One Health Newsletter

A quarterly newsletter highlighting the interconnectedness of animal and human health

Summer 2011 **Volume 4 Issue 3**

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

The summary below provides a broad overview of the key activities and discussions at the 1st international One Health Congress, and also identifies some science innovations that were presented.

1st International One Health Congress, February 14-16, 2011

More than 650 people from over 60 countries attended the 1st International One Health Conference, held in Melbourne on 14 – 16 February 2011. Scientists, clinicians, government officials, and community members from a range of disciplines came together to discuss the benefits of working together to promote a One Health approach to human, animal, and environmental health（One Health embraces systems thinking and recognizes the interdependence of people, animals, and the environment）. The conference was hosted by the Commonwealth Scientific and Industrial Research Organization（CSIRO） and was supported by international agencies, industry, and the Australian and Canadian governments.

The Organizing Committee recognized from the outset the need to provide a forum not just for scientific presentation, but also for open discussion and dialogue around the policy and political issues, as well as the science, that drive the One Health agenda. The Committee was also cognizant of the need to embrace a definition of One Health that includes food security and food safety, and takes into account the social and economic pressures that shape human, animal, and environmental health. The meeting was therefore organized under four themes with plenary sessions **(Disease Emergence; Environmental Drivers; Trade, Food Security, and Food Safety; and Science Policy and Political Action)** followed by breakout parallel sessions for each of these. Importantly, throughout the conference at various times, sponsored sessions dealing with particular areas of science or policy were held that gave a further framework to learn current science and provided opportunities for debate and discussion.

The One Health Newsletter is a collaborative effort by scientists and health professionals from the following organizations:

- Palm Beach County Health Department
- Florida Department of Health
- University of Florida
- Kahn/Kaplan/Monath/ Woodall One Health Team

DIVISION OF Environmental Health

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Key messages arising from the inaugural International One Health Congress:

The One Health approach...

- **Recognizes the interdependence of, and seeks to improve, human, animal, and environmental health**
- **Recognizes that communication, collaboration, and trust between human and animal health practitioners is at the heart of the One Health concept**
- **Has a broad vision and includes other disciplines such as economics and social behavior that are essential to success**
- **Needs to also promote the 'doable' (such as improving surveillance and response for emerging infectious diseases) while developing the broader approach**
- **Emphasizes community participation, development of community capacity, and especially an open transparent dialogue**
- **Requires both 'ground up' and 'top down' action**
- **Recognizes that understanding ecosystems, including molecular eco-biology, are an essential part of One Health**
- **Recognizes that One Health is a major component of food security and safety**

The conference began with dances, stories, and songs from the traditional people of the Wurundjeri. The songs and stories told of the need of harmony between the earth, animals, and man for physical, mental, and spiritual wellbeing.

The plenary speakers at the opening session, 'Setting the Scene,' put forward the challenges that framed and informed the three days of intense discussion. It was fitting that humanitarian, scientist, and Nobel Laureate, Professor Peter Doherty, opened the conference.

Setting the Scene

Professor Doherty's keynote speech dealt with the growing evidence of the negative impact of human behavior on the health of the world and the likely risk to humankind. He called on the scientific world to push for a collaborative, principled plan to examine and provide evidence-based pathways addressing the causes and effects of deteriorating global ecosystems.

Laureate Professor Peter Doherty

This was followed by a series of presentations to set the scene for developing the later discussions at the international, national, and local levels. Dr. Takeshi Kasai, Director of Health Security and Emergencies at the WHO Western Pacific Regional Office, provided an overview of some of the regional disease threats. He then discussed the processes which WHO has developed to ensure that *rapid reporting of outbreaks of international public health concern is achieved through the new International Health Regulations,* and the bi-regional Asia Pacific Strategy for Emerging Diseases (in which a One Health approach with support from FAO and OIE forms a major

component in providing a response to zoonotic disease threats). Dr. Suwit Wibulpolprasert, senior adviser in disease control to the Thailand Ministry of Health, spoke of the challenges of applying a One Health approach to global health.

He delineated the four main challenges as: determining definition and scope, being clear whose wellbeing we are talking about, working together with trust as a team, and, finally, how to avoid failing.

The conference began with dances, stories, and songs from the traditional peoples of the Wurundjeri.

