One Health Newsletter

Volume 9, Issue 1

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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Subsistence Health as an Approach to Engage Students in Rural Communities in Biomedical Research

Karsten Hueffer, DVM*, PhD, FHEA Arleigh Reynolds, DVM, PhD, DACVN Barbara Taylor, PhD
*German equivalent

Rural communities often face unique health challenges that fall under the One Health paradigm, which advocates that humans, animals and the environment share one health because their interactions are extensive and they have all-encompassing impacts on one another. Communities in extremely remote areas live in closer proximity to animals and are more directly dependent on environmental factors as determinants of health outcomes. Furthermore, these communities face educational challenges that lead to an underrepresentation of their citizens in the biomedical workforce, either as researchers or health professionals.

The Biomedical Learning and Student Training (BLaST) program at the University of Alaska takes a One Health approach to engage students from rural Alaska, one of the most remote areas in North America. Subsistence lifestyles are especially common and greatly impact the well-being of communities and individuals. The One Health concept resonates with rural Alaskans. To make the relevance of this concept even more recognizable to citizens in these remote communities, we coined the term Subsistence Health.

Subsistence Health refers to the benefits and hazards, as well as the security and sustainability of subsistence foods. As such it is the conceptualization of the environment, animals and humans interacting in a quintessential example of One Health. Examples of Subsistence Health issues in Alaska include: cardiovascular and metabolic health benefits of the polyunsaturated fatty acids of marine fishes; mercury and its concentration in marine food chains; reduced availability of salmon due to vanishing populations; and potential pathologies causing dramatic declines in caribou herds. A focus on these issues brings biomedical research into the experiential sphere of students in isolated rural Alaskan communities, which are often connected only by air travel to other communities and especially education centers.

Logo Credit: BLaST Program

BLaST student working on a project on crested auklets on Little Diomede Island. *Photo Credit: BLaST Program*

BLaST is a partnership between the University of Alaska Fairbanks, the University of Alaska Southeast and Ilisagvik College, Alaska's only tribal college, and is funded as part of the National Institutes of Health (NIH) Diversity Program Consortium. By focusing our outreach and research activities on the themes of Subsistence Health and One Health, we reach students and communities that often dismiss basic biomedical research as having little direct relevance to their lives and cultural experience. Incorporating the general One Health paradigm and the specific Subsistence Health paradigm into genuine research experiences for undergraduate students, especially those from remote communities, increases the participation of underrepresented groups in biomedical research.

BLaST students benefit from research experience, which has been designated a high impact practice in higher education, and the field of One Health research

from the broadened and diversified experience base of its practitioners. The participation of communities and individuals whose health is directly affected by One Health issues is crucial to expanding research approaches and improving implementation in regions where One Health outcomes often determine individual and public health. Thus, our BLaST program benefits both its student participants and the field of One Health research.

BLaST students analyzing samples in the laboratory. *Photo credit: BLaST Program*

Within the BLaST program, the One Health and Subsistence Health themes are the basis of experiential learning, which is the central premise in our approach to research and education. Experiential learning is based on active experimentation by the learner, resulting in direct experiences that the student reflects upon, and leading to abstraction and continued experimentation based on previous experiences. This repeating cycle leads to optimal learning outcomes. Combining experiential learning with our newly coined term of Subsistence Health within the One Health paradigm assures that the BLaST program provides relevant and engaging experiences for rural Alaskan students.

Engagement of BLaST students is further enhanced by providing tiered-group mentoring to complement the experiential learning activities of the program, especially the active participation in genuine research projects connected to the One Health theme. In tiered-group mentoring, multiple researchers at a variety of career stages mentor each undergraduate student. The range of mentors includes senior faculty, junior faculty, postdoctoral fellows, staff research technicians, graduate students and fellow undergraduate students. Tiered-group mentoring provides students with advice and role models from all aspects of the research enterprise and facilitates students' self-identification as part of the scientific community. Self-identification as a scientist is enhanced by interaction with role models at different career stages investigating One Health and Subsistence Health questions that are germane to life in the far North.

In summary, the BLaST program utilizes One Health and Subsistence Health approaches to engage students from educationally underserved areas in the natural sciences. Successful student engagement is predicated on presenting the natural sciences as culturally and personally meaningful. BLaST's One Health approach improves health of the environment, animals and people, and it broadens participation of Alaska's youth in science education and meaningful research. We believe this approach, ultimately, will strengthen post-secondary education and enhance One Health research, which will lead to more Alaskans pursuing health-related professions. Furthermore, the success of our approach will lead to its implementation in other rural areas of North America, which will contribute to the NIH goal of increasing the diversity of the biomedical workforce by increasing participation of people from backgrounds historically underrepresented in biomedical research careers.

