

'One Health' in Action Series: Nos 1-8

Laura H. Kahn⁽¹⁾, MD, MPH, MPP, Bruce Kaplan⁽²⁾, DVM & Thomas P. Monath⁽³⁾, MD

Summary

This series of short articles was published in 2007 and distributed to the Kahn-Kaplan-Monath 'One Health' email distribution list. The articles are further examples of historical achievements obtained across numerous scientific disciplines, including human and veterinary medicine. Each article was written and developed with assistance from the Kahn-Kaplan-Monath 'One Health' team.

The expanding 'One Health' email distribution list now totals approximately 590 individuals in 38 countries including Argentina, Australia, Bangladesh, Bahrain, Belgium, Belize, Bosnia and Herzegovina, Brazil, Canada, China, Colombia, Costa Rica, Croatia, France, Germany, Grenada, India, Indonesia, Israel, Japan, Malta, The Netherlands, Nepal, New Zealand, Nigeria, Norway, Portugal, Puerto Rico, Senegal, South Africa, Sri Lanka, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States and Uruguay.

The list of supporters currently totals 417. If these lists are still being actively maintained by the publication date of this 'One Medicine – One Health' monograph, any allied health scientist, physician, osteopath or veterinarian may be added to one and/or both lists by contacting us at bkapdvm@verizon.net. Please include your curriculum vitae or brief biography, title, degree(s), affiliation and address consistent with those currently acknowledged as 'One Health – One Medicine' supporters. There are no obligations attached

to joining this group and you may have your name removed at any time upon request.

Those who have prepared this message and the two lists act independently of any other entity or organisation. However, where feasible, we attempt to augment and support those organisations' efforts to recognise, promote and implement this initiative, such as the American Veterinary Medical Association, American Medical Association, Society for Tropical Veterinary Medicine, Croatian Society for Infectious Diseases, American Society of Tropical Medicine and Hygiene, World Association of Veterinary Laboratory Diagnosticians, Delta Society, American Association of Veterinary Laboratory Diagnosticians, American Phytopathological Society, Association of American Veterinary Medical Colleges, Association of Schools of Public Health, American Society for Microbiology, National Association of State Public Health Veterinarians, Council of State and Territorial Epidemiologists, Association of Academic Health Centers, Association of American Medical Colleges and Immuno Valley Consortium in The Netherlands.

This autonomous endeavour has been maintained *pro bono* due to our firm conviction regarding the enormous value of the 'One Medicine – One Health' concept.

Keywords

Animal, Human, One Health, One Medicine, Physician, Public health, Veterinarian.

- (1) Physician Research Scholar, Program on Science and Global Security, Woodrow Wilson School of Public and International Affairs, Princeton University, 221 Nassau Street, 2nd floor, Princeton, New Jersey 08542, United States of America
lkahn@Princeton.edu
- (2) 4748 Hamlets Grove Drive, Sarasota, Florida 34235, United States of America
bkapdvm@verizon.net
- (3) Partner, Kleiner Perkins Caufield & Byers, Pandemic & Biodefense Fund, 21 Finn Road, Harvard, Massachusetts 01451, United States of America
tmonath@kpcb.com

Serie 'One Health' in Action: N. 1-8

Riassunto

Questa serie di brevi articoli è stata pubblicata nel 2007 e distribuita alla mailing list "Una sola salute" Kahn-Kaplan-Monath. I contributi forniscono ulteriore conferma dei progressi storici compiuti in numerose discipline scientifiche, tra cui la medicina umana e veterinaria. Tutti gli articoli sono stati elaborati e messi a punto con l'assistenza del team "Una sola salute" Kahn-Kaplan-Monath.

La mailing list "Una sola salute", in costante crescita, conta ora circa 590 iscritti di 38 paesi: Argentina, Australia, Bangladesh, Belgio, Belize, Bosnia Erzegovina, Brasile, Canada, Cina, Colombia, Costa Rica, Croazia, Francia, Germania, Giappone, India, Indonesia, Israele, Malta, Nepal, Nigeria, Norvegia, Nuova Zelanda, Paesi Bassi, Portogallo, Porto Rico, Regno Unito, Senegal, Sri Lanka, Stati Uniti, Sudafrica, Svezia, Svizzera, Thailandia, Turchia e Uruguay.

La lista dei sostenitori conta ora 417 iscritti.

Se alla data di pubblicazione di questa monografia "Una sola medicina – Una sola salute" le due mailing list sono ancora attive, ricercatori sanitari interessati, medici, osteopati o veterinari possono richiedere l'iscrizione a una o entrambe le list al seguente indirizzo: bkapdvm@verizon.net. Si prega di allegare il proprio curriculum vitae o una breve biografia, specificando il proprio indirizzo più il titolo di studio, laurea(e) e le affiliazioni, in linea con i requisiti necessari per diventare sostenitori di "Una sola salute – Una sola medicina". L'adesione a questo gruppo non comporta obblighi di sorta ed è possibile richiedere la cancellazione in qualsiasi momento.

Gli autori di questo messaggio e le due mailing list agiscono in modo indipendente da qualsiasi gruppo o organizzazione. Tuttavia, laddove possibile, si impegnano per migliorare e potenziare gli sforzi delle organizzazioni tesi a riconoscere, promuovere e realizzare questa iniziativa, quali l'American Veterinary Medical Association, l'American Medical Association, la Society for Tropical Veterinary Medicine, la Croatian Society for Infectious Diseases, l'American Society of Tropical Medicine and Hygiene, la World Association of Veterinary Laboratory

Diagnosticians, la Delta Society, l'American Association of Veterinary Laboratory Diagnosticians, l'American Phytopathological Society, l'Association of American Veterinary Medical Colleges, l'Association of Schools of Public Health, l'American Society for Microbiology, la National Association of State Public Health Veterinarians, il Council of State and Territorial Epidemiologists, l'Association of Academic Health Centers, l'Association of American Medical Colleges e l'Immuno Valley Consortium nei Paesi Bassi.

