

One Health NewsletterOne Health NewsletterOne Health Newsletter

The One Health
Newsletter is a

collaborative effort
by a diverse group of
scientists and health
professionals

committed to

promoting One
Health.

Editor:

Elizabeth Radke, PhD

Proud Partner of:

Subscribe:

OH@doh.state.fl.us

Submit articles,

contact the editor:

ohnleditor@gmail.com

Spring 2013 Volume 6 Issue 2

The Novel H7N9 Influenza A Virus: Its Present Impact and

Indeterminate Future

Robert Kahn, PhD and Juergen Richt, DVM, PhD

[Originally printed on the One Health Initiative website on April 17, 2013]

Influenza A viruses are unpredictable in their emergence, ability to mutate or reassert, and especially their capacity to cross species. Each of these three aspects of unpredictability are evident in a puzzling new H7N9 influenza virus which began in China earlier this year and has become a significant public health hazard, but not (at least thus far) a harbinger of a pandemic. It appears that this virus is a newly emerging reasserted bird flu virus with the significant characteristic of travelling among numerous avian and maybe mammalian species as a low pathogenic avian influenza virus which surprisingly is a highly pathogenic virus for the human species. The good news is that there is no evidence of sustained human-to-human transmission, but the bad news is that this newly minted H7N9 avian virus can kill human beings who come in contact with birds or poultry that appear healthy but are in fact carrying a lethal zoonotic agent. As Timothy Uyeki and Nancy Cox have pointed out: “intensified surveillance for H7N9 in humans and animals is essential” (See “Global Concerns Regarding Novel Influenza A (H7N9) Virus Infections,” NEJM, April 11, 2013).

The world is being given a crash course in the importance of “One Health,” because it is primarily through research at the human-animal-environmental interface that this virus can be better understood and hopefully controlled. There are no existing vaccines for the H7N9 virus for any species, including humans. Already in Shanghai alone more than 110,000 birds have been culled (ProMed Digest 160 at: <http://www.promedmail.org/> 9 April: Avian Influenza, human [38] [5], China [SH, JS] H7N9 update).

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.

<http://www.onehealthinitiative.com>

An influenza A H7N9 virus as viewed through an electron microscope. Both filaments and spheres are observed in these photos.

Influenza H7N9. Photo credit: CDC

Page 2 One Health Newsletter Volume 6 Issue 2

Despite on-going laboratory investigations on the new viral pathogen in hundreds of laboratories, both in China and globally, the source and significance of H7N9 is not yet clear. The virus has been found in chickens, pigeons and ducks, but the prevalence of the virus in other species (especially wild and domestic birds, geese, pigs, quail and turkeys) remains unknown. Among 39 detected human infections as of April 12, 2013 in 11 cities in Eastern China (including the 23 million people in Shanghai) and one case already in the capital Beijing (with its 22 million people – far away from the epicenter in Shanghai), many (but not all) of the 10 people who have died and the 19 who are at present severely ill had extensive contact with poultry. Underlying health conditions may have been a significant contributory factor to their demise and severe illnesses, but the tracing of hundreds of human contacts has not found a single person who has definitely contracted H7N9 from those who have died or been sickened by the virus.

The current situation has been succinctly summarized by Moderator CP in ProMed Digest 164 of April 11, 2013: “Overall the pattern remains unchanged, the victims are mainly elderly males. Infection in children is rare and mild. Despite the speculation, there is no evidence so far of evolution of human-to-human transmissible virus. The case numbers are rising dramatically but this may in part be a consequence of greater availability of diagnostic agents.” In public health parlance, the basic reproduction rate in humans is zero at this time. For an epidemic or a pandemic to take place, each person infected with the pathogen must pass it on to more than one other person. The question we could ask now is: What are we worried about?

We are worried about the ubiquity of cross-species transmission of avian influenza viruses. We are worried that the astounding mixture of species in Chinese live bird markets has the potential for easy spread of the H7N9 from the

unknown original host species to other hosts, just as happened with SARS (Severe Acute Respiratory Syndrome). In the U.S. and other Western countries, ‘poultry’

means basically chickens, ducks, and geese. “In China, besides those three

species, practically every live market also includes pigeons, quail, pheasants,

guinea fowl, and sometimes peafowl, and right next door you'll have open-air

pet markets selling captive songbirds, many of them illegally caught from the wild,” as well as pigs and maybe dogs. (See M. Clifton’s comment in ProMed Digest Number 151 5 April 2013: Avian Influenza [28] [2] China (Shanghai) H7N9, OIE Update). In brief, the environment of a Southeast Asia wet market is an ideal breeding ground for influenza and other promiscuous viruses, both new and old, which is why the Chinese Government decided to close some of these markets in the epicenter of the H7N9 outbreak. While such closures are an important, sensible and necessary mitigation strategy, it is doubtful if this alone will be sufficient to stop the transmission and spread of this new virus entirely.

In This Issue

Novel H7N9 Influenza A Virus:
Its Present Impact and Indeterminate Future 1

One Health Human-Animal
Comparative Medicine
Presentations: Asthma 5

The Wildlife Health Event Reporter: A Surveillance and
Communication Tool.....8

Study Shows Human-Wildlife
Microbe Exchange and Multi-
drug Resistance in Wildlife in
Protected Areas in Africa 11

Excerpt from: One Health,
Food Security, and Veterinary
Medicine 14

One Health Initiative Advances
Care for Humans, Animals,
and the Environment 15

ProMED Outbreak Reports,
First Quarter 2013 17

Brief Items in One Health 20

Coming Events 21

Recent One Health

Publications..... 22

Page 3 One Health Newsletter Volume 6 Issue 2

Zeng Guang, Chief Epidemiologist at the Chinese Centre for Disease Control and Prevention, has recognized that “banning the [live poultry] trade and culling [i.e. killing] birds is only an expedient. Research into vaccines and effective medication are essential,” he says (at: ProMed Mail 11 April 2013: Avian Influenza [34],[1]: China (ZH), LPAI H7N9 OIE Update). However, Helen Branswell of the Canadian Press, has set out significant problems in both the development and utilization of such a vaccine for human use: (See http://www.huffingtonpost.ca/2013/04/11/h7n9-flu-virus-vaccine-_n_3064478.html?). Furthermore, even if an H7N9 vaccine becomes available and is shown to be safe and efficacious, it will be difficult, if not impossible, to convince poor farmers in Southeast Asia to vaccinate their flocks against a virus which does not cause any loss or obvious clinical disease (See ProMed Digest 166, 12 April 2013: Avian Influenza [34] [3-Mod AS]).

