Volume No. 1 Issue No. 7 September 2011

One World One Health

Veterinary Bulletin - Agriculture, Fisheries and Conservation Department Newsletter

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I. Introduction

One Health: A Paradigm Shift（思考模式轉移）

The One Health idea is an example of a paradigm shift. It is a paradigm shift in the way we think about human and animal health in the world. A paradigm shift is a change from one way of thinking to another. This change of thinking can be due to many reasons such as technological, environmental or political developments to give a few examples.

A paradigm shift is a revolution, a transformation or a metamorphosis（生物形態的轉化或脫變）, usually driven by agents of change. The agents of change giving rise to One Health are represented in the diagram below. They are a complex set of multifactorial circumstances such as population growth, changes in nutritional, agricultural and trade practices, globalization, shifts in land use, accelerated urbanization, deforestation, encroachment（侵佔）on wildlife and climate change.

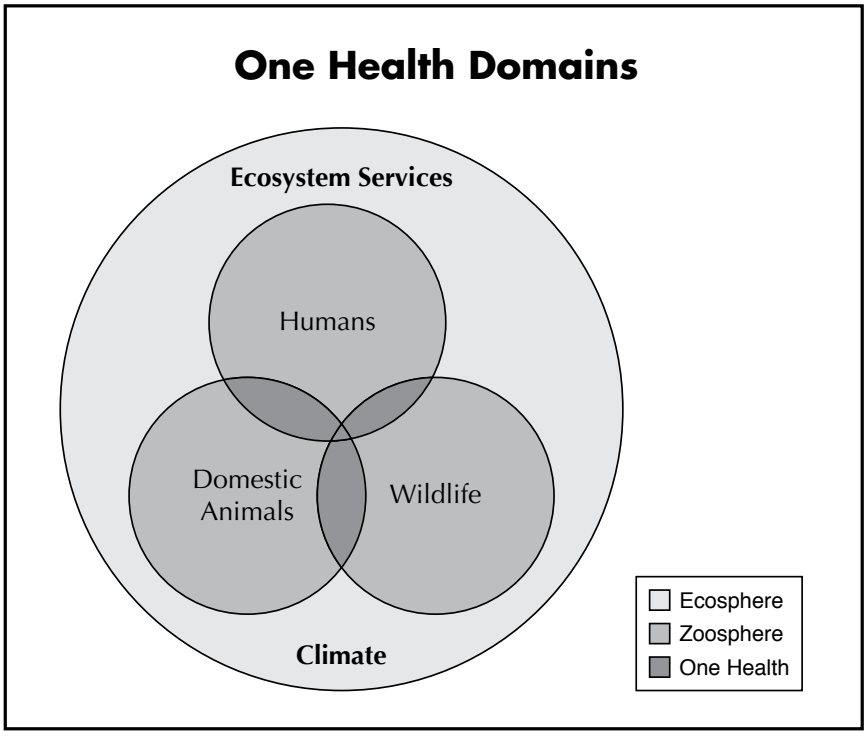


Diagram: One Health Domains[a]

One way to understand One Health is to think carefully what it is not. It is not a single institution: it is many institutions and many individuals. A rulebook does not govern its ideas and ways of working. It has no set of laws: it has many concepts, which are formed by consensual agreement by all the relevant "actors" (see below). It is not about one disease or a few main listed diseases: it concerns all human and animal diseases and all related ecologies. It is not owned by anyone: all are welcome to contribute if they can help the One Health aims.

II. The Ideology of One Health

One Health is a modern global movement to promote collaborative efforts between different health related professionals, including medical doctors, veterinarians and many other scientific, health, environmental and other related disciplines. Although there is not an agreed One Health definition, a useful one is; "the collaborative effort of multiple disciplines working locally, nationally, and globally to attain optimal health for people, animals and our environment". [1]

Photo: This image depicted sanitary procedures being practiced in a Kikwit, Zaire clinic during the country's 1995 Ebola outbreak. (Source: Public Health Image Library of CDC)

Photo: Chest X ray of patient with SARS showing Lung opacities (Source: Wikipedia)

Photo: BSE issues. Protests in South Korea against imports of US beef. (Source: Photo by hojusaram)

Although government and powerful international institutions are actively involved, it is not an imperative movement, ordering people to respond. Instead it works mainly through collaboration and agreed goals of the players: this is now termed 'soft government'. One of the best ways to understand the thinking behind One Health is to read the Manhattan Principles. (See Box 1 on page 3).