For more information visit https://alaska.edu/blast/

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Elephant Tuberculosis, a View From the Inside

Kay A. Backues, DVM, DACZM

Everything about elephants is big, from their size to their popularity in mainstream media. Add in a well-known human pathogen and you have a news story of, excuse the term, "elephantine proportions." Elephant health stories that make the lay news are often alarmist, factually inaccurate and driven by animal extremists - elephant tuberculosis reports are no exception. Tuberculosis, a zoonotic disease caused by *Mycobacterium tuberculosis* (*Mtb*), has become one of the leading issues of elephant health and well-being. We (the captive wildlife veterinary community) have learned a lot about this disease in just the last 20 years, but compared to what is known about *Mtb* in humans, our knowledge is still in its infancy.

What do we know?

African and Asian elephants are both susceptible to infection by *Mtb* complex organisms. Since 1996, elephant tuberculosis has emerged in the United States as a disease primarily of Asian elephants (*Elephas*

Asian elephants. *Photo by Dennis Jarvis, CC BY-SA 2.0*

Elephants performing at a circus show. *Photo by Laura Bittner, CC BY-SA 2.0*

maximus). The Asian elephant has lived in close association with humans in Asian range countries for thousands of years. Elephants have been working animals as well as spiritual and cultural icons. This close partnership is likely responsible for the exposure of the Asian elephant to a disease for which humans are considered the primary reservoir. Incidental reports of *Mtb*-like disease in the Asian elephant go back thousands of years (Chalke 1962). However, the confirmation of *Mtb* in elephants only occurred very recently and is the result of the application of modern veterinary medicine and diagnostics. A decade and a half of routine testing and monitoring in the United States is teaching us a great deal about *Mtb* in elephants.

One of the biggest issues facing the veterinary practitioner and the public health official asked to consult on human elephant interactions is the question of transmission. There have been two well-documented human exposures to *Mtb* through working with elephants (Murphree et al. 2011, Zlot et al. 2016). In both instances what we know about human-to-human transmission appears to have held true for zoonotic transmission related to elephants: *Mtb* is transmitted through close, prolonged contact with a person (or animal in these cases) that is shedding the organism (Heymann 2008). Other routes of *Mtb* exposure in humans have not been documented or are not considered significant (Heymann 2008). Casual contact, such as petting or riding an elephant or indirect exposure to an elephant, has never been shown to be a risk factor for *Mtb* transmission. These are the basic differences between occupational exposure risk vs. public health risk. Occupational risks can be handled through routine staff testing, routine preventative health testing of elephants, and protocols for staff to don personal protective equipment (PPE) where applicable.

There is documented elephant-to-elephant transmission of *Mtb* within herds. In these instances the rule of close prolonged contact holds true also, as affected animals are typically long term companions of carriers, share the same barn, and have trunk to trunk contact. In other instances, where elephants were implicated in *Mtb* infections without prolonged close contact, fomite transmission was postulated but no conclusive evidence was found (Vogelnest et al. 2012).

Is tuberculosis in elephants an epidemic?

Using the Webster's dictionary definition, an epidemic is characterized by very widespread growth or affecting a disproportionately large number of individuals at the same time. As a veterinarian working with elephants, I would say tuberculosis is not an epidemic so much as a slow insidious disease that has only come to the awareness of the veterinary community in the last several decades. Prevalence studies from 1997- 2011 have shown an average annual *Mtb* point prevalence of 5.1% in the living captive U.S. Asian elephant population. For the same time period, the point prevalence of *Mtb* in captive African elephants in

Interested in learning more about tuberculosis in animals and humans? View this informative video created by Charles O. Thoen, DVM, PhD, shared with permission via the One Health Initiative website: "Tuberculosis in Animals and Humans: A One Health Approach"

the U.S. was 0% (Feldman 2013). Most of the Asian elephants alive today in the U.S. have some risks factors associated with higher *Mtb* infection in humans, such as adult to geriatric age and exposure to or time spent living in countries where *Mtb* infection is more prevalent. The majority of Asian elephants in the U.S. are adult animals in the mid 40s or older and were imported from range countries such as India and Thailand up until the mid 1970s.

Another factor affecting the disease in elephants is the difficulty in accurately diagnosing *Mtb*. Similar to latent *Mtb* infection in humans, early infection in elephants is insidious and can have little to no clinical signs. Chest radiography is impossible in elephants due to their large size, and the tuberculin skin test (TST) is inaccurate. This leaves the trunk wash culture (TW) which is the elephant equivalent to the human sputum sample. Similar to the human sputum test, the TW test has high specificity because a positive *Mtb* culture is definitive, but low sensitivity because it may take several attempts to obtain a positive culture. Humoral-based tests are helpful diagnostic tools but have not been validated in the living population of elephants. Other diagnostics such as a qPCR on trunk wash fluids are still being developed and offer the hope of increasing sensitivity of TW samples. Currently, most veterinarians working with elephants are using multiple diagnostic tests as well as herd history to make informed judgments about which elephants may be infected and need treatment. Knowledge of the efficacy of treatment of elephants is also in its infancy, but early studies hold promise that treatment quickly ceases shedding of the *Mtb* organism into the environment (Backues et al. 2015).

What are we doing?

