One Health Newsletter

Volume 8, Issue 2

The One Health Newsletter is a collaborative effort by a diverse group of scientists and health professionals committed to promoting One Health.

This quarterly newsletter is dedicated to enhancing the integration of animal, human, and environmental health for the benefit of all by demonstrating One Health in practice.

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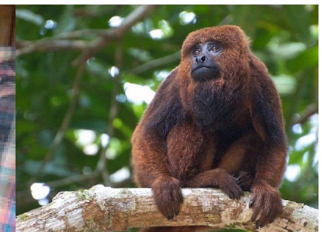

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Two One Health Programs Work to Integrate Human Health into "One Health" (USA)

Peter M. Rabinowitz, MD, MPH, and Eleanor M. Green, DVM, DACVIM, DABVP

[*Originally printed on the One Health Initiative website (onehealthinitiative.com)*]

While One Health stresses the interdisciplinary collaboration and cooperation between human, animal, and environmental health professionals, as well as other disciplines, some have reported that human health has been underrepresented in current One Health efforts at the University level. In response to this need, two U.S. One Health Programs, one based at Texas A&M University and the other at the University of Washington, are taking innovative steps to bring more human health care professionals into the realm of One Health.

At Texas A&M University, a One Health initiative was formed in 2013 following discussions between the deans of the College of Veterinary Medicine & Biomedical Sciences and the College of Medicine. Soon afterwards, "One Health" was designated a university Grand Challenge, signifying an important societal impact area built upon notable university strengths.

An essential component of the One Health Grand Challenge is active participation by multiple colleges across the university and today all colleges at Texas A&M are contributing. While educational, research, and outreach programs in One Health are expanding, one prime example of the partnership between human and veterinary health care professionals with an inclusive approach is the summer practicum experience in Ometepe, Nicaragua.

A multidisciplinary team of students and faculty include medical students, veterinary medical students, public health students, and agriculture from Texas A&M University and other universities, the first being the University of California Davis (USA). The students train and work together to collect data to determine the major health challenges in people, animals, and the environment and to provide sustainable solutions for the community, doing so with full understanding of local culture, assets, and limitations. They provide clinical care to both people and animals in a rural setting.

> ***"…there is true cross coverage and cross training…, with the medical students working with the local veterinarian to take care of the animal patients and the veterinary medical students working with the physician in the care of the human patients."***

At the clinic sites, there is true cross coverage and cross training among the students, with the medical students working with the local veterinarian to take care of the animal patients and the veterinary medical students working with the physician in the care of the human patients. Through this model there is a continuous rotation of students working in all areas of human, animal, and public health.

Based upon surveys, human and animal patient examinations, and diagnostic testing, areas of needed focus are determined. Nicaragua is certain to benefit from this One Health approach, which is identifying tangible connections between human, animal, and environmental health. Each year, new One Health care teams will visit Nicaragua to build upon the findings and recommendations of previous teams. In addition, as part of recent curriculum revisions in College of Medicine, Texas A&M medical students will now be able to choose a One Health emphasis as an elective component of their training, resulting in a certificate in One Health. The certificate in One Health is also available to all professional students across Texas A&M University, including veterinary medical students. The students have also formed a Student One Health Association.

At the University of Washington (UW) in Seattle, the recently formed UW Center for One Health Research (COHR) is one of the few One Health programs nationally that is based in a public health/medical school complex rather than primarily at a veterinary medical school. COHR is serving as a means for medical and public health students, including global health and environmental health majors, to get involved with One Health efforts, including programs at the Washington State College of Veterinary Medicine.

University of Washington medical students recently teamed up with their counterparts in the WSU College of Veterinary medicine to create student posters for the Zoobiquity conference held in Seattle in November 2014, collaborating on subjects such as Ebola infections across species. UW medical students and public health students are actively working with the COHR on a number of projects, including investigation of E coli O157 infections in humans and animals, sharing of microbiome between humans and domestic animals, antibiotic resistance in different species, and the effect of natural gas extraction activities on the health of humans and animals. COHR has also proposed starting a training track for animal and human health professionals (Occupational Health at the Human Health Interface: OHHAI) to prepare them for careers involved in research and practice regarding the unique occupational health needs of animal workers, including workers in animal agriculture, veterinary workers, and workers with wildlife contact. COHR has applied to the National Institute for Occupational Safety and Health for funding for this program and is hoping to initiate training activities later this year.

Dr. Peter M. Rabinowitz, a physician One Health leader, is director of the UW Center for One Health research in Seattle, Washington (USA). Dr. Rabinowitz is a longstanding collaborator with the One Health Initiative team and concomitantly a member of the One Health Initiative team's Honorary Advisory Board.

Dr. Eleanor M. Green, a veterinarian One Health leader, is Carl B. King Dean of Veterinary Medicine, College of Veterinary Medicine & Biomedical Sciences, Texas A&M University in College Station, Texas (USA) and a longstanding One Health Supporter. Dr. Green's progressive interdisciplinary/multidisciplinary One Health leadership at Texas A&M has been previously documented on the OHI website.

African Researchers Adopt One Health to Stop Rats

Steven Belmain, PhD, FRES, FHEA

Rodents are arguably humanity's oldest and most pernicious pest problem. The collapse of human civilisations through rodent-borne diseases has occurred at least twice in the Old World through plague outbreaks in the Justinian and Middle Ages (Stenseth et al. 2008) and at least twice more in the New World through hantavirus outbreaks in 16th and 19th century Mexico (Acuna-Soto et al. 2000; Acuna-Soto et al. 2004; Marr and Kiracofe 2000). Due to their rapid breeding potential in response to pulsed food resources, rodent population outbreaks have led to repeated regional famines in many parts of the world (Singleton et al. 2010), and such famines have even triggered long-term civil wars such as occurred in Mizoram, India in the late 1950's in response to a 50-year cycle of bamboo seed masting (Bhaumik 2007). Thus, at the best of times, rodents are capable of quickly responding to environmental imbalances that lead to plagues, both in rodent numbers and zoonotic spillover events. Furthermore, many cosmopolitan and regional rodent species have benefitted from human activities, particularly our agriculture, waste production, deforestation and other anthropogenic changes that create imbalances in food and habitat profusion. Rodents, therefore, provide an excellent paradigm for One Health due to their negative multiple impacts on livelihoods through disease transmission and food security and nutrition as well as their positive roles in natural resource succession, acting as prey and predator in most clines.