Despite the significance of wet markets in the spread of H5N1 and SARS, H7N9 is a very different phenomenon than either H5N1 or SARS. The former virus emerged in Hong Kong in 1997 and re-emerged in Southeast Asia and Europe in 2003 killing more than 50% of infected humans; the latter virus emerged in China in 2002 and killed about 10 per cent of the 8,000 people it infected worldwide (See Karl Taro Greenfeld, *China Syndrome: The True Story of the 21st Century's First Great Epidemic*, Penguin Books, 2006). The fact that there appears to be no sustained transmission of H7N9 from humans to humans - similar to H5N1 - is reassuring, but not conclusive in assessing the significance of H7N9. As Anthony J. Michael has reminded us, we have to accept that “humans and microbes are not ‘at war’ (as much popular literature suggests). Rather, both parties are engaged in amoral, self-interested, co-evolutionary struggles ” (See “Environmental and social influences on emerging infectious diseases: past, present and future” in A. R. McLean, R. M. May, J. Pattison and R. A. Weiss, *SARS: A Case Study in Emerging Infections*, Oxford University Press, 2005). As human beings we tend to search

for culprits as to which species or place is responsible for the creation and spread of a dangerous pathogen. However, the reality is that both microbes and people

are striving to live at the animal-human-environmental interface. The precise identification of a new zoonotic pathogen requires animal, human and environmental scientists to carefully work together [i.e. One Health] in the field and laboratory to confirm (i) the identification of the original host species, (ii) its mode of transmission into intermediate host species including humans and (iii) its ecology and survival in the environment.

Avian influenza viruses tend to bind to the lower parts of the human lung, which are not easily reached. Therefore, these influenza viruses are not easily transmissible between humans. However, mutations in the avian influenza genome can allow an avian influenza virus to bind to the human influenza receptor. Such mutations would then render these avian viruses transmissible between humans, as is feared could happen with the H5N1 avian flu virus. It must be em-

Avian influenza viruses are generally not easily transmissible between humans. Mutations in the avian influenza genome could render the viruses transmissible between humans.

File:Chicken market in Xining, Qinghai province, China.jpg
Chicken market in Qinghai province, China. Photo credit: MM

phasized that in the case of H7N9 this has already partially happened. The amoral reality is that influenza viruses are so unpredictable because they use sophisticated and efficient methods of molecular evolution, adaptation and crossspecies transmission. One method is called “reassortment” or “genetic shift,” which is the mixing of the gene segments from different influenza viruses. Another method is called “genetic drift,” which is the constant introduction of mutations into the influenza genome with an unpredictable impact on the phenotype of the newly mutated influenza virus. In the case of H7N9, genetic shift has already occurred, as well as genetic drift with a partial adaptation to the human environment (See R. Gao et al, “Human Infection with a Novel Avian-Origin Influenza A(H7N9) Virus” NEJM, April 11, 2013 and Y.-M. Wen & H.-D. Klenk, “H7N9 avian influenza virus – search and re-search, Emerging Microbes & Infections, April 10, 2013 at: <http://www.nature.com/emi/journal/v2/n4/full/emi201318a.html>). This is a very disturbing reality, as this new avian virus seeks not only to survive in avian species but is looking for new opportunities in mammalian and human populations. The outcome of this cross-species interaction with this new H7N9 virus is at present indeterminate. What is determinate— what is conclusively settled—is that an increased commitment to the objectives and implementation of the “One Health” approach to medicine in general is now more urgent than ever.

An Additional Note

As of May 17, 2013, exactly one month after the preparation of this news item for the One Health Initiative website, there is minimal additional information to report. The number of laboratory-tested confirmed human infections has risen from 39 infections with 10 deaths to 130 infections with 35 deaths, 57 recovered and 38 people still hospitalized. Despite an occasional family cluster of cases, probably caused by exposure to the same infection in the same birds, there still does not appear to have been sustained human-to-human transmission. Tracking of more than 1,000 contacts of people exposed to those who were infected with H7N9 did not lead to a single case of further infection. During the last few weeks, there have been fewer new cases, possibly because of the closing of many live-bird markets, the warmer weather or other unknown factors. Financial losses in China’s poultry industry are now greater than \$1 billion. The animal reservoir and means of transmission remain unclear, despite considerable scientific efforts to learn more about this new virus. For more information, see the WHO Joint Mission Report on human infection with Avian Influenza A (H7N9) virus at: http://www.who.int/influenza/human_animal_interface/influenza_h7n9/ChinaH7N9JointMissionReport2013.pdf

Dr. Robert Kahn is Education Consultant for the College of Veterinary Medicine at Kansas State University. Dr. Juergen Richt is a Regents Distinguished Professor at the College of Veterinary Medicine at Kansas State University and Director of the Center of Excellence for Emerging and Zoonotic Animal Diseases.

The outcome of cross-species interaction with this new H7N9 virus is at present indeterminate. What is determinate is that an increased commitment to the objectives and implementation of the One Health approach is now more urgent than ever.

Juergen Richt

Robert Kahn

Page 5 One Health Newsletter Volume 6 Issue 2

“One Health” Human-Animal Comparative Medicine

Presentations—Asthma

Frank Adams, MD, FCCP and Ann Hohenhaus, DVM, DACVIM

[Originally printed on the One Health Initiative website on April 12, 2013]

People and their pets share many things besides their home and a walk in the park. Both might have leaky heart valves. A pet cat might transmit to a close family member a fungal infection called ringworm. Both cats and people can be diagnosed with asthma and both species might be treated with Flovent®, a corticosteroid inhalant aerosol medication, but do people and their cats really have the same disease?

Clinical Presentation#1: Miss Albright and her cat Spartapuss were both coughing. Spartapuss couldn't seem to catch his breath during one of these coughing episodes; subsequently, his veterinarian diagnosed asthma based on thoracic radiographs and the results of bronchoalveolar lavage (a diagnostic medical procedure in which a bronchoscope is passed through the mouth or nose into the lungs and fluid is expelled into a small part of the lung and then recollected for examination).

Comment:

Dr. Hohenhaus (veterinarian)

Paroxysms (sudden recurrences or intensification of symptoms) of coughing, wheezing and severe respiratory distress typify the clinical signs of a cat with asthma. These signs result from airway hyperreactivity induced by the presence of white blood cells known as eosinophils, infiltrating the airways. The eosinophilic infiltrate is visible on radiographs (x-ray pictures) as a peribronchial pattern. The arrival of eosinophils into the airway is provoked by T helper cells, members of the immune system. In cats, this cellular milieu results in increased mucus production, airway edema and narrowing due to the eosinophilic infiltrates.

Both cats and people can be diagnosed with asthma and both species might be treated with Flovent®, a corticosteroid inhalant aerosol medical, but do people

and their cats really
have the same disease?