To the fourth challenge he presented five points:

1. Regular meetings – confirm we are working together and what allows us to share
2. Consensus, commitment, and collective actions
3. Horizontal and vertical social trends to form strong 'social fabrics'
4. Respect seniority, culture, and historical objects
5. Respect those who are vulnerable – children, women, elders, animals, plants

David Butler Jones, the Chief Public Health Officer of Canada, noted in his speech, '*Breaking down barriers and creating connections,*' that the fundamental resources for health are peace, shelter, education, food, income, stable ecosystems, and sustainable resources. He reiterated Professor Doherty's call for holistic, science-based action by pointing out the need for systems consideration and research, noting, for example, that '*climate change is not a linear model – it cannot be predicted linearly.*'

Dr. Brian Evans, Chief Scientist for the Canadian Food Inspection Agency, put forward that *a One Health approach was a necessity and one in which politics, trade, and economics could not be separated*. Dr. Jim Bishop, Australian Chief Medical Officer, and Dr. Bob Biddle, representing the Chief Veterinary Officer, discussed the impact of One Health on national public health and animal health issues specific for Australia, many of which are common to other countries but which also impinge on aspects of food security. Finally, Professor Tom Riley used the model of *Clostridium difficile* to demonstrate *the importance of better understanding trans-boundary diseases* between animals and humans, as an example of the One Health approaches needed to meet these disease risks.

Summaries of Plenary Theme Sessions:

- Disease Emergence
- Environmental Drivers
- Trade, Food Security, and Food Safety
- Science Policy and Political Action

Summaries of Specific Hosted Sessions:

- The need to embrace community involvement
- Previous One Health Initiatives
- An International Society for One Health

Dr. David Heymann

Closing Plenary

In the closing plenary, Dr. David Heymann, Head and Senior Fellow of the UK Centre on Global Health Security, joined Dr. David Nabarro in noting the consensus in spirit on a broad approach incorporating the principles of collaboration and holistic eco-health system thinking, but stressed the importance of advancing quickly where possible. This was echoed by Ms. Jane Halton, Secretary of Australia's Department of Health and Ageing, who urged for clarity and a clear business case to take forward to

Dr. David Nabarro

policymakers and for moving forward with the 'do-able.' Jorgen Schlundt, of the National Food Institute at the Technical University of Denmark, emphasized the importance of tackling surveillance and response to emerging infectious disease as an immediate do-able. Many participants were articulate in reminding all the speakers of the need for a broad vision for One Health, but at the same time to have targeted and focused actions to deliver tangible outcomes. Developing the interconnectedness, collaboration, and principles needed to fully practice One Health was seen as a must, as was aiming for progress in goals that can be achieved immediately.

Professor Martyn Jeggo

Discussions have begun already with interested countries on the Second International One Health Congress, to be held in 2013.

Abstracts can be accessed in a special supplement of the EcoHealth Journal: 2011,Volume 7, Supplement 1 and can be accessed on line at www.springerlink.com

Professor John Mackenzie

The Organizing Committee was co-chaired by Professor Martyn Jeggo, Director of CSIRO's Australian Animal Health Laboratory, and Professor John MacKenzie, previous Director of the Australian Cooperative Research Centre in Emerging Infectious Diseases and a Consultant to the World Health Organization.

MONITORING KILLER MICE FROM SPACE

GREEN ON SATELLITE IMAGES WARNS OF HANTAVIRUS OUTBREAKS

Lee J. Siegel

The risk of deadly hantavirus outbreaks in people can be predicted months ahead of time by using satellite images to monitor surges in vegetation that boost mouse populations, a University of Utah study says. The method also might forecast outbreaks of other rodent-borne illnesses worldwide.

Satellite image showing plant cover in June 2004 in the U.S. Four Corners region of Utah, Colorado, New Mexico, and Arizona

"It's a way to remotely track a disease without having to go out and trap animals all the time," says Denise Dearing, professor of biology at the University of Utah and co-author of the study published online Wednesday, Feb. 16, in the journal *Global Ecology and Biogeography*. "The satellite measures the greenness of the Earth, and we found that greenness predicts deer mouse population density."

While the study focused on hantavirus in deer mice, its findings could help health officials fight other rodent-borne diseases such as rat-bite fever, Lyme disease, bubonic plague, Lassa fever, salmonella infection, and various hemorrhagic fevers.