A new project in Africa is trying to understand some of these complex One Health issues around rodent pest management, particularly the often quite severe problems faced by smallholder subsistence farmers (Yonas et al. 2010; Singleton et al. 1999). The European Union funded project: Sustainable Technologies to Overcome Pest Rodents in Africa through Science, or StopRats for short, is led by Prof Steven Belmain from the Natural Resources Institute, University of Greenwich in the United Kingdom and involves partners from six African countries (see Box 1). StopRats aims to help build the capacity of African researchers to develop innovative strategies and technology that can help reduce rodent

Photo 1. Rural community members learn how to use new technology traps as part of StopRats demonstration activities about intensive trapping for managing rodents in households.
Image courtesy of Steven Belmain

pest problems without causing further damage to the environment as well as understanding how the environment may be able to help farmers manage their rodent pest problems more effectively.

Two steps is all it takes

Despite being a well-recognised problem throughout the world, there has been relatively little research on rodent pest management since the advent of anticoagulant rodenticides in the 1950's. Anticoagulants revolutionised rodent control, overcoming inherent aspects of rodent behaviour that affect older acute poisons, and became ***the*** global panacea for rodent management. Although anticoagulants can work very well, their usage is increasingly challenged because of their damage to non-target species and the environment (Sanchez-Barbudo et al. 2012). Safe and effective use requires good training, and unfortunately such knowledge is often not provided or found among the many rural and urban users of rodenticides in Africa. Furthermore, small-holder farmers will say anticoagulants are ineffective, unaffordable or unavailable. Ultimately many African families resort to highly toxic and illegal substances for rat control. For example, the nematicide, Aldicarb (carbamoyloxime), is not licensed as a rodenticide but is illegally sold for killing rats, dogs and even people throughout Africa (Rother 2010). Aldicarb is famously known throughout southern Africa as Two Step, because if accidentally ingested one takes no more than two steps before death (Kahn 2012).

With rodenticide misuse and poor application perhaps causing more problems than those resolved, particularly in Africa, what other options are available? Trapping is usually argued to be too labour intensive to be cost-effective. However, the economics of labour and input costs are reversed in developing economies where labour is often poorly valued and the costs of inputs can be prohibitive. StopRats team members have shown that intensive trapping across communities can be highly effective in reducing rodent numbers as well as increasing food security and nutrition whilst being cost-beneficial (Belmain et al. 2015; Taylor et al. 2012). To work, all households in a community must first have access to good quality traps and diligently set them every day. The second step to sustainability is organising communities to work together, and StopRats is demonstrating intensive trapping with African communities with a view of understanding how such a programme could be scaled out (see Photo 1 and Figure 1).

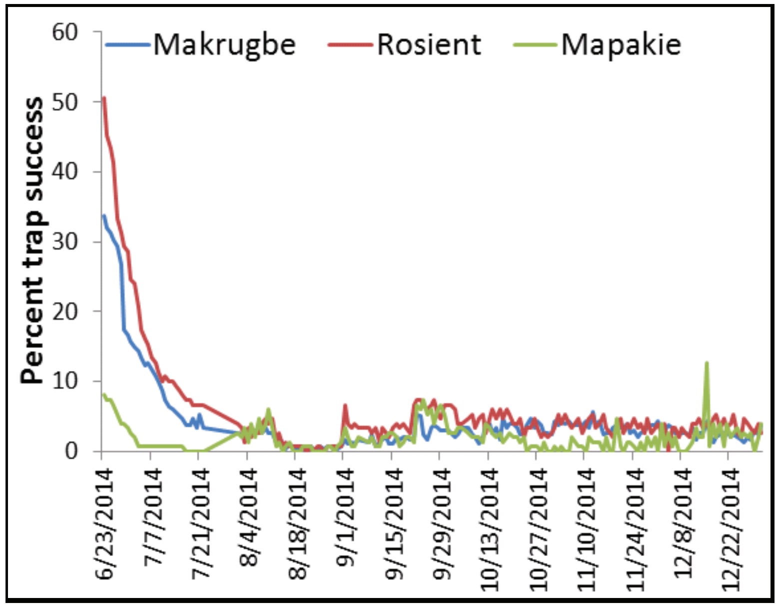


Figure 1. Intensive daily trapping in three communities in Sierra Leone, June to December 2014. Each household is provided with a 'new' design rat trap and instructions on how to set the trap. Rodent populations rapidly decline and remain low as long as households continue to set traps daily. See Belmain et al. 2015 and Taylor et al. 2012 for more details and evidence of intensive trapping programme effects.

Ecosystem services for rodent management

The StopRats team is also interested in the potential role predators may have on rodent pest populations in rural farming communities. Subsistence farming in Africa is typically low input and thus embedded in a mosaic habitat of farm, fallow and uncultivated bush land, where semi-natural habitats and farmers' fields form a patchwork environment (Makundi and Massawe 2011). Although big cats and large predator species are not found in such areas, smaller carnivore and meso-carnivore species, such as genets and mongooses, as well as domestic/semi-feral cats and dogs share these environments. Several studies are under way to understand the spatio-temporal dynamics in rodent species diversity and meso-carnivore diversity among these different habitats and ultimately understand who is eating whom and whether rodent pests in farmers' crops are being regulated by the presence of meso-carnivore species. The results of this study should help to provide farmers with an understanding of the value of the environment and may lead to ways of preserving or managing environments more effectively to increase natural regulation of rodent pest species.

With rodents transmitting more than 60 diseases to people and domestic animals (Meerburg et al.

Box 1. The StopRats team consists of:

Steven Belmain, StopRats Principal Investigator
Natural Resources Institute, University of Greenwich

Ara Monadjem and **Themba Mahlaba**
University of Swaziland

Seth Eiseb
University of Namibia

Peter Taylor and **Lourens Swanepoel**
University of Venda, South Africa

Emil von Maltitz, **Frikkie Kirsten** and **Phane Malebana**
ARC-Plant Protection Research Institute, South Africa

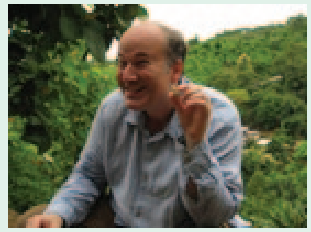
Rhodes Makundi, **Apia Massawe** and **Loth Mulungu**
Sokoine University of Agriculture, Tanzania

Ruth Davies and **Prince Norman**
Concern Worldwide, Sierra Leone

Steve Goodman and **Voahangy Soarimalala**
Association Vahatra, Madagascar

More information about StopRats can be found at the project's website: http://projects.nri.org/stoprats/

2009), damaging food production systems, and exacerbating sanitation problems, few would argue society's rat problems have been solved. Indeed, our problems with rodent pests are very much because of our disregard for the principles of One Health. The StopRats team believes overcoming the challenges posed by rodents to our livelihoods is possible. To do this, StopRats partners are reaching out to other institutions in each of the target countries to develop a network of stakeholders. By engaging with farmers, community based organisations, researchers, policy and decision makers, StopRats will try to raise awareness about rodent problems and potential solutions, including the bottlenecks and opportunities for delivering ecologically-based rodent management in Africa. Improving rodent management in the developing world could be one of the most important interventions of the 21st century across the Tropics to reduce poverty, improve people's livelihoods and to lead the way to One Health.