Questa iniziativa indipendente è stata sostenuta pro bono in quanto crediamo fermamente nell'immenso valore del concetto "Una sola medicina – Una sola salute".

Parole chiave

Animale, Medico, Salute pubblica, Umano, Una sola medicina, Una sola salute, Veterinario.

7 June 2007

'One Health' ... in Action! (#1)

A prime example of 'One Health' in action has been described with verve in Richard Preston's book, *The Hot Zone*. This was the story of how two of our 'One Health' supporters, both eminent virologists, Frederick A. Murphy, DVM, PhD and Karl M. Johnson, MD worked closely together (along with others) to help unravel the mystery surrounding the initial outbreak of Ebola hemorrhagic fever and how they discovered its etiologic agent, Ebola virus.

Prior to working at CDC with Dr Murphy (a veterinarian), Dr Johnson (a physician) had directed the NIH Middle America Research Unit in the Panama Canal Zone, where he and his colleagues discovered one of the first viruses causing a hemorrhagic fever, i.e. Machupo virus, the etiologic agent of Bolivian hemorrhagic fever. In addition to discovery and description of new zoonotic viruses, over many years Dr Johnson worked in infectious disease epidemiology and on experimental therapies for several of the hemorrhagic fever agents.

Dr Murphy, a virologist/pathologist and Chief of the CDC Viral Pathology Laboratory and

Dr Johnson were close colleagues for several years at CDC, working hand-and-(surgical) glove together (the gloves were for protection against the dangerous pathogens they both dealt with in their laboratories). According to Dr Johnson, Dr Murphy was 'vitaly interested in viral pathogenesis in addition to viral taxonomy, and was always ready to chime in when something novel appeared'. While the two were working on Machupo virus at CDC in Atlanta in October 1976, along with the late medical virologist Patricia Webb, MD, they discovered Ebola virus in specimens from hemorrhagic fever victims received from Sudan and Zaire (now the People's Republic of Congo). One of the famous electron micrographs taken by Dr Murphy at that time showed an Ebola virus virion as a 'Sheppard's crook'. This image is almost as famous as its photographer!

These very brief comments about these two public health pioneers represent only a fraction of what they have accomplished together and separately. But they reflect how veterinary medicine and human medicine can come together, in a kind of scientific meeting-of-the-minds, in this case resulting in the discovery of an important hemorrhagic fever virus – a virus that has continued in recent years to plague the people of central Africa. Hemorrhagic fever viruses are now designated by CDC as potential bioterrorism agents.

17 June 2007

'One Health' ... in Action! (#2)

Lassa fever is an acute viral hemorrhagic fever, with a case-fatality rate of >30%, first discovered in West Africa (Nigeria) in 1969. Epidemics in that year and in the next few years affected patients and staff in hospitals and involved person-to-person spread, fomites, aerosol transmission, or reuse of contaminated needles. The causative agent was shown to be an arenavirus, the same virus group responsible for Argentine and Bolivian hemorrhagic fevers. However, the natural history, transmission cycle, and reservoir hosts remained obscure. In 1972, a large outbreak of Lassa fever occurred in eastern Sierra Leone.

Since cases appeared to be occurring in villages and towns (in addition to spread within the hospital environment) a unique opportunity arose to uncover the source of human infections.

Thomas P. Monath, MD, a CDC medical virologist with experience working in West Africa on Lassa and other hemorrhagic fevers was assigned the task. Recognizing the need to form a multi-specialty team to uncover the vector of Lassa virus, Monath brought together a team of physician-epidemiologists (including David Fraser, MD and Carlos C. 'Kent' Campbell, MD, MPH, now the President of the American Society of Tropical Medicine and Hygiene), Jordi Casals, MD, a renowned Rockefeller Foundation virologist who was immune to Lassa by virtue of a laboratory infection acquired during the original work in 1969, Vernon F. Newhouse, PhD, a CDC virologist-zoologist and experienced field researcher, and Graham E. Kemp, DVM, MPH, a Rockefeller Foundation veterinary virologist with whom Monath had worked closely in Nigeria and who had been part of the original work on Lassa in Nigeria in 1969. This team arrived at the epicenter, Panguma, Sierra Leone in September 1972 to find a town nearly paralyzed by fear of a terrifying, fatal disease.

They set to work to establish a Lassa fever ward at the Panguma hospital with patient isolation that interrupted nosocomial spread, mapped the town, and traced cases to specific households. The team began an exhaustive effort to trap and sample potential vectors, focusing on bats and rodents because of their known association with other arenaviruses.

The multi-disciplinary team collected, took virus samples from, and preserved specimens for species identification. Virus samples were placed in liquid nitrogen and metal canisters were filled with formalin-preserved carcasses. The outbreak eventually dissipated without any specific control measures, although cases appeared at a lower level, showing that this region of Sierra Leone was continually affected. CDC subsequently established a permanent field station here, under the direction of Karl M. Johnson, MD (the physician member of our previously profiled

veterinarian-physician, Murphy/Johnson 'One Health' in Action team).

Upon return to CDC in Atlanta, Monath began the systematic testing of the field material, resulting in the elucidation of the rodent reservoir host. The results were published in *Science* (T.P. Monath, V.F. Newhouse, G.E. Kemp, *et al.* Lassa virus isolation from *Mastomys natalensis* rodents during an epidemic in Sierra Leone, 1972. *Science*, 1974, **185**, 263-266). In addition, Monath later collaborated with James C. DeMartini, DVM, PhD, a veterinary pathologist at Colorado State University School of Veterinary Medicine to study the *Mastomys* rodents collected in Sierra Leone, showing that Lassa virus had subtle detrimental effects on the reservoir host, a potentially important factor in the Lassa life cycle (DeMartini J.C., Green D.E. & Monath T.P. Gross and microscopic findings in Lassa virus infected and non-infected wild *Mastomys natalensis* from Sierra Leone. *Bull WHO*, 1975, **52**, 651).

