

# 'One Health' – the Rosetta stone for 21st century health and health providers

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## Summary

The transformation and implementation of the One Health concept into a broad-spectrum institutional approach for health, health care and environmental health for humans and animals in society will require a paradigm shift. This represents a worldwide strategic scientific revolution vis-à-vis the status quo of traditional science-based activities of past and current medical and health endeavours that are frequently limited to provincial 'turf'-domains. It means expanding interdisciplinary collaborations and communications into an all inclusive utilisation of co-equal participation among physicians, veterinarians and a host of other health scientist professionals. The resulting synergism will 'advance health care for the 21st century and beyond by accelerating biomedical research discoveries, enhancing public health efficacy, expeditiously expanding the scientific knowledge base, and improving medical education and clinical care'. Untold millions of lives will be protected and saved in this generation and in those of the future.

## Keywords

Animal, Environment, Health, Human, One Health, Physician, Veterinary.

## 'One Health' – La stele di Rosetta per la salute e i professionisti sanitari nel XXI secolo

### Riassunto

*La trasformazione e l'implementazione a livello di società del concetto "One Health" in un approccio istituzionale a più ampio spettro per salute, assistenza sanitaria e ambiente, con riferimento a uomo e animali, richiede un cambiamento di prospettive. Cambiamento equivalente a una rivoluzione scientifica strategica a livello globale rispetto allo status quo delle attività scientifiche tradizionali in campo medico e sanitario che spesso hanno carattere provinciale. Si tratta di trasformare la rete di canali di comunicazioni e collaborazioni interdisciplinari in un tutto unico che vede la partecipazione paritaria di medici, veterinari e altre professioni sanitarie. La sinergia che ne deriva "promuoverà il progresso dell'assistenza sanitaria per il XXI secolo e oltre, accelerando le scoperte biomediche, aumentando l'efficacia dei sistemi sanitari pubblici, ampliando rapidamente la base di conoscenze scientifiche e migliorando l'educazione medica e l'assistenza clinica". Una trasformazione che proteggerà e salverà milioni di individui di questa e delle generazioni future.*

### Parole chiave

Ambiente, Animale, Medico, One Health, Salute, Uomo, Veterinario.

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no single organization, and no single nation or  
people invented or owns One Health  
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belongs to all of humanity  
A caveat: while honest debate over efficacious  
process should be welcome,  
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## Introduction

There was a 21-gun salute marking the 65th anniversary of D-Day on the Normandy shores (Omaha Beach) on 6 June 2009. All who know history can easily recognise this commemoration of the liberation of France as a paradigm-like shifting victory for world freedom over the evils of Nazism. Without it, many of us in North America, Europe and elsewhere might not be here today and others could be living as slaves to an ideology of intolerance and hate.

The famous paradigm change in the science of astronomy, resulting from the emergence of Copernicus’ successful predictive concept about the changing positions of both stars and planets (his heliocentric theory of planetary movement) in the 16th century, ushered in the beginning of a scientific revolution with a new view of a greatly enlarged universe. This one man was a seminal figure in the history of scientific thought(s) that reverberate to this day... as was Winston Churchill during World War II.

A paradigm has been described as ‘picking up the other end of the stick’, which is essentially a process of ‘handling the same bundle of data as before, but placing them in a new system of relations with one another by giving them a different framework’ (1).

The One Health concept is a ‘tradition-shattering complement to the tradition-bound activity of normal [medicine and health related] science’. Implementation would be a virtual revolutionary paradigm shift where ‘one conceptual world view is replaced by another’ (5). One Health takes this philosophical logic a step further. It melds the

revolutionary competition into a paradigm by: ‘[espousing] a worldwide strategy for expanding interdisciplinary collaborations and communications in all aspects of [health and] health care for humans and animals. The synergism achieved will advance health care for the 21st century and beyond by accelerating biomedical research discoveries, enhancing public health efficacy, expeditiously expanding the scientific knowledge base, and improving medical education and clinical care. When properly implemented, it will help protect and save untold millions of lives in our present and future generations’ (7).

This is truly a paradigm shift – a type of scientific revolution – away from the past acceptance by many in the health and health care milieu. Old turf barriers would be eliminated or at least significantly lowered in the interest of more rapid scientific advancement for protecting and saving lives in today’s world and that of tomorrow. This represents a pattern of scientific maturation. To be accepted as *the* health paradigm of our time, it would need concrete examples of how it appears to compete more effectively, i.e. more successfully than the status quo. Indeed, it has had prominent advocates for the past 200 years! Yet, it is only now re-emerging again in the early 21st century as a viable competitor.