Dr. Steven Belmain is Professor of Ecology at the Natural Resources Institute of the University of Greenwich in the United Kingdom. Steve's research interests range across the social anthropological and environmental aspects of pest management in developing countries. He has led several interdisciplinary multi-country research projects in Africa, Asia and Europe, often with a focus on poverty alleviation and applied ecology at the interface between agriculture, health and the environment with a view to improving people's livelihoods whilst sustainably managing natural resources. Email: s.r.belmain@gre.ac.uk

Five Years after the Deepwater Horizon Oil Spill: Impacts on Gulf Communities and Seafood

Andrew S. Kane, PhD

Many people were affected by the Deepwater Horizon oil spill that occurred five years ago today, even communities that didn't have oil spilled directly onto their shorelines.

Hundreds of thousands of multi-generational families from Texas and Louisiana, to Mississippi, Alabama and Florida, call the Gulf Coast home. Many coastal residents are commercial, recreational and subsistence fishers, and they depend on local seafood harvests to put protein on the table for their families and neighbors. It's the basis for their regional economy.

My involvement with the oil spill disaster came in response to concerns from coastal residents and community partners that have previously worked with our research collaborators at the University of Florida. Coastal residents were suffering job losses and mental health stress, and they voiced concerns about seafood safety.

In response to community concerns, my colleagues and I developed a research consortium, called Healthy Gulf Healthy Communities (HGHC), led by Dr J Glenn Morris at the University of Florida, which was awarded support through the National Institute of Environmental Health Sciences, a branch of the National Institutes of Health. The team included academics with expertise in individual and family mental health, community-

The project investigators worked with closely with coastal community members. Pictured here is the author at a Pensacola fishing tournament talking with anglers.
Photo by Andrew S. Kane

based social vulnerability and resiliency, and seafood safety, which is my area of research.

Outreach experts within the consortium fostered communication between the academics and the community and helped to establish a framework for working with individuals and communities in everything from data collection to tailoring communication for different audiences.

The goal of this community-based participatory research program was to fill critical gaps left by federal and state studies. We gathered data on potential oil spill-related human health risk in seafood, focusing onlocal, inshore harvests that may not have been assessed by the National Oceanographic and Atmospheric Administration (NOAA) or the Food and Drug Administration (FDA).

We tested locally caught fish to understand the impact on public health. If there were seafood species from any locations that posed a human health risk from oil spill contaminants, people would need to know that. Alternatively, if the seafood was truly safe, as safe as NOAA and FDA claimed, people needed to know that, too.

But more importantly, people would need to believe it.

Uncertainty over seafood safety caused anxiety in coastal communities in the wake of the spill. *Photo by Brittany Randolph CC BY-NC-ND 2.0*

Creating a local picture

Rather than look at the impact of the spill on offshore fishing as NOAA did, we looked at fish, shrimp, blue crabs and oysters that were being harvested and eaten by local fishers. We processed and conducted analytical toxicology on seafood portions that we knew many Gulf residents consume: fish fillets, whole crab, whole shrimp and whole oysters. And we processed them as individuals – without pooling – so that we could see the variation between samples at different sites, and understand the range of contamination (if present) without diluting potential outliers.

The efforts required an integrated, transdisciplinary approach. A team of collaborating scientists supported my seafood safety efforts with expertise in aquatic pathobiology, analytical toxicology and the chemistry of hydrocarbons, food science and human nutrition, geography and GIS, biostatistics, risk assessment and community outreach.

We couldn't assume anything. It was important to know exactly what kind of seafood folks were eating in different communities.

In order to use any potential contaminant data to develop meaningful community-specific risk assessment, we needed to integrate exposure data. Instead of relying on national statistics for seafood consumption and body weight values for Gulf Coast residents, we conducted our own surveys to discern what types of seafood people ate, how often they ate it and their typical portion sizes.

We collected seafood samples with the help of local fishers. We interacted with community members on piers and bridges bridges, from inshore small boats and from fishing tournaments. There were lots of interactions with lots of people at fishing tournaments, in American Legion lodges and community clubs, seafood festivals, science cafes and seafood worker meetings.

We learned that different communities are different. People catch, harvest and consume seafood differently based on availability, preferences and economics. Also, many Gulf coastal residents consume more seafood than national statistics might indicate. A lot more.

Stressed communities, safe fish

It was interesting to do community-based science alongside social scientists, and it was disconcerting to learn community concerns from the residents who were challenged, suffering, concerned and angry about their situations after the spill. I wanted to contribute needed solutions and make a difference, even a small one, in these historically vital and vibrant communities that represent a unique way of life along the Gulf Coast.

My social science colleagues from our consortium team discovered that there was higher-than-expected mental illness, substance abuse and family strife in the aftermath of the spill. Loss of jobs and income appeared to be more important drivers for psychological stress than physical oiling of the shoreline. Thankfully, this trend appears to have leveled off recently and is showing signs of improvement.

Compensation from BP was provided to people and businesses that relied on Gulf resources affected by the spill. Parts of the compensation process were divisivefor communities. For example, payment inequities within and between certain communities fueled people's anger.

