One Health Newsletter

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

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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.

Why physicians should be interested in One Health

James M. Hughes, MD, FIDSA

James Hughes

Alert health professionals (physicians, veterinarians, laboratorians, public health officials) have played important roles in initial recognition of new and emerging infectious diseases over the past 40 years. Reviews of the historical experience indicate that approximately two-thirds of such diseases are vectorborne or zoonotic diseases and represent cross-species transmission events. In addition, the majority of Category A biothreat agents represent zoonotic pathogens. Current trends in the 13 factors identified by the Institute of Medicine as contributing to disease emergence are operating in favor of the microbes, ensuring that new infectious diseases will continue to arise (SARS, the recently recognized novel coronavirus infection in the Middle East, and H5N1, pandemic H1N1, and swine H3N2 influenza come to mind as recent examples), and long recognized diseases will continue to appear in new geographic areas (West Nile, monkeypox, and Chikungunya are recent noteworthy examples). Hot spots for emergence of new diseases have been identified; many of these are in areas of environmental degradation, rainforest intrusion, and deforestation. Until more progress is made in identifying and intervening to prevent cross-species transmission of new agents from animal reservoirs (especially wildlife), humans are likely to remain sentinels for disease emergence and health workers are likely to continue to play important roles in the initial recognition of new diseases.

The veterinary community deserves credit for generating interest in the importance of a One Health approach involving trans-disciplinary collaboration and opening communication channels across professional categories. Physicians who are interested in or involved with influenza, antimicrobial resistance, heath care-associated infections, foodborne diseases, blood, organ, and tissues safety, pathogen discovery, biosafety or biosecurity programs, or bioterrorism preparedness should be supportive and willing to reach out to veterinary colleagues.

In This Issue

When the SARS pandemic was recognized in early 2003, CDC investigators soon realized that the veterinary community was much more knowledgeable about coronavirus infections than those of us involved in human medicine and public health.

In addition to physicians working in public health, those focused on family medicine, pediatrics, emergency medicine, infectious diseases, occupational medicine, and preventive medicine come to mind as physician groups who should have a vested interest in One Health issues and approaches. When taking a history from a patient with an unexplained febrile illness, it is important to elicit information about occupational and environmental exposures (including hobbies), recent domestic and foreign travel, and pet and wildlife exposure as the responses may provide important clues to the diagnosis or suggest the need for consultation with experts in other disciplines. As efforts continue to add polio and guinea worm to the list of eradicated diseases, the medical and public heath communities should recognize the recent success of the veterinary community in the eradication of rinderpest and determine whether lessons were learned that may be relevant to ongoing efforts to eradicate other diseases.

At the policy level, the White House released for the first time a National Biosurveillance Strategy in July 2012 calling for an all hazards approach to improving situational awareness and early detection capabilities for threats to or adverse events in humans, animals, and plants. Recognizing the importance of emerging microbial threats and problems arising at the human, animal, ecosystem interface, medical and public health schools and many professional societies have an important role to play in education of their students and members regarding the importance of interdisciplinary communication and collaboration.

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Advance One Health or impede One Health—an opinion

One Health Initiative Autonomous *pro bono* team: Laura H. Kahn, MD, MPH, MPP, Bruce Kaplan, DVM, Thomas P. Monath, MD, Jack Woodall, PhD, and Lisa A. Conti, DVM, MPH

“Let us go forward together…” —Winston Churchill

The One Health movement may be trending away from the true spirit of One Health, i.e. the collaborative, interdisciplinary/multidisciplinary principle of sharing and outreach beyond organizational, institutional, national, and international boundaries.

At One Health interest and implementation activities have literally "taken off" during the last two years in the U.S. and worldwide. This is evidenced by the numerous national and international meetings, symposia, "official" governmental agencies and unofficial organizations, university institutions and grassroots individuals as well as "VIPs" raising the banner for more One Health performance and execution.

Examples include:

- A host of recent VIPs and prominent organizational endorsements have encouraged and helped by articulating One Health positions and endorsements, e.g. American Academy of Pediatrics, American Association of Public Health Physicians, American Nurses Association, United States Animal Health Association, and the U.S. National League of Cities. (www.onehealthinitiative.com/supporters.php and www.onehealthinitiative.com/endorsements.php)
- Emerging One Health organizations, symposia and publications have an all-inclusive policy, e.g. the U.S. One Health commission (www.onehealthcommission.org), the 1st International One Health Congress meeting in Australia (www.onehealthinitiative.com/publications/One%20Health%20Society%20Proposal%20Amended%20version.pdf), Veterinaria Italiana Journal (www.izs.it/vet_italiana/index.htm), and Infection, Ecology and Epidemiology One Health Journal (Sweden) (www.infee.se/infeecommunity/node/14). The One Health Initiative team/website (www.onehealthinitiative.com) has always been all inclusive and offered free participation.
- Since the landmark American Veterinary Medical Association's (AVMA) One Health taskforce report (www.onehealthinitiative.com/taskForce.php) a host of legitimate and useful publications, white papers, and blogs have appeared with repetitive dissertations from different worldwide perspectives as to how to proceed.

Essentially, these accumulative views all express goals for the classic management principles for planning, organizing and executing One Health into the scheme of providing more efficacious public health and clinical health care for society with the reasonable incorporation of One Health principles.

However, from our viewpoint, it now appears (January 2013) that the One Health movement is precariously trending towards many factions or "silos" vying for shortsighted supremacy and/or One Health ownership, absent the true spirit of One Health (formerly called "One Medicine"), i.e. the collaborative, interdisciplinary/multidisciplinary principle of sharing and outreach beyond organizational, institutional, national and international boundaries...previously admonished in www.izs.it/vet_italiana/2009/45_3/377.pdf:

"...no single person, no single health profession, no single organization, and no single nation or people invented or owns One Health. It is an all-inclusive, co-equal endeavor that belongs to all of humanity. A caveat: while honest debate over efficacious process should be welcome, factionalism should not."

Hopefully all groups will begin to recognize that long-term, it will be much more efficacious for all to work together and share the benefits equally in the true spirit of One Health. Everyone working on the same page is a tall order. This will require altruistic individual, national and international leadership emergence—with emphasis on "leadership"... otherwise, in the words of one One Health VIP, "the life protecting-life saving One Health movement will likely wither on the vine." Cui bono?