The captive wildlife community is very dedicated to researching and eradicating this disease in our captive elephants and acting as a resource for information to protect human health and facilitate the best care for elephants in the U.S. and worldwide. To that effort, the Stakeholders Task Force on Management & Research Priorities of Tuberculosis in Elephants was formed in 2011. This group includes veterinarians, elephant managers, public health specialists, epidemiologists, pharmacologists, physicians and other professionals working with elephants in zoos, circuses, and private facilities. 'The Stakeholders' have made a multi-year effort to cooperate with USDA, State Veterinarians, and State Public Health Veterinarians and have developed useful, evidence based, and easy to follow guidelines for dealing with elephant tuberculosis. The **'Recommendations for the Diagnosis, Management, and Treatment of Tuberculosis in Elephants'** was produced in 2015 (Backues & Wiedner 2015) and is available via link at **AAZV.org**. This is a useful guide for veterinarians, elephant managers, and public health officials dealing with elephants and will serve as an accurate source of information for those groups and the general public. These recommendations serve as a living document to be updated regularly as the science and knowledge of *Mtb* in elephants advances through good management, medical surveillance, and scientific cooperation. The Stakeholders intend to continue to identify research priorities as well as learn more about potential risks and *Mtb* transmission pathways to further refine these recommendations for diagnosis, management, and treatment of tuberculosis in elephants.

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Gideon and One Health

Steven A. Berger, MD

This article was originally published on the One Health Initiative website.

As of 2016 humans are subject to 354 generic infectious diseases, distributed in a seemingly haphazard fashion among 231 countries and regions. 307 anti-infective drugs and 70 vaccines have been developed to deal with over 3,000 named pathogens. Fifty-nine percent of known human infections are associated with an animal reservoir, and awareness of these diseases among health-care workers and the lay public has grown steadily with the appearance of such conditions as Ebola, SARS, Avian Influenza virus and West Nile virus infection.

Gideon is an online system for diagnosis support and informatics in the field of Human Infectious Diseases. As the user enters any combination of signs, symptoms, exposure history (country, dates of exposure, food, specific animal contact), a ranked differential diagnosis list appears. Additional modules present the descriptive epidemiology of each disease, clinical features, diagnostic tests, therapy, etc. A free 15-day trial is available on the website.

A second sub-module in Gideon follows the status of every individual disease – in every country. As of 2016, the program includes 21,460 country-specific notes which incorporate over 3.9 million words of text. Data include local vectors, vehicles, populations at risk, all published outbreaks, serological surveys, vaccination uptake, etc. This sub-module is complemented by 5,000 color figures, 83,500 listed outbreaks and surveys, 31,500 graphs and 462,000 linked references.

Descriptive and numerical data for all relevant diseases also include the status of these conditions among animals in every country. A copy of one recent note is available here. This is currently the most extensive note in Gideon and incorporates an impressive amount of data regarding disease among birds and other vertebrates. As for brucellosis, anthrax and other zoonoses, a chronology of animal outbreaks is integrated into the text.

The third sub-module follows the pharmacology and usage of all antimicrobial agents and vaccines, while the fourth sub-module is designed to identify any human pathogen based on phenotypic tests entered by the user. The entire Gideon program is updated every 48 hours. In 2016, Gideon released two series of 423 e-books (120,000 single-spaced pages): one each devoted to every country and every disease. All titles are automatically updated yearly.

Gideon was first released in 1992, and is currently used by W.H.O, C.D.C, European C.D.C, travel clinics, medical schools and infectious diseases departments in over 50 countries. Although scientific content to date has been edited by specialists in human infectious diseases, **the staff are strongly committed to the One-Health concept**. We are currently searching for colleagues to expand Gideon with a parallel module in Veterinary Medicine. The technical work involved would be rather simple, since necessary computer programming is already in place. The principal task will be creation of a two spreadsheets for diagnosis support (Disease name vs. Symptom occurrence; Disease name vs. Incidence by country) – for each

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relevant animal species. In a later stage, text regarding country-specific epidemiology, Veterinary drugs/vaccines, pathogens, etc. can be added.

Colleagues interested in collaborating on a One Health version of Gideon should contact Dr. Steve Berger at steve@gideononline.com