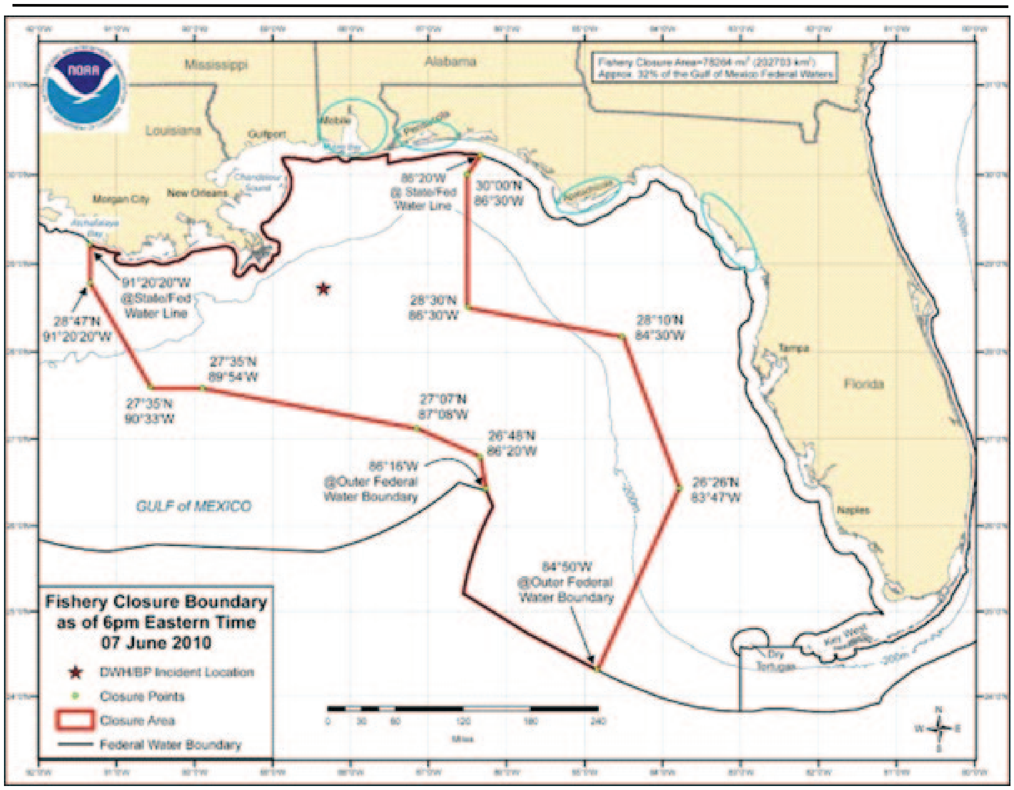
We learned that community cohesiveness and the degree of individual connectedness (how well folks are networked) had an impact on individual stress levels, anxiety and depression. It also had an effect on the degree to which the community was resilient and could come up with strategies for coping with stress.

Analytical chemistry data from more than 1,000 fish, shrimp, crab and oyster samples shows only background levels of contaminants that could possibly be related to oil. In other words, seafood appears as clean now as it was prior to the oil spill. It was reassuring that our data is not dissimilar to those produced by NOAA, the FDA and other agencies and institutions doingsimilar studies in other parts of the Gulf.

There remain many basic science questions to be answered regarding the chemical signature of the Deepwater Horizon oil spill in seafood, and the fate of this oil in the environment. Nevertheless, the basic answer remains positive: we don't see evidence that the oil spill has created significant seafood-related risks.

Personal Lessons

Efforts on this project have fostered reflection about my personal role as an environmental and public



The red-bounded areas were closed to commercial fishing as of June 7, 2010 (open now). Red star indicates the location of Macondo wellhead. The green circles show coastal regions where scientists engaged with communities to sample seafood and take consumptions surveys. Courtesy of NOAA.

health scientist. Several concepts came into focus that became guiding principles for me: honesty and transparency are important in my interactions with other scientists; managers and community members made me human in the eyes of the community; and humans are easier to have meaningful interactions with than white coats in ivory towers.

It takes time to get to know people and communities – and for them to get to know you. Not everyone will agree, but all reasonable voices need to be heard. Never promise more than you can deliver. Scientists can contribute to social capital within communities.

Andrew S. Kane, MS, PhD, is an associate professor of Environmental and Global Health in the College of Public Health and Health Professions, University of Florida. Dr. Kane also serves as director of the UF Aquatic Pathobiology Laboratories, and has secondary appointments in UF's College of Medicine, College of Veterinary Medicine and the School of Natural Resources and Environment that support his multidisciplinary research collaborations and teaching.

"What's in a name?" Plenty!

Jan Clement, MD, John P. Woodall, PhD, and Charles H. Calisher, PhD

[*Originally printed on the One Health Initiative website (onehealthinitiative.com)*]

"... in 1970, British veterinarians in Uganda sent 699 cattle ticks to the East African Virus Research Institute, from which a strain (AMP 10358) of Congo virus was isolated. These findings suggested that ticks could be vectors of the virus to humans and that livestock might constitute at least hosts if not reservoirs of this newly recognized hemorrhagic fever virus. In May 1973, Greek veterinarians isolated AP 92 virus from ticks feeding on goats in Vergina, northern Greece. Moreover they showed that AP 92 virus clearly reacted in immunodiffusion tests with the same goats' sera. In the same study they demonstrated that AP 92 virus reacted in the same way with Russian antisera to Crimean hemorrhagic fever virus and with antisera to Congo virus, provided by Chumakov and Casals, respectively. Casals' paradigm was thereby confirmed. In subsequent years demonstrations of the relatedness of AP 92 and several other Crimean-Congo hemorrhagic fever viruses from Greece and surrounding countries allowed an increasing **'One Health approach'** to studies of this emerging virus."

Words are the primary means by which we communicate with each other. Use the wrong word, misuse a pause or a punctuation mark, and you might be misunderstood. Viral taxonomists are particularly fussy about such things. Viral taxonomists have conjured up rules and traditions to follow, and most investigators adhere to such rules, which have been published by the International Committee on Taxonomy of Viruses (ICTV). However, some, by ignorance or arrogance, unintentionally re-invent taxonomy by misnaming their little friends. This has caused complications and confusions that have had to be addressed. The intent of this paper is to present three interesting examples of such misnamings, the problems thereby caused, and the possible solutions to those problems. Reading this One Health Initiative website and/or the One Health Newsletter is or should be important to physicians, veterinarians, osteopaths and others in health and environmentally related disciplines who intend to publish or to scan the scientific literature.

Crimean–Congo hemorrhagic fever virus

Although a similar disease had been reported at least 800 years earlier in what is now Tajikistan, beginning in 1944 Russian scientists were first to record the clinical aspects of Crimean hemorrhagic fever (CHF) and in 1947 demonstrated that it had a viral etiology in 200 Russian soldiers appointed by the Russian authorities to harvest crops during wartime in the Crimea instead of the local peasants, who had been driven away. However, due to this unexpected and previously non-scheduled military activity, these soldiers had to sleep outdoors, were fed upon by ticks, and shortly afterwards many suffered a severe hemorrhagic fever, thus named CHF.