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. The Initiative's distribution lists includes individuals in 61 countries.

Human-driven environmental change influences malaria transmission

Sarah Olson, PhD

Malaria is one of the most important global health issues and is directly influenced by the environment. The close connections between humans, vectors and the environment that need to be addressed for malaria resonate with the holistic viewpoint of One Health. Regarded as the world's most serious vector-borne disease of humans, malaria afflicts 500 million people and causes 1 to 2 million fatalities annually, mostly in children[1]. Despite worldwide eradication efforts in the 1960s and 70s, it consumes 0.25-1.3 percent of per capita GNP in endemic countries[2,3]. The vast majority (~90%) of global malaria mortality burden occurs in Africa, but from the 1960s onward, substantial increases of incidence have been documented in Southeast Asia and the Amazon – areas that are experiencing rapid population growth and environmental change[4-6].

Malaria's persistence is a function of the vector, parasite, and human host interactions. The vectors, mosquitoes of the *Anopheles* genus, transmit the disease agent, a parasite of the genus *Plasmodium*, from infected to susceptible


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Bruce Kaplan


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Lisa Conti

The close connections between humans, vectors and the environment need to be addressed for malaria to resonate with the holistic viewpoint of One Health.

Malaria is a fascinating One Health case study because it can infect a multitude of species.

individuals. The parasite itself undergoes a complicated lifecycle both in the mosquito (sexual phase) and human host (asexual phase).

Malaria is a fascinating One Health case study because it can infect a multitude of species. Malaria is not limited to humans; almost 200 species of Plasmodium are known to infect birds, reptiles, and mammals. Interestingly, the origin of one of the deadliest human malaria species, *P. falciparum*, has been traced back to gorillas[7]. While this article focuses on human malaria, there are likely many untold stories of environmental linkages in animal reservoirs of malaria as well. The survival and proliferation of malaria in the face of a barrage of medical technology attests to the ecological complexity of the disease. Treatment drugs have lost effectiveness as the parasites developed resistance from widespread misuse, and mosquitoes have demonstrated resilience to widespread DDT applications. Moreover, the current situation is dynamic and very responsive to change on local and global scales. Global models of future climate change have projected increasing risk of malaria concurrent with increasing local temperatures. The environmental linkages are especially present at the local scales where human development has dramatic effects on ecology for the better or worse, such as through agricultural modification and deforestation. Here we will examine two different stories that illustrate these important environmental linkages.

Laborers "sitting down to work in a cacao estate" from a 1946 study on bromeliad malaria performed by Downs[9].

In the course of human history, humans have often mitigated malarial risk factors by altering the environment with intentional or unintentional impacts on mosquito habitat. Perhaps one of the first public health environmental interventions was the drainage of swamps surrounding Rome, which were identified

Malaria research must address environmental linkages and mosquito ecology, in addition to traditional approaches such as bednets, access to healthcare, and clinical studies. In addition to deforestation and agricultural development, drivers such as dam construction and climate change are also known to alter mosquito ecology.

as the source of "miasma" or disease[8]. Another historical tale of malaria's environmental connection is the bromeliad malaria epidemic in Trinidad. Economic pressures and poverty in the 1940s pushed the agriculture sector of Trinidad into the cacao industry, and subsequent labor demands brought a large human population into the forest. The cacao trees establish a lighter and drier environment than the surrounding natural forests and required shade trees. These shade trees supported a bromeliad "tank species,, which have an internal structure that captures a small amount of water and creates an ideal breeding site for *A. bellator*. *A. bellator* and other forest mosquitoes were found in distinct ecological niches within the natural vertical configuration of the forest canopy[9]. These niches correspond to vertical structures and subtle variations in light, wind, thermal conductance, and humidity[10]. During the epidemic medical doctors noted splenomegaly, an indication of malaria, among school children correlated with areas cultivating cacao and *A. bellator* was only found near the cacao farms. Removal of the bromeliads either by hand or with herbicides *reduced A. bellator* populations and returned malaria rates to prior endemic levels[9].

Deforestation in the Amazon was recently identified as a more contemporanious anthropogenic activity with strong associations to malaria risk [11,12,13]. New research in the Amazon Basin shows links between deforesation, *Anopheles darlingi* mosquito populations, human-biting risk, and incidence of malaria. One pair of studies, set in the Peruvian Amazon, simultaneously looked at mosquito larvae presence and mosquito biting rates of humans. After adjusting for human population density, the authors found larval presence in 2% of forested sites and 17% of deforested sites[11]. The average human-biting rate of mosquitos trended in the same direction, with no biting in mostly pristine sites but over six bites per person nightly in the deforested sites[12]. Notably, the abundance of native forest mosquitoes dropped in deforested areas. Another study in the group measured the impact of these factors during a malaria epidemic in Mâncio Lima, the western-most municipality of Brazil. Working with reports from 54 health districts within the municipality, the authors found that a roughly 5% change in forest cover was associated with a 50% increased risk of clincally diagnosed malaria[13].

Diagnostic post for malaria in Mâncio Lima, Brazil. Photo credit: Eduardo Macário.

As these examples show, malaria research must address environmental linkages and mosquito ecology, in addition to traditional approaches such as bed-nets, access to healthcare, and clinical studies. In addition to deforestation and agricultural development, drivers such as dam construction and climate change are also known to alter mosquito ecology. The government of Brazil has acted with foresight by requiring a health impact assessment of a new dam near Porto Vehlo to include malaria. It's a hopeful sign that integrated environmental and human health assessments can become a mainstream practice as ecologists, medical doctors, public health practioners and planners can all contribute perspectives to interdisciplinary malaria teams. Malaria provides an excellent example of the interconnected nature of human health and the environment, and the need for transdisciplinary approaches.

Sarah Olson

References are available at: http://myfloridaeh.com/medicine/One_Health/Olson_malariatransmission_references.pdf

Sarah Olson is a Wildlife Epidemiologist at the Wildlife Conservation Society-Canada, Nanaimo office. She is also a member of the USAID-PREDICT project which is surveying wildlife viruses in over 20 countries around the world.