Right lateral radiograph of a cat with asthma. Note the peribronchial infiltrate and the flattened diaphragm indicating pulmonary hyperinflation. Photo credit: AMC archives

Page 6 One Health Newsletter Volume 6 Issue 2

Cats with asthma may also suffer from acute airway narrowing due to smooth muscle constriction. Pulmonary function testing is rarely performed in cats as it requires a cooperative patient, i.e. a human who can follow instructions, the antithesis of a feline patient. The pulmonary function of a handful of cats with asthma has been studied and it demonstrates obstruction with both increased resistance and decreased dynamic lung compliance.

Clinical Presentation #2: Miss Albright presented to her physician with cough. Physical exam revealed wheezing and LAB analysis showed elevated Immunoglobulin E (IgE) which is a class of antibody that has only been found in mammals. Chest radiographs (x-ray pictures) revealed bronchial wall thickening and hyperinflation. Pulmonary function tests documented reversible obstructive dysfunction diagnostic of asthma.

Comment:

Dr. Adams (physician)

Human asthma is a chronic inflammatory disorder of the airways producing airway hyper responsiveness and airflow obstruction resulting in respiratory symptoms (shortness of breath, wheezing, cough). Our understanding of human airway inflammation followed the discovery of special immune cells called Th1 and Th2 helper cells in animal models of allergic inflammation. As in animals, a predominance of inflammatory mediators known as Th2-cytokines occurs in the majority of people with asthma, resulting in eosinophilic infiltration and inflammation [similar to cats].

However, the effector cells in humans with asthma are slightly different than cats with asthma. Increased numbers of eosinophils can be found in the airways of most, but not all people with asthma. Current understanding suggests

that the eosinophil is only one of several effector cells in this complex disease and that its role may change in different phases of the illness. Human asthmatics who do not have eosinophilic infiltration are generally not allergic individuals. Non-allergic asthma appears to be related to other factors such as the environment (pollution, tobacco), drugs (aspirin or other non-steroidal anti-inflammatory drugs [NSAIDs] like ibuprofen) and infection. Respiratory viral infections, especially when they occur in infancy from respiratory syncytial virus (RSV), are associated with the development of asthma.

Clinical Presentation #3: Miss Albright responded to a brief course of prednisone followed by a regimen of Singulair®, Flovent®, and as needed use of albuterol (a drug to relieve bronchospasm).

Page 7 One Health Newsletter Volume 6 Issue 2

Comment:

Dr. Adams (physician)

Similarities in the treatment of human and animal asthma abound since both illnesses are characterized by swollen, inflamed airways. Bronchodilators are needed for immediate relief of bronchospasm and corticosteroids are essential for their potent anti-inflammatory effect. Mediators of inflammation (leukotrienes) are important in human asthma and anti-leukotriene medications (such as Singulair®) may be helpful for many patients.

Pulseoximetry (a non-invasive method allowing the monitoring of the oxygen saturation of a human or cat's blood hemoglobin) showed Spartapuss did not

need oxygen therapy, but needed daily corticosteroid treatment with Flovent® through a mask and spacer (an add-on device used to make it easier when administering aerosolized medication from a metered-dose inhaler) specifically designed for cats. The cat also received a bronchodilator, aminophylline. Unlike his owner, he did not receive therapy with Singulair®, an anti-leukotriene.

Dr. Hohenhaus (veterinarian)

Treatment of acute cases of feline asthma involves oxygen therapy, usually administered in a specially designed oxygen cage using bronchodilators and corticosteroids. Once stabilized, the feline asthma patient can be managed with either oral bronchodilators and corticosteroids or the inhaled versions of these drugs given via a specially designed feline face mask and spacer. Because inflammation is an important component of feline asthma, the role of proinflammatory leukotrienes in this disease have been investigated; however, the increased levels of a particular leukotriene (LTE₄) have not been found in the urine or bronchoalveolar lavage fluid suggesting antileukotriene therapy is not appropriate in cats with asthma.

Conclusions

Although a cure for asthma in cats and humans is beyond our reach at this time, control of this increasingly common disease can be accomplished with combinations of a bronchodilator and anti-inflammatory medications. Comparative medical interdisciplinary collaborations (One Health) are instructive and potentially useful to help us better understand the nature and management of asthma.

Dr. Frank Adams is a physician in private practice and Dr. Ann Hohenhaus is a veterinarian at Animal Medical Center, both in New York, New York.

Comparative medical interdisciplinary collaborations (One Health) are instructive and potentially useful to help us better understand the nature and management of asthma.

Aerokat spacer for administering inhaled drugs to feline patients. Photo credit: Aerokat

Page 8 One Health Newsletter Volume 6 Issue 2

The Wildlife Health Event Reporter—A Surveillance and Communication Tool

Cris Marsh, MLS and Megan Hines

Wildlife can be effective sentinels that alert us to potential health hazards and environmental concerns, but information about sick/injured/dead wildlife need to be reported and shared in a timely manner for professionals to evaluate and determine if response is warranted. The Wildlife Health Event Reporter (WHER), www.wher.org, developed by the Wildlife Data Integration Network (WDIN) and maintained by University of Wisconsin-Madison, School of Veterinary Medicine, not only provides a destination for observations of sick/injured/dead wild animals, but also functions as an alerting system, quickly distributing these reports to those who are signed up to receive them. Since 2010, the system has been collecting reports from the public, citizen groups, wildlife rehabilitators and other wildlife professional organizations and is building a long-term dataset of

wildlife morbidity and mortality event data.

Get Alerts! Stay Informed about Emerging Events

Did you hear about the multiple seabird mortality events that were reported along the US' East coastline beginning in January 2013? An unusual number of dead/injured dovekies, razorbills and grebes have been reported along the US' Northeast coast; while puffins and loons are being reported along the East coast from Florida to Maine. If you were subscribed to alerts through the Wildlife Health Event Reporter (WHER), you would know about these occurrences as well as future unfolding events.

Alerts can be delivered daily by email (when reports are available) or in near-real time as an RSS feed. In addition, you can choose what geographic locations (by state or equivalent administrative unit) you want alerts from (e.g. Wisconsin, United States; Alberta, Canada; or Hunan Province, China). Or if you're

The Wildlife Health Event Reporter not only provides a destination for observations of sick/injured/dead wild animals, but also functions as an alerting system, quickly distributing these reports to those who are signed up to receive them.

Alerts can be delivered daily by email or in near real time as an RSS feed.

Screenshot of WHER homepage

Page 9 One Health Newsletter Volume 6 Issue 2

interested, you can select to receive all the reports made to WHER from around the globe. Alerts include summary information about the wildlife health event, including the location, species involved, how many of each species were observed to be dead, sick and alive, and what actions were taken.

