotic diseases leading to importance and control measures being directed towards non-priority zoonotic diseases. Some of this was due to media representation, donor demands and misperceptions. This finding helped ILRI come up with a structured prioritisation list of diseases that looked at zoonotic diseases with special reference to poverty and the impact it had on humans and animals.

Case Study 2: More than 50 studies conducted by ILRI looked at food safety in the informal sector

Informal markets are where the poor buy and sell their food. These markets escape sanitary regulations and are most under-researched. When people try and regulate them, they usually make them worse because the regulation acts as a burden that makes it difficult for people to earn their livelihoods and also ensures they get nutrition. Thinking about food safety and medical problems results in a solution that may not meet needs of the community. On the contrary, an approach that takes into account how food contributes to livelihoods and nutrition, results in better solutions addressing community needs.

Each of the studies found hazards in the food sold in the informal sector but in many cases the formal sector was not found to be better or worse at meeting standards than the informal sector. Example of raw milk and pasteurised milk was given to validate the finding as it was found that both failed to meet standards. It was also seen that the high hazards of the informal sector often do not translate into risks. Every study found

massive nutrition and livelihood benefits for the informal sector. A valid question that then arises is that if the informal sector is not meeting standards, how can it be regulated and controlled. Perhaps, the sector should be viewed as a system that has risks and hazards but at the same time is capable of providing millions of jobs and benefits.

Case Study 3: Studies led by Dr. Jeff Gilbert in South East Asia in a four-year project focused on relative EcoHealth

The studies looked at barriers and bridges to EcoHealth and One Health. The key take home message was that if effectiveness or cost savings of One Health or EcoHealth were considered, then there would be a long way to adopting these approaches.

Need for a business case for One Health that is accepted and practised: A common view is that zoonotic disease control and prevention is a multifaceted problem calling for multisectoral intervention and yet practitioners do not adopt this approach, continuing to work with sectoral and donor-driven approaches. One of the challenges is to show added value of One Health and overcoming an inherent limitation of generating economic evidence. This can be overcome by building a business case for One Health. An important aspect to be considered is the identification of behavioural, institutional and incentive factors which influence ways through which people can adopt One Health.

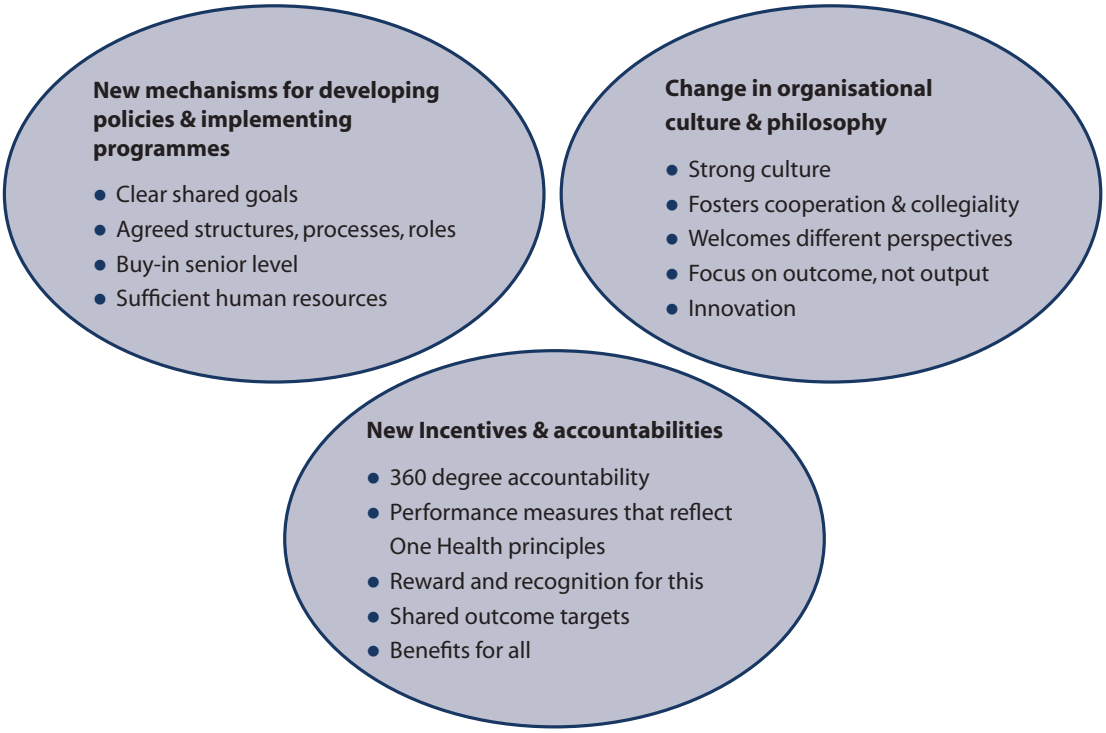

Figure 4: Framework for Overcoming Barriers and Bridges to One Health

Ways have to be found to demonstrate benefits of zoonotic disease control which are more than the cost of controlling zoonotic diseases (Table 1).

	Annual benefit	Annual Cost	Confidence
Sharing resources	4 billion	1 billion	++
Controlling zoonoses	90 billion	15 billion*	+++
Ensuring timely response	6 billion	3.4 billion	++
Averting pandemics	37 billion		+
Improving reasearch and development	?	?	+++
	137 billion	20 billion	++

Table 1: Costs and Benefits of Controlling Zoonoses

Going forward, it would be important to understand the different dimensions that currently govern the One Health paradigm. On one hand are the benefits that the approach illustrates, namely, how it provides important and non-obvious insights, and on the other it helps attain multiple societal objectives while improving effectiveness and efficiency. Some of the obvious challenges that have been encountered relate to the up-scaling and out-scaling of One Health and demonstrating added value. However, these opportunities need to be recognised and developed. Specifically, they centre around building a strong business case for One Health and overcoming barriers in an effort to pave the way for new beginnings and the bridging of gaps.

One-Health Activities for Building Institutional Capability across SAR through a World Bank/Massey University Managed Project (2010-2013)

Dr. Eric Neumann provided a brief history of the project, recounting how it was initiated after the emergence of the H1N1 pandemic strain in April, 2009. Around this time, the Avian and Human Influenza Trust decided to use its residual funding to initiate a strategic One Health training programme for institutional capacity building across SAR Region. Massey University has been working in Asia for 30 years and was selected as the implementing agency for the project.

The objective of the project was to strengthen national institutional capacity and sustainability in epidemiology and biosecurity by introducing and operationalising the One Health concept at national institutions in seven countries in South Asia, namely, Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka in SAR region. These institutions were directly or indirectly responsible for diagnosis, preparedness, response, prevention and control of Highly Pathogenic Avian Influenza (HPAI) and other zoonoses in domestic poultry and other animals.

The project was implemented in two phases. The MVH/MPH programme was a Masters-level training programme following a blended learning model. The 70 students who enrolled in the course already had a degree in medicine, public health or animal health. The programme had eight modules that had to be completed successfully before degrees could be awarded to the students. There were four core modules and four specialised modules for public health professionals.

Phase 1: 2010-11

During Phase I, training materials were developed and delivered to the partner nations. An entirely new online training delivery programme was finalised by Massey University, leading to the building of a network that allowed professionals to be in touch, post completion of the programme in a virtual milieu. Bringing together animal and human health professionals, the programme was delivered in 16 months. It was interactive in nature with most of the group work and discussions providing a healthy platform for exchange of views and ideas amongst human and animal health professionals. The online programme was delivered through a Moodle platform, which is an open source platform/software that organisations develop to rebrand and use for their purpose.

The group work sessions were conducted to build professional relationships among members.

Blended learning model combined face-to-face and online training. This was particularly relevant given the sensitive nature of participants who were representing their country's prestigious government institutions and the restriction on them in terms of being out of their country for a two-year offshore training programme. The model provided a more viable and convenient option.

One of the mechanisms used to deliver group work included the 'scenario-based learning model' that allowed participants to work in an online milieu. This approach worked through an unfolding scenario, applying theory and techniques. It proposed a hypothesis, encouraged discussion in small groups and then reported findings before asking for consensus/vote. The exercise concluded with the writing of a report that presented the findings and recommendations for the 'client'. This effort was made possible with the help of an Scenario Based Learning (SBL) platform that was developed by members of Massey University. Additionally, it is also available as an open source platform.