This collaboration between physicians, PhD virologists and zoologists, and veterinarians is a unique episode in history illustrating the power of close interaction across these disciplines. The story of these investigations has been told in several books, e.g. John G. Fuller, Fever: The hunt for a new killer virus. Readers Digest Press, New York, 1974; Laurie Garrett, The coming plague: Farrar, Strauss and Giroux, New York, 1994; and Frank Ryan, Virus X, Tracking the new killer plagues, Little Brown & Co., Boston, 1997.

22 June 2007

'One Health' ... in Action! (#3)

By Jerry P. Jaax, DVM, ACLAM

A detailed account of the known history and emergence of the deadly hemorrhagic fever viruses, Marburg and Ebola, was presented in Richard Preston's book, *The Hot Zone*. The core principles of the 'One Health' initiative were at the heart of the story: mysterious, exotic new diseases with extraordinary grisly clinical signs and exceptionally high mortality in animals and man; historic outbreaks in Germany, Zaire and the Sudan that suddenly

appeared, and just as rapidly subsided; and unknown reservoirs and natural history for the etiologic agents. *Moreover, there was intense and close collaboration between veterinarians, physicians and other allied health professionals and scientists to manage a potentially catastrophic disease outbreak in 1989.*

Noted researchers had identified and characterized the lethal etiologic agents of Marburg and Ebola fever, bizarrely shaped viruses unlike anything ever seen before (see 'One Health' in Action Series #1). But the more complex answers to their secrets continued to elude medical science.

Without warning, a cohort of nonhuman primates in a civilian quarantine facility in Reston VA broke with a lethal, undiagnosed hemorrhagic fever syndrome. Researchers at the U.S. Army Medical Research Institute of Infectious Disease (USAMRIID) discovered that the monkeys were infected with Ebola virus (by electron microscopist Tom Geisbert, PhD and Peter Jahrling, PhD). Never before seen outside of Africa or in any species of animal, the discovery of a lethal virus (90% mortality in the Zaire outbreak) in the densely populated metropolitan area of the U.S. National Capitol launched an unprecedented multi-agency, multi-disciplinary response. The Department of Defense (DoD) and USAMRIID became the lead agency for the response with the Centers for Disease Control and Prevention (CDC), World Health Organization (WHO) and state health departments in strong support.

COL C.J. Peters, MD, an internationally known tropical disease physician and researcher was the overall on-site leader of the subsequently named Reston Ebola emergency response effort. Key members of the team included veterinarian pathologists LTC Nancy K. Jaax, DVM, ACVP (who had extensive research experience with Ebola Zaire and Sudan), LTC Ronald (Ron) Trotter, DVM, ACVP, and MAJ Martha (Marty) Hanes, DVM, ACVP, DACLAM. Laboratory animal medicine veterinarians LTC Jerry P. Jaax, MAJ Mark C. Haines, DVM, DACLAM, MAJ Nathaniel (Nate) Powell, DVM, DACLAM, and MAJ Stephen (Steve) Denny, DVM, MS, DACLAM,

deployed to the Ebola-contaminated quarantine facility with other critical members of the USAMRIID Veterinary Medicine Division to manage and contain the outbreak. Other key personnel included veterinarian microbiologist LTC Thomas G. Ksiazek, DVM, PhD, Pierre Roland, MD, a French infectious disease physician, and Joseph B. McCormick, MD and Margaret 'Peg' A. Tipple, MD, physicians from the CDC.

Senior leadership for the management of Reston Ebola outbreak was provided by a pair of unique and distinguished soldier/scientists – Physician BG Phillip Russell, MD and Veterinarian COL David L. Huxsoll, DVM, PhD, Commanders of the Medical Research & Development Command and of USAMRIID respectively. Both possessed international reputations in tropical medicine and infectious disease research. *Without their leadership which embodied the principles of 'One Health'*, the ultimate resolution of the Reston Ebola outbreak might have been very different.

Subsequently, the CDC set new guidelines for the (now routine) quarantine of nonhuman primates imported into the United States, and concerted efforts were made by veterinarian, Dr Ksiazek (now the Chief of the Special Pathogens Branch at CDC) to track down the origin of Ebola Reston virus in monkeys imported from Asia. Thus, the premier public health agency responsible for safeguarding human health played a key role in the prevention and control of a disease principally affecting animals.

The Reston Ebola incident demonstrated what strong leadership and interdisciplinary collaboration can accomplish. Paul R. Epstein, MD, MPH of the Harvard Medical School has recently said that 'never has the divide between animal and man been so porous – or the threat to public health more urgent'. Proper implementation of 'One Health' will be an essential strategic step toward improving our ability to deal with the stark realities of global health threats.

7 July 2007

'One Health' ... in Action! (#4)

By Peter M. Rabinowitz, MD, MPH

In the spring of 1979, an unusual epidemic of anthrax occurred in the city of Sverdlovsk, 1400 miles east of Moscow. Soviet medical authorities reported that the epidemic was linked to an outbreak of anthrax among livestock in the area, and that the human cases were due to people eating contaminated meat and having skin contact with contaminated animal carcasses. The size of the human epidemic, however, led to international speculation whether it was natural or accidental, and if accidental whether it was due to activities in violation of the Biological Weapons Convention of 1972. After repeated attempts to bring independent scientific teams to Sverdlovsk, permission was granted for a scientific team to visit, and the investigation took place in 1992 and 1993.