The driving intellectual force for this ideology（意識形態）can be found in the following opening and closing statements made at that meeting in Manhattan:

"Recent outbreaks of West Nile Virus（西尼羅河病毒）(WNV), Ebola Hemorrhagic Fever(伊波拉病毒出血熱), *Severe Acute Respiratory Syndrome (SARS)*（嚴重急性呼吸道症候群), *Monkey pox*（猴痘病), *Mad Cow Disease*（瘋牛病）*and Avian Influenza remind us that human and animal health are intimately connected.*

A broader understanding of health and disease demands a unity of approach achievable only through a consilience of human, domestic animal and wildlife health - One Health. Phenomena such as species loss, habitat degradation, pollution, invasive alien species, and global climate change are fundamentally altering life on our planet from terrestrial wilderness and ocean depths to the most densely populated cities.

The rise of emerging and resurging infectious diseases threatens not only humans (and their food supplies and economies), but also the fauna and flora comprising the critically needed biodiversity that supports the living infrastructure of our world.

The earnestness and effectiveness of humankind's environmental stewardship（管理工作）*and our future health have never been more clearly linked.*

To win the disease battles of the 21st Century while ensuring the biological integrity of the Earth for future generations requires interdisciplinary and cross-sectoral approaches to disease prevention,

surveillance, monitoring, control and mitigation as well as to environmental conservation more broadly."

"It is clear that no one discipline or sector of society has enough knowledge and resources to prevent the emergence or resurgence（再現）of diseases in today's globalized world. No one nation can reverse the patterns of habitat loss and extinction that continue to undermine the health of people and animals. Only by breaking down the barriers among agencies, individuals, specialties and sectors can we unleash the innovation and expertise needed to meet the many serious challenges to the health of people, domestic animals, and wildlife and to the integrity of ecosystems. Solving today's threats and tomorrow's problems cannot be accomplished with yesterday's approaches. We are in an era of One World, One Health and we must devise adaptive, forward-looking and multidisciplinary solutions to the challenges that undoubtedly lie ahead." [(2)]

Box 1: The Manhattan Principles

We urge the world's leaders, civil society, the global health community and institutions of science to:

1. Recognize the essential link between human, domestic animal and wildlife health and the threat disease poses to people, their food supplies and economies, and the biodiversity essential to maintaining the healthy environments and functioning ecosystems we all require.

2. Recognize that decisions regarding land and water use have real implications for health. Alterations in the resilience of ecosystems and shifts in patterns of disease emergence and spread manifest themselves when we fail to recognize this relationship.

3. Include wildlife health science as an essential component of global disease prevention, surveillance, monitoring, control and mitigation.

4. Recognize that public health programs can greatly contribute to conservation efforts.

5. Devise adaptive, holistic and forward-looking approaches to the prevention, surveillance, monitoring, control and mitigation of emerging and resurging diseases that take the complex interconnections among species into full account.

6. Seek opportunities to fully integrate biodiversity conservation perspectives and human needs (including those related to domestic animal health) when developing solutions to infectious disease threats.

7. Reduce the demand for and better regulate the international live wildlife and bush meat trade not only to protect wildlife populations but also to lessen the risks of disease movement, cross-species transmission, and the development of novel pathogen-host relationships. The costs of this worldwide trade in terms of impacts on public health, agriculture and conservation are enormous, and the global community must address this trade as the real threat it is to global socio-economic security.

8. Restrict the mass culling of free-ranging wildlife species for disease control to situations where there is a multidisciplinary, international scientific consensus that a wildlife population poses an urgent, significant threat to public health, food security, or wildlife health more broadly.

9. Increase investment in the global human and animal health infrastructure commensurate with the serious nature of emerging and resurging disease threats to people, domestic animals and wildlife. Enhanced capacity for global human and animal health surveillance and for clear, timely information-sharing (that takes language barriers into account) can only help improve coordination of responses among governmental and non-governmental agencies, public and animal health institutions, vaccine or pharmaceutical manufacturers, and other stakeholders.

10. Form collaborative relationships among governments, local people, and the private and public (i.e. non-profit) sectors to meet the challenges of global health and biodiversity conservation.

11. Provide adequate resources and support for global wildlife health surveillance networks that exchange disease information with the public health and agricultural animal health communities as part of early warning systems for the emergence and resurgence of disease threats.