Phase 2: 2011-2013

Phase II focused on sustainability and creation of One Health Hubs in each of the seven countries along with collaborative disease investigation projects (CIPs) for applied training. Priority diseases in the different countries were looked at (Figure 5).

Multi-disciplinary teams implemented one or more CIPs per country. Phase I graduates served as key resource people for Phase 2 activities, applying and extending their specialised training to the wider government and non government communities involved. Along with whatever resources people

from the laboratories could extend in the countries where the project was being implemented.

All participants were brought together to do a needs assessment to identify priority areas where project money could be invested to generate evidence and data to suggest improvement in existing health policies. These CIPs provided focus for applied training with multi-disciplinary teams implementing one or more CIPs per country. Further specialised training in spatial/temporal analysis or other technical tools/software which may not be covered in the scheduled training sessions was taken up through specialised trainings.

One Health Hubs: A Hub is a collection of people with common interests in One Health. Activities and resources of Hub participants are aided by an internet technology which is the Hubnet that connects people across sectors and countries. It is a networking structure that encourages and supports communication and access to resources. It paves the way for developing common interest in adopting a One Health approach between disciplines and sectors. Core ministries are the founding organisations that have its membership spanning a wide variety of individuals.

The Hubnet is a place where further expansion and development of professional networks was taken up. Specialised epidemiology training workshops were organised along with strengthening of professional networks. The core group of the Hub comprised of students who underwent the Masters degree programme and the expanded group of people who were involved in the implementation of the CIPs. These Hubs have been created in each of the seven countries and are currently at different stages of development. It has been mandatory for the hubs to be endorsed by their respective governments, especially in terms of endorsing collaboration and consortium projects for sustainability.

'One Health Network' in the South Asia Region (SAR OH): Country hubs are connected to form a SAR OH network. Operating rules of the Hub are not dictated by Massey University. The participating countries are free to formulate their own rules based on their need and scenarios. Massey University identified administrators in each country who could control some of the technical aspects as the system advanced. Massey University helped identify focal points or gate keepers who were basically one each from human health and animal health side. Their chief objective was to control and monitor membership on the Hubs.

Working with governments for sustainability

Massey University was advised early into the programme that it might be easier to work with non governmental organisations (NGOs) since transfer of money would be smoother and faster, but to bear in mind that the decision to work with the government would ensure sustainability. The government endorsement would help assign authority and permission to people to continue with their work. Establishing partnerships and agreements with local governments therefore was central to the implementation of the programme. Currently all governments in the seven countries have completed or are ready to complete the process of finalising government endorsements for their respective Hubs.

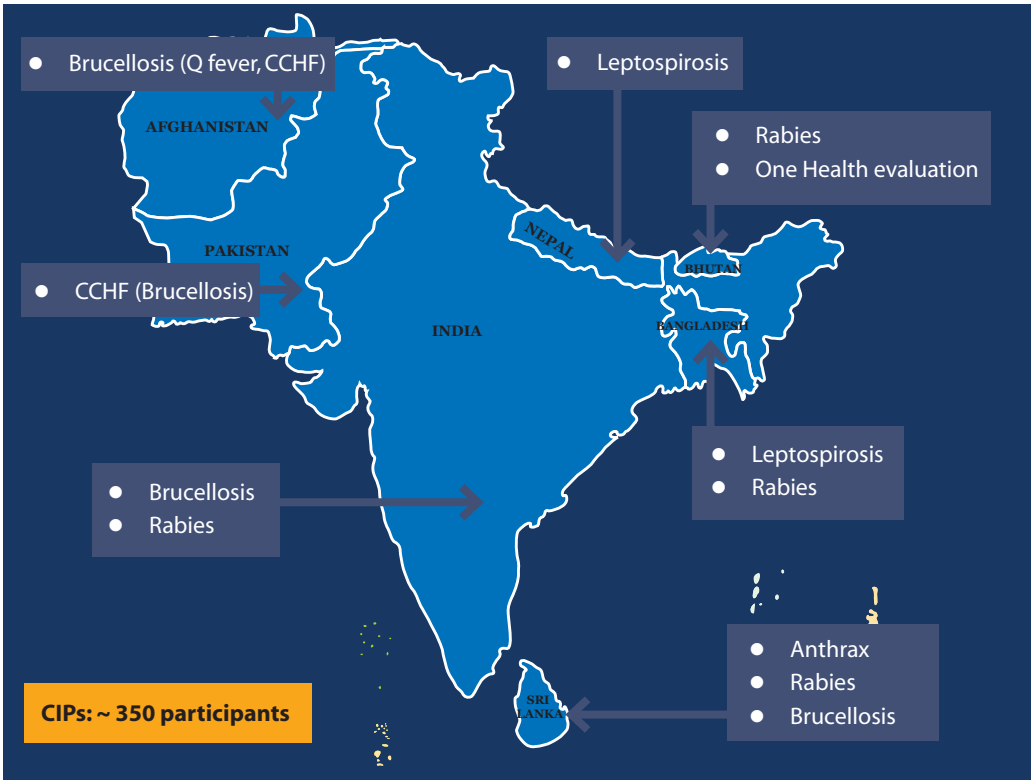

Figure 5: Priority Diseases in Different Countries

Outcomes and Lessons Learnt

Some of the key outcomes and lessons learnt during Phase 1 and Phase 2 are enumerated below.

Outcomes

Phase I: : MVM/MPH (Biosecurity) training	Phase II: One Health Hubs and CIPs
59 students were awarded Masters degrees	Hubs and Hubnet • 7 One Health Hubs established • Regional network of Hubs made live (government endorsed) • Regional network strengthened and cross-sectoral collaborations established • Hubnet went live with the commitment of being supported for three years • Emerged as a useful web-based tool to support communication and collaboration within and between countries
7 students successfully completed foundation courses (but unable to complete speciality courses and awarded post-graduate certificate)	

Lessons Learnt in Phase I

- Blended learning was acknowledged as a good model that enhanced functionality between online and workshop model
- Having a longer duration in terms of hours for the training was important to show commitment (1200 hrs to 1800 hours)
- Internet was problematic in some countries but participants managed to cope with the erratic connectivity
- Face-to-face interaction was important to establish a connect and build rapport, especially in interpersonal communication between participants of different countries. This was particularly useful in the early days of the training
- There was an under-appreciation of the wide range of basic knowledge that was present amongst the participants
- More time should have been allocated for each region
- A general perception was that participants needed to have some tangible take aways in the form of laptops, software licenses, hard-copy books and such like to feel satisfied with the programme
- Group work was appreciated but was found to be complicated and tedious by some moreso during assessment when there were possibilities of plagiarism and asynchrony

Lessons Learnt in Phase 2

- Scientists collaborating together was easy, but is a trend that is not always rewarded in public policy
- There was resistance and anxiety around use of an online environment, though this was gradually overcome
- Communication part of Hubnet has value that was acknowledged by all participants from the 7 countries
- Everyone has their own idea of collaboration though a common thread was the need to 'belong' which is different from wanting to work together
- Specific themes can be taken up across the region on One Health. For instance, Pakistan and Bangladesh could look at environment, pesticide, entomology and wildlife. A short primer course of One Health philosophy could be made mandatory for Public Health universities. With AI attracting less attention in the region, there could be devolution from central to state dealing with national and state level governments for budgets

Sharing & Discussions

Through interaction, discussion and fielding questions to the presenters/panelists and session chairman, a number of relevant issues were further discussed and clarified. These have been summarised below.

"One Health is not just a collection of people, rather it is a process and method to deal with different zoonotic diseases requiring integrated as well as specific responses."

Dr. Eric Neumann, Massey University

"At the district level it would be good to integrate the One Health approach with Project Implementation Plans (PIPs)."

Dr. SK Satpathy, Policy Development Initiative and Octavo Solutions

Expanding the concept of One Health: One Health is a process and method to mobilise necessary resources to address different zoonotic diseases. For instance, some of the diseases spreading through insects and larva might require entomologist's involvement while others may not. This does not mean that they get excluded from One Health discussions.