The method was tested on deer mice that carry hantavirus and proliferate when their food supply is abundant, "but it potentially could be applied to any animal that responds to vegetation," says Dearing. "It would have to be calibrated against each specific species of rodent and the disease, but it's really powerful when it's done."

Courtesy: Philip Dennison, University of Utah

Lighter, brighter greens indicate a greater amount of green plant cover

The study combined satellite imagery with data from thousands of mice captured over three years in central Utah. The total number of trapped mice and the number of mice with the disease, a strain of hantavirus known as Sin Nombre virus, both climbed after peaks in greenery.

Sin Nombre virus is carried by rodents, primarily deer mice, in the western

In areas where deer mice carry the deadly hantavirus, a surge in greenery shown on satellite images can help predict increased mouse populations and risk of hantavirus transmission more than a year later.

United States. In humans, it causes a disease known as hantavirus pulmonary syndrome. It was discovered in 1993 after several young, otherwise healthy people in the Four Corners area of Utah, Colorado, New Mexico, and Arizona died of a mysterious respiratory illness. Hantavirus kills 42 percent of its victims and is contracted by inhaling dust containing mouse urine or feces.

Previous studies also have looked for links between satellite images and deer mouse populations, but they used less trapping data and collected it in a single trapping season. The mice in the new study were caught during six trapping seasons in the spring and fall over three years, revealing how the population changed over time. The study also used several different methods for estimating the amount of fresh vegetation in an area from satellite images, and a goal of the research was to see which measures are the best predictors of mouse populations. Health officials can use such information to see where hantavirus outbreaks are likely to occur.

"The point of this whole exercise is to develop disease-risk maps, which would show the distribution of infected hosts - in this case, deer mice - overlaid with human population density," explains Thomas Cova, an author of the study and associate professor of geography at the University of Utah.

"Although the focus of this work is hantavirus in deer mice, it contributes to our broader understanding of how to monitor the spread of infectious diseases from space, which in the long run could save lives," he adds.

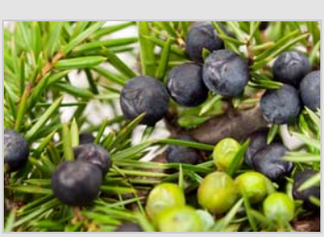
Catching Sick Mice

The study was conducted at the University of Utah by Lina Cao, a graduate student in geography, and Philip Dennison, an associate professor of geography, as well as Dearing and Cova. The field data came from an ongoing mouse-trapping project funded by the University of Utah and the National Science Foundation.

Vegetation indices were significantly correlated with mouse population.

Twice a year for the past nine years, scientists from Dearing's lab have traveled to Juab County, Utah to trap deer mice. During each trapping season, they set up 1,728 traps for three consecutive nights; tag each mouse's ear so they can identify mice that are recaptured; record their sex, weight, and condition; and draw blood to test whether they are infected with hantavirus.

During the early years, Dearing and her colleagues checked their traps wearing protective gear that looked like space suits, inspiring the nickname "hantanauts." "We still didn't understand the risk of trapping mice and contracting hantavirus," she says. "We didn't understand the risk to personnel so we took extreme precautions."



Juniper berries

Now scientists have a better understanding of how hantavirus is transmitted. Mice get it from other mice, probably through bites, while humans get it by breathing in mouse urine and feces during activities such as sweeping out a garage. Humans can't get it by handling infected mice or even by being bitten, so the "hantanauts" have been able to shed their space suits and check traps unencumbered.

The absolute number of infected mice infected with hantavirus increased along with the mouse population.

The new study looked at the overall number of captured mice and the number that were infected in the spring and fall of 2004, 2005, and 2006.

Seasonal heavy rains in the U.S. Southwest spur the growth of plants such as juniper, sagebrush, and spring-blooming annuals. While deer mice do not feed on such vegetation, they directly depend on it because they eat seeds and plant-eating insects. The satellite images came from Moderate Resolution Imaging Spectroradiometer

Yellow and red areas had lower green vegetation cover in 2004 than in 2003.

Satellite image showing the change in plant cover in the U.S. Southwest between June 2003 and June 2004

Courtesy Philip Dennison
University of Utah

Blue areas had higher green vegetation cover in 2004 relative to 2003.