Wildlife Health Observation Network for Data Exchange

Due to the health consequences of emerging diseases in wildlife and their potential effects on human and domestic animal populations, the collection of wildlife health data is increasing not only through professional monitoring efforts but also through citizen science projects. Despite this increase, the data often is not standardized nor formatted for distribution (e.g. as XML web services or RSS feeds) and therefore cannot be easily integrated or shared effectively across political or academic boundaries for practical surveillance applications or scholarly research. In addition to functioning as a data collection application and alerting system for wildlife health events, WHER is also an open data exchange hub capable of importing, exporting and integrating basic but essential data fields from more complex datasets for epidemiologic study.

The WHER team works with organizations who are interested in sharing their surveillance data with WHER to help them automate the delivery process that will integrate pertinent data with WHER's dataset. Currently WHER is integrating data from multiple sources. In addition to the public sharing their wildlife health observations through WHER, the Seabird Ecological Assessment Network (SEANET), a citizen science effort that tasks trained volunteers to record seabird deaths and injuries along the Atlantic coastline, pushes their reports to WHER

through an automated feed. HealthMap is also providing a feed of its wildlife health reports made through its mobile application, Outbreaks Near Me. In the near future, through a southeastern pilot study, US Fish and Wildlife Service field staff and other conservation partners will be submitting their wildlife health observations to WHER.

As a hub, WHER can exchange and integrate wildlife health data either within the WHER system (e.g. view joined data on maps or tables) or in a user's local system (e.g. WHER data can be streamed or downloaded for analysis in outside systems) to evaluate for trends or investigate potential disease hot spots.

We Work Better When We Work Together

The ecology of wildlife disease is complex and poses many challenges to effective disease management, which can be best overcome through collaboration that leverages resources, reduces duplication of efforts and broadens access to information about disease events. WHER can facilitate communication and collaboration about emerging wildlife health events. It was developed to collect

The WHER team works with organizations who are interested in sharing their surveillance data to help them automate the delivery process.

An example of a WHER alert delivered via email that provides a summary of the reports entered into the system the previous day.

and distribute wildlife health data, and complement other organizations' surveillance systems. Whether you are interested in contributing or obtaining WHER data, you are invited to become a member of the WHER community. Increase your awareness about wildlife disease and health events and your ability to work with others to address the challenges of wildlife disease!

Want to Learn More about WHER?

You are invited to check out this online wildlife health surveillance and communication tool at www.wher.org and explore its capabilities to inform you about where wildlife disease incidences are occurring on the ground through maps, tables, downloadable data and alerts. Email comments and questions to us at wher@wdin.org

WHER Resources

- . Use case of how WHER is being used for tracking and communicating unusual bird mortalities as described above <http://seanetters.wordpress.com/tag/reporting-dead-birds/>
- . How to get report alerts from WHER - <http://feeds.wher.org>
- . Handout [benefits and proposed enhancements] - http://www.wdin.org/documents/wher/wher%20handout_biologists.pdf
- . Two- minute overview video - <http://www.whmn.org/wher/pages/about#video>

Cris Marsh is Content Manager and Megan Hines is Technical Director for the Wildlife Data Integration Network.

The ecology of wildlife

disease is complex and poses many challenges to effective disease management, which can be best overcome through collaboration that leverages resources, reduces duplication of efforts and broadens access to information about disease events. WHER can facilitate communication and collaboration about emerging wildlife health events.

Diagram showing WHER's capability of taking multiple wildlife data sources to produce a unified view of the data in different formats

Cris Marsh
Cris Marsh

Page 11 One Health Newsletter Volume 6 Issue 2

Study Shows Human-Wildlife Microbe Exchange and Multidrug Resistance in Wildlife in Protected Areas in Africa

Lynn Davis and Kathleen Alexander, DVM, PhD

[Reprinted with permission from Virginia Tech News, April 26, 2013]

A team of Virginia Tech researchers has discovered that humans are passing antibiotic resistance to wildlife, especially in protected areas where numbers of humans are limited. In the case of banded mongoose in a Botswana study, multidrug re-

sistance among study social groups or troops was higher in the protected area than in troops living in village areas. The study also reveals that humans and mongoose appear to be readily exchanging fecal microorganisms, increasing the potential for disease transmission.

“The research identifies the coupled nature of humans, animals, and the natural environment across landscapes, even those designated as protected,” said Dr. Kathleen Alexander, associate professor of wildlife in Virginia Tech’s College of Natural Resources and Environment. “With few new antibiotics on the horizon, wide-scale antibiotic resistance in wildlife across the environment presents a critical threat to human and animal health. As humans and animals exchange microorganisms, the threat of emerging disease also increases.”

The National Science Foundation funded research project investigating how pathogens might move between humans and animals was published by EcoHealth on April 24, 2013 (Tracking Pathogen Transmission at the Human-Wildlife Interface: Banded Mongoose and Escherichia coli)

The researchers collected fecal samples from three troops of banded mongoose living in Botswana’s Chobe National Park and three troops living in villages outside the park. Alexander, a veterinarian and researcher with the non-profit Center for African Resources: Animals, Communities, and Land Use (CARACAL), has been conducting a long-term ecological study of banded mongoose in the region.

Humans are passing antibiotic resistance to wildlife in Botswana. Human and banded mongoose appear to be readily exchanging fecal microorganisms, in-

creasing the potential for disease transmission.

Kathleen Alexander has been conducting a long-term ecological study of banded mongoose in Botswana.

Photo credit: C.E. Sanderson

Page 12 One Health Newsletter Volume 6 Issue 2

“Banded mongoose forage in garbage resources and search for insects in fecal waste, including human sources found in the environment,” said Alexander. “Mongoose contact with other wildlife and humans, and broad occurrence across the landscape makes this species an ideal candidate for evaluating microbial exchange and the potential for pathogens to be transmitted and emerge at the human-wildlife interface.”

With the exception of one mongoose troop, all study animals had some level of their range overlap with human populations. Two of the study troops had home ranges that included ecotourism facilities in the protected area, with some contact with humans and development “but at a much lower level than in the village troops,” the article reported.

Fecal samples were collected from these mongoose troops living in a protected area and in surrounding villages. Human feces were collected from sewage treatment facilities, environmental spills, and bush latrines or sites of open-air defecation within mongoose home ranges. The team used *Escherichia coli* (*E. coli*), which is commonly found in the gut of humans and animals, as a model microorganism to investigate the potential for microorganisms to move between humans and wildlife. They evaluated the degree of antibiotic resistance considered an important signature of bacteria that arise from human sources. The researchers also extracted data from the local hospital to assess antibiotic resistance among patients and identify resistance patterns in the region. Like many places in Africa, antibiotics are widely available and there are few controls on the dispensing of such drugs.

The project screened for nine locally available antimicrobials, including ampicillin, tetracycline, doxycycline, and streptomycin, as well as ceftiofur, a veterinary drug not available in the study area. The researchers discovered 57 percent of banded mongoose had *E. coli* that was antibiotic resistant. "Resistance was identified among individuals in all sampled troops," the article reports.