Move from concept to strategy: One Health is gaining importance in India but the country is still at the conceptual stage where efforts are being made to sell the idea. Thus, there is need to move from concept building to strategy development.

Functional collaboration, need of the hour: Structurally speaking, for professionals representing the human and animal health sides to come together and strategise, it would be important to press more for functional collaboration rather than structural integration. There is need to develop mechanisms by which all relevant sectors can come together. In the One Health arena, there must be one integrated plan and one monitoring and evaluation framework. Often, animal sector is the first line of defence but since in a country like India, the public health system is weak and veterinary public health even weaker, there is urgent need to brainstorm on strategies to strengthen and build capacities of the two sectors. There must be more opportunity to work together, collaborate, strategise, plan and monitor.

Bringing veterinarians on board: Not enough collaborative work is taking place between the animal and health sectors. Both sectors have been working in isolation and unless there is greater integration, results will not be seen on the ground. The recent announcement under the 12th Five Year plan by the Ministry of Health, to recruit for the first time, veterinarians under IDSP will facilitate collaboration between the two sectors.

Government's plans for intersectoral coordination: In the 12th Five Year Plan there is provision for strengthening intersectoral collaboration. There is also provision for hiring a medical consultant to be posted at the state surveillance unit under IDSP. The person would coordinate with the veterinary consultants posted under IDSP.

Integration of animal and human health: Positioning a veterinarian under Ministry of Health will need to be combined with integration of the two sides under IDSP through training and orientation as well as coordination at higher administrative levels.

Framework for intersectoral coordination: There is a lot of experience at the district and sub-national levels where intersectoral collaboration is taking place. Experience suggests that availability of a framework for intersectoral collaboration is more likely to make things move further.

"It would be pertinent to find answers to why enough people have not been found to fill positions? Why is there a dearth of veterinary professionals? Is the training provided to them attractive enough to keep them interested?"

Prof. Ramanan Laxminarayan, PHFI

"The issue of recruiting veterinarians must be addressed. The ministry should issue ToRs to states and representatives from human and animal health sides must sit together and develop these. Once ministry approval is obtained, these must be handed over to the states."

Dr. P Ravindaran, DGHS

"Greater advocacy, especially at higher levels is required, since at lower levels, disease specific collaboration is already in place at the time of an outbreak. For regular and ongoing intersectoral collaboration, stronger awareness, advocacy, commitment and coming together of partners is vital."

Dr. Veena Mittal, NCDC

"Look at first all the strategies for intersectoral coordination and then decide on a possible vision that is most suited for the state. This can later be effectively implemented in the short to medium term."

Dr. Ritu Chauhan, WHO

2.1.3 Current Status of Zoonoses in India

Dr. Veena Mittal, presented the current scenario of zoonoses in India, highlighting that nearly 80% of the country's population resided in villages where people were in close contact with animals. Majority of the outbreaks over the last decade had been zoonotic diseases and major emerging and re-emerging diseases zoonotic in nature, leading to morbidity and mortality in human and animals, leading to large-scale economic losses. Some of the zoonotic diseases of public health importance in India included endemic diseases of rabies, anthrax, brucellosis, toxoplasmosis, cycticersosis and echinococcosis; re-emerging diseases of Japanese encephalitis, plague, leptospirosis, scrub typus and KFD; and emerging diseases of avian influenza, nipah, trypanosomiasis, H1N1, CCHF and trichenellosis.

Some of the future threats to India vis-à-vis zoonotic diseases include yellow fever, hanta virus, rift valley fever, ebola and marburg as some of these have been reported from neighbouring countries that have epidemiological conditions for their emergence and spread. For instance, evidence of ebola virus has been found in bats in Bangladesh. Globalisation and travel further increases the threat of these diseases.

Important lessons learnt while dealing with outbreaks

- Disease can re-emerge any time
- Standard case definition/ availability of guidelines necessary
- Early suspicion, early reporting and prompt response are key to effective disease prevention, control and management
- Appropriate lab diagnosis, management/ treatment of patients, chemoprophylaxis and timely control measures must be supported with community awareness and regular and continuous surveillance

India's Level of Preparedness

An analysis of some of the major outbreaks in the country and their management offer insights into the preparedness and progress made so far. Plague, for instance, re-emerged after 28 years in 1994 in Beed, Maharashtra and Surat, Gujarat. Bubonic plague and pneumonic plague registered 876 cases and 54 deaths with economic loss to the tune of 1.7 billion USD. The situation created panic and chaos. Inadequate and delayed response was attributed to 28 years of quiescence (low suspicion index), deficient laboratory support and poor coordination and management amongst different disease control agencies. Subsequently, the health sector was strengthened. This strengthening was reflected during the plague outbreak in 2002 that occurred in Hatkoti village, Himachal Pradesh. Pneumonic plague saw 16 cases and 4 deaths, lasting 12 days and an outbreak in 2004 in Dangud village, Uttarakhand saw 8 cases of bubonic plague and 3 deaths, lasting 10 days.

These events were followed by the emergence of SARS and avian influenza (H5N1) that led to important steps being taken to contain the infection. These were:

- WHO recommended case definition and guidelines being sent to all concerned stakeholders on 18th March
- Control rooms set up in Directorate General of Health Services and National Institute of Communicable Diseases (NICD) and NICD designated as nodal agency to investigate the outbreak
- Intersectoral meetings held at the central and state levels and Joint Action Committee formed
- Technical guidelines made available on the website of the Ministry of Health & FW
- Screening of international visitors made mandatory
- Case Management Facility, infection control measures and PPE carried out
- Laboratory investigations stepped up (5 national laboratories strengthened) and capacity building undertaken
- Mass Awareness Programmes held, IEC activities undertaken and media coverage ensured
- Daily monitoring at all levels done besides constant monitoring at highest level
- Total transparency in sharing data – WR India SEARO
- Availability of drugs and PPE ensured at the point of use
- Confirmation of laboratory diagnosis in poultry in BSL 4 lab and establishment of BSL3 labs undertaken
- Coordination and networking with international agencies like WHO, OIE, CDC-HSS and FAO adopted on a sustained basis and a sound contingency plan developed

Several mechanisms for disease-specific intersectoral coordination are already in place. These include surveillance and response through IDSP, RRTs and national programmes like NVBDCP; operational guidelines for prevention and control of zoonotic diseases (JE, anthrax, leptospirosis, scrub typhus etc); training/sensitisation/ awareness at all levels, laboratory facilities (human and animals, BSL-2, BSL-3, BSL-4 facilities and networking of laboratories – influenza, NVBDCP labs, IDSP labs , glanders, rabies, anthrax), internal collaboration, emergency response mechanism and public involvement.

Future disease specific programmes envisioning intersectoral collaboration are National Rabies Control Programme with involvement of Animal Welfare Board of India (AWBI) with the main objective of Mass Vaccination and Animal Birth Control of stray dogs. Other such programmes include prevention and control of Leptospirosis and Multisectoral project for prevention and control of JE/AES.

Way Forward: Strengthen Intersectoral Coordination

Suggested next steps with regard to combating zoonoses in the country, include a mix of programme, policy and systemic level strengthening:

- Strengthen intersectoral coordination utilising existing surveillance system of IDSP under XIIth Five Year Plan. Within this undertake Centre, State and District level strengthening; set up the State surveillance unit (SSU), IDSP; hire a Veterinary officer (under IDSP) and a Medical officer (under intersectoral coordination project)
- Joint Monitoring Group to expand the mandate of JMG Avian Influenza

- Conduct further rounds of training to ensure manpower across levels is updated on disease management
- Sensitise professionals in various sectors
- Undertake state-specific IEC to create awareness and change behaviours
- Greater coordination needed with National Animal Disease Reporting System (NADRS)

2.1.4 Significant Zoonotic Disease in India: Recent Events, Experiences, Lessons Learnt & Framework for Collaboration

Dr. Hans Raj Khanna, in his presentation reviewed preparedness of veterinary sector in light of recent EID events and future threats. Given India's large livestock wealth a huge infrastructure of veterinary services is deployed. This includes hospitals, polyclinics, dispensaries, laboratories and animal quarantine stations located at select places for disease testing. The recently launched National Animal Disease Expert Referral System (NADRES) links each block, district and state headquarters to a central unit in New Delhi at DADF, Ministry of Agriculture. All notifiable diseases scheduled in `Prevention and Control of Infectious & Contagious Diseases in Animals Act 2009' are included in this system.