A need for a One Health approach to anthrax surveillance and control

Jason K. Blackburn, PhD

Anthrax – an important and poorly understood zoonosis

Globally, anthrax is an important zoonosis with rapid onset and high mortality in wildlife and livestock, a cause of secondary human cases, and a security risk as a bioterror agent. The pioneering work of Koch and Pasteur identified the Gram-positive, spore-forming bacterium *Bacillus anthracis* as the causal agent, making it among the first pathogens identified (Carter 1988). The disease can exert significant impacts on wildlife and livestock populations (Hugh-Jones and De Vos 2002). Human cases are most commonly associated with slaughtering infected animals (Woods et al. 2004). However, anthrax ecology and transmission remain poorly understood and understudied (Turnbull et al. 2008, Blackburn 2010, Blackburn et al. 2010). Broadly, outbreaks in enzootic regions arise in specific environmental conditions (Blackburn et al. 2007), such as semi-arid grasslands and steppes, and at times of seasonal transitions in climate (Turner et al. 1999, Parkinson et al. 2003). This is true for livestock and wildlife populations. There are also situations where livestock outbreaks are associated with contaminated

Anthrax is an important zoonosis with high mortality in wildlife and livestock, and a security risk as a bioterror agent. However, anthrax ecology and transmission remain poorly understood.

animal feed (Fasanella et al. 2012).

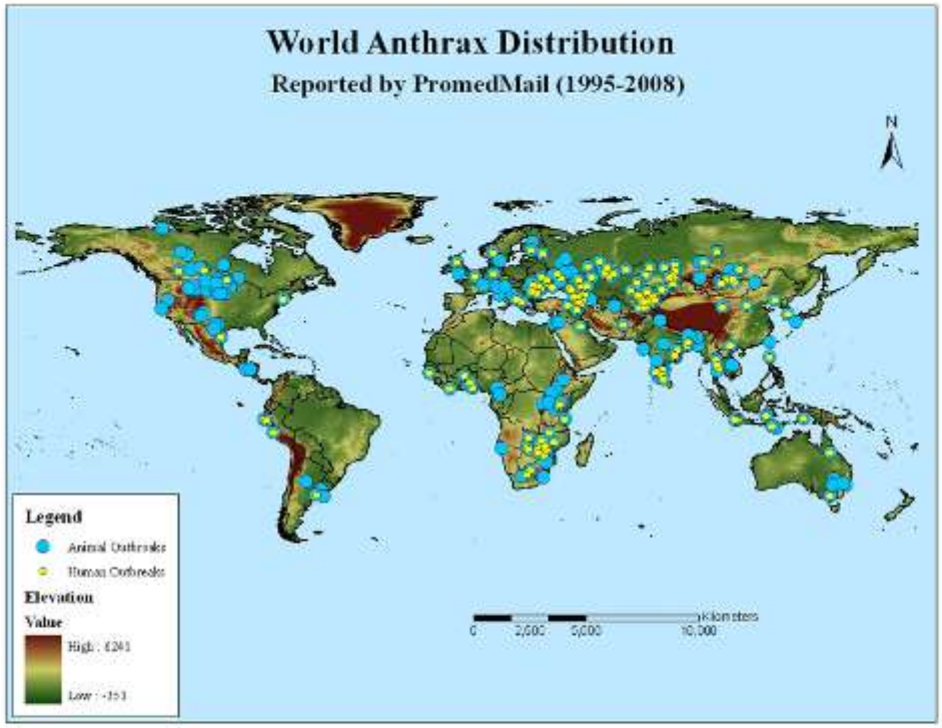

Figure 1. Global distribution of human (yellow dot) and livestock (blue dot) anthrax cases based on an analysis of Promed reports from 1995-2009. From Truong et al. 2009

Anthrax occurs nearly worldwide with the heaviest livestock and human disease burden in resource limited countries.

Global patterns of anthrax

Anthrax occurs nearly worldwide with the heaviest livestock and human disease burden in resource limited countries (Hugh-Jones 1999). Using data from Promed Mail (www.promedmail.org), Truong et al. (2009) illustrated the concentration of human cases in relation to livestock for the period 1995-2009 (Figure 1). Animal cases occurred across much of the globe, but human cases were most concentrated in Central Asia, Southern Africa, and the Caucasus. During that period, Kyrgyzstan had some of the highest reported human case numbers. Additionally, Turkey (Özkurt et al. 2005) and the Republic of Georgia have both reported high numbers of human cases. Disease control in these areas requires approaches that provide livestock control, such as vaccination campaigns and increased animal surveillance (Kracalik et al. 2012) and education programs targeting animal handlers and local slaughter operations.

Figure 2. A dead white-tailed deer in the enzootic zone of west Texas. Photo credit: Jason Blackburn.

Anthrax in wildlife

Reports of wildlife cases are becoming more common in North America. Wildlife outbreaks are regular in white-tailed deer, *Odocoileus virginianus*, in Texas (Figure 2) (Hugh-Jones and De Vos 2002) and bison, B*ison* ssp., in Canada

(Dragon et al. 1999). Generally, anthrax is considered an acute disease with potential for large rapid epizootics. However, recent evidence from Texas suggests that the pathogen circulates annually, with few cases in some years and epizootics in other years, likely associated with climatic conditions (Blakburn and Goodin, in Press). We can define three active foci for wildlife anthrax in the American west (Figure 3). Southern Texas has a history of anthrax in deer and cattle, with sporadic reports of cases in both groups in and around Jim Hogg County. Remote sensing analyses of the environmental conditions suggest that this area is generally poor to support bacterial survival (Hugh-Jones and Blackburn 2009). In contrast, the area of West Texas (particularly around Del Rio, Texas) can be defined as an enzootic zone, where the disease is reported regularly and environmental conditions are generally good for pathogen persistence. Deer epizootics have been frequently documented in west Texas over the last decade (Hugh-Jones and De Vos 2002, Blackburn 2006, Hugh-Jones and Blackburn 2009). A third focus is in southwestern Montana.