12. Invest in educating and raising awareness among the world's people and in influencing the policy process to increase recognition that we must better understand the relationships between health and ecosystem integrity to succeed in improving prospects for a healthier planet.

III. The Actors in One Health [3]

The International Organizations

An alliance of a few international organizations including the Food and Agriculture Organization (FAO), World Organisation for Animal Health (OIE), World Health Organization (WHO), World Bank, United Nations System Influenza Coordination (UNSIC), etc. has mobilized to develop One Health. In doing so they have tried to build upon the global governance that emerged throughout the fight against avian influenza. The alliance, aside from its core centre, remains very flexible and shifting, as inner alliances within the main group continue to redefine or refocus One Health. This flexible and "soft" or non-rigid approach is characteristic of One Health. The World Bank is also involved as an organization that pushes for the implementation of One Health: its most important recent statements and action were at the Stone Mountain meeting (see The History of One Health). Other organizations have, in the flexible nature of One Health, different involvements e.g. United Nations Development Programme (UNDP), United Nations Department of Public Information (UNDPI), United Nations Educational, Scientific, and Cultural Organization (UNESCO), United Nations Environment Programme (UNEP), and United Nations Children's Fund (UNICEF).

Networks of Researchers and NGOs

Organizations that promote One Health include organizations as different as the World Small Animal Veterinary Association (WSAVA), the Federation of Veterinarians of Europe (FVE), the surveillance organization ProMED, the British Royal Society (through the concept 'One Medicine'), the US Army Medical Department, the American Society of Toxicological Pathology and others.

Public Officials of Nation States

Significant contributions to One Health come from senior public servants working in such diverse nations such as China, India, the UK, America and Australia to mention a few.

IV. The History of One Health

The Modern Era 1999 to 2011

The spark that lit the modern era of One Health was probably one observation of a veterinary surgeon. Certainly many other factors before and after this event have caused One Health to come to the fore. But this one observation marked a new era in modern animal and human disease control.

1999: West Nile Virus at the Bronx Zoo New York

In 1999, Dr Tracey MacNamara working at the Bronx zoo noted that wild crows and the zoo's exotic birds were dying in large numbers about a month or so before people in New York were getting sick. The people suffered with symptoms like flu but some also progressed to serious cases of meningitis. In both birds and mammals the cause was, 'an African virus', the West Nile Virus (WNV). The virus, previously unknown in the Americas, is known to multiply easily in birds, making birds the main reservoir of the virus. It is transmitted from bird to bird and from bird to mammal by the bites of mosquitoes. Mammals are dead end hosts and don't transmit the disease on. From 1999 through 2001, the US Center for Disease Control (CDC) confirmed 149 West Nile virus infections, including 18 human deaths. The

disease spread across the USA and in 2002, a total of 4,156 cases were reported, including 284 human fatalities. The cost of WNV-related health care in 2002 was estimated in the USA to be about $200 million. As a result of this disease and others, the CDC established the National Center for Zoonotic, Vector-borne, and Enteric Diseases, now known as the National Center for Emerging and Zoonotic Infectious Diseases.

Photo: A CDC Real One Player Information issue about West Nile Virus
(Source: Public Health Image Library of CDC)

1997 to 2003: Bird Flu in Hong Kong, China and South East Asia

If the arrival of West Nile Virus in America was the spark that lit up the modern One Health paradigm, the outbreak of "Bird Flu" in Hong Kong in 1997 and the subsequent epidemics were the fuel that spread this concept like a fire all round the world. The highly pathogenic avian influenza (HPAI) H5N1 epidemic that began in Hong Kong in 1997 forced the global community to recognize that animal health and human health are linked. The 1997 outbreak infected 18 people, killed 6, and required the culling of 1.5 million birds.

The HPAI H5N1 virus resurfaced in isolated outbreaks between 1998-2003, but a widespread outbreak occurred in mid-2003 in South Korea, it spread on through Southeast Asia and then to the rest of Asia, Africa and Europe. It continued to cause a high mortality in the few human cases that contracted the disease.

2004: The Manhattan Principals

Health experts from around the world met in New York on September 29, 2004 for a symposium focused on the current and potential movements of diseases among human, domestic

Photos: Bird suffering from avian influenza in Hong Kong

animal, and wildlife populations. This conference produced The Manhattan Principles, which lists 12 recommendations for establishing a more holistic（全面的）approach to preventing epidemic/epizootic disease and for maintaining ecosystem integrity for the benefit of humans, their domesticated animals, and the foundational biodiversity that supports us all. (See Box 1 on Page 3).