The investigative team, led by the noted American geneticist, molecular biologist and Harvard biochemist, Matthew S. Meselson, PhD, included Jeanne Guillemin, PhD, noted author/sociologist/medical anthropologist, Alexis Shelokov, PhD, a vaccine expert from the Salk Institute with a long career in public health, David Walker, MD, well known University of Texas Medical Branch pathologist, and renowned veterinary medical epidemiologist Martin Hugh-Jones, DVM, MPH, PhD. In her book [entitled *Anthrax: the investigation of a deadly outbreak*], Dr Guillemin said, 'The veterinary perspective is essential. Anthrax is a zoonosis, a disease that can travel from animals to humans. It is almost always associated with grazing animals, especially sheep, cows, goats, and horses that pick it up from contaminated soil, by either eating or inhaling the tough spores that are the dormant form of its deadly bacteria'. The legendary human medical epidemiologist, Alexander D. Langmuir, MD was involved in deciphering data for publication.

From the beginning, the team took a 'One Health' approach with human medicine and veterinary medicine professionals working side by side to

investigate both human and animal cases of anthrax that had occurred.

Since the KGB had apparently destroyed hospital and public health records of the outbreak, the team had to locate (using government compensation lists) and personally interview survivors as well as family and friends of anthrax cases, search local cemeteries, and comb through hospital autopsy reports and individual case histories. They also searched reports from veterinary laboratories and interviewed owners of sheep and other livestock that had died. Through this painstaking process, they were able to analyze 77 human cases, and establish that most of them lived and worked in the southern part of the city.

The clinical histories of anthrax victims suggested that many of them had become sick through inhalation of anthrax spores, not eating contaminated meat as the government had claimed. The apparently 4-km long area where cases were clustered was downwind from a military microbiology laboratory that had officially been developing an improved anthrax vaccine at the time of the outbreak. This seemed to provide evidence that an accidental release of anthrax from the military facility had caused the human outbreak. At the same time that this human epidemiological work was proceeding, the team was investigating animal cases of anthrax in the Sverdlovsk area during the same period.

They found that in six villages located to the south (downwind) of Sverdlovsk, including one village 50 km south of the area of human cases, sheep and cows started dying at around the same time that human cases were appearing. In those same towns, there were no reported human cases. Together with the human data, these animal case findings further supported the hypothesis that there had been a single release of anthrax spores from the military facility that had drifted south, causing the largest documented outbreak of human inhalation anthrax.

The fact that animals died in an area almost 50 km from the nearest human case provided key information about the movement of the

airborne anthrax spores and showed that there was exposure risk over a much greater area than would have been expected without the animal data. It also indicated that sheep may be more susceptible than humans since they apparently became sick and died at exposure levels an order of magnitude lower than where human cases occurred. In this way, the animal deaths served as 'sentinel events' providing warning information to humans about an environmental health hazard, in this case a pathogen that is a prime bioterrorism agent.

The success of the 'One Health' approach used in this investigation underscores the urgent need for human and veterinary medical health professionals to work cooperatively on 'shared risk' issues from bioterrorism agents, most of which are zoonotic in origin. Physicians, a veterinarian and allied health scientists worked synergistically in tandem!

The findings of the team's investigation were published in *Science* (M. Meselson, J. Guillemin, M. Hugh-Jones, A. Langmuir, I. Popova, A. Shelokov & O. Yampolskaya. The Sverdlovsk anthrax outbreak of 1979. *Science*, 1994, **266** (5188), 1202-1208 and *Anthrax: the investigation of a deadly outbreak* by Jeanne Guillemin, University of California Press, 1999.

7 July 2007

'One Health' ... in Action! (#5)

An unsung 'One Health' public health hero ...

Graham E. Kemp, VS, DVM, MPH

Veterinarian, Dr Graham E. Kemp graduated with a degree in veterinary medicine from Ontario Veterinary College, University of Toronto, Guelph, Canada in 1951. He spent a year with the State of Illinois, Division of Livestock Industry, General Disease Control Activities primarily with their tuberculosis and brucellosis control program. Kemp entered the private practice of veterinary medicine (large and small animals) in Palestine, Illinois where he owned and operated the Wabash Animal Hospital. During this time he also assisted in the State-Federal Brucellosis and Tuberculosis Eradication programs and was a rabies inspector for Crawford County, Illinois.

After earning his MPH, majoring in epidemiology from the School of Public Health at UC, Berkeley in 1958, Kemp became a public health veterinarian at the Bureau of Communicable Diseases, Division of Preventive Medical services at the California State Department of Health until 1964. He was in charge of California's psittacosis epidemiology as well as surveillance, epidemiology and control of foodborne diseases. He also worked with rabies, leptospirosis, tularemia, anthrax, trichinosis and other zoonotic diseases.

Kemp became a veterinary medical epidemiologist/virologist and began work in 1964 at the Rockefeller Foundation as a staff member assigned to the Virus Research Laboratory, Faculty of Medicine, University of Ibadan, in Ibadan, Nigeria where he held the appointment of senior lecturer in the University of Ibadan, faculty of medicine. While assistant director of the virus research laboratory he investigated the occurrence, prevalence and significance of many viral diseases of humans and domestic animals. This included working with wildlife attempting to elucidate the role(s) they played as vectors or reservoirs of zoonotic agents.



Rockefeller Foundation, Virus Research Laboratory, Ibadan, Nigeria, 1968

Group celebration of the definitive identification of a number of their isolates including the first of Dengue virus in West Africa

Left to right: Calista Causey, PhD, Ottis Causey, MD (Director of the Laboratory, just before retirement), Ted O'Connor, laboratory technician, Donald Carey, MD (new Director), Graham Kemp, DVM, MPH (pointing)

From 1972 to 1975, Kemp was chief of the virology section, Center for Disease Control at the San Juan Laboratories, Puerto Rico, USPHS. His work included research programs to elucidate aspects of dengue fever infections in the Caribbean and to prepare laboratory personnel for studies of dengue hemorrhagic fever and shock syndrome. From 1975 until his retirement, Kemp was a research veterinarian and chief, scientific services, office of the director, Division of Vector-Borne Viral Diseases, Center for Infectious Diseases, Centers for Disease Control and Prevention, Fort Collins, Colorado. During that period he was responsible for arbovirus research, epidemic aid and animal care.