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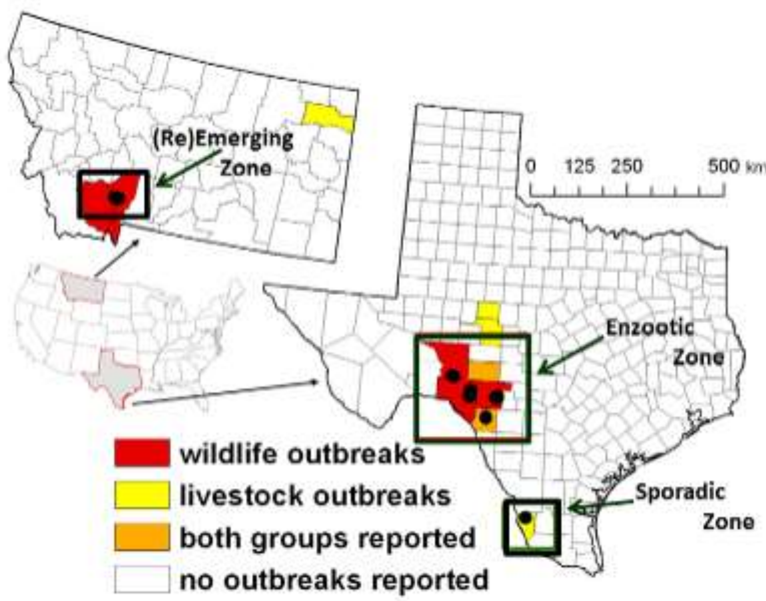

Figure 3. The geography of wildlife anthrax foci in the western U.S. based on reports from the last decade.

(Re)Emerging anthrax in southwestern Montana

Until 2008, there were no recent reports of anthrax in wildlife or livestock in western Montana. A large epizootic occurred on a ~115,000 acre ranch on the Gallatin/Madison county line during the 2008 summer, including ~300 bison, ~43 bull elk, two white-tailed deer, and a suspect black bear. The outbreak began after a mid-summer rainy period in an otherwise hot dry summer, the classic conditions for anthrax epizootics (Hugh-Jones and Blackburn 2009). Bison deaths were concentrated in two large pastures in the southwestern portion of the ranch with a third isolated pasture eruption late in the outbreak (Figure 4). This was the first report of free range elk, *Cervus elaphus*, in North America with carcasses found across the ranch (Figure 5). Reports from the early 20th century suggest a history of anthrax in the region (Stein 1945), but there had been no recent reports until 2008. Since then, we have monitored the situation and documented cases in bison in 2010. In the 2010 situation, we confirmed active bacteremia in two wolf-killed bison. More recently, we have use serological testing to confirm that bison and elk sampled 2009 – 2010 sero-convert, suggesting pathogen exposure, even in periods with no documented mortality events (Blackburn, unpublished data).

Anthrax is a disease that crosses the human/livestock/wildlife interface. Because of this, effective surveillance and control strategies require a One Health approach.

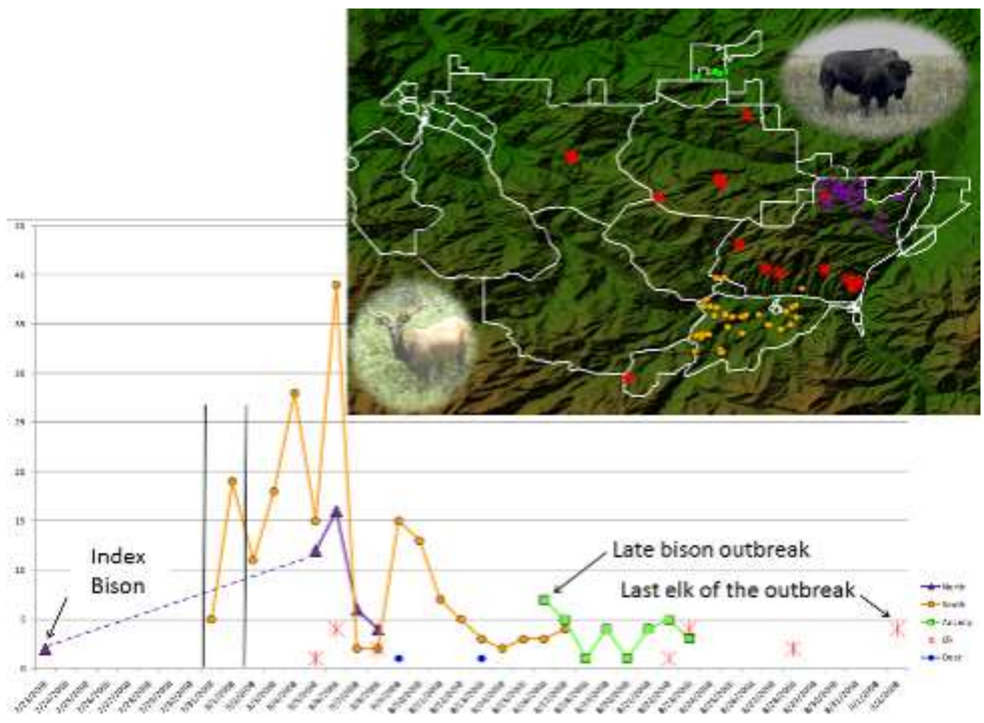

Figure 4. The spatio-temporal patterns of the 2008 wildlife epizootic in western Montana. *Purple, green, and orange dots represent bison cases, red stars indicate elk cases, and the graph reflects daily mortality rates from July-August 2008. The ranch is a large, ~115,000 acre ranch delimited by the white lines.*

A One Health strategy should have an impact on the human burden of anthrax as most human cases stem from livestock cases.

A call for One Health strategies for improved anthrax surveillance and control

As illustrated in the examples presented here, anthrax is a disease that crosses the human/livestock/wildlife interface. Because of this, effective surveillance and control strategies require a One Health approach. These strategies should target different groups across the geography of the disease. Central Asia, southern Africa, and the Caucasus require improved livestock surveillance and vaccination strategies aimed at reducing the livestock burden. Such a strategy should have an impact on the human burden as most human cases stem from

In the absence of vaccination, rapid carcass cleanup during outbreaks is the only apparent means of reducing the size of outbreaks.

Ecological niche models can be used to identify areas of high risk and areas where passive surveillance should increase.