2006: The Beijing Declaration

In 2006, the aims of the strategic framework mentioned above became more concrete with the announcement of the Beijing Declaration. Here the Government of the People's Republic of China, the European Commission and the World Bank met, along with the close coordination of WHO, FAO and OIE. They organized to promote, mobilize, and help coordinate financial support from the donor community for the national, regional and global response to highly pathogenic avian influenza (HPAI) and to support efforts at all levels to prepare for a possible human influenza pandemic. The conference was attended by representatives from more than 100 countries around the world and representatives of international technical and financing agencies, organizations, the private sector and civil society. Various initiatives arising out of the 2006 Beijing Declaration have since led to a number of high level international advocacy meetings, resulting in greater collaboration of international bodies on One Health matters. (See Box 2).

Box 2: Initiatives Arising Out of the 2006 Beijing Declaration

Details and summaries of these meetings can be found on the Web at:
(http://www.cdc.gov/onehealth/meetings.html) [Ref 4].

The International Ministerial Conference on Avian and Pandemic Influenza: New Delhi, India in 2007;

The FAO-OIE-WHO Joint Technical Consultation on Avian Influenza at the Human Animal Interface: Verona, Italy in 2008;

The International Ministerial Conference on Avian Influenza: Sharm El Sheikh, Egypt in 2008;

One World, One Health: From Ideas to Action: Winnipeg, Canada, March 16-19, 2009;

Shifting from Emergency Response to Prevention of Pandemic Disease Threats at Source: Chatham House, London, UK, March 16-17, 2010;

The International Ministerial Conference on Animal and Pandemic Influenza: The Way Forward: Hanoi, Vietnam, April 19-21, 2010;

The Second FAO-OIE-WHO Joint Technical Consultation: Verona, Italy, April 27-29, 2010;

Operationalizing "One Health": A Policy Perspective – Taking Stock and Shaping an Implementation Roadmap: Atlanta, USA, May 4-6, 2010;

Infectious Disease and One Health: Vaccines and Therapeutics: Atlanta, USA, February 2, 2011;

One Flu Strategic Retreat: Castelbrando, Italy, February 1- 3, 2011

2006 to 2009: The One Health Initiative and the One Health Commission

In addition to and in tandem with the above-mentioned One Health developments, two important groupings of veterinarians, physicians and scientists gathered together in the USA between 2006 and 2009 to form the One Health Initiative and the One Health Commission respectively. [5], [6] and [7]

The One Health Initiative website has since been serving as a global repository for all news and information pertaining to One Health.

2008 The Sharm El Sheik Conference.

A thorough review of progress of the Beijing Principles occurred at an International Ministerial Conference on Avian Influenza held at Sharm El Sheikh in Egypt on October 24-26, 2008.

An important document communicating the Sharm El Sheik meeting, **"Contributing to One World, One Health. A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystems Interface"** was released at the conference. [8]

The importance of the Sharm El Sheikh meeting was the creation of six specific interlinked objectives, which were one of the first articulations of the One World One Health (OWOH) paradigm in the modern era.

In addition the Sharm El Sheik document listed a number of One World One Health, zoonotic and non-zoonotic diseases of "common interest" to all in attendance.

Another important part of the conference was the discussions of (a) the role of wildlife epidemiology in HPAI and (b) the impacts of emerging and re-emerging infectious diseases (EID).

(a) The Role of Wildlife Epidemiology in HPAI Discussed at Sharm El Sheik

Many emerging and existing infectious diseases concern the global community because of their epidemic and endemic potential and their wide-ranging socioeconomic impacts.

Some of the most recent examples of EID are Nipah virus infection in humans and animals, SARS in humans and H5N1 HPAI in domestic poultry, wild birds and humans. Other EID will emerge in the future unexpectedly and may disperse rapidly and widely. [8]