Denise Dearing, PhD

Although the focus of this work is hantavirus, it contributes to our broader understanding of how to monitor the spread of infectious diseases from space, which in the long run could save lives.

Thomas Cova, PhD

(MODIS), a sensor on NASA's Terra satellite. The images of the study site were processed using four different vegetation indices - mathematical techniques for turning satellite data into plant-cover measurements. Three of the four indices measure green light reflecting from chlorophyll in plants. One measures infrared light absorbed by water in plant leaves. The researchers measured changes in plant cover from 2003 to 2006.

Greenery Blooms, then Mouse Population Booms

The study answered two questions: which vegetation indices are the best predictors of hantavirus risk and how long does it take for that risk to peak after surges in plant growth?

To find the best vegetation indices, the researchers looked for correlations between vegetation and the numbers of trapped and infected mice. To see how long it took for mice to respond, they tested for correlations at various time lags: 0.3 years, 1 year, and 1.3 years after the satellite images were taken.

All the vegetation indices were significantly correlated with mouse population. The best predictors of mouse populations were two greenness indices named the Normalized Difference Vegetation Index (NDVI) and the Enhanced Vegetation Index (EVI). For both indices, the strongest correlations were for mouse population booms 1 year and 1.3 years after surges in plant growth stemming from snow and rainfall.

"You can think of it as a kind of air drop of food for the mice," says Cova. "It's rained and suddenly there's just so much food that they're rich. They get fat, population density goes up, and about a year-and-a-half later population peaks."

After vegetation growth spurts, the fraction of mice that carried hantavirus stayed relatively constant, but the absolute number of infected mice increased along with the mouse population. More infected mice mean more opportunities for humans to get sick, so mouse population size indicates risk to humans.

The new study indicates people are at greatest risk of catching hantavirus a little over a year after peaks in plant growth, and it pinpoints the best methods for measuring those peaks. This should allow researchers to create risk maps showing where and when outbreaks are likely to occur.

Cova says 2004 and 2005 were really wet years. The vegetation indices showed lots of plant growth in those years, and the number of mice peaked the year after that. Later, the mouse food ran out and their population crashed. The results are consistent with earlier findings showing an increase in hantavirus infections the year after the heavy rains of the 1991-92 El Nino, a quasi-periodic climate pattern characterized by abnormal warming of eastern Pacific waters and increased rains in the U.S. Southwest.

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Dr. Denise Dearing is Professor of Biology at the University of Utah.

Dr. Thomas Cova is Associate Professor of Geography at the University of Utah.

Trees brighten city streets and delight nature-starved urbanites.

“A people without children would face a hopeless future; a country without trees is almost as hopeless.”

Today, Arbor Day is observed nationwide on the last Friday in April.

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What Is a Tree Worth?

Jill Jonnes, PhD

Trees brighten city streets and delight nature-starved urbanites. Now scientists are learning that they also play a crucial role in the green infrastructure of America ’s cities.

On April 8, 1905, President Theodore Roosevelt, attired in a dark suit and top hat, could be found in Fort Worth, Texas, where youngsters looked on from a nearby window as he shoveled soil over the roots of a sapling. It was Arbor Day, which schools across the nation had recently begun commemorating, and the ever vigorous president was demonstrating his hands-on love of trees. For Roosevelt, Arbor Day was no publicity stunt. In an address to America ’s schoolchildren a couple of years later, he celebrated “the importance of trees to us as a Nation, of what they yield in adornment, comfort, and useful products.” He saw trees as vital to the country ’s well-being: “A people without children would face a hopeless future; a country without trees is almost as hopeless.”


Theodore Roosevelt Collection, Harvard College Library

For centuries, tree lovers mighty and humble have planted and nurtured trees—elms, oaks, ginkgoes, magnolias, apples, and spruces (to name but a handful of America ’s 600-some species). “I never before knew the full value of trees,” wrote Thomas Jefferson in 1793. “Under them I breakfast, dine, write, read, and receive my company. What would I not give that the trees planted nearest the house at Monticello were full grown.” But trees were often taken for granted in a new nation that seemed to have a limitless supply.