Figure 5. A bull elk dead of anthrax in Montana in 2008. Photo credit: Neil Cadwell.

livestock cases. In contrast, the wildlife situation in the western US poses a different challenge. With the exception of the bison herd described in western Montana, vaccination is untenable in wildlife. The bison herd, though free range through most of the year, is rounded up annually for brucellosis testing and can be vaccinated. The elk however cannot; the same is true for deer in Texas. In the absence of vaccination, rapid carcass cleanup during outbreaks is the only apparent means of reducing the size of outbreaks. Because of this, there is a need to better understand the timing of epizootics and the geographic space where these are likely to occur. This would allow managers to stage surveillance and disposal resources ahead of "bad years" and vaccinate pinned wildlife and livestock early. Time series analyses of remotely sensed data can assist with the former, while ecological niche modeling and wildlife telemetry studies can assist with the latter.

Ecological niche models can be used to broadly define the geographic range of *Bacillus anthracis* and target surveillance efforts (Mullins et al. 2011, Alexander et al. 2012). When coupled with spatial statistics of outbreaks, we can identify areas of high risk (where the clusters occur) and areas where passive surveillance should increase (where niche models predict in under investigated areas). More locally, wildlife telemetry studies can assist in understanding the relationship between individual animals in a herd and their use of the landscape during anthrax risk periods (Blackburn 2006). Such studies can shed light on the role of animal behavior in contacting the environmental reservoir for the pathogen.

Much of the recent spatial modeling of anthrax has relied on mortality data to understand the disease, which likely underestimates the extent and intensity of the disease (Bellan et al. 2013). Recent serological studies in Africa (Lembo et al. 2011), and our own data from Montana, suggest that pathogen exposure is frequent, even without mortality events. Coupling data from across these scales and across host species in a modeling framework should provide better information on the disease that can be shared with wildlife managers, re-

Jason Blackburn

gional public health officers and policy makers. Such communication should include wildlife researchers, veterinary and human public health personnel and academicians to evaluate One Health approaches and support integrate control and surveillance strategies.

References are available at: http://myfloridaeh.com/medicine/One_Health/Blackburn_anthrax_references.pdf

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Coughs and sneezes, bats, birds, pigs, and you

Jack Woodall, PhD

In 1998, pig farmers in northern Peninsular Malaysia noticed that their pigs were getting a disease that caused loud coughing. Next, people started coming down with fatal encephalitis, which was attributed to endemic, mosquito-transmitted Japanese encephalitis. But some of the victims also had atypical pneumonia, some of them had been vaccinated against Japanese encephalitis and would have been immune to it, and all of them were ethnic Chinese. The solution to the riddle was that in Moslem Malaysia, only non-Moslem Chinese raised pigs, and the vaccination did not protect because it was a different virus, a new member of the paramyxovirus family that is responsible for respiratory disease in humans and animals. It was named Nipah virus, after the Malaysian village from which the specimen came which yielded the first isolate of the virus. Its origin was traced back to fruit bats, which had been displaced from their original habitat by forest clearing and sought alternate food on farms. They were feeding on mangoes in trees overhanging the pig pens, into which their dejecta fell and contaminated the pig feed and water.

Cases turned up in later years, also in Asia: in Bangladesh between 2001 and 2008, outbreaks claimed over 129 victims with a case fatality rate (CFR), of about 75%; and in 2007 in India, with more than 70 cases and a 70% CFR. Transmission was no longer airborne from livestock, but was still connected with fruit bats. In those countries, collectors of palm sap for fermenting into palm wine found that their containers were attracting the bats, which were contaminating them in the same way as in Malaysia. By keeping out the bats with slatted bamboo mats over the cups on the palm trees, these outbreaks were curtailed.

Nipah virus, swine flu, SARS, bird flu, and the novel coronavirus are examples of diseases at the interface of humans, bats, birds, and pigs.

Swine flu

Type A influenza viruses, including H3N2 and its variants, commonly cause outbreaks in pig farms. Most of the type A influenza viruses that infect swine are genetically very different from human (seasonal) influenza viruses. In 2012, an influenza A(H3N2)v (v for variant) swine influenza virus strain has been causing human infections at agricultural fairs in some parts of the United States. It has not so far been detected in pigs in European countries. Only people in direct contact with infected swine, such as in barns and livestock exhibits housing swine at fairs, are likely to be at risk of contracting this H3N2v strain of influenza virus. However transmission of this variant strain is thought to occur in the same way that seasonal flu transmits in people, which is mainly through coughing or sneezing by people who are infected. People also may become infected by touching something with flu viruses on it and then touching their mouth or nose. In most cases, variant flu viruses have not spread widely from person to person.

Severe Acute Respiratory Syndrome (SARS)

Coronaviruses, so called because they look like little crowns under the electron microscope, are common causes of the common cold in humans and animals, but most of them cause little inconvenience to you and me apart from giving us the occasional case of the snuffles. But in late 2002, one strain turned nasty. In Guangdong province, China, people started coming down with a fatal pneumonia. The first the world knew about it was from an American public health physician who came across it by chance in an internet chat group with Chinese teachers, and reported it globally on ProMED. The disease spread to Hong Kong, where a visiting businessman came down with it, and unknowingly gave it to a number of fellow guests in his hotel. The virus couldn't have chosen a better base, because those infected people travelled to their home countries and spread it all over the world. The disease was named Severe Acute Respiratory Syndrome (SARS), and before the pandemic burned itself out it had infected over 8,000 people in 26 countries and killed nearly 800.

Masked palm civet.
Photo credit: Denise Chan

The proximate source appeared to have been masked palm civets, slender cat-like animals sold in wet markets all over southern China as a much sought-after delicacy. After they were banned

Photo credit: Mnolf

All of us who deal with livestock, companion animals or wildlife -- farmers, pet owners, zoo keepers, park rangers and nature lovers – should look out also for unusually virulent respiratory symptoms in the animals we care about, and report suspicious cases to the relevant authorities.

from sale, and the markets disinfected, the epidemic ceased in China, and soon in the rest of the world. Much later, after the genome of the virus was sequenced, its closest relatives turned out to be bat coronaviruses, but nobody can figure out how bats could have infected civets.