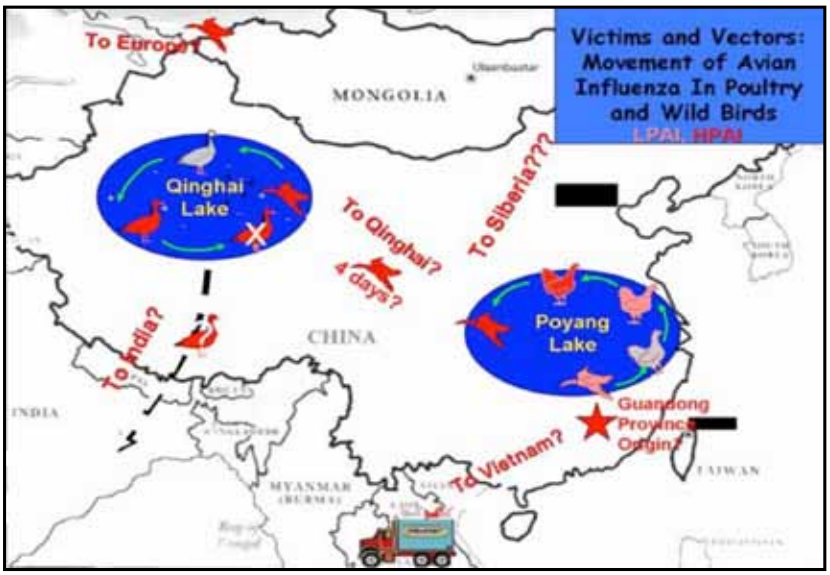


Diagram: (Source: Patuxent Wildlife Research Center, USGS, USA) [b]

(b) Impacts of Emerging and Existing Infectious Diseases (EID) also Discussed at Sharm El Sheik

In 1999, Nipah virus outbreak in Malaysia destroyed the swine industry, while the associated human fatalities simultaneously created

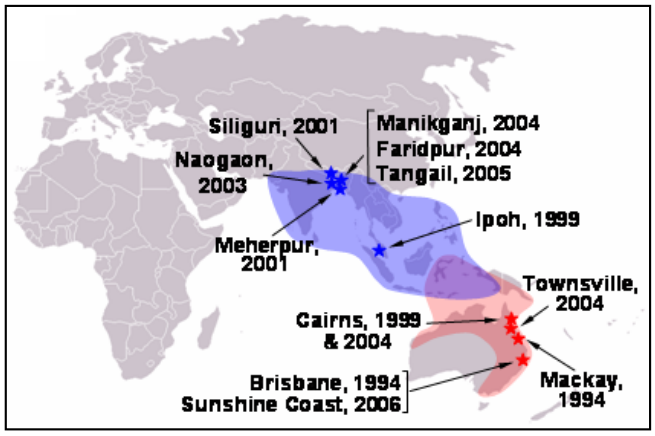


Diagram: Locations of henipaviruses outbreaks (red stars–Hendra virus; blue stars–Nipah virus) and distribution of henipaviruses flying fox reservoirs (red shading–Hendra virus; blue shading–Nipah virus): (Source from Rhys at en.wikipedia)

Photo: This image depicts a "Spectacled flying fox". The natural reservoir for Hendra virus is thought to be flying foxes (bats of the genus Pteropus) found in Australia. The natural reservoir for Nipah virus is still under investigation, but preliminary data suggest that bats of the genus Pteropus are also the reservoirs for Nipah virus in Malaysia.
(Source from Mnolf at en.wikipedia)

massive public panic. This 'new' virus was found to have been dormant in fruit bats for decades and only emerged through a complex interaction of factors such as habitat destruction, climatic events and the encroachment of food-animal production into wildlife domains. The cost of the outbreak was estimated at $ 350 to 400 million. [9]

Hendra Virus in Australia

The Hendra virus in Australia is another example of the dangers involved when there is a spillover of a disease from a wildlife reservoir to livestock: starting in September 1994, the virus killed both horses (39 horses) and human beings (6 men) [11]. This year, there has once again been a significant outbreak of Hendra virus in Australia.

Hendra virus continues to be an important emerging disease of horses and humans and highlights the disease dangers that arise when humans and their companion animals move into ecological niches previously only occupied by native animals and their attendant viruses. Hendra virus is widely distributed in fruit bats (狐蝠) (Megachiroptera) in Australia, suggesting that fruit bats may be the natural host of the virus. Hendra virus-infected fruit bats have also been reported in Papua New Guinea and the virus is similar but not identical to Nipah virus found in bats in Malaysia and Bangladesh.

The 2003 outbreak of SARS infected a worldwide total of about 8,000 people in China, Hong Kong, Taiwan, Canada, Singapore, and Vietnam. In addition, it cost Asian countries between US$30–50 billion, mostly due to economic repercussions from widespread public fear of the disease. In the case of SARS it was first thought that the virus reservoir was the civet cat, until the discovery that horseshoe bats were the real hosts [9][10].