With the world's second largest human population, two biodiversity hotspots, and one of the world's greatest livestock densities, India has a favourable environment for transmission of known and novel diseases between animals and people. The country is also at risk of major zoonotic disease viz. endemic diseases like rabies, anthrax, brucellosis, toxoplasmosis, cysticercosis and echinococcosis (hydatid disease); emerging diseases like avian influenza, CCHF, japanese encephalitis and food-borne pathogens; and re-emerging diseases like tuberculosis, leptospirosis and toxoplasmosis.

Rabies is a major public health concern with challenges in its prevention and control. Large number of animals succumbing to it places amongst other things, a heavy financial loss to livestock owners. With as many as 92-97% cases on account of dog bites, the absence of an effective national control or surveillance programme is acutely felt. Inadequate vaccine availability, large dog population of 22 million, huge under-reporting, negligible efforts to register dogs and few State biological production units manufacturing post-exposure vaccines for animals, further compounds the problem.

Status of **Anthrax** and **Brucellosis** are not very encouraging either. In India, Anthrax is endemic in few states in humans. With more than 48 outbreaks in animals (33 in cattle, 15 in sheep/ goats), 362 cases, 323 deaths in 2012, most outbreaks usually are reported in eastern and southern states. A preventive vaccination is currently being researched and assistance provided to States under ASCAD. Brucellosis is viewed as an economically important reproductive disease of livestock, with zoonotic importance. Bovine brucellosis is prevalent in almost all states. The Government initiated the 'National Programme on Control of Brucellosis' in August, 2010 to control the disease in animals.

Citing One Health initiatives in the context of DBT Network Project on Brucellosis there are currently 5 sub-projects on Brucellosis Epidemiology, Brucellosis Vaccine, Brucellosis Diagnostics, Brucellosis Repository and Brucellosis Bioinformatics which commenced in October 2012 and are likely to be completed in 2015 with budgetary allocation of Rs. 16,20,34,100.

The first **Avian Influenza** outbreak in 2006 was followed by outbreaks every year in different states. A total of 23 episodes with 97 outbreaks have been reported so far. Currently, the country

has been free from disease since November, 2013 thanks to an efficient country-wide surveillance. No human cases have been reported and monitoring preparedness with various pre-emptive measures have been stepped up. The Department is in constant touch with each state, issuing advisories and uploading them on the website. Training of manpower is regularly reviewed and any unusual mortality in birds vigorously followed. In the event of an outbreak, affected and the adjoining States are alerted. The AI diagnostic Network in India - HSADL, Bhopal (an OIE reference laboratory), NIV and five BSL-III laboratories provide diagnostic support to AI surveillance programme. India's surveillance mechanism conducts routine and targeted surveillance of poultry and wild birds. Over eight lakh samples have been tested since November, 2005 with 5 RDDLs receiving and testing random samples in respective regions. The High Security Animal Disease Laboratory (HSADL) at Bhopal oversees surveillance and final diagnosis besides advising DADF. In addition, NIV, Pune also undertakes surveillance and confirmatory diagnostics.

Some of the strategic control measures include setting up of a control room, immediately notifying infected and surveillance zones, deploying Rapid Response Teams (RRTs) for culling poultry, conducting intensive human health surveillance in operations, strengthening border posts for stopping illegal movement of poultry or products, conducting a publicity campaign by Animal Husbandry & Health Ministries in print and electronic media with focus on safe poultry practices, initiating post-operation surveillance in consultation with State Government for implementing control operations and declaring freedom.

"WHO too has set a goal to eliminate Rabies from South East Asia region by 2020. Recently WHO, OIE and FAO called for elimination of rabies."

Dr. Hans Raj Khanna, Ministry of Agriculture

Other One Health Initiatives

- As part of epidemiology capacity building initiatives, there is the FAO project and Massey University programme.
- Ongoing facilities for prevention of zoonoses include facilities for diagnosis (BSL-2, BSL-3, BSL-3+labs, training manpower)
- National programmes/projects include Integrated Disease Surveillance Programme, Standing Committee on Zoonoses, State Committee on Zoonoses, Interstate Plague Coordination Committee, ICMR & ICAR joint task force on Zoonoses, Operational Guidelines on Prevention and Control
- Well coordinated surveillance network for zoonotic diseases with human health and a network of reference labs have been set up
- Trained manpower development, facilities for diagnosis (BSL 2, BSL 3, BSL4), operational guidelines on prevention and control of various diseases, regular reporting/ meetings, Action Plans

"Brucellosis was identified as priority disease because there was a National Brucellosis Control Programme that gave way to collaboration between human and animal health sides. A recent call by WHO, OIE and FAO drew attention to the need to eliminate rabies in humans. This will give a fillip to building an intersectoral national-level response to zoonoses and One Health issues."

Dr. Veena Mittal, NCDC

"For creating a business case, economic status and data on diseases must include lost lives/resources as there are differences between experts' priorities within themselves and those of farmers and communities."

Dr. Delia Grace, ILRI

of Animal Husbandry and Public Health, numerous cross border initiatives on AI with Nepal and Bangladesh are already in place

- Legal framework for animal and human diseases includes the Prevention of Contagious & Infectious Diseases in Animals Act, 2009 and the Livestock Importation Act, 1898 and Export Inspection Act, 1963

Going forward what is needed are strategic actions to improve prevention and control of zoonoses in the country, better surveillance and monitoring of diseases and surveillance programmes, development of a diagnostic network, greater transparency and mutual trust, a larger number of public private partnerships and more collaborative research.

Sharing & Discussions

Some of the important aspects that were flagged included strengthening advocacy that was specifically related to policy, resources and partnerships; building capacity in the area of laboratory testing, scaling up responses to zoonoses; and documenting evidence and communication in zoonotic disease control. It was suggested that based on feedback from different stakeholders, a list of challenges in the context of One Health in India must be drawn up.

"Risk communication is an opportunity for collaboration on both sides. It is only when one goes beyond human and animal health to depict zoonoses as a developmental issue that policymakers allocate resources for these diseases."

There is need to look at human and livestock loss. In case of H5N1 most economic impact was on animals due to culling of chickens. Prompt action will help estimate economic losses and micro-level impact of H5N1 virus on poor families. Their survival is linked to backyard chicken which if culled, causes grief and economic penury."

Dr. Shashi Khare, NCDC

Setting priority zoonotic diseases in India: A nation-wide framework was suggestedto set up priorities in the context of zoonoses. Strong logic should precede the decision to shortlist concerned diseases. For instance, rabies inspite of being a 100% preventable disease with available medical infrastructure to prevent it, still sees a large number of deaths occur. This necessitated Rabies being accorded priority status which incidentally matched national and global goals.

Developing a business case for zoonoses based on evidence: There is hardly a business case for public health in the country and any investment in health by policy makers and financial authorities is inadequate simply because there isn't enough data on disease burden on human and animal sides. One Health must bring together not just veterinary and human health professionals but also economists, sociologists and gender specialists. In the absence of data it is important to bring in economists to gather data and show governments the cost and implications of losses due to diseases as also benefits due to prevention and control of disease in rupees. It is important to estimate burden of the disease and its macro impact in terms of GDP.

Understanding disease burden in the context of livelihoods: Professionals are still struggling between disease burden and the decision regarding which disease should be selected. Not only is burden of disease important but also its impact on livestock since individuals survive on livestock too. There was emphasis on diseases which had impact on humans, which is why Rabies was selected, for it had a major impact on humans and could be prevented. However there is need to also look at loss of livelihoods because of the disease and not just the health impact of disease.

Exploring multisectoral collaboration and 'whole of society' approach in zoonoses prevention and control: Zoonoses has a deep link with poverty and marginalised communities. There is need to go beyond animal and human health sectors by involving other agencies and departments like education and by working more closely with all people dealing directly/indirectly with zoonoses. Risk communication of disease is at a nascent stage in terms of IEC and there is need to look beyond traditional ways of communication to understand risks involved.