Bird flu

At the end of 2003, an avian influenza virus jumped species from wildfowl, principally waterbirds, to poultry and people. It was named influenza A H5N1. Since then, it has spread to over 60 countries, where more than 250 million poultry in infected flocks have died or been culled, and over 500 human cases have been reported in 15 countries, with a 60% CFR. Since October 2012 outbreaks have been reported in poultry in India and Australia, and thousands of wild ducks have died from it in Russia, on lakes near the Black Sea. Ducks and hens don't cough; bird flu spreads between poultry and waterfowl through the feces, just like the bat-related viruses that caused the SARS pandemic and Nipah outbreaks.

Novel coronavirus

Fast forward a decade to April 2012, when there was an outbreak in a hospital in Jordan, which spread from a patient with pneumonia to a dozen members of the hospital staff, one of whom died. Their specimens were tested against all known human respiratory agents without a positive result. Careful surveillance did not reveal any community spread. But in late November, World Health Organization (WHO) reported that a novel coronavirus had been isolated from another Arab pneumonia patient, this time from Saudi Arabia, and that retrospective testing had found the same virus in yet another recent Arab pneumonia patient from Qatar. Molecular studies have found that this virus is, once again, closely related to bat coronaviruses.

Before you suggest that all we have to do to protect ourselves is exterminate bats, be aware that they eat vast numbers of mosquitoes, protecting us from many mosquito-borne diseases, and they also pollinate most of the fruit trees which provide an important part of our food.

What we can do

On 30 November 2012, WHO put out a global alert asking all health personnel worldwide, not just in Arab countries, to look out for cases of severe acute respiratory infections (SARI), especially clusters in health care personnel. Given the history of bird and swine flu, Nipah and SARS viruses, I would strongly suggest

The experience of recent years shows that we ignore diseases in the animals around us at our peril.

that all of us who deal with livestock, companion animals or wildlife -- farmers, pet owners, zoo keepers, park rangers and nature lovers – look out also for unusually virulent respiratory symptoms in the animals we care about, and report suspicious cases to the relevant authorities. The experience of recent years shows that we ignore diseases in the animals around us at our peril.

ProMED-mail outbreak reports, September-December 2012

Jack Woodall, PhD

Due to publishing deadlines, the roundup of disease outbreaks in the last (Fall) issue of this newsletter only covered them through August. Since then, there have been a number of undiagnosed and otherwise notable outbreaks around the world, a sample of which are covered here. They included the largest yellow fever outbreak in Africa for 20 years, and the appearance of fatal cases of a new human betacoronavirus in Arab countries. Tests on samples from a grass-fed cow that died in Brazil in December 2010, and which never entered the food chain, were finally confirmed positive for (probably spontaneous) BSE in December 2012, and the case was reported to the OIE, which ruled that it did not alter Brazil´s classification as a country with negligible risk of BSE.

There have been a number of undiagnosed and otherwise notable outbreaks around the world since the last issue of this newsletter.

Lastly, not forgetting crop plant outbreaks that are important for human and livestock nutrition and therefore our health, in the last four months of the year there have been microbial attacks by known pathogens on avocado, citrus, grapes, kiwi fruit, maize, potatoes, bananas, sugar beet and sugar cane, coffee, pepper, rape, rice, watermelon, wheat, and the spread of a soybean virus to Canada and huanglongbing disease of citrus to Argentina. New or undiagnosed diseases seriously affected potatoes in Bulgaria, coffee in Central America, dates in Qatar, tomatoes and passion fruit in India. For details, you can search the ProMED outbreak page on the OHI website or ProMED at www.promedmail.org.

Yellow fever – Africa: Sudan (Darfur)

Experts claim that the outbreak of yellow fever affecting Sudan is the worst Africa has experienced for 20 years. By the end of 2012 the disease had killed 168 people, while 800 suspected cases of the mosquito-spread disease had been reported across Darfur since the outbreak began in October. Many more cases have likely not been reported to health authorities. The official death toll surpassed that of a 2005 yellow fever outbreak in Sudan's South Kordofan region, which led to 163 deaths from 604 cases over a period of five months. Information suggests that 35 out of the 64 localities of Darfur had been affected by the disease. Central Darfur was reportedly the most affected state with 51.5 percent of the registered cases, followed by North Darfur (21 per cent), West Darfur (17.4 percent) and South Darfur (9.5 percent). East Darfur wa allegedly the least affected state with less than one percent of cases. So far, approximately one million people have been vaccinated against yellow fever in Darfur.

Glanders, equine -- Brazil (Ceara)

In October, the Ceara State Department of Health recorded five cases of glanders in animals in the metropolitan area of the state capital, Fortaleza, and is attentive to the risk of the disease in humans. The disease is transmitted by ingestion of contaminated food or water and affects horses, donkeys, and mules. Although it is a zoonotic disease, glanders has not been registered in any humans in Brazil, but the animals are at serious risk. It is a Scheduled Agent because of its potential for use as a biological weapon. Minas Gerais State also recorded five cases in July. Over the past 10 years, glanders affected horses in 15 states of Brazil. Glanders is a very painful disease in humans and can be up to 95 percent fatal if not treated.

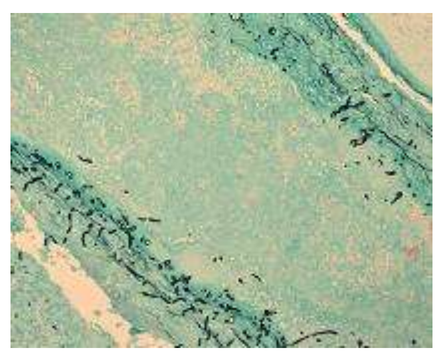
Passionfruit flower.
Photo credit: George Halt.

Undiagnosed disease, Passion fruit -- India (Manipur)

Owing to widespread destruction of passion fruit plants by a serious unknown disease in the Mao area (northern Manipur), Exotic Juice Ltd has stopped production of passion fruit juice for the past two seasons. Commercial production of passion fruit juice started in 2004, and the product was sold locally and also exported to South Africa and Middle Eastern countries. Raw material was supplied by farmers from other districts. Profits from the international market were huge. Although scientists from ICAR (Indian Council of Agricultural Research) are trying to identify the cause of the disease, nothing has been ascertained up to now.