The animals were most commonly resistant to ampicillin, followed by doxycycline, tetracycline, and streptomycin. But it was the prevalence of multidrug resistance that was most alarming. "There was a significant difference between troops in protected area and those outside the park, although not what you might expect," said Alexander.

One troop in the town of Kazungula, outside the protected area, had the lowest level of multidrug resistance among sampled mongoose, while a troop from the protected area living near an ecotourism facility had the highest levels. At least one sampled mongoose in this particular troop in the protected area was resistant to each of the 10 antibiotics screened in the study.

File:Mongoose.jpg
Banded mongoose.

Photo credit: T. Knox

Page 13 One Health Newsletter Volume 6 Issue 2

As is common of mongoose that live near humans, the troop near the ecotourism facility utilized the opportunities presented by its human neighbors, setting up residence in the drain fields of the open septic tanks servicing the employee accommodations and foraging around employee living quarters, including eating food remains from dishes left outside. One interaction between the employees resulted in an unexpected finding — the kitchen staff fed raw meat waste from commercially produced chickens to mongoose. “This may be how the mongoose developed resistance to ceftiofur,” said Alexander.

The one troop living in an undisturbed region of the park was resistant to only ampicillin. “These findings reinforce the significance of human impacts to natural environments, even when human numbers are low,” said Alexander.

The article reports that mongoose were resistant to the same antibiotics as humans in the region, but at a lower level. Of human fecal samples collected in the mongoose home ranges, 80.3 percent were resistant to at least one antibiotic. Of the human clinical samples screened at the local hospital, 89.9 percent of various isolated bacteria species were resistant to at least one antibiotic.

“This work identifies direct support for the possibility that direct human fecal contamination of the environment is an important potential source of microbial exposure and transmission to wildlife living in these areas,” said Ponder, who was with the U.S. Centers for Disease Control and Prevention before coming to Virginia Tech. “Ecotourism developments are important for conservation and economic growth, but the associated human waste, which includes garbage as well as feces and waste water, may expose wildlife to human-associated patho-

gens and antibiotic resistance, ultimately increasing future threats to human health,” said Alexander.

“The impact of microbial exchange and antibiotic resistance accumulation in mongoose may extend through food webs,” the researchers conclude. “Mongoose are eaten by a large number of avian, reptile, and mammalian predators including domestic dogs. Thus, the cascading effects of exposure of wildlife species to human waste-associated microbes can impact an array of susceptible species across an ecosystem and in turn increase human exposure, coupling humans and natural systems in complicated ways.” They recommend closed sewage systems, wildlife-proofed trash receptacles, and prohibiting feeding poultry and livestock products from kitchen waste to either wildlife or domestic animals.

“As we change our natural environments, these modifications can in turn impact our own health,” said Alexander. “We are working with the Botswana Ministry of Health and Ministry of Environment, Wildlife, and Tourism to minimize these impacts and develop sustainable approaches to the protection of human, wildlife, and ecosystem health.”

This work provides support for the possibility that direct human fecal contamination of the environment is an important potential source of microbial exposure and transmission to wildlife living in these areas.

The researchers recommend closed sewage systems, wildlife-proofed trash receptacles, and prohibiting feeding poultry and livestock products from kitchen waste to either wildlife or domestic animals.

Page 14 One Health Newsletter Volume 6 Issue 2

Pesapane said the research experience reinforced that “the issue of global sustainability and health is multifaceted, and an interdisciplinary approach is vital to achieving progress in managing health threats at this complex interface.” Pointing out the interconnectedness of human health and wellbeing and conservation of natural resources, she said, “We cannot begin to address issues of conservation without also improving quality of life in neighboring communities.” “The Virginia Tech/CARACAL program under the NSF-funded program embodied this concept with expanded program focus beyond research in the Chobe region to include educational outreach and partnered efforts with the Government of Botswana to improve the quality of life for the citizens of Botswana,” she added.

Pesapane, who completed her master’s in wildlife science at Virginia Tech in December 2011, is now project director of Rural System Inc. “My experience with the Alexander lab, its nonprofit affiliate CARACAL, and my education in the fish and wildlife conservation department at Virginia Tech provided a solid foundation for an inspiring career in global conservation,” she said.

“Our next step,” Alexander said, “is to begin to unravel the interdependent natural and human drivers of microorganism exchange, emergence of disease, and spread of antibiotic resistance among wildlife and across environments. This will be essential to our ability to effectively manage this interface and protect the health of humans, wildlife, and environments on which we depend.”

Kathleen Alexander is an Associate Professor in the Department of Fish and Wildlife Conservation at Virginia Tech. Lynn Davis is the Director of Communica-

tions for the College of Natural Resources and Environment at Virginia Tech.

Excerpt from: One Health, Food Security, and Veterinary

Medicine

Alan Kelly, BVSc, PhD, James Ferguson, VMD, MSc, David Galligan, VMD, MBA,
Mo Salman, BVMS, PhD, Bennie Osburn, DVM, PhD

[Excerpted with permission from JAVMA, March 15, 2013]

At the Group of Eight (G8) Summit in L'Aquila, Italy, in July 2009, the leaders of the world's largest economies committed to "act with the scale and urgency needed to achieve sustainable global food security." The statement was precipitated by spikes in food prices, a rising incidence of hunger in 2008, a realization that price spikes are likely to recur, and an understanding that global food security is among the most formidable challenges facing all of humankind in the 21st century. This urgent global challenge will require a dramatic and coordinated

Global food security is among the most formidable challenges facing all of humankind in the 21st century.

Kathleen Alexander (left) and Risa Pesapane, coauthors on the study

effort by multiple stakeholders, including a crucial role for the veterinary profession in the United States and the developing world.

The world's livestock sector is growing at an unprecedented rate, driven principally by urbanization and rising incomes. Because of this, annual meat production is projected to increase from 218 million tonnes from 1997 through 1999 to 376 million tonnes by 2030, an increase of more than 70% in 30 years. To

meet the demand, global livestock and poultry production must increase in efficiency. Animal-source foods are important for nutrition of young children and pregnant and lactating women because of the high-quality protein and bioavailable micronutrients they contain. Even small quantities of meat, milk, or eggs can make substantial differences to the food security and health of people living in poor communities. The livestock sector can also be an important way of lifting small farmers out of poverty. These factors present the veterinary profession with an opportunity to become a pivotal force in overcoming many aspects of food insecurity by improving the health and economic prospects of millions of small livestock farmers, especially in the developing world, where private and public veterinary services for livestock and poultry production, disease control, animal welfare, and environmental sustainability need to be strengthened. Such long-term, complex challenges require veterinary expertise at multiple levels, especially at the level of formulating and implementing policy. Presently, however, there is an extreme paucity of veterinarians involved in strategic planning in US agencies for international development.