"Road map suggested during international conference on Avian Influenza, 2007 can be referred to for developing white paper on One Health approach. Existing committees on human and veterinary health can be merged into one, with influence across levels."

Dr. SK Satpathy, Policy Development Initiative and Octavo Solutions

2.1.5 One Health Capacity Building in India: Experience Sharing by Select Members of MVH/MPH Community in India

Dr. P. Ravindaran, Director, Emergency Relief, DGHS: As part of Ministry of Health was assigned the task of managing the SARS and avian influenza outbreaks. He interfaced with animal health professionals who understood the different issues of public health, particularly zoonoses. Post 2007, there were numerous outbreaks of zoonotic diseases, creating

"During a research project on Bovine brucellosis, effort was made to look for collaborators from human health side. Many were contacted but none agreed to join. It was only through Massey University's network that relevant professionals were identified and motivated to come on board."

Dr. Premanshu Dandpat, IVRI

critical need for collaboration between human health and animal health side. During this phase, Massey University-World Bank MPH/ MVM project was initiated. It led to more interaction by providing forums for sharing knowledge and experience. Close and prompt interfacing was possible between sectors, contributing to better and speedier management of outbreaks, in a way that bypassed red tape. Much of this was attributed to the MVM/MPH course.

Dr. Premanshu Dandpat, IVRI: The One Health concept materialised post the AI outbreak which brought together the three ministries of animal husbandry, human health and environment and forest. However, the concept remained limited to AI and could not be extended to other diseases. The Massey University programme brought together animal and human health and fostered collaboration between them. During Phase 2 of the programme, opportunities to work on Rabies and Brucellosis presented themselves. While conceptualising these projects, he received the assistance and help from relevant stakeholders but the project could not be implemented owing to administrative systems and issues. The experience brought out the challenges and constraints faced in implementing such projects.

Dr. Shashi Khare, Head of Microbiology and Additional Director, NCDC: She concurred that there are many lessons to be learnt when agencies come together to contain an outbreak. AI, for instance turned out to be an excellent example of advocacy and coordination between human and animal health sides. Telephonic exchange of information took place in both technical and logistical aspects between the two sides. Both sectors made contingency plans and ensured these were synchronised. A multisectoral approach was adopted through involvement of Civil Aviation Ministry and Airport Health Officer to get reagents, materials and shipments. Risk communication was done through Ministry of Communication and training of personnel was conducted in animal health and human health side. Also, the quality assurance programme was implemented in the laboratories. These were significant steps that made efforts in the post epidemic outbreak period, more manageable.

Dr. Tarasankar Pan, Deputy Director, Department of Animal Resource Development, West Bengal: The MVM/MPH course provided excellent opportunity to interact with a diverse group of health professionals from the two sectors. Through the sharings and interactions, insights were obtained on different on-the-ground experiences, the strategies that were adopted and the results that emanated. These provided additional insights into identification of diseases and epidemiology, as also ideas on how to set up a platform where this knowledge could be applied.

Dr. Arvind Nath, ICMR: The programme offered a new and refreshing approach from the traditional classroom method and provided a unique opportunity to all participations to interact in real time with colleagues from neighbouring countries. Useful veterinary literature was accessed and discussed, which otherwise would not have been possible through the usual PubMed searches.

Dr. Shivraj Vasavraj Morad, Scientiest, Institute of Animal Health and Veterinary Biologicals, Karnataka: The course led to capacity building of various professionals. It was important for them to further build capacities of their subordinates across levels and extend it to other diseases. The programme brought professionals of human and animal health from different countries on a common platform leading to better understanding of priority diseases. For example, Rabies is important for human health but Brucellosis might take an upper hand since more animals are affected by it.

"State-level zoonotic committees be formed to transfer acquired knowledge to states while finding ways of promoting collaboration between animal and human health sides."

Dr. Tarasankar Pan, Department of Animal Resource Development

Session Summary

The key issues highlighted included upscaling, outscaling and refining the concept of One Health. It must define it and create a boundary in a way that makes an average clinician understand that animal health is important. It should also outline ways in which the message is sent across the human and medical community. Linking animal and human health as also adopting One Health approaches to ensure this happens within the context of each of the participating countries will be of vital importance.

Already, there are many committees and bodies in place for zoonoses. It would be useful to build on existing structures rather than create new ones. However, activities that need to be taken up by human and animal health side - separately and together, can be further identified.

Some initiatives in One Health have already been taken up and will be carried forward by emphasising and developing models on PPP, communication, surveillance, strengthening of security measures and cross-border transmission of diseases. India's infrastructure capacity in the veterinary sector, though requiring large investments in its current state is in a position to offer resources that can be pooled to combat zoonotic diseases through the One Health approach. These need to be encouraged and strengthened.

Making important decisions on priority diseases through collaborative process between human and animal health professionals was a key component of the programme. Application of knowledge, online training and adopting multidisciplinary approach were winning features. A platform has been created and onus is now on health professionals to utilise it to improve control and prevention of zoonotic disease in their countries."

Dr. Shivraj Vasavraj Murag, Institute of Animal Health and Veterinary Biologicals

2.2 Session 2

The Session was chaired by Dr. P Ravindran, Director (EMR) and Dr. Hans Raj Khanna, Assistant Commissioner (LH), DADF. Dr. Eric Neumann outlined the concept of Hubnet and gave a demonstration on its functionalities. This was followed by a panel discussion and interaction.

2.2.1 Hubnet as an Online Network, Communication and Collaboration for SAR One Health Network: Concept and Progress and Demonstration of Hubnet

Professor Eric Neumann provided an overview of the process and experience that preceded culmination of Phase 2 into Hubnet. Also, more specifically about One Heath Hubs, how they are a component of the larger South Asia Regional One Health Network (SAR OHN), One Health Hubnet online infrastructure, its capabilities and features were described. Phase 2 of the programme focused on One Health Hubs and on making them live and visible while helping build a Hubnet online communication and collaboration tool. The Hubnet infrastructure is currently going through the third round of iterations. It will further continue to evolve before reaching a stage where it can be handed over to an interested and responsible party who would manage it on behalf of the region. To understand the concept fully, it is important to distinguish One Health Hubs from One Health South Asia Network and Hubnet, each of which although related, have different functions.

One Health Hubs	One Health South Asia Network (www.hubnet.asia)	Hubnet
It concerns people, connects them and comprises of them	Country Hubs in each of the seven countries are part of the larger One Health Network South Asia	Is a flexible infrastructure with scope to incorporate new need-based functionalities and features, like display of a particular resource in a particular format
Brings value to them and dips into their resources to further add value to its infrastructure	Each Hub is managed differently so that it is useful in the specific context of the country. Functioning of these Hubs is not dictated by World Bank or Massey University	Helps make the invisible, visible, serving as a glue that holds One Health Hubs and SAR One Health Network together
The moment it ceases to be of use to them, it will die a natural death	The Hubs are professional networks of animal, health and environmental health experts. They are linked informally through people and informally through Hubnet	Is operationalised through online features that enable working across boundaries/ sectors/disciplines/ organisations (extension and research)/districts and provinces/ countries/globally

Table 2: Hubnet as an Online Network

Figure 6: One Health Hub Architecture

"Emerging zoonoses must be managed using intersectoral response. Areas of concern include having an evidence-based policy framework on One Health; develop capacity building at various levels for training; create platforms for networking and providing forum for sharing information and exchange of experiences; look for opportunities to mainstream One Health into formal programmes. The real challenge is to back these efforts by actions."