The true cost of HPAI is still being evaluated. One estimate suggests that a human influenza pandemic today would cost an extremely high figure, difficult to calculate [9].

Another surprising statistic is that more than 55,000 people die of rabies each year and an estimated

2 to 8% of the 1.6 million annual human deaths from tuberculosis are from bovine origin [12][13].

Some of these EID remain endemic in many developing countries, where they have been neglected. Foot and mouth disease (FMD), for example, remains endemic in large parts of Latin America, Africa and Asia, causing huge production losses and adversely affecting the livelihoods of poor farming communities. FMD also seriously threatens the trade prospects of developed and emerging economies.

No matter the country, the estimated costs of an FMD outbreak can be high. The FMD outbreak in the UK in 2001 was estimated to have US$30 billion though others put it at a lower figure [13].

The FMD outbreak in Taiwan in 1997 caused an estimated loss of US$5-8 billion. (See Veterinary Bulletin: Volume No 1 Issue No 2 in this series)

2010 April: The Hanoi Declaration: A Tripartite Agreement

In recognition of the particular global threat that HPAI H5N1 and other emerging zoonotic diseases posed, the FAO, WHO, and the OIE agreed upon and signed a strategic framework, a **Tripartite Agreement**, to work more closely together to address the animal-human-ecosystem interface. In simple terms the three world organizations that look after the interest of farmers and producers (FAO), the interests of animal and birds (OIE) and the interests of mankind's health (WHO) formulated a world view which would benefit farmers, animals and other living creatures, the world ecology and man himself [14].

2010 May: The Stone Mountain Meeting

A select group of leaders from national Ministries of Health and Agriculture, the European Commission, the United Nations, the World Bank, and other diverse institutions from the academic, policy and economic sectors, met in Atlanta in the USA to review progress in terms of practices related to "One Health" and identified key policy decisions and financial commitments necessary to support sustainability and expansion. Seven activities were identified as being critical steps in attaining the 3-5 year vision and separate workgroups were formed to address each of these activities. Since the meeting, two of the workgroups have merged and now the six workgroups have been collaboratively developing and implementing the key activities [15] [16].

Photo: APEC One Health Forum in Hong Kong: One Health - Increasing Cross-Sectoral Functioning Capabilities for APEC member economies for human and animal health agency leaders (4-5 May 2011)

V. The Successes of One Health

It is very hard to 'rewrite history'. So it is hard to say what would have happened if One Health had not started after 1999. If it had not started, would the world be a more dangerous place? The answer is probably "Yes".

There is a link between One Health and the more coordinated control of both animal and human diseases. While this is not obvious in every case, certainly at the level of the experts and health professionals, there is the view that much progress has been made. There is much greater awareness that disease, while it can come from 'anywhere', may well originate from animals or birds.

In Malaysia Nipah virus while causing a terrible disease outbreak has been controlled.

SARS also has been controlled.

It is true that H5N1 is still well entrenched in five or more countries in the world. But in simple terms, there are over 160 countries in the world and the majority of them do not have H5N1.

Hendra virus in Australia may well have only affected a few people but it is one of the most lethal viruses known to affect man. We now understand its epidemiology quite well and recently a vaccine has been developed to help control it.

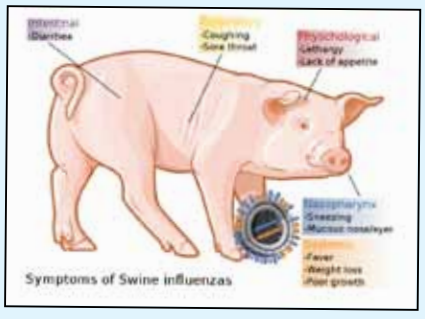
Ebola almost certainly is the most dangerous virus to man but it has been confined to the African continent and is closely monitored there. Also all related less virulent strains of the Ebola virus are being monitored e.g. the Reston virus in the Philippines.

VI. The Challenges Facing One Health

Neglected and Emerging EID

One Health is still applying itself to the disease problems it has addressed, and it is also very aware that there are large areas of what amounts to 'uncharted territory'（地圖上沒標明的區域）of disease and situations yet to be addressed; the two main ones being (a) neglected and endemic zoonosis and (b) recent emerging or re-emerging diseases [17].