ProMED Quarterly Report: Yellow Fever Reaches China

Jack Woodall, PhD

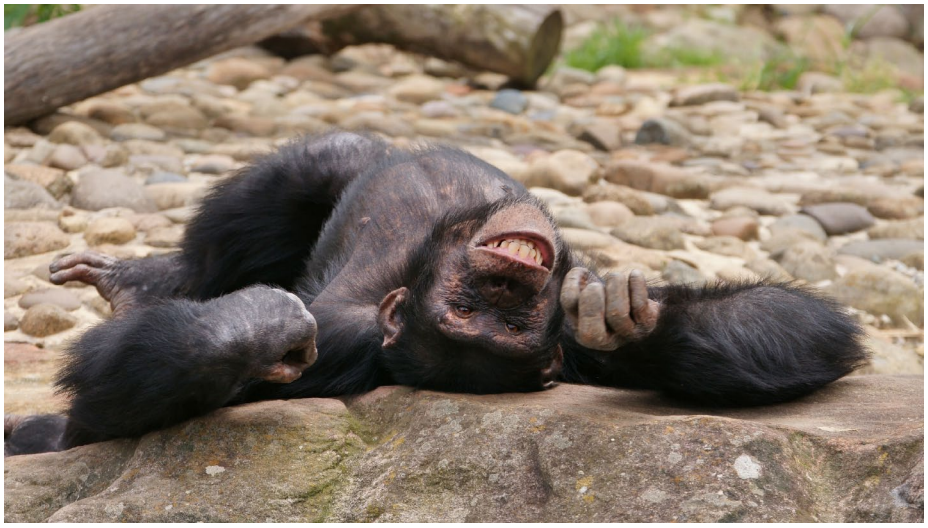
Ebola and **MERS** just won`t go away, and now we have new viruses to worry about: **Zika** is spreading like wildfire in the Americas and causing an epidemic of microcephaly in newborns, and the first ever confirmed **yellow fever** cases imported into China, luckily not during the mosquito season. Other yellow fever cases will arrive in the summer when mosquitoes are active, and could spread across China's border into tropical Asia just as Zika has spread through the Americas.

Ebola sequelae

WHO announced the end of Ebola in Sierra Leone and the end of transmission in West Africa on 17 Mar 2016. On the same day, Guinea announced two new and three more probable cases in a remote, forested location on its border with Liberia and Côte d`Ivoire, and since then the disease has re-appeared in Liberia. Sporadic cases of Ebola like this will continue to pop up and are likely to continue indefinitely.

Human-to-human transmission linked to the most recent cases of Ebola virus disease (EVD) was declared to have ended in Liberia on 14 Jan 2016, in Sierra Leone on 17 Mar 2016, and Guinea completed its 90-day period of enhanced surveillance on 27 Mar 2016. Surveillance is intense. In the week prior to 13 Mar 2016, 1,611 suspected cases and deaths from EVD were reported in Guinea, and 370 new and repeat samples were tested, most from suspected deaths; 663 alerts were reported in Liberia, which tested 595 new and repeat samples, most from live suspect cases; and in Sierra Leone 1,494 alerts were reported and 952 were tested, most from suspected deaths. Samples were tested in the region's 21 operational labs over the same one-week period – all were Ebola negative.

It is becoming clear that up to half of the estimated 10,000 survivors of EVD infection in West Africa, and some of the international volunteers after their return home, are suffering from temporary vision problems and chronic neurological and/or painful physical symptoms months after they have been discharged from the hospital. The Scottish nurse survivor who suffered a relapse with viral meningitis months after returning home and was put on the critical list for the second time, recently relapsed with unspecified symptoms, and recovered yet again. In-country Ebola research is



Retired laboratory chimpanzees on mangrove islands off the coast of Liberia are in need of food and water supplies, which were halted during the height of the Ebola outbreak. *Photo by Roger Smith, CC BY-NC 2.0*

tasked with addressing these remaining issues, even while many healthcare workers and potential patients are too frightened to enter Ebola treatment centers (which is why a million-dollar center in Sierra Leone was recently decommissioned).

The lingering consequences of EVD are not only affecting humans. Retired research chimpanzees on six uninhabited islands off the shores of Liberia escaped Ebola infection because the islands host no wildlife ebolavirus reservoirs. However, the chimpanzees are slowly dying of starvation and dehydration. There is no natural food or water supply on the islands, and international aid to pay local people to care for the chimpanzees stopped last year.

MERS-Coronavirus in Saudi Arabia & South Korea

Severe MERS-coronavirus pneumonia will continue to spread as long as patients choose to wait in the grossly overcrowded waiting areas of flagship hospitals instead of seeking care at less crowded but less well-known institutions. The cumulative end of March case counts for Saudi Arabia were 1,366 laboratory-confirmed cases including 583 deaths (reported case fatality rate of 42.7%). In comparison, the epidemic in South Korea lasted from May-October 2015 and resulted in 1,260 cases and 539 deaths (case fatality rate of 42.8%, almost identical to Saudi Arabia). A case in a native of Oman was detected after his arrival in Thailand.

In the face of the known risk, there is really no excuse for lax infection control procedures that allow the sometimes fatal contamination of doctors and other health workers by their patients. However, an increasing number of patients deny any prior contact with other cases, hospitals, or camels/camel products, suggesting community transmission is sometimes occurring. Surveys have found infected camels in Egypt, Sudan, and other African countries without detection of any MERS type human illness or infection.

Yellow fever

Yellow fever (YF) has reappeared in the Angola capital of Luanda after an absence of 30 years. Worse, it is spreading country-wide, and cases imported from Angola have been confirmed in the capital cities of China and Kenya (1 fatal). There is currently no risk of spread in China since it is not the mosquito season yet, but if cases arrive in summer in the more southerly provinces there would be a high risk of spread. Guangzhou International Airport is operating thermal body scanners and questioning arriving passengers about the origin of their travel, but those measures failed to detect a single case of Ebola when applied worldwide last year.