Dr. J.P Narain, NCDC

Operationalising the Hubs

Hubs are underpinned by an online communication and resource-sharing platform called 'Hubnet.' These Hubs are supported by Hubnet which is a tool/online structure. Designed as a powerful web-based collaboration system, it allows geographically widespread people to work on projects collaboratively, helping them access resources and exchange ideas, consult experts and information sources and communicate with people within and outside a project. Hubnet has a detailed and exquisite permission structure that enables people to securely surround themselves in a collaborative environment with tight control on who comes in and what s/he can see/publish. Currently, with a highly authoritative permission structure to publish through designated focal points, these Hubs are up and running in the seven

Initially people could be given deep access to provide users plentiful exposure to various aspects and features of the Hub and South Asia network to enable them find value and utility in the Hub. Another reason for promoting wider access is the fact that currently the Hub does not house any critical or secret information. Later when it does, it would be made more secure and membership too would be restructured, scrutinised and controlled.

implementation countries. They have sought permission of their respective government ministries to work within a permissive environment.

Distinguishing Features of Hubs

- Building a community of people who allow 'groups' or 'projects' to be organised securely for collaboration and communication
- Support and strengthen existing government systems and networks
- Provide an Operational Framework within each country
- Function as Coordination Centres for people and organisations working on One Health activities
- Link Massey University with other global institutions

Strong Collaborative Features

The two sides of Hubnet include the backend and frontend. Its utility is through a communication device at the frontend and collaboration device at backend. Distinctive features of Hubnet that were appreciated by users include the convenient registration and login process; using Hubnet for communication and collaboration; allowing user to enter his/her professional profile; outlining way to share documents; and guiding on writing/editing documents 'as a group'.

Role and Responsibility of Focal Points

- Get in touch with the person and collect details, ensuring s/he is credible with honest reasons to be part of the Hub
- Give preliminary permission to see home page of the Hub and South Asia network but not inside pages like resources and database
- Restrict membership to the South Asia network and not the country Hub
- Decide whether to provide deep or superficial access to a person
- Have the authority to set up projects that allow not just viewing information but also sharing and publishing
- Designate an administrator to manage different functionalities. Get the Administrator of the Hub to follow a simple and structured process, built as per individual country requirements. Massey University will support these administrative functions for another three years

Hubs Operating in the South Asia Network

Figure 7 shows how Hubs are operating in a larger South Asia network, collaborating with other countries on different projects through the Hubnet tool. Therefore, through Hubnet, thousands of people can be brought

collaboratively together and given additional permission to collaborate, share files, use community resources and publish information. The collaboration could reside entirely within a country or there could be projects which could reside partially in a country's Hub. Hubnet gives people permission to collaborate, communicate and publish information to other out-groups but an independent group of people who intend to do a project cannot be part of the Hubnet unless as members they belong to a particular country Hub.

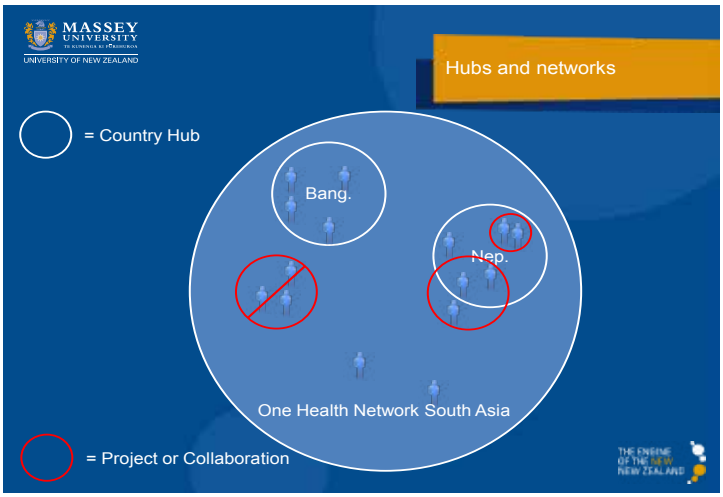

Figure 7: Hubs and Hubnet

Figure 8: Country Hubs on SAR Network

One Health Hub in India

The One Health Hub in India which is part of SAR OH network is linked to other country Hubs in the region. It is proposed to be locally owned and controlled. New Hub participants can be included in the India One Health Hub and SAR OHN. This would increase size of the network without surrendering any of the privileges of the Hub. To further develop the platform, feedback would be sought about what kind of features and functionalities are required by the Indian community.

Ministerial endorsement of the Hub is important to ensure proper functioning and sustainability of the Hub. With core ministries as founding organisations efforts must be made to engage with them and secure their permission to participate in the virtual online structure in the India One Health Hub. PHFI has been chosen as a partner since it has a group of professionals who are well connected and efficient, operating as they are, within a public private partnership paradigm. In the coming months, PHFI under the guidance of the Ministries of Health & Agriculture will collate information on different organisational aspects of the Hubs together, including lists of graduates from Phase 1 of the project, organisations dealing with zoonoses and One Health issues in India, focal points to manage the hub, operational rules and membership.

Making Hubnet User-friendly and Enabling People to Embrace its Technology

There are numerous advantages of taking membership on the Hub in terms of accessing information through blogs, Promed mails, WHO, OIE website etc. The Hubnet would have resources and database of the region in a format which is convenient and easy to use by the first quarter of 2014. With strong demand for access to scientific literature, people in technical institutions will be able to access Pubmet for full-length publications.

Hubnet is a well-controlled permissive environment that tracks web IP addresses and identity of users giving publishers and libraries the security to share their resources. List of resources, such as list of laboratories conducting tests for a particular disease and their contact numbers and addresses could be uploaded. Users can then search for them at one place instead of searching on Google amidst a plethora of links, wading through a lot of information that is not of use to them.

People resources on Hubnet involves compilation and consolidation of information on those who register like their names, professional background, organisations they work for, e-mail ids and contact addresses. Uploading detailed information about oneself would lead to greater visibility, allowing other stakeholders to connect easily. The entire site is searchable. For instance, if one searches for a particular term like CCHF, all events, meetings, discussions, people, resources related to CCHF would pop up. The networking structure encourages and supports communication and access to resources. The Hubnet has potential to emerge as a common interest that can help in adoption of a One Health approach between disciplines and sectors.

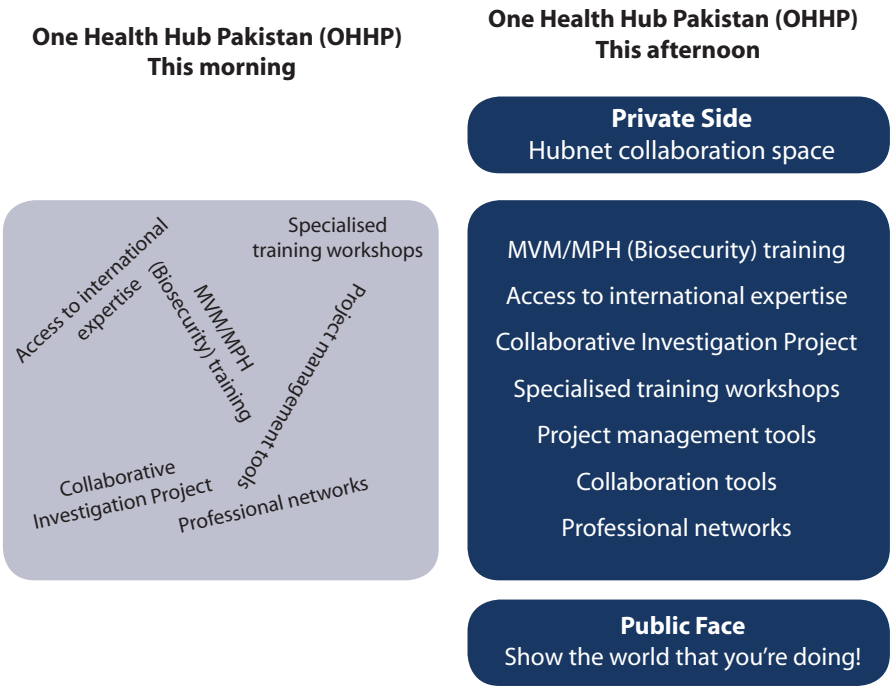

Figure 9: The Evolution of Hubnet in Pakistan

Challenges and Lessons Learnt

Variation was observed in operationalising Phase II of the initiative in the seven countries of the South Asia region. Whereas countries such as Bangladesh with existing strong One Health movement were early adopters, others took longer. Some of the reasons why these countries took a little longer varied from time taken for administrative approvals or for want of emergence of consensus on the nature, structure and confidentiality issues related to One Health hub in the individual country. While the alumni as well as country technical leadership in all countries have considerable enthusiasm for adopting the One Health approach, those countries where the CIPs could be operationalised will be able to give a greater push to the institutionalisation of One Health. In much the same way, other countries too will then be motivated to follow suit.