During his long career, Dr Kemp worked collaboratively with many physicians, allied health scientists and veterinarians alike. Upon review of 56 scientific publications, Kemp collaborated – in the spirit of 'One Health' – contributing his educational talents and expertise to many public health issues. He co-authored scientific papers with *physicians* such as Drs T.P. Monath (see 'One Health' in Action Series #3), E.G. Wood, H.N. Johnson, R. Shope, J. Casals, T.I. Francis, R.W. Emmons, D.E. Carey, J.M. Troup, H.A. White, G.S. Bowen, J.H. Gear, K.R. Brinker, G. LeGonidec and others; *PhD allied health scientists*, Drs A.S. Browne, O.R. Causey, V.H. Lee, D.L. Moore, A. Fabiyi, R.W. Williams, D.B. Francy, D.W. Trent, C.H. Calisher, A.V. Vorndam, E.J. Rayfield, N. Karabatsos, H.W. Setzer and others; *veterinarians*, Drs G.L. Humphrey, I. Alhaji, O. Tomori, A. Fagbami, G.L. Losos, F.A. Murphy (of Ebola virus fame in 'One Health' in Action Series #1) and others.

To illustrate the huge volume of work Kemp and his colleagues produced we examined these 56 scientific publications where his name appeared on all as one of the co-authors; he was listed as senior author on 19 of these papers. Kemp has written and published others that are not available to us at this time. Contributions to virology medical science and public health (as seen in these articles) include issues regarding rabies, western equine encephalitis, Congo virus, African tick-borne

viruses, Lassa virus, *Herpesvirus hominis*, yellow fever, Mokola virus, ephemeral fever virus, Rift Valley fever virus, Nyamanini virus, Quaranfil virus, Dengue fever virus, Rocio virus, St Louis encephalitis virus, Orbivirus and others.

Kemp is perhaps best known for his work on new viruses related to rabies, which he isolated from insects and insectivores, and his exploration of the pathogenesis, transmission and vector host relationships of rabies-related viruses. He was also the first to isolate bovine ephemeral fever virus in West Africa (T.P. Monath, personal communication, 3 July 2007).

A few publication examples include:

- Monath T.P. (MD), Bowen G.S. (MD), Trent D.W. (PhD), Cropp C.B., (MS) and Kemp G.E. (VM) 1981. Variation in infectivity, pathogenicity, antigenic reactivity, and genome structure of St Louis encephalitis virus strains of different origin. Proc. Int. Symp. Trop. arboviruses and haemorrhagic fevers. Belem, Brazil.
- Gear J.H. (MD), Bowen G.S. (MD) & Kemp G. E. (DVM) 1981. Yellow Fever in Chapter 28, Vol. 2, Textbook of Pediatric Infectious Diseases, Edited by Feigin and Cherry. W.B. Saunders Company.
- Graham E. Kemp (DVM), George L. Losos (DVM), Ottis R. Causey (DSc), Richard W. Emmons (MD) & Robert R. Golding (Department of Zoology, Faculty of Science, University of Ibadan, Ibadan, Nigeria) Isolation of *Herpesvirus hominis* from Lemurs: A naturally occurring epizootic at a zoological garden in Nigeria. *Afr J Med Sci* (1972) **3**, 177-185.

Obviously, this multi-disciplined approach to epidemiology and medical scientific research was synergistic. Investigations and biological discoveries were derived from combined diverse knowledge. This type of creativity facilitated more rapid understanding and discoveries, beyond what would have otherwise been expected.

Dozens of 'One Health' accomplishment stories are wrapped up in the exploits of this one veterinarian and his collaborators. Think of how many others in the past and present

performing similar important work are never heard of or known about. Keeping these undertakings a secret does a disservice to our past, present and particularly our future public health and biomedical research programs. They have significantly enhanced and accelerated them but ...

'Multiply the past and present enlightened collaborations and imagine the advanced developments and rewards ... human and animal health care will be accelerated so that those of the present can receive benefits otherwise afforded only to those of the future!'

7 July 2007

'One Health' ... in Action! (#6)

By Peter M. Rabinowitz, MD, MPH

Despite nationwide efforts at prevention, lead poisoning continues to occur in the U.S. According to the CDC, the greatest risk of lead poisoning to children is from lead-based paint and dust from deteriorating buildings (www.cdc.gov/nceh/lead/faq/about.htm).

Since primary prevention cannot prevent all cases, clinicians must rely on secondary preventive measures, including the screening of children who are close contacts with a child diagnosed with lead poisoning.

Since more than 50% of U.S. households have pets, a 'One Health' approach to prevention of lead poisoning involves awareness that lead poisoning in an animal could indicate risk of lead poisoning in an asymptomatic child sharing the household. It is also possible that a human case of lead poisoning may inform veterinarians about the risk to animals in the vicinity. The following actual cases illustrate these points.

A letter to the *New England Journal of Medicine* reported on a lead treatment program's experience with lead poisoning in animals and children. (Dowsett B.M., Shannon M. Childhood plumbism identified after lead poisoning in household pets. *NEJM*, **331**, 1661-1662, 1994).