By the end of March Angola had reported over 1,400 cases (490 confirmed) with 198 deaths, probably gross underestimates, and had vaccinated 88% out of a target population of 6.6 million in Luanda, but YF has now spread to much of the rest of the country of 24 million. Cases have been reported from the Democratic Republic of the Congo, Mauritania, and Kenya in arriving Angolans, but no reports yet of spread within these countries.

The *Aedes aegypti* mosquito is the primary vector of both yellow fever virus and Zika virus. *Photo by James Gathany, US CDC.*

Zika, birth defects, and more

The emergence of Zika virus in the Americas has coincided with increased reports of more than 5,000 babies (1,000 confirmed) born with microcephaly and other birth defects in Brazil and Colombia, and

sporadic cases in the USA and other countries linked to infection of the mother during pregnancy. On 1 February 2016, WHO declared the suspected link between Zika virus and microcephaly to be a Public Health Emergency of International Concern. Retrospective analysis of the 2013-14 Zika epidemic in French Polynesia has revealed that cases of microcephaly also occurred during that time period, and recently a whole raft of neurological symptoms besides microcephaly have been described in babies born during the epidemics. However, not all such cases are fatal.

The virus is now being transmitted from mosquitos to people in 38 countries and territories, most of them in North and South America. In most cases, the infection is mild, causing only fever, rash, red eyes, and aches. But in an estimated 1% of cases, Zika infection may trigger more serious problems, including Guillain-Barre syndrome (GBS), which causes paralysis. Thirteen Zika-infected countries report increased incidence of GBS. Most people who get GBS eventually recover. In March, doctors reported the first case of meningoencephalitis linked to the virus.

Cases have already been imported to the following countries: Belgium, Israel, France (La Réunion), Norway (suspected), and the USA (258 cases). In these countries, there is no current risk of mosquito transmission either because the vector is not present or because temperatures are still too low for mosquito activity (except in tropical La Réunion), but in Puerto Rico there have been 325 locally-acquired cases as of the end of March. Zika virus will continue to spread to countries with *A. aegypti* until either vector control is seriously improved or until Zika becomes endemic like dengue. Worryingly, New Zealand, Argentina, Chile, France, Italy, and the USA are reporting a few cases of spread of Zika virus through unprotected sex.

Avian influenza

H5N1 cases were reported in Egypt and Algeria (suspected), and **H5N6** in China. **H7N9** is spreading in China; advanced age and delays in confirmation of diagnosis and start of antiviral treatment are the greatest contributory factors to a high risk of death, and viral mutations are also associated with increased fatality rate. No vaccine is available.

HPAI H7N3 was found in poultry in Mexico, and **HPAI H5N1** is spreading in poultry in Viet Nam, both with risk of spread to humans.

Other zoonoses

Rabies continues to kill people in countries that do not vaccinate their dogs or lack enough immune serum or vaccine for bite victims. **Lassa fever** cases are increasing in Nigeria. The disease has symptoms like Ebola and is spread in the urine and feces of field rats and through bodily fluids of patients in hospitals that lack proper infection control.

Other livestock diseases

Foot-and-mouth disease is spreading in the Mahgreb, lowering the productivity of cattle and sheep. **Peste des petits ruminants** (PPR) is spreading in sheep and goats in Algeria, and there was a first report of PPR from the country of Georgia. **Anthrax** continues to kill cattle and sheep and the people who butcher and eat them in India and elsewhere.

Wildlife diseases, poisoning

Killer whales (orcas) and other cetaceans are dying from **PCB contamination** off the coast of Europe.

Orca. *Cropped from photo by Matthew Allen, CC BY-NC 2.0*

Up to 90% of infected massasauga rattlesnake may die from snake fungal disease. *Photo by Ontario Nature, CC BY-NC-ND 2.0*

Elephants are in the news for multiple reasons of concern. Some Asian elephants in captivity in the United States have been diagnosed with tuberculosis, and zoonotic transmission of this disease has been documented.* However, it is uncertain whether tuberculosis in US captive elephant herds originated from an initial human or elephant introduction (Michalak et al. 1998). Elephants are frequently exchanged between zoos and circuses, although they are no longer exhibited in circuses in the USA. Sadly, many African elephants have been poisoned with **cyanide** in their salt licks by poachers in a Zimbabwe game park for their tusks. Heavily armed men have killed rangers who try to stop them. Poach-ers get USD 20 per kilo for the ivory, which sells in the Far East for USD 3000 per kilo. **Anthrax** has killed nine elephants in a sanctuary in India.

Snake fungal disease has now been found in one more state, Louisiana, bringing the total up to sixteen states. It is estimated that up to 90% of fungus-infected massasauga rattlesnakes in the United States midwest die as a result of the disease. Other snake species have a much lower mortality rate.

**A previous version of the ProMED Quarterly Report unintentionally misstated the prevalence of tuberculosis in US elephants. The statement has been revised here.*

Crop diseases

The Kranich strain of stripe rust of wheat was found in the United Kingdom, and **orange rust** of sugarcane was detected in Argentina, both for the first time. A new disease of soybean, **taproot decline**, was found in the United States (Mid-South). There were alerts for vegetable viruses in Spain and fungal diseases of wheat and oilseed rape in the UK.