Fungal meningitis -- USA (Tennessee, North Carolina): contaminated drug

In October there was an outbreak of meningitis among patients given steroid injections in the spinal region for pain at an Outpatient Neurosurgery Center in Nashville, Tennessee. Two people died and nine others became ill. A patient who received the same type of treatment in North Carolina also fell ill. By mid-December, 590 cases had been identified in 19 states, 37 of whom died. The ster-



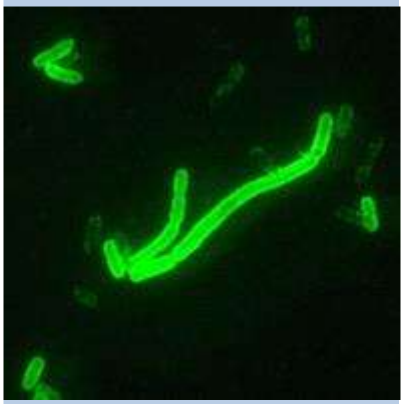
Fungus (stained black) in infected brain tissue. Photo credit: CDC

oid had been contaminated with fungi (*Aspergillus* & *Exserohilum*) when it was prepared by a pharmacy that has since been shut down.

Bacillus anthracis.
Photo credit: CDC.

Anthrax, human – England: information on latest case

A 42-year-old woman from Rochester (UK), who injected herself with heroin contaminated with anthrax, died in December in London. This is the third death which has been recorded in the UK during an outbreak of anthrax among drug addicts. According to experts, the anthrax was caused by infected heroin. The Health Protection Agency says that since June 2012, several European countries have reported 13 cases of anthrax among intravenous drug users. A total of six occurred in the UK (four in England, one in Scotland, and one in Wales). Earlier in the year, two drug addicts died in Blackpool (England) due to the bacterial infection.



Yersinia pestis
Photo credit: CDC.

Plague, bubonic -- Madagascar: fatalities

December is the peak season for the plague in Madagascar. The country is the second most affected by this disease in the world, after the Democratic Republic of Congo. With the seasonal heat and rain, cases increase in this period. Several foci were discovered around the capital, Antananarivo. Ten patients were newly identified some 80 km from the capital. Other cases had been reported even closer. In total, since the beginning of 2012, the plague has already affected 250 people, 90 since early October 2012, with nearly one out of five patients dying. The representative of WHO in Madagascar, said: "Compared to 2011, there are fewer cases, but these cases were more serious. It was noted that there are more deaths in 2012."

Schmallenberg virus -- Europe

In December, Schmallenberg virus (SBV), a new midge-borne virus which causes abortions and birth defects in cattle, sheep and goats, which was first described from the border area of Germany with the Netherlands in 2011, was detected for the first time in the Czech Republic. So far, only two sheep farms, near the border with Germany, have been found affected. In the same month, virus RNA was detected in bovine semen, with international implications for cattle breeding.

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

The new United States Food and Drug Administration (FDA) Food Safety Modernization Act

Michael R. Taylor, JD

Michael Taylor

January 4, 2013 was a historic day for food safety. With publication of proposed rules on produce safety and preventive controls in facilities that produce human food, we are taking an important step forward in preventing foodborne illnesses and outbreaks.

Although ground breaking, these proposed rules represent what we have known for some time—that food safety is no accident. It takes all of those involved in producing and processing food taking the right measures to prevent hazards that can cause illness at each important stage of the process.

Food safety is no accident. It takes all of those involved in producing and processing food taking the right measures to prevent hazards that can cause illness at each important stage of the process.

It may sound simple when stated that way, but make no mistake—building a new food safety system whose goal is prevention and that is science- and risk-based is no easy task. Nor will it happen overnight. It will take sustained effort and continued partnerships with everyone involved.

But the public health imperative for this effort and these new rules is clear. Too often, we have seen major food-related outbreaks, with hundreds of people becoming ill. This isn't acceptable to anyone, whether you are the victim or the victim's parent or child. The burden of illness is backed up from data from the U.S. Centers for Disease Control and Prevention (CDC), which estimates that one in six Americans get ill each year, 128,000 are hospitalized and 3,000 die.

These outbreaks also inflict significant costs on the food industry, due to market disruptions and lost sales. Even businesses that are not at fault suffer because they produce the same product that has been implicated in an outbreak.

We would never claim that all illnesses and outbreaks will be prevented once these rules are implemented, but we are confident that the burden on public health and the economic well-being of the food system will be lessened significantly.

In many ways, the concept of preventing food safety hazards that is represented by these two rules is not new. It has been about 50 years since the U.S. National Aeronautics and Space Administration (NASA) first used preventive controls as a way to keep food safe for astronauts. Since then, many manufacturers have adopted modern preventive controls for food safety as the only acceptable way to do business. Over the past 20 years, FDA and the United States Depart-

The proposed rules reflect the parallel goals of food safety protection and practicality.

In developing the new rules, we have made sure the public's voices have been heard, from the victims of foodborne illness, to farmers in all types of operations, to industry experts who have experience in implementing preventive controls.

ment of Agriculture (USDA) have already set preventive control requirements for seafood, juice, eggs, meat and poultry.

But we still have a lot to do to translate these familiar concepts into regulations that can apply and work in a practical way in the large and diverse array of food production settings that comprise today's food system. This includes farms and facilities of all sizes and types producing a vast array of foods each with its own risk profile. We need rules that work to protect food safety in ways that are adaptable to this diversity. One-size-fits-all-rules won't work. The proposed rules reflect the parallel goals of food safety protection and practicality. We have worked to make the proposed requirements highly adaptable to different settings, whether you are a small organic farmer or a large multi-national corporation. We have worked to make the proposed rules risk-based, recognizing that there is no need to set requirements for produce that is not eaten raw, such as potatoes. And we propose exemptions and modified requirements that recognize the need to be sensitive to small businesses.