In the first case, a dog was admitted to a veterinary hospital with persistent vomiting and weight loss. The owner revealed that the pet lived in a house that had had exterior

renovation one month earlier. During his admission, the dog was diagnosed with lead poisoning and recovered fully after chelation therapy. Nine months later, the dog was readmitted with a similar syndrome of vomiting at which time the blood lead level was markedly elevated (120 micrograms/dl ($\mu\text{g}/\text{dl}$)). At this point, the family's one and three year old children were referred for testing even though they were asymptomatic. Both were found to have lead intoxication, with blood levels of 48 and 37 $\mu\text{g}/\text{dl}$ respectively (CDC recommended level: $<10 \mu\text{g}/\text{dl}$). They required treatment and close follow-up. It turned out that the children and the dog spent considerable time playing in the yard, and that paint chips from the building exterior had contaminated the yard, exposing both the children and the dog.

In the second case, a family cat was found to have vomiting, somnolence and ataxia a month after exterior renovation of the house next door. After the cat was diagnosed with lead poisoning, the family's asymptomatic two-year-old child was found to have lead poisoning, with a blood lead level of 24 $\mu\text{g}/\text{dl}$.

While these cases involved pets being exposed at higher levels than nearby children, sometimes, as in the following case, it could be a human who has the highest exposure and provides warning about the risk to nearby animals. A self-employed painter was evaluated in an Occupational Medicine clinic for abdominal pain, weakness, and vomiting. He had recently been sanding the exterior of a Victorian era house for its new owners. Blood testing for lead revealed a significantly elevated level (112 $\mu\text{g}/\text{dl}$), and he began chelation treatment. The treating physician contacted the local health department, who contacted the couple who had just purchased the house to inquire whether there were any children in the house who might need referral and testing for lead poisoning. The couple did not have any children, but did own two dogs that in recent days had been vomiting and appearing drowsier than usual. The dogs were referred to a veterinarian, diagnosed with lead poisoning, and admitted to a veterinary hospital for chelation treatment.

These cases demonstrate how cooperation and communication between physicians and veterinarians, can lead to improved diagnosis and treatment outcomes for hazards posing a 'shared risk' to both humans and animals. Insights and discoveries from one discipline can be of use to practitioners of the other discipline. In this way the line between 'human health' and 'animal health' truly dissolves, leading to a 'One Health' approach.

Just as canaries once warned coal miners about the presence of deadly mine gases, animals may serve as 'early warning' sentinels for humans about environmental health hazards if they are either exposed at a higher level, have increased susceptibility, or a shorter latency/incubation period between exposure and effect compared to humans. For lead poisoning, family pets such as dogs, cats, birds, rabbits, and iguanas can develop severe and symptomatic lead poisoning, and may have greater exposure compared to humans. Less is known about comparative susceptibility between species to an equivalent exposure.

In recent years, the 'Canary Database', a project funded by the National Library of Medicine has been assembling such pieces of scientific evidence that animals can serve as effective sentinels for human health hazards in the environment. This database (canarydatabase.org) is a free online resource for human and animal health professionals providing information about what is known scientifically about the comparative susceptibility and risk of exposure of humans and non-human species to both toxic and infectious hazards in the environment.

The Canary Database project has revealed that while much is known about such linkages between human and animal health, there is a pressing need for further and more comprehensive merging of the knowledge bases of the medical and veterinary medical disciplines. The 'One Health' approach provides an opportunity for this process to occur at the accelerated pace necessary to address emerging health threats from a rapidly changing global environment.

16 August 2007

'One Health' ... in Action! (#7)

'One Health' Concept: the human-animal bond as a collaborative model

By William F. McCulloch, DVM, MPH

There has been a maturation of our knowledge about the human health implications of human-animal relationships in the United States during the past 50 years. From media comments that it is just a 'passing fad' in the 1970s, the field has progressed to a legitimate area of serious health care research, policy and application in the 1990s to this date.

The bond involves both people and animals. It is an interdisciplinary field requiring cooperation of health and helping professions to succeed. Veterinarians who have been in small animal practice have known for years that pets contribute to human mental health and well-being. This paper is one person's view of those elements most familiar to me and not a complete review of the literature.

Early on, except for a number of anecdotal articles, there was little in the literature on animal-assisted therapy as a field for collaborative studies supporting the 'One Health' concept. The person considered one of the pioneers in the U.S. is my late colleague, Boris Levinson, PhD, a child psychologist who published about pet-facilitated child psychotherapy and the role of the veterinarian in mental health in the 1960s. These articles piqued my late psychiatrist brother, Michael J. McCulloch, MD, who was a medical student at the University of Iowa where I was on the faculty of the medical school. I encouraged him to be a beacon of the medical profession and pursue this area. He did until his untimely death at age 41, when a deranged former patient murdered him in his office in 1985. He was the first president of the Delta Foundation, founded in 1977 and then became the Delta Society in 1981 with another pioneer, Leo K. Bustad, DVM, PhD as president and Michael J. McCulloch, MD, as vice-president. Incidentally, Dr Bustad earned his PhD in physiology

in 1960 from the University of Washington, School of Medicine, where earlier he completed a postdoctoral fellowship from the National Science Foundation.

Other veterinarians who were major players were, R. K. Anderson, DVM, MPH, Stanley L. Diesch, DVM, MPH and William F. McCulloch, DVM, MPH. Linda Hines, MA was our outstanding Delta Society President/CEO for 20 years. Our new President/CEO is Lawrence J. Norvell, an outstanding leader and supporter of teamwork on exploring the benefits of the human-animal bond.

The mission of the Delta Society is to improve human health through service and therapy animals with Pet Partners involved in animal-assisted therapy and activities in health care facilities in all 50 United States and five countries. During the 1980s the Delta society created the refereed journal, *Anthroos*, for publications of scientific articles on human-animal relationships with Andrew N. Rowan, PhD as its editor.

During the early 1970s, Michael J. McCulloch, MD, began lecturing to veterinarians and veterinary medical students at the University of Missouri with the aid of C. Richard Dorn, DVM, MPH and D.C. Blenden, DVM, MS and the author of this piece. The media was somewhat skeptical of this 'new' area of endeavor, with news article headlines such as, 'Psychiatrist Goes to the Dogs'.