There were reports of undiagnosed diseases in potato in Bangladesh; millet in Haiti; coffee in Kenya; banana in Nepal; rice in Nigeria; and legume crops in Tanzania. ProMED would appreciate follow-up reports of their etiology.

There were also reports of new strains of **septoria blotch** in wheat in Ireland. **Blackleg** of seed potatoes underwent a species shift in the Netherlands. The feared **huanglongbing citrus disease** was detected in Colombia, the severe **TR4 strain of Panama disease** of banana in Australia and the Philippines, and **karnal bunt** of wheat in India.

And so it goes worldwide.

Banana crops quarantined due to Panama disease in Australia, *Photo from news.com.au*

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

Adaptation Canada Symposium 2016: time for Canadians to discuss the impacts and adaptation strategies needed to protect health against zoonotic and vector-borne risks from a changing climate

As the global temperature continues to rise year after year and the occurrence of extreme weather events is more frequent, the effects of climate change in Canada are increasing the risk of Canadians acquiring diseases transmitted from animals or vectors such as mosquitoes and ticks.

Symposium logo found at https://adaptationcanada2016.ca/

A joint session between the Public Health Agency of Canada and the National Institute of Public Health of Quebec's Observatory on Zoonoses and Climate Change Adaptation will be held during the Adaptation Canada Symposium 2016 on April 14th in Ottawa. The session will look at predicting current and future risks, use of wildlife health as early warning signals, and adapting as a new reality for public health practitioners. Presentations will showcase provincial work on adaptation to the emergence of Lyme disease in Quebec, Nunavik's adaptation approach to fox rabies and Quebec's innovative adaptation solutions to zoonoses and climate change.

The session will provide the participants with a better understanding of zoonotic and vector-borne public health risks from a changing climate and adaptation strategies to protect the health of Canadians. *(Submitted by Anne-Marie Lowe of the National Public Health Institute of Quebec and Anne Magnan of the Public Health Agency of Canada)*

For more information about this symposium, please visit https://adaptationcanada2016.ca/
To learn more about the Observatory on zoonoses and climate change adaptation, please read the article published in Volume 8, Issue 4 or visit https://www.inspq.qc.ca/zoonoses/observatoire

Novel robotic tick collection method engages multidisciplinary approach

Now known as the Tick Magnet, this tick collecting robot began as an idea from Dr. Greg Gray of Duke University. Students from the Duke

University Robotics Club engineered the robot (pictured) that will be able to conduct field tick collections traditionally done by researchers, and reduce researcher's risk of tick bites. The robot is a small remote controlled vehicle that emits heat and carbon dioxide to attract the ticks and drags a sheet behind it in similar fashion to man-powered tick collection. Once the ticks have been collected, the fabric is rolled into a cylinder for safe transport. The Tick Magnet is able to manage forest terrain and is equipped with a remotely-viewable camera so the driver (up to one kilometer away) can see where the robot is going. This multidisciplinary team continues to improve the design and features of the Tick Magnet, and plans to continue its use in field studies, eventually expanding into other entomological studies.

More information about the tickbot:
https://globalhealth.duke.edu/media/news/tick-collection-theres-bot

The new tick collecting robot, Tick Magnet, at Duke University. *Photo courtesy Duke University*

First One Health Conference Held in Israel

Israel just had its first One Health conference in a hospital! The one day event took place on **February 4th, 2016** at the Tel-Aviv Medical Center, Tel Aviv, and was supported by the Israeli Ministry of Health. Professor Peter Rabinowitz (MD, MPH), the director of the Center for One Health Research and director of Human Health at the University of Washington's School of Public Health in Seattle, Washington (USA), was the keynote speaker. He talked about the potential benefits of the One Health approach, such as de-siloing of the various players and integration of data, and shared his own experience at Washington State. He also provided some preliminary data from research he is leading in Kenya

regarding shared microbiome between humans and animals, showing that the microbiome is more environment-dependent than species-dependent: the microbiome of children was more similar to the microbiome of animals living in the household than to the microbiome of children leaving further away.

The 150 participants of the conference also learned from the other esteemed speakers about the various inter-disciplinary collaborations taking place in Israeli academia and governmental offices and how integration of the **One Health approach** may benefit humans, animals, and the environment. The speakers (physicians and veterinarians) included Dr. Silvia Pessah (MD, MPH), a medical (physician) epidemiologist, in charge of Zoonotic Diseases, Epidemiology Division, Israeli Ministry of Health; Dr. Eyal Klement (DVM, MSc), veterinarian head of the new veterinary Master's degree program in public health at the Hebrew University, Jerusalem; Prof. Mitchell J. Schwaber (MD, MSc), physician director of the National Center for Infection Control; Dr. Nir Rudoler (DVM, MPH, PhD), a veterinarian at Ben Gurion University, Beersheba, Israel; Dr. Yael Paran (MD), physician head of Geographical Medicine at The-Aviv Medical Center; Prof. Nadav Davidovitch (MD, PhD, MPH), physician chair of the Department of Health System Management, Ben-Gurion University; Prof. Gad Baneth (DVM, PhD), veterinarian director of the Koret School of Veterinary Medicine at the Hebrew University; Dr. Michal Perry (DVM), veterinarian poultry epidemiologist at the Israeli Ministry of Agriculture; Dr. Roni King (DVM), chief veterinarian, Israel Nature and Parks Authority; and Dr. Michel Bellaiche (DVM), veterinarian director of the Kimron Veterinary Institute at the Israeli Ministry of Agriculture.