Country Hubs are connected to form a 'One Health Network South Asia'. Founded by people from member organisations acting as controlling bodies for the Hub, India is currently deliberating on the operationalisation of India One Health Hub. Next steps could be the process of responsibility to house people on the Hub and thereafter control, monitor and designate a person from the public health or animal health department to undertake this responsibility.

"Consider sending out periodic mails every six months to all members of India Hub, mentioning that if they are alive on Hubnet and using it regularly, they would have to click on a link. This way registration details would get updated and inactive users pushed out. Hubnet's features would ensure automated mails are sent to users and Massey University can help Indian counterparts with technical solutions once operating rules are finalised."

Prof. Eric Neumann, Massey University

"PHFI will seek approval of ministries of health and animal husbandry on databases created by them. Listserv of its quarterly E newsletter will be made available and membership databases of professional associations accessed to invite members to the Hub. These lists will be collated so they become compatible with One Health Hub structure."

Dr. Manish Kakkar, RCZI/PHFI

Sharing & Discussions

Institutions as members of Hubnet: Currently, membership of the Hub is open to individuals but not institutions, for it fundamentally comprises of a group of individuals and towards that end, membership has to be through an individual ID.

Member countries to manage their own Hubnets: Every country must effectively set up its own structure, in terms of how much authority it wishes to vest in focal points because when they let someone into Hubnet or set up a project on it, the onus would be on them to decide on the nature of information that is going to be uploaded. Massey University's strategy to link with ministries in this initiative from the beginning has provided the platform responsibility for identification and assignment of credible and competent persons in ministries to control information. India is still in the early stages of deliberating on the operationalisation of the India One Health Hub.

Managing security issues: Countries can and must develop their own rules of engagement on how to manage people, an often encountered problem in all virtual environments, to address ways by which a user would disclose his/her change of job/professional status.

Verifying authenticity of information on Hubnet: Since Hubnet is a collection of people including technical personnel, they upload and publish data and information based on their work. This information is accessed by others in their scientific endeavours. Each country has its own special reasons for using Hubnet and therefore, must decide on the level of control they would want to exercise on its use. For example, when rules of engagement in Hubnet are established in India, it is possible that focal points in the country may decide to control everything that is published on it. This would ensure a permissive environment but at the same time also control what is being published. To that extent, Hubnet is a flexible technology.

Massey University is planning to roll out a version of Hubnet by rebranding it as a university site, using it within its university environment to house projects, collaborate between projects and share information with sponsors.

PHFI's role in managing Hubnet: PHFI will play a facilitator's role in setting up the India One Hub and its integration into the SAR Network. Towards that end, PHFI is responsible for collating as many databases of individuals and institutions available on One Health. For example, list of participants of the One Health symposium which features people related to One Health will be made available by PHFI on the Hubnet. Currently, Hubnet is managed by Massey University and its management in India would be decided by key ministries. PHFI would help and facilitate the process of making these decisions by the

ministries and also do the background organisational work to put up the Hub and keep it running. Where content moderation is concerned, existing bodies can come together to form a joint panel that has an equal representation of human and veterinary health.

Hubnet in India: Question of institutional membership on Hubnet would be critical, as also putting up a list of institutions and people, bringing forward issues of approval that specify institutions related to One Health. Ministries would have to provide information and operating rules. The challenge would also be to make technical information easily available to all public health professionals in the country. Information is not readily available to junior staff and field level workers often lack access, especially to information about ministries and their work/schemes etc.

Hence, as in case of other countries and settings, India One Health Hub can make a modest and simple start by getting relevant people's name and professional details and aggregating them in a single spot. Subsequently, to reach out to people from human and animal health performing diverse functions within their sectors, additional functionalities and features such as news items, a public face, value adds such as CD Alert for members and viewers can be added in a step-wise manner. Activities that require engagement with a wider audience could be encouraged on Hubnet, even at the beginning to sustain engagement.

One of the concerns of Massey University, World Bank and countries involved in managing, controlling and reinvesting in the Hubnet, relates to developing it as a resource or community asset and taking it forward. Massey University is thus committed to getting the technology forward and transferred in the region, enabling countries to own, use and sustain it.

"It is suggested that ICMR or Council of Scientific and Industrial Research which is already doing networking and surveys, be roped in to administer Hubnet. ICMR has a publication and bioinformatics division that can look into this."

Dr. Arvind Nath, ICMR

2.3 Recommendations and Way Forward

There was consensus on the view that the One Health Hub is about people and for people. It has a utility and very specific mandate which through its initial work has already got established and found support at national as well as regional level. Going forward, it would be important to explore how to make the Hubs viable as a collective, professional platform for health professionals to come together, share information, connect and collaborate with each other.

2.3.1. Recommendations for creating an implementation platform that can function effectively in support of One Health initiatives in India

The key recommendations emerging from the discussions, suggestions and feedback of the participants during the symposium were as follows:

- Critical need to graduate from conceptual clarity and understanding of One Health approach to formulate a strategy and workable model for implementation of One Health activities in India
- Imperative to build a business case to adopt One Health approach to zoonoses in India in order to get buy-in from relevant ministries and sectors
- Moot for intersectoral collaboration for prevention and control of zoonoses among various sectors, specifically human health, animal health and environmental health
- Utilise existing mechanisms to promote One Health approach to zoonoses in India viz. National Standing Committee on Zoonoses, State Committees on Zoonoses, Integrated Disease Surveillance Programme and National Animal Disease Reporting System (NADRES) amongst others
- Extend intersectoral collaboration beyond disease specific programmes and responses to all zoonotic diseases of public health importance in India

- Collate and compile available data and literature on zoonoses in India to estimate disease burden and prioritisation of zoonotic diseases in India
- Develop an online platform to exchange information, ideas and experiences of prevention and control of zoonoses across the country and South Asia region

2.3.2 Recommendation for strengthening One Health network in the South Asian regional context

Meeting of the Drafting Committee was held to review recommendations for strengthening One Health initiatives in India, summarise issues and draft resolutions to bring forward to SAR Regional One Health Symposium with the goal of strengthening One Health network from a regional perspective. Members of the Committee included Dr. P Ravindran, Dr. Eric Neumann, Dr. R Bambal, Dr. HR Khanna, Dr. Arvind Nath, Dr. Shashi Khare and Dr. Manish Kakkar. Draft resolutions that were taken by the group were as follows:

Need for an evidence-based policy framework to:

- Estimate disease burden
- Strengthen intersectoral approach
- Generate evidence at micro and macro levels

Use existing data where available to:

- Ensure systematic reviews of available information on priority zoonoses
- Generate available information (especially in case of non-availability of scientific data) for formulating policy recommendations
- Collate data for priority diseases to inform decision making
- Build national and sub-national One health capacity (Relevant ministries, institutions, laboratories and other stakeholder bodies) around multiple areas (training, logistics, infrastructure, etc)

Create advocacy for One Health approach to:

- Promote awareness on One Health
- Create material on risk communication
- Develop a 'whole of society' approach

Strengthen networking and provide a forum to share information, knowledge and experiences on the interface between animal health, human health and environmental health

- Establish a strategic research agenda for One Health
- Develop a web portal to share information and collaborate for zoonoses prevention and control; Hubnet is a promising and 'viable' platform to serve this function
- Reach out to relevant experts, impressing upon them the efficacy of the One Health Hub and enrol and utilise the same

2.4 Conclusion and Next Steps

Some of the issues that were highlighted include ensuring institutional membership for the Hub and creating secure and authentic data. Towards this end, the data Bioinformatics division of ICMR and CSIR could help in content moderation. Dr. Hans Raj Khanna reiterated that participants of Hubnet needed to take responsibility for publishing information on the Hubnet, but in a responsible manner and in line with accepted norms for the country.