A national symposium was convened on 'Implications of History and Ethics to Medicine—Veterinary and Human' at Texas A & M University in 1976 between the medical and veterinary medical professions. Psychiatrist Michael J. McCulloch, MD gave a landmark paper entitled, 'The Veterinarian and Human Health-Care Systems: Issues and Boundaries'. Dr McCulloch also promoted the need for interdisciplinary research and more involvement by the medical profession by his efforts with the American Psychiatric Association in the early 1980s.

In 1975, R. K. Anderson, DVM, MPH and Leonard M. Schuman, MD at the University of Minnesota, received a federal grant to do a national study on the human health activities

of the veterinary medical profession. Michael J. McCulloch, MD was a member of the national advisory committee. He wrote the chapter on one of the final nine human health goals that supported the now coined, 'One Health' (formerly 'One Medicine') concept, i.e. 'Mental and Emotional Health' role of the veterinarian with other health professionals.

It was during these meetings on this study that the concept of the Delta Foundation had its beginning with Drs R.K. Anderson, Stanley L. Diesch, Joseph Quigley, Michael J. McCulloch and William F. McCulloch. A film, 'Three is Company, Not a Crowd' was made with Dr Michael J. McCulloch as a joint effort of the University of Minnesota and the Texas A & M University Institute of Comparative Medicine that the author directed.

To show the interdisciplinary model, I am highlighting some of the early Delta Board members and consultants with their primary professional degrees: *Michael J. McCulloch, MD, Leo K. Bustad, DVM, R.K. Anderson, DVM, William F. McCulloch, DVM, Stanley L. Diesch, DVM, Aaron H. Katcher, MD, James Knight, MD, George Saslow, PhD, MD, Suzanne Robb, RN, PhD, Alan Beck, DSc., Susan Cohen, MSW, PhD, Al Hopkins, DVM, Earl Strimple, DVM, John New, DVM, Marvin Samuelson, DVM, James Harris, DVM, Lynn C. Anderson, DVM, Linda Hines, MA and Sophie Engelhard Craighead, MA.*

Some of the early interdisciplinary centers established to promote and study the human-animal bond included the People-Pet-Partnership at Washington State University, the Center for Study of Human-Animal Relationships and Environments (CENSHARE) at the University of Minnesota and the Interaction of Animals in Society Center at the University of Pennsylvania. Numerous other centers developed in the 1980s, with most associated with medical, veterinary medical and nursing schools and schools of public health. Research papers are now in the thousands, but more needs to be done to bring the potential for the human-animal bond to further the healing power of our companion animals (pets). *Some examples of medical and social benefits include: reduced blood pressure, enhanced healing and recovery, improved speech*

and detection of seizures in some children, and improved motivation, exercise, and less anxiety for seniors. (Please see published studies of benefits to human health at www.deltasociety.org.)

Some Comments and Recommendations for the Future of the Human-Animal Bond and using the 'One Health' concept to further advance human and animal health studies, policy and practice in clinical and community settings:

- There is a continuing scarcity of funds for studies on the human health benefits of our companion animals. New clinical studies with appropriate experimental design and controls are needed. Studies need to show both immediate and long term benefits. If this is accomplished, it is conceivable that animal-assisted therapy will become medical policy for third party pay in insurance. Currently most of the efforts of animal-assisted therapy depend on volunteers as are in the Delta Society's Pet Partner program.
- There are some wonderful signs about the importance of the Masters Degree in Public Health for health care professionals' graduate training. *My MPH studies at the University of Minnesota School of Public Health taught me the importance of teamwork in healthcare and research with two glowing examples being Gaylord W. Anderson, MD, MPH and R. K. Anderson, DVM, MPH.* There are now examples of joint DVM/MPH degree programs in the United States at the University of Minnesota/School of Veterinary Medicine, Iowa State University/University of Iowa College of Veterinary Medicine, Tufts University School of Medicine (the first to establish an MD/MPH program), University of Georgia/College of Veterinary Medicine, University of Wisconsin-Madison/School of Veterinary Medicine, and the University of Florida/College of Veterinary Medicine.
- One of the main voices for promoting the healing power of pets in recent years is Marty Becker, DVM, who has appeared regularly on TV programs and with writings such as his book on *The Healing Power of Pets* and a Co-author of *Chicken Soup for the Pet*

Lover's Soul. He is a member of Delta Society's Honorary Board.

- *This is where the medical profession needs a new champion*. Michael J. McCulloch, MD, from the 1970s until his death in 1985, was a steady but sometimes solitary voice educating practitioners in human medicine about the value of human-animal interactions, especially those in his specialty of psychiatry.

Summary Quote

from Michael J. McCulloch, MD, 1981

'In an age of research when it is tempting to reduce emotions to biochemical reactions and to rely heavily on the technology of medicine, it is refreshing to find that a person's health and well-being may be improved by prescribing contact with other living things. Members of the health and allied professions must continue to combine resources, work together in the spirit of cooperation, and never forget to 'cure when possible but comfort always'.

The 'One Health' concept and efforts to support it among the allied health professions will help accomplish Dr Michael J. McCulloch's poignant vision.

3 November 2007

'One Health' ... in Action! (#8)

The value of collaboration among health science professionals

By Roger K. Mahr, DVM

Immediate Past President, American Veterinary Medical Association (AVMA)

This past year has been an honor of a lifetime for me to represent the American Veterinary Medical Association (AVMA) and the veterinary medical profession around the world.

As I prepared to assume the AVMA presidency, I focused on the AVMA Mission, 'Improving Animal and Human Health, Advancing the Veterinary Medical Profession'. I also contemplated the following question: What is the value and responsibility of the veterinary medical profession to our global society?