Physicians of the past, such as:

- Benjamin Rush, MD (18th century), famed during the American revolutionary period
- Rudolf Virchow, MD, (19th century) known as ‘father of cellular pathology’
- Sir William Osler (19th century), dubbed the ‘father of modern medicine’ pioneered and supported the principles of collaboration between human and veterinary medicine.

Among this illustrious threesome, Virchow, known as the founder of comparative medicine, cellular biology and veterinary pathology, coined the term ‘zoonosis’ meaning diseases transmissible from animals to humans and said ‘between animal and human medicine there are no dividing lines – nor should there be. The object is different but the experience obtained constitutes the basis of all medicine’ (3).

On the veterinary medical side of the One Health equation, three notable veterinarians of the 20th century include:

- Karl F. Meyer, DVM, MD (Hon), regarded as 'the most versatile microbe hunter since Louis Pasteur and a giant in public health'
- Calvin Schwabe, DVM, DSc, coined the term 'One Medicine' (now called One Health)
- James H. Steele, DVM, MPH, founder of the veterinary public health division of the Centers for Disease Control and Prevention (CDC) in the United States.

So what? What did One Health contribute to the 20th century?

## The marriage of human and veterinary medicine

### Karl Johnson and Fred Murphy

Eminent virologists, Karl Johnson (physician) (Fig. 1) and Fred Murphy (veterinarian) (Fig. 2) worked at the CDC as co-equal investigators, together discovering the aetiological agent of Ebola haemorrhagic fever, the Ebola virus. Johnson described their 'One Health' collaborations as follows:



Figure 1  
Karl M. Johnson, MD  
Past Director, Middle America Research Unit  
National Institute for Allergy and Infectious Disease,  
National Institutes of Health  
Founding Chief, Special Pathogens Branch, Centers  
for Disease Control and Prevention

'Fred Murphy and I collaborated on zoonotic viruses, their pathogenesis, epidemiology, and ecology; initially at great distance but later in daily contact at CDC. Although Ebola virus was perhaps the most notable project, our work over many years truly exemplifies the

concept of One World, One Medicine, One Health. My prayer is that support, both scientific and financial, for the marriage of human and veterinary medicine will grow at an ever expanding rate. The earth requires it.'

Fred Murphy, Johnson's CDC colleague-collaborator in the discovery and identification of the aetiological agent of Ebola haemorrhagic fever, the Ebola virus commented as follows in a statement dated 15 November 2008: 'My recent delving into the foundations of medical and veterinary virology has provided much evidence of common roots and incredible early interplay, much more than we see today. For example, Walter Reed and his colleagues, the discoverers of the first human virus, yellow fever virus, acknowledged the influence of Friedrich Loeffler and Paul Frosch, who had discovered the first virus, foot and mouth disease virus, a few years earlier.



Figure 2  
Frederick A. Murphy, DVM, PhD  
University of Texas Medical Branch, Department of  
Pathology, Galveston

From my reading, it was Sir William Osler, the founder of modern human medicine and of veterinary pathology, who in the late 1800s coined the term 'One Medicine'. Calvin Schwabe, the inspiring veterinary epidemiologist from the UC Davis [University of California, Davis], has been credited with revitalizing the concept, and now it seems that the concept is gaining new breadth and depth, thanks to the efforts of the One Health Initiative. As others have noted, bringing substance to the concept, shaking up institutions and individuals, will require a difficult and long-term effort, especially as this

applies to the interplay of physicians, veterinarians and biological scientists in biomedical research and in the scholarly base for public health – but, as Arnold Palmer said, "Never up, never in".'

### Rolf Zinkernagel and Peter Doherty

Another monumental example was the 1996 Nobel Prize awarded to a physician Rolf Zinkernagel (Fig. 3) and veterinarian Peter Doherty (Fig. 4). These two collaborators discovered how the body's immune system distinguishes normal cells from virus-infected cells.



Figure 3  
Rolf Zinkernagel, MD, PhD – Nobel Laureate 1996  
University Hospital Zurich, Institute of Experimental Immunology, Zurich



Figure 4  
Peter C. Doherty, DVM, PhD – Nobel Laureate 1996  
Department of Immunology, St Jude Children's Research Hospital,  
332 North Lauderdale, Memphis

### Ron Davis and Roger K. Mahr

The early 21st century physician and former President of the American Medical Association (AMA), Ronald Davis<sup>†</sup>, MD (Fig. 5)

collaborated with the former President of the American Veterinary Medical Association (AVMA), Roger K. Mahr (Fig. 5), DVM, helping to establish a bond between the AMA and AVMA. Davis skilfully shepherded an historic One Health supportive resolution through to adoption by the AMA membership – a major milestone in the progress of this modern day One Health movement.