In 1945, inoculation of "volunteers" with filtered suspensions of ticks and with tissues of these CHF patients proved that CHF was caused by a tick-transmitted virus (1). However, Russian scientists were unable to isolate the virus. It was not until 1967 that the great Russian virologist Mikhail P. Chumakov and his colleagues formally registered an isolate of the virus from a fatal human case that occurred in Samarkand (in Central Asia, not in the Crimea) in the International Catalogue of Arboviruses Including Certain Other Viruses of Vertebrates (2). This was the result of a visit, prior to publication of the description of Congo virus, to the second author [JPW] of this article who explained that the isolation had been made in newborn mice rather than in the adult mice the Russians had been using. The following year the Russians published additional information about their virus (3), but they did not send the virus to the World Arbovirus Reference Center at Yale University, probably because of political constraints.

However, and unbeknown to them, in 1956 Ghislain Courtois, a physician working at the Provincial Medical Laboratory in Stanleyville (now Kisangani), Belgian Congo (now Democratic Republic of the Congo), had isolated a virus from the blood of a 13 year-old local African male with fever, headache, nausea, vomiting, backache, generalized joint pains, and photophobia. Shortly after this virus isolation in his own laboratory, Courtois himself fell ill for three days with high fever and symptoms similar to his young patient. Courtois isolated a similar virus from his own blood taken on the day of onset of his illness and named it strain V3010. V3010 was later found in Greece, Portugal, South Africa, Madagascar, the Maghreb, Dubai, Saudi Arabia, Kuwait and Iraq. Meanwhile, the virus was re-named "Congo virus", but descriptive information about it was not published until 1967 (4, 5), the year before Chumakov et al. published their findings. Of note, Congo virus was also isolated from a cow in Kenya (4), and from a goat in Nigeria (6).

In February 1967, Congo virus strain V3010 was sent to the Rockefeller Foundation Virus Laboratory (RFVL) in New York City and there found by Jordi Casals to be identical to another virus from Uganda, but to no other named virus. Chumakov later sent his strain to the RFVL, where it was found to be identical to the Congo virus (7, 8). In 1970, Chumakov published a book in Russian including a chapter on isolations of the virus from ixodid ticks in European Russia.

Also in 1970, British veterinarians in Uganda sent 699 cattle ticks to the East African Virus Research Institute, from which a strain (AMP 10358) of Congo virus was isolated. These findings suggested that ticks could be vectors of the virus to humans and that livestock might constitute at least hosts if not reservoirs of this newly recognized hemorrhagic fever virus. In May 1973, Greek veterinarians isolated AP 92 virus from ticks feeding on goats in Vergina, northern Greece (9). Moreover they showed that AP 92 virus clearly reacted in immunodiffusion tests with the same goats' sera. In the same study they demonstrated that AP 92 virus reacted in the same way with Russian antisera to Crimean hemorrhagic fever virus and with antisera to Congo virus, provided by Chumakov and Casals, respectively. Casals' paradigm was thereby confirmed. In subsequent years demonstrations of the relatedness of AP 92 and several other Crimean-Congo hemorrhagic fever viruses from Greece and surrounding countries allowed an increasing **"One Health approach"** to studies of this emerging virus (10).

These findings and the dates of their publications created a nomenclatural quandary. Should the virus be named "Congo virus" because it was isolated first, or should it be named "Crimean hemorrhagic fever virus" because a description of the disease was published first and because it incorporated the name of an important human disease? Because this situation had both nomenclatural and political implications, the ICTV attempted to find a proper solution. Against the principles of scientific nomenclature based on priority of publication, recognizing that Congo virus was the etiologic agent of illnesses other than relatively simple fevers, including hemorrhagic manifestations (4), and because it seemed too late to rename it "Congo hemorrhagic fever virus", in 1973 the virus finally was re-named "Crimean-Congo hemorrhagic fever virus" (C-CHFV; family *Bunyaviridae*, genus *Nairovirus*). So there are now a number of publications in the literature with "Congo virus" and even "Congo-Crimean hemorrhagic fever virus" in the title. Of course, this did not satisfy everyone, but everyone recognized that life and taxonomists are not perfect and further arguments were settled or at least disregarded. The virus is now known to be widespread in Africa, and from the Middle East and southern Europe to Asia, due to the preferred dry and sunny biotope of its global vectors, *Hyalomma* spp. ticks (10, 11).

Sin Nombre virus

Hantaviruses (family *Bunyaviridae*, genus *Hantavirus*), found essentially worldwide, are known to cause hemorrhagic fever with renal involvement in Asia (Hantaan virus) and, albeit somewhat milder disease, in Europe (Puumala virus). Hantaviruses are rodent-borne but, while not seriously affecting the rodent host, cause serious, often life-threatening, illnesses in humans. Prospect Hill hantavirus was recognized in the eastern U.S. but was and is not known to cause human illness. In the spring of 1993 a then unexplained outbreak of adult respiratory distress syndrome was observed in rural residents of the Four Corners region (where New Mexico, Arizona, Utah, and Colorado are contiguous) of the southwestern U.S. Antibody to a recognized hantavirus (Puumala virus) was detected in patient sera, suggesting that whatever the etiologic agent, it likely was a hantavirus (12). It was quickly shown that this disease was caused by a previously unrecognized hantavirus (13).

The virus was first named "Muerto Canyon virus" after a nearby Arizona historic site (Spanish: Canyon del Muerto = Canyon of Death) where, in 1863, the U.S. Army killed Native Americans in order to control the land. That name certainly was unacceptable to Native Americans and to others and so was replaced by "Four Corners virus". However, the name Four Corners virus was unacceptable to tourist bureaus and others in the area so was discarded and replaced by the name Sin Nombre (Spanish for "without a name"). Viruses traditionally are named for the disease they cause, or the place where they were first recognized (or at least a general location, e.g., "eastern equine encephalitis virus"), so this name was not traditional. However, given the intensity of the epidemiologic and laboratory efforts in the U.S. to understand the disease and to prevent it at that time, naming the virus was considered of relatively trivial importance, and the name Sin Nombre virus was accepted by everyone, even if only for expedience.