Selected topics included antimicrobial resistance in animals and humans, Leishmania, Brucella, the current Zika virus outbreak, Salmonella, bats as zoonotic reservoir and disease surveillance in wildlife. We would like to thank the speakers from academia and various government agencies for sharing their experience, the participants, and the Tel-Aviv Medical Center for opening its doors to us. We hope that this event marks the beginning of an inter-agency and interdisciplinary collaboration that aims to benefit animals, humans, and the environment, in keeping with the One Health spirit. *(Reprint from the One Health Initiative Website, February 25, 2016. Provided by co-organizers: Zohar Lederman, MD and Sharon Amit, MD, PhD.)*

Fame and Zoonosis

Diseases acquired from animals have repeatedly shaped human history; but the influence of zoonoses on well-known leaders in science, politics, war, religion, art, industry or even crime is not as well known. The suffering or death of a world leader from plague, anthrax or rabies can serve as an important paradigm in **the appreciation of One Health.**

In this series I will explore the impact of zoonotic diseases on famous and infamous humans throughout history. Background data are derived from a "hobby" which I maintain at www.VIPatients.com. The site is interactive. Users can explore the diseases of over 22,000 "VIPs"; or generate lists based on disease, profession or year of death. Although specific "diagnoses" are derived primarily from biographies, and are often speculative or biased, entries are regularly updated as additional information becomes available.

Rabies and Fame:

Although rabies was first described as early as 1930 B.C.E., only five famous persons are known to have died of the disease. The first VIP to die of rabies was Charles Lennox, Duke of Richmond. Richmond was appointed Governor General of North America in 1818, but died only one year later after contracting rabies from the bite of a fox in Quebec. In 1868, Gieseppe Abbati, an Italian painter from the Macchiaoli School, died of rabies after his pet dog bit

him. Ironically, both Abbati and the dog had been memorialized in a portrait painted three years earlier (pictured at right). Six years later, Ada Clare, a little known American actress died of rabies following the bite of a dog. Hayes St. Leger, 4th Viscount Doneraile was an Irish peer who sat in the British House of Lords. In 1887, he developed rabies from the bite of a pet fox, and died as his house-servants smothered him to end his suffering. Actor Fernando Poe, Sr. is a household name in the Philippines. Poe was injured while filming a movie in 1951, and died of rabies after allowing a dog to lick his wound. Thus, the disease does not require an overt animal bite for transmission.

Ironically, the best-known encounter with rabies did not result in death. In 1886, a Spanish child prodigy was bitten by a rabid dog. One year earlier, a Frenchman named Pasteur had developed a vaccine for the disease, and this boy became one of the first humans to be saved through vaccination. In 1891, young Pablo Casals went on to give his first cello recital, in Barcelona. *(Reprint from the One Health Initiative website, March 21, 2016. Written by Steve A. Berger, MD.)*

Portrait of Giuseppe Abbati by artist Giovanni Boldini {{PD-US}}. *Image source credit: JSS Gallery*

Major U.S. Company (US Biologic) Strongly Endorses One Health

(Reprint from the One Health Initiative Website, April 5, 2016. Prepared by the One Health Initiative Autonomous pro bono team Laura H. Kahn, MD, MPH, MPP; Bruce Kaplan, DVM; Thomas P. Monath, MD; Jack Woodall, PhD; Lisa A. Conti, DVM, MPH)

According to the CDC (2016), "Scientists estimate that more than 6 out of every 10 infectious diseases in humans are spread from animals." While human-focused diagnostic, preventative, and treatment innovations will remain critical tools in protecting human health, special focus also must be paid to the animals with which humans interact. The One Health movement understands the interconnection between human and animal, and so its tenants of focusing on animal health to improve human health bear relevance to all global efforts to reduce disease, and improve and save human lives.

US BIOLOGIC has developed a unique One Health solution: an oral-delivery platform that can target "disease reservoirs" such as the white-footed mice known to be the primary carrier for LymeBorrelia. This solution allows for cost-efficient application of the vaccine in a wildlife setting, thus changing the environmental role of the mouse from disease reservoir to being an integral part of the Point of Disease Prevention cycle.

"Implementation of such a long-term public health measure could substantially reduce the risk of human exposure to Lyme disease" (*Richer LM, et al. Reservoir targeted vaccine against Borrelia burgdorferi: A new strategy to prevent Lyme disease transmission. Journal of Infectious Disease. 2014; 209: 1972-1980*).