Nearly all of the infectious diseases that are household names have been transferred to us from domestic livestock diseases (e.g. influenza from pigs); 58 per cent of the 1,407 recognized species of human pathogen are zoonotic and, of these, 177 are regarded as emerging or re-emerging. Although zoonotic pathogens are the most likely source of emerging and re-emerging infectious disease, so far luckily only a small minority have caused major epidemics in the human population.



Swine Flu

The World Health Organization declared the 2009-2010-flu season a pandemic because the novel H1N1 flu (swine flu) had occurred in multiple countries around the world and human infection was widespread. The classification does and did not reflect the severity of individual infections. Flu pandemics typically occur when a virus mutates into something very different from what people have been exposed to in the past. The first H1N1 pandemic occurred in 1918 and it killed millions of people. Luckily, the 2009 pandemic was much milder.

Diagram: Main symptoms of swine flu in swine.(Source from Swine_virus.svg: *AntigenicShift_HiRes.png: National Institute of Allergy and Infectious Diseases (NIAID).)

VII. Conclusion

The world is forever a changing place. Yet our "wants" have little changed: we all hope for a peaceful, healthy, safe and fulfilling life. This was highlighted at the 1st International One Health Congress held in Melbourne Australia on 14 – 16 February 2011[18].

One could suggest that the fast development of science, the rapid development of economies and the great changes in our own local environment are our enemies. This is because we now find ourselves living in such uncertain times, always moving at a frenetic pace with many stresses. But these developments are not working against our attempts to improve our quality of life. Science and technology help us solve difficult problems, economic growth takes more people out of poverty and gives them a richer more varied life and with better technology the local environmental factors can be managed so that our lives are less affected by weather changes.

Last century man discovered many of these new technologies; the population rose dramatically and along with it came two world wars, a cold war and many minor wars. Wars have always been good "mixing vessels" for disease: the most serious flu pandemic ever occurring after the First World War. After the World Wars new organizations were created in an effort to nullify the long term effects of war, reduce the risk of recurrence of war, and to fairly distribute throughout the world new technological advances. The League of Nations, the United Nations, the FAO, WHO and OIE are examples of these organizations. They had a structure reflecting the nation states that framed them. But now in the 21st Century the world is changing again. We have to come to terms with a new world: with many new problems and old problems not yet resolved: the continued population growth, the issues of global warming, the challenges of feeding the world population without at the same time exasperating（加劇）global warming, the rapid movement of information and people around the globe, the emergence of new diseases, the major shift of economic growth, and by implication the shift of influence, from Europe and America towards the Asian countries. All these matters are demanding our attention.

In the 21st century, into this arena, One Health arrived: it has come almost from nowhere. Ten years ago it was almost unknown. It is a sign of hope for future times. Its aim is to address many of the future issues we face. It is a new approach not allowing issues of nation states or vested interests to hinder its way. But instead it takes account of them and uses them for its own altruistic（利他主義的）aims.

One Health aims to make man communicate with each other. It aims to be a facilitator, helping the world organizations such as FAO, OIE, WHO and the World Bank to carry out their functions and solve problems together, in concert, efficiently for everyone's benefit. Of course One Health can be accused of being a Utopian pipe dream: - It has no buildings, it does not have its own institutional finance, it has no One Health President. But it does have this for it: it is backed by nearly all the professional health care workers in the world who have met it, it is new 'soft governance' wholly appropriate to the 21st century with its instant communication. It is seen to fill a 'need' for this modern world's problems thus being a "public good'. One Health assumes rightly or wrongly that man, when he works cooperatively, can do more good than all the other forces in the world. Simply for that reason it is the 21st century's first new paradigm which should command worldwide support.

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Picture reference

(a) Diagram after page 22 of People, Pathogeus and Our Pathogens and Our Planet Volume 1: Towards a One Health approach for Controlling Zoonotic Diseases. The World Bank, Agriculture and Rural Development Health, Nutrition and Population. Report No 50833-GLB

(b) Takekawa, J. Y., D.J. Prosser, S.H. Newman, S. Bin Muzaffar, N. J. Hill, B.P. Yan, X.M. Xiao, F.M. Lei, T.X. Li, S.E. Schwarzbach, and J.A. Howell. 2010. Victims and vectors: highly pathogenic avian influenza H5N1 and the ecology of wild birds. Avian Biology Research 3(2):51-73. which can be found at:
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