Then along came Julius Sterling Morton, a nature lover who moved to Nebraska in the 1850s, briefly edited the state ’s first newspaper, and soon entered politics. He conceived of an annual day of tree planting, inaugurating a tradition that was rapidly adopted around the country and then the world. (Today, Arbor Day is observed nationwide on the last Friday in April, though individual states mark it on other days.) In 1874, when Nebraska proclaimed Arbor Day an official holiday, *The Nebraska City News* rhapsodized about trees: “The birds will sing to you from their branches, and their thick foliage will protect you from the dust [and] heat.”

But tree lovers quickly learn that many practical-minded Americans—especially politicians—see little value in trees, except perhaps as board timber. Roosevelt was an exception. An ardent birder and conservationist, he reveled in his power to create or

Chicago mayor Richard Daley Jr. vowed to plant a half-million trees as part of his effort to revive his decaying Rust Belt city.

Courtesy dbking

"Don't trees clean the air?"

How many gallons of rainwater do the leaves of a Norway maple absorb and keep out of stressed sewerage systems?

enlarge 150 national forests, mainly by presidential fiat. In 1905, he appointed his partner in boxing and bush-whacking, forester Gifford Pinchot, to run the newly created U.S. Forest Service and ensure the wise conservation and use of these public lands.

Roosevelt's national forests were the grand gesture, but they were supplemented by the more modest efforts of a number of arborists who saw a need for trees in the nation's cities and towns. The Progressive Era witnessed a great burst of urban tree planting, with Chicago's municipal forester declaring in 1911 that "trees planted in front of every home in the city cost but a mere trifle, and the benefits derived therefrom are inestimable." In the years after World War II, city forestry departments planted new trees and maintained maturing ones, while the U.S. Forest Service became known for Smokey Bear and efforts to fight forest fires that raged out west during the dry season.

By the 1970s, most Americans lived in cities and suburbs, and the tree lovers among them watched sadly as graceful old elms, big oaks, and verdant small woodlands disappeared, victims of Dutch elm disease, development, and shrinking municipal budgets. This urban deforestation was one more blow to declining cities. City streets stripped of trees lost much of their character and beauty. "Elm trees were part of my life," one Chicago woman ruefully told a forester in the 1980s. She cherished the deep shade and cathedral-like canopy of these majestic giants. "As each one died in my neighborhood . . . the place began to look old, worn, and crowded." Soon thereafter, she moved to another neighborhood that still had trees.

Chicago mayor Richard Daley Jr., a self-proclaimed tree-hugger born on Arbor Day, was equally heart sore. Upon taking office in 1989, he vowed to plant a half-million trees as part of his effort to revive his decaying Rust Belt city. "What's really important? . . . A tree, a child, flowers," the mayor said in a *Chicago Wilderness Magazine* interview. "Taking care of nature is part of life. If you don't take care of your tree and don't take care of your child, they won't thrive." Knowing that his city's air was among the most polluted in the nation, he asked, "Don't trees clean the air?"

Lumberjacks had long known how to calculate the board feet value of a single lodgepole pine or a vast forest, farmers the price of fruit-tree crops. And yet, in the late 20th century, city trees collectively created an urban forest about which we knew almost nothing. The truth was that no one could provide an answer to Daley's question that was grounded in science.

In fact, no one had concrete answers to a host of fundamental questions. What was the character of an American urban forest? How many poplars, ashes, or lindens were there? How old were they and what size? How healthy? How did trees interact with the ecosystem? Did they really affect air quality? Anyone whose family home was shaded by large oaks or maples knew the delicious cool of those trees on a hot summer day, but how much did they reduce the need for air conditioning?

When thunderstorms lashed down, how many gallons of rainwater did the leaves of a Norway maple absorb and keep out of the stressed sewerage system? And what effect did tree-lined streets and tree-rich landscaping have on commerce? Or crime? Or human well-being? Finally, how could you quantify the benefits so as to persuade city officials that trees were valuable green infrastructure and not mere ornamentation—or, worse yet, a leafy liability?

Daley hired a young arborist named Edith Makra to be his "Tree Lady." She was to get lots of trees planted, but the mayor still wanted to know if more trees meant

cleaner air. To get an answer, he prevailed on a fellow tree lover in Congress, 20-term representative Sidney R. Yates（D-Ill.）, to earmark some serious federal research dollars. Makra was soon on the phone to the man she believed could answer the mayor ' s question, and many others about city trees: Rowan Rowntree, a 55-year-old visionary U.S. Forest Service scientist and the grandson of the famous California wildflower botanist and author Lester Rowntree.