Please continue reading at: <http://avmajournals.avma.org/doi/pdf/10.2460/javma.242.6.739>

One Health Initiative Advances Care for Humans, Animals, and the Environment

Laura Kahn, MD, MPH, MPP, Bruce Kaplan, DVM, Thomas Monath, MD, Jack Woodall, PhD, Lisa Conti, DVM, MPH

[Reprinted with permission from the Horizon Solutions Site and One Health Initiative, April 27, 2013]

The One Health Concept is generally defined as “a worldwide strategy for

expanding interdisciplinary collaborations and communications in all aspects of health care for humans, animals and the environment. The synergism achieved will advance health care for the 21st century and beyond by accelerating biomedical research discoveries, enhancing public health efficacy, expeditiously expanding the scientific knowledge base, and improving medical education and clinical

The veterinary profession has an opportunity to become a pivotal force in overcoming many aspects of food insecurity by improving the health and economic prospects of millions of small livestock farmers.

care. When properly implemented, it will help protect and save untold millions of lives in our present and future generations.” “One Health” has been the most commonly used term for the concept in the early 21st century. This evolved from the term “One Medicine” used during the latter half of the 20th century, first coined and promoted by veterinarian Calvin Schwabe, DVM, MPH, ScD .

The One Health Initiative team was founded originally by physician Laura H. Kahn, MD, MPH, MPP, veterinarian Bruce Kaplan, DVM, and physician Thomas P. Monath, MD in 2007 for the purpose of promoting the One Health concept. The team was expanded to include health research scientist Jack Woodall, PhD in 2009 and veterinarian Lisa A. Conti, DVM, MPH in 2012. Drs. Kahn, Kaplan and Monath initiated the One Health Initiative Web site in October 2008. Please visit http://fridayletter.asph.org/article_view.cfm?FLE_Index=8121&FL_Index=1537 and http://www.princeton.edu/coverstories/onehealth_10-08/.

Over the last few years the OHI Web site’s individual daily/monthly visits (currently over 600 visits per day) from over 150 countries has expanded exponentially. It has been referred to internationally by many as the “clearing house for all pertinent One Health information worldwide” and recently some prominent One Health advocates have called it the “New York Times of One Health.” However, there are numerous other highly informative One Health oriented national and international Web sites from U.S. Government agencies [e.g. the U.S. Centers for Disease Control & Prevention (CDC) and U.S. Department of Agriculture, Animal Plant and Inspection Service (USDA-APHIS)], U.S. and international university institutions, the One Health Commission (a U.S. based incorporated organization), and others. See http://en.wikipedia.org/wiki/One_Health.

The policy of the One Health Initiative team has always been and continues to be free access for reading and submitting acceptable One Health News, Publications, and Upcoming Events items for posting on the OHI Web site. All One Health “silos,” i.e. reputable organizations, and individuals in the U.S. and worldwide are recognized and welcomed as supporter/advocates without discrimination. The OHI team works pro bono and requires/accepts no fees whatsoever from any and all One Health supporter/advocate organizations and individuals who wish to participate.

The OHI team’s purpose and goals are strictly for educating international

multidisciplinary scientific communities, political and governmental leaders, the general public, and news media about the One Health concept and helping to promote the One Health concept's expeditious implementation worldwide. This has been done via numerous publications and book chapters (see below) as well as through the OHI Web site's posting contributions over the years.

The One Health concept
has been successfully
applied to many clinical
health and public health
milieus.

www.onehealthinitiative.com Web site Visits by Month –October 2008 through March 2013
www.onehealthinitiative.com
website visits by month—
October 2008 — March 2013

The One Health concept has been successfully applied to many clinical health and public health milieus, primarily during the 19th, 20th and early 21st centuries. Some significant examples of clinical health advances through comparative medical/surgical endeavors occurred during the past three centuries using the One Health approach. A recently described desirable comparative medicine promotional activity is termed “Zoobiquity,” which mimics past One Health history.

Public health achievements utilizing the One Health approach are even more prolific than clinical health endeavors and have been described in the News and Publications pages of the One Health Initiative Web site as well as in many other reference publications worldwide. This has been illustrated by some of the prominent One Health support endorsements on the One Health Initiative Web site. Much more activity in this arena is essential and indeed critical in today’s rapidly evolving and dangerous emerging and reemerging zoonotic diseases environment.

For an extensive list of One Health resources and links, please visit the original article at: <http://www.solutions-site.org/node/875>

Drs. Laura Kahn, Bruce Kaplan, Thomas Monath, Jack Woodall, and Lisa Conti make up the One Health Initiative team. The One Health Initiative is a movement to forge co-equal, all inclusive collaborations between physicians, osteopaths, veterinarians, dentists, nurses, and other scientific-health and environmentally related disciplines.

ProMED Outbreak Reports, First Quarter 2013

Jack Woodall, PhD

Avian influenza H7N9 – China

The big news in the first quarter of 2013 was the reporting on March 31st of two fatal human cases of this normally inoffensive bird virus in Shanghai, with onset in mid-February, and who died in early March. For more information on this outbreak, see page one of this issue.

Novel betacoronavirus -- Arabia

In late 2012, WHO received reports of nine cases of human infection with a novel betacoronavirus. Coronaviruses are a large family of viruses that affect both humans and animals. In humans, these illnesses range from the common cold to infection with Severe Acute Respiratory Syndrome (SARS) coronavirus (SARS CoV). The cases have come from Qatar, Saudi Arabia and Jordan, and were

Laura Kahn

Lisa Conti

Jack Woodall

Thomas Monath

Bruce Kaplan

identified in laboratories affiliated with the European hospitals to which the victims had been medically evacuated. All 17 patients (to date) were severely ill, and 11 died. There was no connection between the patients. The only clue to the origin of the infection was that one patient had cared for a sick racing camel, on a farm where fruit bats fed or roosted. Fruit bats are known reservoirs of coronavirus.

Yellow fever – Africa: Sudan (Darfur) and South America (Peru)

The Sudan epidemic was noted in the last (Winter) issue of OHNL. It ended in late November after more than 840 people had been infected and reportedly 171 had died. Approximately 7.5 million people live in Darfur, according to the last census in 2010. At the end of February, the federal health minister announced that six million people across Darfur had been vaccinated against yellow fever since the campaign started last November. At the end of March, one person was reported to have died of yellow fever in the endemic Puno region of the Peruvian Amazon; provincial authorities received five million doses of vaccine in early April with which to protect the inhabitants.

Severe fever with thrombocytopenia syndrome (SFTS)

The phlebovirus causing this tick- or mite-borne disease was first described from central China in 2009, where it causes hundreds of cases a year, with a 12% case fatality rate. The number of cases in Japan appears to be increasing and contracted locally rather than imported from China. Transmission from arthropods has not been verified in all cases. Currently the tally in Japan stands at 11 confirmed cases and seven deaths. It is related to but distinct from Heartland virus, a new virus isolated from two patients in Missouri last year.