Tick-borne encephalitis virus

Tick-borne encephalitis is the name of a constellation of clinical findings. It can be caused by any of a number of etiologic agents, including viruses, bacteria, and parasites, but is most commonly thought of as being the result of infection with viruses of the family *Flaviviridae*, genus *Flavivirus*, although other tick-borne flaviviruses, i.e., Powassan virus, can cause this disease. For many years these viruses were described as distinct and given distinct names in different locations. Later, more detailed studies showed that most were redundant descriptions, the data were merged, and the number of names thankfully reduced. More recently, molecular studies have led to separation of these viruses as subtypes of a single species, Tick-borne encephalitis virus, European subtype, Far Eastern subtype, and Siberian subtype. This nomenclature (and taxonomy) is far from satisfactory, given that species are non-concrete entities (that is, they do not exist, except as names on lists) (14). Obviously (to some), there cannot be a real subtype (a virus) of a non-real entity (a taxon). It is hoped that someday this will be corrected. Meanwhile, the same confusion of species (taxa) and viruses (the real deal) persists, probably and understandably because a relatively few understand what they are talking about.

There are other examples of virus names that are more confusing than helpful. Viruses named after patients; after phages named for the bacteria from which they were isolated (*Staphylococcus phage 44AHJD*, for example; how does one teach a student to remember that?); names including the name of the genus to which it belongs (Australian bat lyssavirus and bovine viral diarrhea virus 1 (redundant); viral hemorrhagic septicemia virus Fil3 (viral virus?); and many more. Veterinarians almost universally call any of the 26 bluetongue viruses "bluetongue virus" when, in fact, "bluetongue" is the name of a disease, and *Bluetongue virus* is the name of the species (taxon) in which these 26 viruses have been placed. The point to be made is that care should be taken when first naming a virus and inventing a unique abbreviation for it, so that that name and its abbreviation cause the least confusion among those who will be writing and reading about it.

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Bats, Birds, and Camels Are Still Bad News, and Now People Too: ProMED Quarterly Update

Jack Woodall, PhD

In the 3 months ending 31 May 2015, the 3 top epidemics of special interest to One Health, because they are zoonoses, continued to spread, in part due to human carelessness.

Ebola

The good news about this terrible epidemic is that **Liberia** was declared Ebola-free as of 9 May 2015, 42 days (2 incubation periods) after the last known case, with a final total of 10 666 cases & 4806 deaths, of which 3151 cases were confirmed; the number of confirmed deaths is not yet available. The bad news is that since the week ending 10 May 2015, when a

Guinea Red Cross volunteers travel door-to-door sharing information about Ebola. *Photo by US CDC*

10-month low of just 9 cases of Ebola virus disease (EVD) were reported from two prefectures of Guinea and one district of Sierra Leone, both the intensity and geographical area of EVD transmission have increased. In the week ending 31 May 2015, a total of 25 confirmed cases were reported from 4 prefectures of Guinea and 3 districts of Sierra Leone, arising from unknown sources of infection in areas that have not reported confirmed cases for several weeks.

As of 31 May 2015, **Sierra Leone** had reported a total of 12 827 cases & 3912 deaths, with 3223 confirmed cases, and **Guinea** reported 3652 cases & 2429 deaths, with 3223 confirmed cases. The number of confirmed deaths is not yet available in either country. The combined figures for all 3 countries are 27 145 cases & 11 147 deaths as of 31 May 2015, with 14 994 confirmed. The crude apparent case fatality rates (CFR) are 67% for Guinea, 45% for Liberia, and 30% for Sierra Leone, making an overall CFR of 40%. For what it`s worth – these figures will be revised when more laboratory results become available, but at least the CFR is not as drastic as the 90% widely feared at the start of the epidemic.

MERS-CoV

Globally, WHO has been notified of 1149 laboratory-confirmed cases of infection with Middle Eastern Respiratory Syndrome coronavirus (MERS-CoV) since 2012, including at least 431 related deaths (crude CFR 38%). Most of those have been in Saudi Arabia, with a few in other Arab countries and occasional imports outside the region. But in May an unrecognized case arrived in the Republic of Korea from travels in Arabia, fell ill and was hospitalized, infecting 11 more family, hospital staff, and visitors by 30 May 2015 (this had risen by mid- June to 126 infected with 10 fatalities, and 3800 people have been isolated at government-designated facilities or their homes).

A Korean whose father had MERS travelled to mainland China via Hong Kong against medical advice fell ill with the disease and was traced and placed in isolation there. Health officials said more than 120 people were being monitored after direct or indirect exposure to the man.

Camel calves have been shown to be an infectious reservoir - and a single bat has been found with the virus, which belongs to the coronavirus group widespread in bats - but many cases have denied any contact with camels, their milk or urine (taken for medicinal purposes). Family and hospital contacts are the major mode of spread. The results of a serosurvey of 10,000 people in Saudi Arabia suggest that there have been a lot of unrecognized infections, meaning that the crude CFR there would be approximately 2% - much lower than the apparent 38% mentioned above.

Man kissing camel. *Photo by* *David Dennis*

Avian Influenza

H5N1: Egypt, which has millions of backyard (and rooftop) chicken coops and pens, has been particularly hard hit, with 35 human cases so far this year. Since November 2014, Egypt has seen a major rise in the number of human cases, but the proportion of fatal cases, especially in children, has been consistently lower in Egypt than in other countries.

H5N1 & H5N2: these highly pathogenic strains have continued to kill and cause the preventive culling of millions of poultry in Africa, the Middle East, China, Viet Nam and the Americas (by early May more than

600 000 had been culled in Belize because of H5N2 infection).

H5N2: An outbreak was identified in a series of chicken and turkey farming operations in the Midwestern region of the USA and Canada. As of 30 May, more than 43 million birds in 15 US states had been destroyed in an attempt to stop its spread, including nearly 30 million in Iowa alone, the nation's largest egg producer. Egg prices around the country more than doubled in May.

Chicken flock. *Photo by Oregon Department of Agriculture CC BY-NC-ND 2.0*

Many US states have canceled their annual poultry shows as a preventive measure. Vaccines for protection against highly pathogenic avian influenza (HPAI) have not been approved by USDA because they are not effective enough. Backyard poultry owners are encouraged to be aware of the signs of avian influenza and report illness and/or death to the USDA Healthy Birds Hotline: 866-536-7593.

CDC said that the current H5N2 bird flu in the USA has not been detected in humans and remains a low threat to the public. But about 20% of chicken exports have been halted by countries deciding to ban either all poultry exports from the USA or exports from specific states. However, infected poultry and eggs are safe to eat if cooked properly.