According to Dr. P Ravindran, Massey University through the MVH/MPH programme in India helped bring together health professionals and the government sector in creating a rigorous study programme that was of immense use and relevance to the human and animal health trainees. The opportunity provided by Massey via Hubnet is something to build upon. The bottlenecks in smooth transitioning into Phase 2 of the programme should thus be ironed out in the coming months.

Next Steps

The India One Health Symposium identified the following definite next steps. First, present the recommendations and resolutions from the Symposium at the Bhutan SAR symposium held from December 2-6, 2013 to provide country perspective and align national priorities with goals for One Health strengthening in SAR. Second, step up efforts to establish and operationalise an India One Health Hub in order to consolidate the achievements from the Massey University capacity building programme and build upon the successes. Finally, it was suggested that strategies and mechanisms be identified and institutionalised to strengthen the One Health approach in India and to do this, key stakeholders to come together by pooling in their resources and expertise.

Annexures

Annexure 1: List of participants

A. Human health

Name	Position, Organisation	Country
Professor Ramanan Laxminarayan	Vice President, Public Health Foundation of India, New Delhi	India
Dr. Sanjay Chaturvedi	Professor, Dept of Community Medicine, University College of Medical Sciences	India
Dr. Ritu Singh Chauhan	National Professional Officer-Microbiology, World Health Organization India Office	India
Dr. Manish Kakkar	Senior Public Health Specialist, Public Health Foundation of India, New Delhi	India
Dr. Syed Abbas	Senior Research Associate, Public Health Foundation of India, New Delhi	India
Dr. Shashi Khare	Consultant , Division of Microbiology, Ministry of Health	India
Dr. Anil Kumar	Additional Director, National Centre for Disease Control	India
Dr. Sanjay Kumar	Airport Health Officer, Ministry of Health Family & Welfare	India
Dr. Alok Mathur	Chief Medical Officer, Directorate General of Health Services	India
Dr. Veena Mittal	Head, Zoonoses Division, National Centre for Disease Control	India
Dr. J P Narain	Advisor, Epidemiology & Epidemic Intelligence Service, National Centre for Disease Control	India
Dr. Arvind Nath	Programme Officer, Indian Council of Medical Research	India
Dr. Palliri Ravindran	Director, Emergency Medical Relief, Directorate General Of Health Services	India
Dr. SK Satpathy	Advisor. Policy Development Initiative & Octavo Solutions	India
Dr. Charan Singh	Addl Director (Public Health), Department of Health & Family Welfare	India
Dr. Jagvir Singh	Additional Director, National Centre for Disease Control	India
Dr. Leimapokpam Swasticharan	CMO, Emergency Medical Relief, Directorate General o f Health Services	India

B. Animal health

Name	Position, Organisation	Country
Dr. Premanshu Dandapat	Senior Scientist, Indian Veterinary Research Institute	India
Dr. Ram Deka	Scientist - Livestock & Livelihoods, International Livestock Research Institute	India
Dr. JPS Gill	Director, School of Public Health &Zoonoses, Guru AngadDev Veterinary and Animal Sciences University	India
Dr. Jeff Glbert	Livestock Coordinator-ZEID Project, International Livestock Research Institute	Kenya
Dr. Delia Grace	Program Leader, Food Safety and Zoonoses, Integrated Sciences, International Livestock Research Institute	Kenya
Dr. Eric Neumann	Associate Professor Eric Neumann, One Health Programme Director, Institute of Veterinary, Animal and Biomedical Sciences, Massey University	New Zealand
Dr. Ashok Kumar	Principal Scientist & Head (Veterinary Public Health), Indian Veterinary Research Institute	India
Dr. PK Malik	Head, Department of Wild Life Health, Wildlife Institute of India	India
Dr. John McDermott	Director, CGIAR Research Program – Agriculture for nutrition and health , International Food Policy Research Institute	USA
Dr. Purvi Mehta	Head- Asia Region, International Livestock Research Institute	India
Dr. Shivaraj Basavaraj Murag	Scientist, Institute of Animal Health & Veterinary Biologicals	India
Dr. Vasudha Nair	Veterinarian, Institute of Biological Products	India
Dr. Tara Sankar Pan	Deputy Director, Animal Resource Development Department, Government of West Bengal	India
Dr. Shailesh D Pawar	Scienties 'C', Avian Influenza Group, National Insititute of Virology	India
Dr. Suresh Suryavanshi	Deputy Commissioner A.H.(Animal Disease Surveillance), Western Regional Disease Diagnostic Laboratory, Directorate of Animal Husbandry	India
Dr. Hansraj Khanna	Assistant Commissioner, Dept of Animal Husbandry	India
Dr. Lipi Kasleshwari	Livestock officer, Dept of Animal Husbandry	India
Dr. Fred Unger	International Livestock Research Institute	Nairobi
Ms. Johanna Lindahl	FSZ, Researcher, International Livestock Research Institute	Nairobi
Dr. M R Gajendragad	Principal Scientist (Epidemiology), PD-ADMAS	India
Dr. Vijay Ingle	Associate Professor, Nagpur Veterinary College	India
Dr. Hans Raj Khanna	Assistant Commissioner, Ministry of Agriculture	India
Dr. D D Kulkarni	Joint Director, High Security Animal Diseases Laboratory	India

Annexure 2: List of speakers

Name	Position, Organisation	Country
Delia Grace	Programme Manager, CGIAR Research Programme on Agriculture for nutrition and health, International Livestock Research Institute	Nairobi, Kenya
Dr. Eric Neumann	Associate Professor Eric Neumann, One Health Programme Director, Institute of Veterinary, Animal and Biomedical Sciences, Massey University	New Zealand
Dr. Veena Mittal	Addl Director at National Centre for Disease Control	India
Dr. Hans Raj Khanna	Assistant Commissioner, Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture	India
Alumni of Massey – World Bank, capacity building programme; MVH/MPH community members		
Dr. P. Ravindran	Director, Emergency Relief, DGHS	India
Dr. Arvind Nath	Scientist, ICMR	India
Dr. Pramanshu Dandpat	Senior Scientist, Indian Veterinary Research Institute, West Bengal	India
Dr. Shashi Khare	Additional Director, NCDC	India
Dr. Tarasankar Pan	Deputy Director, Department of Animal Resource Development, West Bengal	India
Dr. Shivraj Vasavraj Murag	Scientist, Institute of Animal Health and Veterinary Biologicals, Karnataka	India

Annexure 3: Symposium Programme

Start time	Topic	Speaker
9:00 – 9: 10	Welcome	Massey University & PHFI
Session 1: Chair: Dr. Jai Prakash Narain, GDD Centre (India) & Prof. Ramanan Laxminarayan, Vice President, PHFI		
0910 – 0950	One Health approaches: Genesis, implementation and best practices	Delia Grace, ILRI
0950 – 1030	One-health activities for building institutional capability across SAR through the World Bank/ Massey University managed project (2010-2013)	Dr. Eric Neumann, Massey University
1030 – 1100	***Morning tea***	
1100 – 1140	Current status of zoonoses in India	Dr. Veena Mittal, NCDC
1140 – 1220	Significant zoonotic disease in India: Recent events, Experiences, Lessons learnt & Framework for collaboration	Dr. Hans Raj Khanna, DADF
1220 – 1300	One-health capacity building in India: Experience sharing by select members of *MVH/MPH* community in India	*MVM/MPH* community in India
1300 – 1400	***Lunch***	
Session 2: Chairs: Dr. P Ravindran, Director (EMR) & Dr. Hans Raj Khanna, Asst. Commissioner (LH), DADF		
1400 – 1430	Hubnet as an online network, communication and collaborationtool for the SAR One Health Network: Concept and Progress	Dr. Eric Neumann, Massey University
1430 – 1530	Demonstration of Hubnet	Dr. Eric Neumann, Massey University
1530 – 1600	Panel discussion, Q&A.	
1600 – 1605	Vote of Thanks and Dispersal	All
1615 – 1700	Drafting committee to meet and summarize issues and resolutions to bring forward to SAR Regional One Health Symposium.	**Members**: Dr. P Ravindran, Dr. Eric Neumann, Dr. Arvind Nath, Dr. Shashi Khare, Dr. Hans Raj Khanna, Dr. Manish Kakkar

Public Health Foundation of India

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