So how did all these trees benefit the city?

"I told him the mayor would be getting us $900,000 and could he help us, " Makra recalls. The timing was perfect. While studying urban forests in Oakland, Tucson, and Menlo Park, New Jersey, Rowntree and his colleagues had figured out how to establish a science of urban trees, but they lacked critical funding, staff, and data. Now, not only was Makra offering significant financing, but Rowntree had trained two young scientists, Gregory McPherson and David Nowak, who were ideally suited to work on the ambitious project.

Everyone "knew" that trees cooled down buildings.

McPherson had grown up in a small, elm-shaded town in southern Michigan, then discovered a love for the American West while studying in Utah for a master ' s degree in landscape architecture. Design was not his strong point, but marshaling data was. He became Rowan ' s doctoral student at the College of Environmental Science and Forestry at the State University of New York（SUNY）, Syracuse, before taking a tenured position at the University of Arizona in Tucson. That ' s where he was when Rowntree lured him to Chicago.

Rowntree had met Nowak in the early 1980s when the younger man was a SUNY undergraduate, and was so impressed that he suggested Nowak do a master ' s in urban forestry with him. In 1987, when Rowntree returned home to Berkeley to help run a U.S. Forest Service research project there, Nowak came out with him to work on his Ph.D. at the University of California. Chicago would be Nowak' s first post-doctoral job.

In 1994, after three years of work that encompassed Chicago as well as surrounding Cook and Du Page counties, Rowntree and his protégés issued their study, the "Chicago Urban Forest Climate Project." They could at last report the size of the Chicago metro area's urban forest: It consisted of roughly 51 million trees, two-thirds of which were in "good or excellent condition." The report was replete with charts and graphs and included detailed information about commercial and residential distribution, tree canopy density, and other attributes of Chicago's woodlands. In Chicago, street trees made up only a tenth of the urban forest, but they provided a quarter of the tree canopy—what a bird flying overhead would see of the leafy tree crowns and foliage that provide shade and cover. And the canopy shaded only 11 percent of the city, less than half of the proportion city officials believed was ideal.

Dr. Gregory McPherson, Research Forester with the USDA Forest Service

Gregory McPherson measured the actual energy savings from Chicago's trees.

So how *did* all these trees benefit the city? Certainly the trees of Chicago had long sweetened the air and sheltered homes and streets from hot summers and freezing winters, but now here were actual data to show it. "In 1991, trees in Chicago removed an estimated 17 tons of carbon monoxide, 93 tons of sulfur dioxide, 98 tons of nitrogen dioxide, 210 tons of ozone, and 234 tons of particulate matter," Rowntree and his colleagues said in the conclusion to their report. In neighborhoods where trees were large and lush, they could improve air quality by as much as 15 percent during the hottest hours of midday. More trees and bigger trees meant cleaner air.

Trees in the Chicago metro area sequestered about 155,000 tons of carbon a year. This sounded like a large amount, but, the report noted, that annual intake equaled the amount of carbon emitted by transportation vehicles in the Chicago area in just one week.

The benefits that each tree provided over its life span came to $402—more than twice its cost.

The Sacramento Municipal Utility District discovered that a tree planted to the west of a house saved about three times more energy ($120 versus $39) in a year than the same kind of tree planted to the south.

However, over time the urban forest could sequester as much as eight times more carbon if the city planted greater numbers of large, long-lived species such as oaks or London planes and actively nurtured existing trees to full maturity. A big tree that lives for decades or even a century or two can sequester a thousand times more carbon than, say, a crab apple with a life span of 10 or 20 years.

Everyone “knew” that trees cooled down buildings. McPherson measured the *actual* energy savings from Chicago’s trees. The shade from a large street tree growing to the west of a typical brick residence, he found, could reduce annual air-conditioning energy use by two to seven percent. By planting more trees to cool down built-up city neighborhoods whose higher temperatures made them urban “heat islands,” and promoting utility-sponsored residential tree plantings, the city government could further curtail energy use.

All of this information about an urban forest, never fully documented before, meant that Rowntree and his colleagues could calculate that forest’s monetary value. The benefits that each tree planted among Chicago’s streets, yards, and businesses provided over its life span came to $402—more than twice its cost.