No other profession has as much impact on the health of both animals and people. I truly believe that animal and public health are at a crossroads. The convergence of animal, human and ecosystem health dictates that the 'One World, One Health, One Medicine' concept must be embraced. The veterinary medical profession has the responsibility to assume a major role in that effort.

It was upon that basis of value to our global society, and that sense of responsibility to the future, that I revealed my vision for a 'One Health' Initiative in July of 2006 as I became AVMA president.

I have traveled the world meeting and talking with veterinarians, physicians, public health professionals, academicians, students, government officials, legislators and other stakeholders about the interrelationship between all health science related professions.

One of the most rewarding relationships which I established this past year has been with American Medical Association (AMA) president Ronald M. Davis, MD, MS, FACPM. Soon after I was installed as AVMA president and Dr Davis was elected AMA president-elect, I contacted and met with him to share my vision for a 'One Health' Initiative.

As a public health physician and a preventive medicine specialist, Dr Davis has been a prominent voice on public health issues, including tobacco use, obesity, and vaccinations. During our meeting Dr Davis readily recognized the potential value for collaboration between our respective professions. Subsequently, I invited him to be a guest speaker at the AVMA Annual Convention in July of 2007.

On April 14, 2007 the AVMA Executive Board took official action to establish the 'One Health' Initiative by approving my recommendation to establish the AVMA 'One Health' Initiative Task Force. I was very pleased that the AVMA on behalf of the veterinary medical profession committed to assume a major leadership role to establish a coordinated mechanism to facilitate collaboration and cooperation among the various health science professions, colleges,

governmental agencies and industries with a focus on 'One World, One Health, One Medicine'.

In June of 2007, following the leadership of Dr Davis, a resolution was introduced to the AMA House of Delegates by the American College of Preventive Medicine, American College of Occupational and Environmental Health, American Association of Public Health Physicians, and Academy of Pharmaceutical Physicians and Investigators. The resolution called for the AMA to support a 'One Health' Initiative designed to promote collaboration between human and veterinary medicine and to engage in a dialogue with the AVMA to discuss means of enhancing collaboration in medical education, clinical care, public health and biomedical research.

It was indeed a privilege to be invited by Dr Davis to the AMA Annual Meeting and granted the opportunity to testify before the AMA House of Delegates Reference Committee which considered this resolution. I was extremely pleased that the AMA House of Delegates passed this resolution unanimously. I am particularly grateful for the leadership taken by Dr Davis following our initial contact and communication.

At the AMA Annual Meeting, Lonnie J. King, DVM, MS, MPA, director of the Center for Disease Control and Prevention's (CDC), National Center for Zoonotic, Vector-Borne and Enteric Diseases (ZVED), and I were invited to address the AMA Student Medical Section concerning the integration of animal, human and ecosystem health. Dr King is serving as chair of the 'One Health' Initiative Task Force. Nurturing student involvement and leadership in the 'One Health' Initiative is vitally important to our future.

The Student AVMA has established a 'One Health' Challenge program, which this year supported World Rabies Day. All student chapters of the AVMA participated in an event promoting rabies prevention through educational symposia, community fundraisers, and athletic events. Serving as valuable members of the AVMA 'One Health' Initiative Task Force will be the Student AVMA

president Justin Sabota, a University of Florida fourth year veterinary medical student, and Travis Meyer, a Pennsylvania State University second year medical student.

It was extremely gratifying that this year's 144th Annual AVMA Convention provided a venue at our nation's capital (Washington, DC, USA) for the culmination of a multitude of actions and presentations, which not only supported the 'One Health' concept, but created further momentum for the 'One Health' Initiative. The 'One Health' concept was highlighted during the opening session when Julie L. Gerberding, MD, MPH, director of the CDC and administrator of the Agency for Toxic Substances and Disease Registry, gave the keynote address. Dr Gerberding said that veterinarians and physicians must present a seamless front to protect human and animal health in a small world.

Special sessions were held which centered on the 'One Health' concept. One focused on emerging global animal health threats and included a presentation by United States Ambassador John E. Lange, who is the nation's representative on avian and pandemic influenza and heads the U.S. State Department's Avian Influenza Action Group. Another session featured Anthony S. Fauci, MD, the renowned researcher on AIDS and HIV, who is director of the National Institute of Allergy and Infectious Diseases (NIAID), U.S. National Institute of Health (NIH).

At the convention Dr Davis and I participated in a joint press conference concerning the 'One Health' Initiative. Following the press conference we both presented together in a collaborative session, 'One Medicine – Fly Under One Flag'. We were joined at this session by Jarbas Barbosa, MD, head of Health Surveillance and Disease Management of the Pan American Health Organization (PAHO).

We are now approaching the first AVMA 'One Health' Initiative Task Force meeting which will be held November 27-28 to be followed by a second meeting at the end of January, 2008. I consider this Task Force as the first step, and most critically important, of the 'One Health' Initiative. I envision the success of this Task

Force will lead to an integrated national strategy, and ultimately an international strategy, for 'One Health – One Medicine'. The Task Force is comprised of thirteen, visionary individuals with an appreciation for the 'One Health' concept who are excellent collaborators and communicators. Serving as liaisons to the Task Force will be myself, Dr Davis, and Jay Glasser, MD representing the AVMA, AMA and American Public Health Association (APHA), respectively.

It has been very heartening to experience so much commitment of support for the 'One Health' Initiative during this past year. By

uniting our professions with a common focus, we can convert our 21st century challenges into opportunities for the benefit of our global society.

It is now my fervent hope and vision that we as health science professionals will assume our collaborative responsibility to protect and promote our immeasurable value, to utilize that value to its fullest, and to make sure that our future is a promising future, a future of even greater value.

'One World, One Health, One Medicine'... that, my colleagues, translates to value.