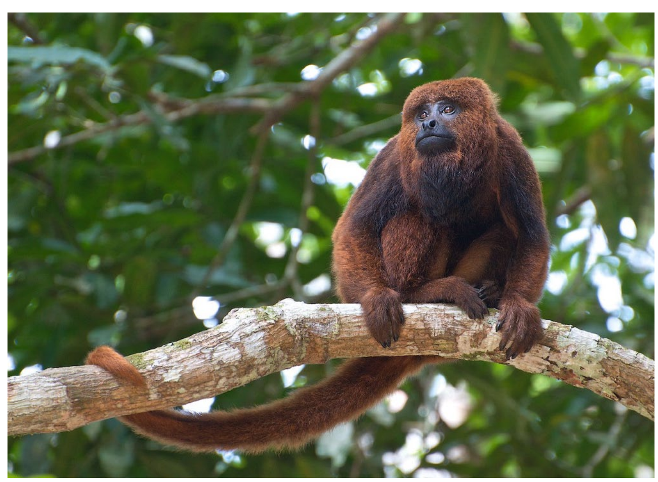
H5N6: In March & April a few human cases were detected in Viet Nam.

H7N9: China reported six more cases in April, to add to the 630 cases reported since this type first appeared in 2013. The cases include 39 this last quarter, with two importations to Canada in February and one to Malaysia.

H9N2: Egypt reported its first human case of H9N2 in February, and two more since then.
Other A(H5) subtypes, such as influenza H5N3, H5N8 and H7N3 have recently been detected in wild birds in West Africa, Asia, Europe and North America. Although these viruses might have the potential to cause disease in humans, with the exception of types **H5N1, H5N6, H7N9** & **H9N2** (above), no other human cases of subtypes of A(H5) virus infection have been reported so far.

Yellow Fever

Yellow fever (YF) seems to break out in the central Brazilian forest (not just in the Amazon) in approximately seven-year cycles, long enough for howler monkey populations to recover from their mortality in the previous epizootic. Brazil reported no cases of YF in 2014, but a few monkey carcasses were found in a forest in Tocantins state that year, indicating that YF



Brown howler monkey near Caratinga, Minas Gerais, Brazil. *Photo by Peter Schoen CC BY-SA 2.0* was returning. Since February (two cases) there have been three confirmed cases originating in Goias, Mato Grosso do Sul (central Brazil) and Amapa, north of the Amazon. (Another case was contracted in Goias in early June). Those were unvaccinated nationals, two of whom died in hospital in Brasilia, with a low risk of spread. The Brazilian government recommends YF vaccination for everyone over 6 months of age who resides in or visits the endemic zone.

Peru reported 9 cases in March, and Argentina reported 22 suspected cases in several provinces in April.

Other zoonoses

Zika virus, which is mosquito-borne, has a reservoir in African forest monkeys, and has been spreading in Asia, was detected for the first time in the Americas, in April in Brazil, where 34 cases have since been confirmed in eight states. There are concerns that the virus will spread widely there just as another virus originating in Africa, chikungunya, has done in recent years. These two viruses are hard to distinguish clinically from dengue.

The second case of the newly discovered tick-borne **Bourbon virus**, which presumably has a wildlife reservoir, was reported from Oklahoma at the end of May. The patient survived.

Rabies was reported in one of a herd of cattle after being bitten by vampire bats in Honduras in April, and a dog brought from Algeria to France died of rabies after potentially exposing 52 people, some of whom have not been traced for preventive vaccination. **Leishmaniasis** was reported during the quarter from French Guiana, Argentina, Israel, Thailand & Syria, and from dogs in Uruguay, suggesting that there may be unreported human cases.

Livestock & aquaculture diseases

African swine fever has not spread further in Europe, but has been officially reported from Cape Verde (islands off the west coast of Africa) in March for the first time since 2009. There were also first reports of **lumpy skin disease** in cattle in Saudi Arabia, and an oyster disease, **Bonamiosis**, in Denmark. A different oyster disease, **perkinsosis**, caused an outbreak in Australia.

Oysters ready to be consumed. *Photo by Jeffrey Bary CC BY-SA 2.0*

The following outbreaks were among those reported to the World Animal Health Organization (OIE in its French acronym) in March through May: **foot & mouth disease** in Algeria, Angola, Botswana, Mauritania, Namibia, Zimbabwe, Mongolia, South Korea, and Taiwan; **Newcastle disease**, Nicaragua, Costa Rica, and Israel; **bluetongue**, Australia; **peste des petits ruminants**, Israel; **classical swine fever**, Mongolia; **equine influenza**, Croatia; **sheep & goat pox**, Kazakhstan; **infectious salmon anemia**, Norway; and **epizootic ulcerative syndrome** in fish, South Africa.

In May, research was published showing that grass can bind, retain, uptake, and transport infectious prions, the cause of **CWD** (chronic wasting disease) in cervids and **BSE** (mad cow disease) in humans. Is this the reservoir?

Wildlife diseases

White nose syndrome, a fungal disease that is killing millions of bats in the USA, has spread to Oklahoma. A **chytrid fungus** has attacked salamanders in the UK and has been detected in Madagascar, home to

Great crested newts, native to the UK, could be in danger if chytrid fungus spreads to wild populations. *Photo by Jürgen Mangelsdorf* CC BY-NC-ND 2.0

around 300 unique species of frogs. The pathogen is classified as one of the greatest threats to biodiversity worldwide.

Crop diseases

During this last quarter, there was an alert posted for **barley yellow dwarf** on cereals in the USA (Idaho), and **cyst nematodes** were found in potatoes imported into Germany from Cyprus. There were first reports of the **coffee** strain of Xylella from France; a new liberibacter species, Lso, and its leafhopper vector, the **tomato-potato** psyllid, from Norfolk Island (halfway between Australia & New Zealand); Panama disease TR4 on **banana**, Pakistan & Lebanon; bacterial leaf streak on **rice**, Burundi; strain Blue13 and new A1/A2 strains of late blight (the cause of the Irish **potato** famine), Spain; the Rec strain of **plum** pox virus, France; and a new strain of downy mildew on **lettuce** in Europe. Post bloom fruit drop of **citrus** has re-emerged in the USA (Florida), threatening the country`s orange juice supply -- some growers reported losing 90 percent of a tree's fruit to it. Panama disease TR4 of **banana** and a new strain of leaf rust of **wheat** are spreading in Australia. Undiagnosed diseases attacked **mango** in Bangladesh and **oranges** in Nepal. ProMED also reported disease outbreaks on **hazelnut** in Canada and **passionfruit** in New Zealand. Streptomycin resistance has appeared in bacterial canker on **kiwifruit**, New Zealand – I never realized before that some crop diseases are treated with antibiotics as well as humans and livestock, but it seems logical. According to the OIE, antibiotic use in plant agriculture constitutes only about 0.12% of total antibiotic use in agriculture, therefore not common enough to contribute to development of resistance.