Figure 5  
Ronald M. Davis<sup>†</sup>, MD and Roger K. Mahr, DVM  
R.M. Davis<sup>†</sup>, former President, American Medical Association and Director, Center for Health Promotion and Disease Prevention, Henry Ford Health System, Detroit  
R.K. Mahr, former President, American Veterinary Medical Association and current Project Director and Interim Chief Executive Officer, One Health Commission, United States

Ron Davis said the following at a meeting of the AMA on 3 July 2007: 'I'm delighted that the AMA House of Delegates has approved a resolution calling for increased collaboration between the human and veterinary medical communities and I look forward to seeing a stronger partnership between physicians and veterinarians. Emerging infectious diseases, with the threats of cross-species transmission and pandemics, represent one of many reasons why the human and veterinary medical professions must work more closely together'.

### Jimi Cook and Sonny Bal

So what has One Health done for us lately, i.e. in the 21st century? One impressive guiding light example is given below.

During the first decade of this century, veterinarian James, 'Jimi', Cook, DVM, PhD

(Fig. 6), a University of Missouri-Columbia college of veterinary medicine professor of orthopaedic surgery and physician B. Sonny Bal, MD, JD, MBA (Fig. 7), associate professor of orthopaedic surgery at the college of medicine have been on the trail of practicable clinical medicine betterment. Cook and Bal have collaborated for over seven years on efforts to create hip and knee replacements without using commonplace biomechanical metal and plastic materials. The technique, initially developed by Cook for dogs, involves the use of laboratory-grown tissue (cartilage) that can be moulded into replicas of joints that require replacement. Bal and Cook are concomitantly developing a process whereby a similar process can be adapted for humans.

These two One Health supporters were recognised for their important biomedical research in the *Missourian* newspaper at the beginning of June 2009 (6).



Figure 6  
James ('Jimi') L. Cook, DVM, PhD, Diplomate ACVS  
William C. Allen Endowed Scholar for Orthopaedic Research  
Director, Comparative Orthopaedic Laboratory,  
University of Missouri, Columbia

Following this story, Sonny Bal told the One Health Initiative website: 'Jimi Cook and I have worked alongside a team of specialists from medicine, veterinary medicine, and engineering for seven years now. Our current focus is to develop replacement joints that mimic the natural process of cartilage and bone formation as they grow and develop. This kind of collaboration is essential to the

creation of better options for the replacement of failing hips and other joints. By working with specialists in the veterinary field, we are able to evaluate our technology more rapidly, and that means that we will be able to develop these alternatives for humans sooner than if we worked alone'.



Figure 7  
B. Sonny Bal, MD, JD, MBA  
Interim Chairman and Associate Professor  
Department of Orthopedic Surgery, University of  
Missouri, Columbia

## Conclusions

Now in the early 21st century, the health sciences stand on the threshold of implementing the 'One Health' paradigm shift that will enhance and fast forward the protection and saving of millions of lives in today's and tomorrow's generations. Unlike the Copernicus example, no single person, no single health profession, no single organisation, and no single nation or people invented or owns One Health. It is an all inclusive, co-equal endeavour that belongs to all of humanity. A caveat: while honest debate over efficacious process should be welcomed, factionalism should not.

A unique and first of its kind One Health monograph – containing 13 diverse essays – was published recently, providing a strong scientific international case for implementing

the One Health concept worldwide. It is the product of contributions of 53 interdisciplinary prominent professionals (physicians, veterinarians and health scientists) from 12 countries (4).

One Health has indeed become the *Rosetta stone* (something that is a critical key to the process of decryption or translation of a difficult encoding of information) for a health enlightening paradigm shift revolution. It is the critical key that translates difficult problem-solving into less difficult models. It presents a means for the health scientific

communities to pivot towards a more panoramic view, a sustainable revolution ('by understanding the characteristics and intentions of the sustainability revolution, we will be better prepared to tackle complex problems requiring an open-minded and cooperative approach') (2) (described as an environmental definition for our civilisation to survive) and the pursuit of altruistic excellence notwithstanding respectable status quo advancements of the past.

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