Toward that end, US BIOLOGIC is pleased to endorse the One Health Initiative in its many forms, and we look forward to growing together, creating groundbreaking technologies that may improve animal and human health all over the world.

Sincerely, Mason Kauffman, President & CEO (http://usbiologic.com)

Upcoming Events

19th Annual Conference on Vaccine Research
Baltimore, MD
April 18-20, 2016
http://www.cvent.com/events/19th-annual-conference-on- vaccine-research/event-summary-9c2a6b5301a64921afbd9c07a4cffa14.aspx?refid=spcoc

4th International Climate Change Adaptation Conference
Rotterdam, Netherlands
May 10-13, 2016
http://www.adaptationfutures2016.org

Society for Healthcare Epidemiology of America Spring Conference: Science Guiding Prevention
Atlanta, GA
May 18-21, 2016
http://sheaspring.org

10th International Conference on HFRS, HPS and Hantaviruses
Colorado State University
Fort Collins, CO
May 31-June 3, 2016
http://hantavirus2016.org/

International Symposium on One Health Research
Ulaanbaatar, Mongolia
June 15-16, 2016
http://sites.globalhealth.duke.edu/dukeonehealth/5th-interna-tional-symposium-on-one-health-research-mongolia/

8th Summer Institute Series in Statistical: Genetics/Big Data/Modeling in Infectious Diseases/ Clinical Research
University of Washington, Seattle, WA
July 11-27, 2016
http://www.biostat.washington.edu/suminst

5th World Congress of Clinical Safety
Joseph B. Martin Conference Center,
Harvard University Medical School, Boston, USA
September 21-23, 2016
http://www.iarmm.org/5WCCS/

One Health Inter-Regional European Conference
Palace of the Parliament, Bucharest, Romania
September 22-23, 2016
http://www.onehealth.ro/en/#general-presentation

One Health EcoHealth 2016
Melbourne Convention & Exhibition Centre, Australia
December 4-7, 2016
http://oheh2016.org

Visit onehealthday.org for more information!

Recent Publications in One Health

Journal Articles

Proteomics and the search for welfare and stress biomarkers in animal production in the One-Health context. A. Marco-Ramell, A.M. de Almeida, S. Cristobal, P. Rodrigues, P. Roncada, A. Bassols. Molecular BioSystems. March 2016. http://www.ncbi.nlm.nih.gov/pubmed/26931796

Human-animal health interactions: The role of One Health. M.J. Day. American Family Physician. March 2016. 93(5):344–346. http://www.aafp.org/afp/2016/0301/p344.html

A new global agenda for nutrition and health: The importance of agriculture and food systems. A.D. Jones, G. Ejeta. Bulletin of the World Health Organization. March 2016. 94(3):228–229. http://www.who.int/bulletin/volumes/94/3/15-164509/en/

Recent Publications (continued)

Journal Articles

Antibiotic resistance: The emergence of plasmid-mediated colistin resistance enhances the need of a proactive One-Health approach. P. Jean-Claude. FEMS Microbiology Letters. March 2016. 363(5). http://www.ncbi.nlm.nih.gov/pubmed/26872493

Antimicrobial resistance, food safety, and One Health: The need for convergence. S.L. Lammie, J.M. Hughes. Annual Reviews of Food Science and Technology. February 2016. 7:287–312. http://www.ncbi.nlm.nih.gov/pubmed/26772408

Transdisciplinary project communication and knowledge sharing experiences in Tanzania and Zambia through a One Health lens. B. Bagnol, E. Clarke, M. Li, W. Maulaga, H. Lumbwe, R. McConchie, et al. Frontiers in Public Health. February 2016. 4:10. http://journal.frontiersin.org/article/10.3389/fpubh.2016.00010/full

Biodiversity and health: Lessons and recommendations from an interdisciplinary conference to advise Southeast Asian research, society and policy. B.A. Walther, C. Boëte, A. Binot, Y. By, J. Cappelle, J.J. Carrique-Mas, et al. Infection, Genetics and Evolution. February 2016. 40(2016):29–46. http://www.ncbi.nlm.nih.gov/pubmed/26903421

One Health and EcoHealth: The same wine in different bottles? F. Roger, A. Caron, S. Morand, M. Pedrono, M. de Garine-Wichatitsky, V. Chevalier, et al. Infection Ecology and Epidemiology. February 2016. 6:30978. http://www.infectionecologyandepidemiology.net/index.php/iee/article/view/30978

Epidemiology of Brucellosis, Q Fever and Rift Valley Fever at the human and livestock interface in northern Côte d'Ivoire. Y.B. Kanouté, B.G. Gragnon, C. Schindler, B. Bonfoh, E. Schelling. Acta Tropica. February 2016. http://www.ncbi.nlm.nih.gov/pubmed/26899680

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Call for "One Health" Manuscripts

EcoHealth
This open access journal features articles from multiple disciplines that draw scientific connections between of ecology and health. Authors may submit papers in the form of original research, reviews, short communications, forum, book reviews, brief update, letters to the editor or art essays. http://springer.com/public+health/journal/1039

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/

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

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

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

Recent Publications (continued)

Journal Articles

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