Iatrogenic infections

In the USA, since September 2012, 722 people in 20 states have fallen ill (690 with CNS infections) from steroid injections contaminated with fungi, produced by a pharmacy in the USA, and 50 have died. Three patients in the USA who had never visited the tropics became infected with *Strongyloides stercoralis*, an intestinal nematode, after receiving organs transplanted from an apparently healthy Puerto Rican donor. Addicts in Europe continue to die sporadically from heroin contaminated with anthrax of unknown origin, something that has been happening since the year 2000.

Undiagnosed illness

Outbreaks, so far without a definitive diagnosis, have been reported in children in India, Nepal, and Mexico (fatal), and in adults in Germany (fatal), USA, Vietnam, Ghana, and Uganda (fatal). The cruise ship terminal in the Turks & Caicos islands was closed due to recurring infection of passengers with gastrointesti-

nal illness after eating in its restaurant.

File:Aedes aegypti.jpg
Aedes aegypti mosquito

Photo credit: Muhammad

Mahdi Karim

File:Strongyloides stercoralis larva.jpg
Larva of Strongyloides stercoralis. Photo credit: CDC

Page 19 One Health Newsletter Volume 6 Issue 2

Schmallenberg virus, livestock – Europe

This new midge-borne virus that causes abortions and birth defects in livestock in western Europe has now been found in two cattle that were imported into western Russia. The World Organisation for Animal Health (Office International des Epizooties -- OIE) at its meeting in May, will consider including SBV disease in the list of infectious animal diseases with mandatory notification.

Undiagnosed outbreaks in livestock were reported in poultry in Bangladesh, camels in Jordan, pigs in the Dominican Republic, buffaloes, cows, and goats in Pakistan, and in wildlife in USA (pelicans, walrus, seals, manatees), New Zealand (penguins, plover), India (elephant), Belarus (deer), Ireland (dolphin) and Costa Rica (sea turtle).

Crop plant diseases

Outbreaks in food crops are important for human and livestock nutrition and therefore our health. A new lineage of potato late blight (the fungus-like pathogen that caused the Irish potato famine in the mid-19th century) raises a worldwide food security issue as it has already spread beyond Europe, where it was first detected, to North Africa, India and China, threatening the livelihoods of communities relying on potato for food and income. The disease is difficult to control as it is more aggressive, fungicide-resistant, and able to attack cultivars previously not considered susceptible to blight.

In the first quarter of the year, the Guatemalan National Coffee Association declared a state of emergency due to the spread of coffee leaf rust, a fungus which has completely destroyed coffee industries in several countries. It says it will result in losses of 15% of the 2012-2013 national Arabica harvest, and as much as 40% of the 2013-2014 national harvest. Rust-resistant cultivars exist, but the crop is generally of poorer quality. More than 30 races of the fungus have been detected, making it particularly difficult to establish durable host resistance. Apple proliferation phytoplasma, one of the most serious diseases of the crop, has been found for the first time in North America (Canada). There have been first reports of the spread of known diseases of maize to El Salvador, Kenya, Uganda, and Tanzania, and of known diseases of beans to Cuba. New strains or undiagnosed diseases are seriously affecting pomegranates in Australia, coconut palms in Cote d'Ivoire, and grapes in the USA.

For details of all the above, you can search the ProMED outbreak page on the OHI website or ProMED at www.promedmail.org.

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

Brief Items in One Health

University of Edinburgh Launches New One Health Master of Science Program

The University of Edinburgh is launching a new Master of Science (MSc) degree program in One Health. It is for working professionals looking to study the complex relationships and interactions between animal health, human health, and ecosystem health. The program will be part time, online distance learning starting in September 2013. For more information, please visit www.ed.ac.uk/vet/one-health. Provided by: Michael Thrusfield and OHI.

One Health Journal Name Change

Infection Ecology & Epidemiology, founded in 2010, has changed its name to One Health Sweden. The overall goal of this journal is to improve health for humans and animals, and to do this by stimulating interdisciplinary research and increased knowledge about One Health. Provided by: Björn Olsen and OHI.

New CDC Website on Zoonotic Gastrointestinal Diseases

A new CDC website is now available for information and resources about enteric zoonoses. It is located at: <http://www.cdc.gov/zoonotic/gi/index.html>. It is a one-stop shop for information about zoonotic outbreaks, prevention messages, and helpful resources related to enteric zoonoses.

One Health

Newsletter

Contributors:

Steven W. Atwood, VMD,
MD, MRCVS, MPH

University of Pennsylvania School of
Veterinary Medicine

Philip J. Bergman, DVM, MS,
PhD

BrightHeart Veterinary Centers

David L. Heymann, MD

Editor, Control of Communicable
Diseases Manual; Health Protection
Agency, London, UK

William D. Hueston, DVM,
PhD

Global Initiative for Food System
Leadership, University of Minnesota

Laura H. Kahn, MD, MPH,
MPP

Princeton University

Lawrence C. Madoff, MD

University of Massachusetts Medical
School and Massachusetts

Department of Public Health

Leonard C. Marcus, VMD, MD

Tufts University Cummings School of
Veterinary Medicine

Thomas P. Monath, MD

Kleiner Perkins Caufield & Byers

The One Health Newsletter is interested in publishing articles from a variety of view points and perspectives, and thus any opinions or statements made in the Newsletter's articles belong solely to the respective author(s), not the Editor, Editorial Board, or Newsletter Contributors.

One Health

Newsletter

Contributors
(continued):

Glenn Morris, Jr. MD, MPH,
TM

Emerging Pathogens Institute,

University of Florida

Michael T. Osterholm, PhD,
MPH

University of Minnesota

Peter M. Rabinowitz, MD,
MPH

Yale University

Ralph C. Richardson, DVM,
Dipl. ACVIM

Kansas State University

James Steele, DVM, MPH

Professor Emeritus,

University of Texas

Jedd D. Wolchok, MD, PhD

Memorial Sloan-Kettering Cancer
Center

John (Jack) Woodall, PhD

Director (retd),

Nucleus for the Investigation of
Emerging Infectious Diseases;

Institute of Medical Biochemistry,
Federal University, Rio de Janeiro,
Brazil

Coming Events

2nd International Congress on Pathogens at the Human-Animal Interface

“One Health for Sustainable Development”

Porto de Galinhas, Brazil

August 14-17, 2013

<http://icophai2013.org/>

World Research and Innovation Congress

“Pioneers in Healthcare”

Brussels, Belgium

June 5-6, 2013

Featuring presentation: “The One Health Initiative Movement’s International Innovative Impact on Global Health: Addressing an Essential One Health Paradigm Shift”