Cyst nematodes were found on potatoes imported into Germany from Cyprus. *Photo by 16:9clue* CC BY-SA 2.0

Jack Woodall, PhD, is Co-founder and Associate Editor of ProMED-mail. He is also a member of the One Health Initiative team.

Brief Items in One Health

World Veterinary Association/ World Medical Association Global Conference on One Health

Originally printed on the One Health Initiative website.

The World Veterinary Association (WVA) and the World Medical Association (WMA) in collaboration with the Spanish Medical (SMA) and Veterinary (SVA) Associations organized the Global One Health Conference this past

May in Madrid, Spain, bringing together 330 delegates from 40 countries. The theme of the conference was: **Drivers towards One Health "Strengthening collaboration between Physicians and Veterinarians."**

The conference objectives were to strengthen the links and communications and to achieve closer collaboration between Physicians, Veterinarians, and relevant stakeholders to improve the different aspects of health and welfare of humans, animals, and the environment.

For more information about the conference including the full report and conference materials please visit: http://www.worldvet.org/uploads/news/docs/gcoh_report_may_2015.pdf and http://www.worldvet.org/news.php?item=233#prettyPhoto .

FDA Research Helps Keep Pets and Humans Safe

The Veterinary Laboratory Investigation and Response Network (Vet-LIRN), a partnership between the Food and Drug Administration (FDA) and 34 state and university laboratories across the United States, is conducting research to determine how often contaminated pet food makes dogs and cats sick. Handling contaminated pet food or caring for dogs and cats that are carrying harmful bacteria can in turn cause illness in humans. Dr. Renate Reimshuessel, head research biologist at Vet-LIRN, says they hope to learn ways in which the FDA can help minimize the incidence of foodborne illness associated with pet foods and treats. The study examines Salmonella infections in cats and dogs, primarily focusing on dogs, as dogs are easier to obtain stool samples from and are more likely to be brought to a veterinary office for gastrointestinal problems. Preliminary results indicate almost half of the dogs that test positive for Salmonella infection show no signs of illness. Those that test positive are more likely to have consumed a raw pet food diet.

For more information please visit the FDA website: http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm450115.htm?source=govdelivery&utm_medium=email&utm_source=govdelivery

White House Forum on Antibiotic Stewardship

Originally printed on the One Health Initiative website.

On June 2, 2015, the White House convened the Forum on Antibiotic Stewardship, which brought together more than 150 food companies, retailers, and human and animal health stakeholders for the development, promotion, and implementation of activities to ensure the responsible use of antibiotics. Over the next five years, this group will implement changes to slow the emergence of resistant bacteria and prevent the spread of resistant antibiotic infections.

For more information please visit: https://www.whitehouse.gov/the-press-office/2015/06/02/fact-sheet-over-150-animal-and-health-stakeholders-join-white-house-effo

Mighty Farming Microbes

Just as physicians are under pressure to limit use of antibiotics, farmers are in need of alternatives to conventional chemical pesticides and herbicides, and organic farmers have limited options in protecting their crops. Now there

Brief Items (continued)

is a growing market of new biopesticides attracting corporations like DuPont, Monsanto, and Bayer, based on research of naturally occurring microbes commonly found in soils. Hundreds of identified microbes are being studied for their abilities to control weeds and pests.

For more information please visit: http://www.npr.org/sections/thesalt/2015/06/12/413692617/mighty-farming-microbes-companies-harness-bacteria-to-give-crops-a-boost and http://www.epa.gov/pesticides/biopesticides/whatarebiopesticides.htm

Upcoming Events

Practical Antimicrobial Stewardship: Implementation and Expansion in Healthcare Facilities
Symposium presented by the Infectious Disease Association of California
July 18, 2015
Irvine, CA
http://www.idac.org/brochures/2015Summer.pdf

64th Annual Wildlife Disease Association Conference
Novotel Twin Waters Resort, Queensland, Australia
July 26-30, 2015
http://www.wda2015.org

American Society of Microbiology International Conference on Emerging Infectious Diseases
Hyatt Regency, Atlanta, GA
August 24-26, 2015
http://www.iceid.org

32nd World Veterinary Congress
Istanbul, Turkey
September 13-17, 2015
http://www.wvcistanbul2015.com

7th Trends in Medical Mycology
Lisbon, Portugal
October 9-12, 2015
http://www.timm2015.org/en/Home_10_6_12.html

64th Annual American Society of Tropical Medicine & Hygiene Meeting
Philadelphia, PA
October 25-29, 2015
http://www.astmh.org/Home.htm

Upcoming Events (continued)

143rd American Public Health Association Annual Meeting & Exposition
Chicago, IL
October 31-November 4, 2015
https://www.apha.org/events-and-meetings/annual

The Princeton-Fung Global Forum: Modern Plagues—Lessons Learned from the Ebola Crisis
Dublin, Ireland
November 2-3, 2015
http://fungforum.princeton.edu

23rd Biennial Coastal and Estuarine Research Federation Conference
Portland, OR
November 8-12, 2015
http://www.erf.org/cerf2015

Fifth International Conference on Infectious Disease Dynamics
Clearwater Beach, FL
December 1-4, 2015
http://www.epidemics.elsevier.com

One Health EcoHealth 2016
Melbourne Convention & Exhibition Centre, Australia
December 4-7, 2016
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Recent Publications in One Health

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Climate change in the North American arctic: a One Health perspective.
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Call for "One Health" Manuscripts

Infection Ecology & Epidemiology: The One Health Journal
This open access journal features original research articles, review articles, or other scientific contributions in One Health, that motivate interdisciplinary collaborations between researchers in various clinical and environmental health disciplines.
http://www.infectionecologyandepidemiology.net/index.php/iee

Veterinary Sciences
This open access journal supports original scientific research, review articles and short communications that promote theoretical and experimental studies in the veterinary sciences and improve understanding of "One Medicine" and "One Health".
http://www.mdpi.com/journal/vetsci

One Health
This new open access journal supports multi-disciplinary research collaborations that focus on the One Health platform, in order to provide rapid dissemination of scientific findings related to zoonotic pathogens, as well as their inter- and subsequent intra-species transmission.
http://onehealthplatform.com/engine/?page_id=89

International Journal of One Health (India)
This open access, peer reviewed journal focuses on One Health topics in a global context.
http://www.onehealthjournal.org/

Recent Publications (continued)

Journal Articles

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