The two proposed rules are the first among five rules that would lay the cornerstone of a prevention-based, modern food safety system that addresses the safety of both domestic and imported products. Three additional rules will follow. The proposed rule on Foreign Supplier Verification is the central element of the new import oversight system mandated by FSMA (http://www.fda.gov/food/foodsafety/fsma/default.htm) and thus an essential component of the modern food safety system envisioned by Congress for today's global food system. It will strengthen the oversight of foods imported to the U.S. by making importers accountable for verifying that the food they import is produced in a way that achieves the same level of public health protection as required of domestic growers and processors. The proposed rule on Accreditation of Third Party Auditors would also strengthen assurances about the safety of imported food by setting standards for accreditation of private third-party auditors in foreign countries. The proposed rule on Preventive Controls for animal food is similar to the rule for human food. Together, they complement each other in a way that reflects the "One Health" concept, which supports collaboration among the medical and veterinary communities and recognizes the convergence of human and animal health.

In developing all of these rules, we have made sure the public's voices have been heard, from the victims of foodborne illness, to farmers in all types of operations, to industry experts who have experience in implementing preventive controls. Our extensive outreach has included trips to farms in 14 states and various processing facilities, 500 presentations to stakeholders around the country, and we have worked closely with our colleagues at USDA, who have the most experience working with the farm community. We will continue to listen during the 120-day comment period as we schedule public meetings and briefings and as we prepare the next three rules for publication. This open and public debate is essential to ensuring we end up with the best rules possible, and a new food safety system that works well for consumers and industry alike.

Michael Taylor is the Deputy Commissioner for Foods at the United States Food and Drug Administration (FDA).

Opportunities in One Health

Funding opportunity in One Health

Grand Challenges in Global Health is looking for novel and innovative ideas within the concept of One Health to address the issues in the following areas: specific human and livestock disease (listed on website), human nutrition, health service delivery, and measurement of impact. http://www.grandchallenges.org/Explorations/Topics/Pages/OneHealthRound11.aspx

Open faculty position in One Health

The University of Florida's College of Public Health and Health Professions invites applications for a tenure-track Assistant/Associate/Full Professor faculty position in One Health. The new faculty member will academically join the College's Environmental and Global Health Department and may have additional research affiliations within UF. The candidate will be responsible for developing an independent research program and for teaching One Health, zoonotic diseases, or environmental health courses. Applicants should have a doctoral degree in veterinary medicine, public health, environmental health, medicine, microbiology, entomology, or a related field. https://jobs.ufl.edu/ngs/37275.

One Health Newsletter

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Coming Events

Medical Library Association Conference
"One Health: Information in an Interdependent World"
Boston, MA
May 3-8, 2013
http://www.mlanet.org/am/am2013/

World Research and Innovation Congress
"Pioneers in Healthcare"
Brussels, Belgium
June 5-6, 2013
http://www.worldresearchcongress.com/

University of Georgia One Health Symposium
"Breaking Barriers and Crossing Scales"
Athens, GA
March 21-24, 2013
http://www.onehealth.uga.edu/symposium.php

Colorado State University 4th Annual Public Health Symposium
"One Health: National and global perspectives on the public health implications of the human-animal-environment interface"
Fort Collins, CO
April 2, 2013
http://www.publichealth.colostate.edu/GPPH/2013Symposium.pdf

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/

Recent One Health Publications

One Health compelling stories: evidence of One Health in action. *University of Minnesota Center for Animal Health and Food Safety.* http://www.cahfs.umn.edu/appliedresearch/globalohimplement/CompellingStories/index.htm

One Health explores animal to human spread of disease. Mitchel L. Zoler. *Internal Medicine News* blog. March 2013. http://www.internalmedicinenews.com/views/blognosis-the-internal-medicine-news-blog/blog/one-health-explores-animal-to-human-spread-of-disease/0acadab8995f3dd792abe9c2f671fb1b.html

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Opinion: Cooperating to study cooperation. David Smith. *The Scientist.* February 2013. http://www.the-scientist.com//?articles.view/articleNo/34468/title/Opinion--Cooperating-to-Study-Cooperation/

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Experts call for One Health approach to tackling zoonotic diseases. Tezira Lore. *AgHealth.* January 2013. http://aghealth.wordpress.com/category/one-health/.

Antimicrobial resistance: a global public health challenge requiring a global One Health strategy. Guy H. Palmer and Douglas R. Call. *Institute of Medicine of the National Academies*. February 2013. http://iom.edu/Global/Perspectives/2013/AntimicrobialResistance.aspx?utm_medium=etmail&utm_source=Institute%20of%20Medicine&utm_campaign=02.07.13+Perspective+Alert&utm_content=Forum%20on%20Microbial%20Threats&utm_term=Unknown

Neurological manifestations of Bartonellosis in immunocompetent patients: a composite of reports from 2005-2012. Edward B. Breitschwerdt, Sushama Sontakke, and Sarah E. Hopkins. *Journal of Neuroparasitology.* Volume 3. 2012. http://www.ashdin.com/journals/jnp/235640.pdf.

Dog sniffs out deadly *C.diff* infection. Salynn Boyles. *WebMD.* December 2012. http://www.webmd.com/digestive-disorders/news/20121212/dog-sniffs-c-diff-infection.

Zoonoses—from panic to planning. *Institute of Development Studies Rapid Response Briefing.* January 2013. Issue 2. http://steps-centre.org/wpsite/wp-content/uploads/ZoonosesRapidResponseBriefing_jan_2013.pdf.

Recent One Health Publications (continued)

Transboundary animal diseases and international trade. Andres Cartin-Rojas. *International Trade from Economic and Policy Perspective, book edited by Vito Bobek.* August 2012. http://www.intechopen.com/books/international-trade-from-economic-and-policy-perspective/transboundary-animal-diseases-and-international-trade

One Health: perspectives on ethical issues and evidence from animal experiments. GV Asokan, Z Fedorowicz, P Tharyan, and A Vanitha. *Eastern Mediterranean Health Journal.* November 2012. Volume 18, Issue 11. http://www.emro.who.int/emhj-volume-18-2012/issue-11/article-15.html.

A quantitative and novel approach to the prioritization of zoonotic diseases in North America: a public perspective. Victoria Ng and Jan M. Sargeant. *PLOS ONE*. November 2012. http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0048519.

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

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

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

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