Oddly, Daley, who was remaking Chicago as a glamorous green city, never embraced the implications of the report. He pushed tree planting, but not in the scaled-up, strategic way Rowntree and his team had hoped for. In the byzantine world of Chicago politics, no one ever discovered exactly why. Still, Daley’s patronage had made possible groundbreaking tree science.

The Chicago study introduced a radically new way to think about city trees, even for those who had been thinking about urban forests for years. Ray Tretheway, longtime head of the Sacramento Tree Foundation, a nonprofit tree-planting organization, vividly remembers hearing McPherson speak at an urban forestry conference in 1991. “He just blew me away,” Tretheway recalls. “These tree benefits, I’d never heard of this before.” After meeting with McPherson and Rowntree, Tretheway persuaded the U.S. Forest Service to open a new research station in Davis, not far from Sacramento. With the Chicago study concluded, McPherson headed to California to become head of the station’s Center for Urban Forest Research. The University of California, Davis, provided a source of graduate students to carry out the research.

Tretheway acquired a wealth of studies and new data from McPherson and other tree scientists, who in the late 1990s worked up a detailed portrait of Sacramento’s five million trees and their numerous benefits. McPherson’s graduate student Qingfu Xiao did pioneering research on the impact of trees on stormwater dispersal—an expensive problem for the many cities faced with federal mandates to upgrade their sewerage and water systems—by measuring how much rainfall trees of various species and sizes intercepted.

When McPherson had come west, he found under way in Sacramento a real-life study of how trees save energy. In 1989, the Sacramento Municipal Utility District had been forced by outraged voters to close its dysfunctional Rancho Seco nuclear plant. To reduce its peak load, the electric utility’s new, tree-loving CEO, S. David Freeman, had partnered with Tretheway’s foundation to plant half a million young trees for free in the yards of residential customers over the course of a decade.

By 1993, more than 111,000 trees had been planted, and the utility wanted to assess whether they were starting to reduce energy use. It gathered information from 326 homes on tree mortality, location, species, and size, as well as all the relevant specs on each house. McPherson’s number crunching revealed that a tree planted to the west of a house saved about three times more energy ($120 versus $39) in a year than the same kind of tree planted to the south. The shade program underwent “a paradigm shift,” according to

The New York Parks Department asked McPherson to value all of New York City's 592,000 street trees.

The net benefit the city was getting for all the trees was an impressive $100 million.

In 2008, Mayor Michael Bloomberg launched Million Trees NYC and quadrupled the city's forestry budget.

For the first time, urban forestry science had a dramatic effect on public policy.

economist Misha Sarkovich, whom the utility had assigned to monitor the program's impact. Today Sarkovich runs the program, and he evaluates performance not by how many trees are planted but according to the "present value benefit" of each tree, expressed in a dollar amount.

About half of the nearly 500,000 trees the utility has planted in the last 20 years are still alive, and their overhanging boughs have done much to improve customers' quality of life. Some of that improvement can be measured. The trees' shade collectively saves the utility from having to supply $1.2 million worth of electricity annually. Running the shade program costs the utility $1.5 million a year. As more trees are planted and the new canopy becomes lusher, the energy savings will continue to grow. When and if it can begin selling carbon credits, the utility will start to make a profit on its shade tree program.

In the post-Chicago years, McPherson and Nowak developed their science and models, engaging in ever more ambitious studies. McPherson began systematically studying a reference city in each of 16 climate zones to expand his database. As this new research became known, city foresters and nonprofit arbor groups increasingly drew on it to advocate for trees.

In 2006, McPherson and his colleagues were adding Queens as a reference city when the New York Parks Department asked them to value *all* of New York City's 592,000 street trees. With the advances made over the preceding dozen years, McPherson could deliver a far more sophisticated report than he had for Chicago. Energy savings: New York City's trees annually saved roughly $28 million, or $47.63 per tree. Air pollution: Each street tree removed an average of 1.73 pounds of air pollutants per year (a benefit of $9.02 per tree), for a total of more than $5 million. The report also calculated that street trees reduced stormwater runoff by nearly 900 million gallons each year, saving the city $35.6 million it would have had to spend to improve its stormwater systems. The average street tree intercepted 1,432 gallons, a service worth $61, a figure large enough to impress cost-conscious city managers.