<http://www.worldresearchcongress.com/>

AITVM 2013 International Congress

“The Livestock-Human-Wildlife Interface: Challenges in Animal Health and Production in Urban/Peri-urban and Extensive Farming/Conservation Systems”

Johannesburg, South Africa

August 25-29, 2013

<http://www.aitvm2013.org/>

2nd Global Risk Forum One Health Summit 2013

“One Health—One Planet—One Future: Risks and Opportunities”

Davos, Switzerland

November 17-20, 2013

<http://onehealth.grforum.org/>

3rd International One Health Congress

Amsterdam, the Netherlands

March 15-18, 2015

<http://www.iohc2015.com/>

Page 22 One Health Newsletter Volume 6 Issue 2

One Health

Newsletter

Editor:

Elizabeth Radke, PhD

Contributing Editor:

Bruce Kaplan, DVM,

Dipl. AVES (Hon)

Associate Editors:

Meredith A. Barrett, PhD

University of California San Francisco;
University of California Berkeley

Carina Blackmore, DVM, PhD

Florida Department of Health

Jenifer Chatfield, DVM

4 J Conservation Center

Lisa Conti, DVM, MPH,

Dipl. ACVPM

Florida Department of Agriculture
and Consumer Services

Mary Echols, DVM, MPH

Palm Beach County

Health Department

Recent One Health Publications

Chapter 30—One Health: Interdependence of People, Other Species, and the Planet. Meredith Barrett and Steven Osofsky. *Jekel's Epidemiology, Biostatistics, Preventive Medicine, and Public Health*, 4th Edition. <http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4557-0658-7..00030-X&isbn=978-1-4557-0658-7&uniqId=411415606-2385#4-u1.0-B978-1-4557-0658-7..00030-X>

Report on the 2013 Conference on “A World United Against Infectious Diseases: Cross-Sectoral Solutions” Prince Mahidol Award Conference, January 28-February 2, 2013, Bangkok, Thailand.

http://onehealthinitiative.com/publications/PMAC2013_Proceeding.pdf

Imported Human Rabies Cases Worldwide, 1990-2012. P Carrara, P Parola, P Brouqui, P Gautret. *PLoS Neglected Tropical Diseases*. January 2013. Volume 7, Issue 5: e2209. <http://www.plosntds.org/article/info%3Adoi%2F10.1371%2Fjournal.pntd.0002209>

Parasitic Zoonoses: One Health Surveillance in Northern Saskatchewan. Janna Schurer, Momar Nda, Stuart Skinner, James Irvine, Stacey Elmore, Tasha Epp, and Emily Jenkins. *PLoS Neglected Tropical Diseases*. 2013. Volume 7, Issue 3: e2141. <http://www.plosntds.org/article/info%3Adoi%2F10.1371%2Fjournal.pntd.0002141>

Bartonellosis: Diagnosing a Stealth Pathogen. Tracey Peake. *The Abstract*. April 2013. <http://web.ncsu.edu/abstract/science/tpbartonellosis-diagnosis/>

Emerging Infections in Perspective: Novel Coronavirus and H7N9 Influenza. Davide Heymann. Chatham House. April 2013.

<http://www.chathamhouse.org/media/comment/view/190809>

Diagnosis and Management of Q Fever—United States, 2013: Recommendations from CDC and the Q Fever Working Group. Alicia Anderson, Henk Bijlmer, et al. *MMWR*. March 2013.

http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6203a1.htm?s_cid=rr6203a1_e

Discrepancies in Data Reporting for Rabies, Africa. Louis Nel. Emerging Infectious Diseases. April 2013. Volume 19, Issue 4.

http://wwwnc.cdc.gov/eid/article/19/4/12-0185_article.htm

Eight Multistate Outbreaks of Human Salmonella Infections Linked to Small Turtles. Centers for Disease Control and Prevention. April 2013.

<http://www.cdc.gov/salmonella/small-turtles-03-12/index.html>

One Health and Hendra virus: a Collaborative Approach in Action. Belinda Crawford, Ian Roth, and Tiggy Grillo. NSW Public Health Bulletin (Australia). 2012. Volume 23, Issue 7-8. <http://www.publish.csiro.au/paper/NB12079.htm>

Synergies across the natural resources management fields in Southern Africa: Disaster Risk Reduction and One Health. Clara Bocchino and Richard Burroughs. Jamba: Journal of Disaster Risk Studies. 2013. Volume 5, Issue 2.

<http://www.jamba.org.za/index.php/jamba/article/view/74>

Page 23 One Health Newsletter Volume 6 Issue 2

One Health

Newsletter

Editorial Board:

Ryan J. Elliott

Princeton University

David N. Fisman, MD, MPH,
FRCP(C)

University of Toronto

Paul Gibbs, BVSc, PhD, FRCVS

University of Florida

Shaiasia Itwaru-Womack

Florida Department of Health

Ann Schmitz, DVM, AM

Florida Department of Health

Gary L. Simpson, MD, PhD,
MSc, MPH

Texas Tech University

Health Science Center

Danielle Stanek, DVM

Florida Department of Health

Kendra Stauffer, DVM,
DACVPM

USDA APHIS

Recent One Health Publications (continued)

The Southern African Centre for Infectious Disease Surveillance: A One Health Consortium. Mark Rweyemamu, Peter Mmbuji, , et al. *Emerging Health Threats*. 2013. Volume 6. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3557954/>

International Development, Emerging Diseases, and Ecohealth. Claire Standley and Tiffany Bogich. *Ecohealth*. March 2013. Volume 10, Issue 1: 1-3.

<http://link.springer.com/article/10.1007/s10393-013-0820-z#>

Perspective: One Health: A Compelling Convergence. Samuel Shomaker, Eleanor Green, and Suzanne Yandow. *Academic Medicine*. January 2013. Volume 88, Issue 1: 49-55. http://journals.lww.com/academicmedicine/Abstract/2013/01000/Perspective___One_Health___A_Compelling.19.aspx

Hendra virus: a One Health Tale of Flying Foxes, Horses, and Humans. Briony hazelton, Fatma Ba Alawi, Jen Kok, and Dominic Dwyer. *Future Microbiology*. April 2013. Volume 8, Issue 4: 461-474.

<http://www.futuremedicine.com/doi/abs/10.2217/fmb.13.19>

Pediatric Visceral Leishmaniasis in Italy: a One Health approach is needed. Vincenzo Lorusso, Filipe Dantas-Torres, et al. *Parasites & Vectors*. 2013. Volume 6, Issue 123. <http://www.parasitesandvectors.com/content/6/1/123/abstract>

doh.state.fl.us/Environment/medicine/One_Health/OneHealth.html

Or visit us on Facebook: www.facebook.com/OneHealthNewsletter

For other One Health publications, please visit the One Health Initiative website:

<http://www.onehealthinitiative.com/publications.php>