McPherson and his colleagues were also able to tally various benefits associated with aesthetics, increased property values and economic activity, reduced human stress, and improved public health, which were estimated at $52.5 million, or $90 a tree. These drew on straight-up economic studies of real estate prices as well as social science research, which showed, for example, that hospital patients who could see a tree out the window of their room were discharged a day earlier than those without such a view. Other studies showed that shopping destinations with trees had more customers than those that didn't, and leafy public-housing projects experienced less violence than barren ones.

All these data led to the finding that each year New York City's street trees delivered $122 million in benefits, or about $209 a tree. As New York City's parks and forestry officials well knew, they received $8 million a year to plant and tend street trees, and spent another $6.3 million to pay personnel. The net benefit they were getting for all these trees was an impressive $100 million.

What's a Tree Worth *Continued……*

***Jill Jonnes* is an author and historian with a Ph.D. from Johns Hopkins University. She has received awards from the Ford Foundation and the National Endowment for the Humanities.**

http://www.jjonnes.com/

Visionary Canadian Medical and Veterinary Medical College Deans Jointly Discuss One Health

David Fisman, MD, MPH and Jan M. Sargeant, DVM, MSc, PhD

A visionary joint meeting of deans from the Canadian medical and veterinary medical colleges was held in conjunction with the Canadian Conference on Medical Education in Toronto, Canada, in May 2011. The theme of the meeting, jointly organized by **Elizabeth Stone** (Dean, Ontario Veterinary College, University of Guelph) and **William Albritton** (Dean, College of Medicine, University of Saskatchewan), was "People and Animals Sharing Disease: Medicine and Veterinary Medicine Perspectives." In addition to medical and veterinary medical deans, meeting participants included representatives from the Public Health Agency of Canada, the Canadian Food Inspection Agency, and the Ontario Agency for Health Protection and Promotion. The event featured presentations on One Health and zoonotic disease prioritization by **David Fisman** (Dalla Lana School of Public Health, University of Toronto) and **Jan Sargeant** (Centre for Public Health and Zoonoses, University of Guelph), integration of veterinary medicine and human health in the community (**Kate Hodgson**, University of Toronto), and rabies as a model for best practices for zoonotic disease prevention (**Cathleen Hanlon**, Kansas State University).

The theme of the meeting was "People and Animals Sharing Disease: Medicine and Veterinary Medicine Perspectives."

The meeting provided a forum for active discussion of zoonotic disease initiatives from both human health and animal health perspectives. Topics discussed included: the potential for novel initiatives in joint undergraduate and postgraduate medical and veterinary teaching; the possibility of developing or identifying collaborative funding streams for joint medical and veterinary research in a climate of fiscal restraint; and the degree to which One Health efforts should be embedded in a broader emerging focus on "ecohealth," which considers the health of humans and animals in the context of broader environmental health. A concept that generated considerable discussion was that of "zooeia," or health benefits of animal ownership, and it was argued that medical-veterinary education should stress this in addition to a more traditional focus on zoonotic disease risk. It is anticipated that this will become an annual event, resulting in stronger networks between the medical and veterinary medical colleges.

One of the novel initiatives discussed was to include "zooeia," the health benefits of animal ownership, in traditional medical-veterinary education.

Drs. William Albritton and David Fisman are physicians. Drs. Elizabeth Stone, Jan Sargeant, Kate Hodgson, and Cathleen Hanlon are veterinarians.

Dr. David Fisman is a member of the One Health Initiative Team's Honorary Advisory Board **http://www.onehealthinitiative.com/advBoard.php** ***and on the editorial Board of the Florida (USA) State Health Department's One Health Newsletter*** **http://www.onehealthinitiative.com/newsletter.php**.

Dr. Jan Sargeant is Director of the Centre for Public Health and Zoonoses (CPHAZ) and Professor in the Department of Population Medicine at the Ontario Veterinary College, University of Guelph, Guelph, Ontario, Canada.

Improving Human Health through a One Health Approach in Bangladesh

Reported by: Programme on Infectious Diseases and Vaccine Sciences, ICDDR,B; Chittagong Veterinary and Animal Science University; Institute of Epidemiology, Disease Control and Research, Government of Bangladesh in the ICDDR,B • Health and Science Bulletin • Vol. 9 No. 1 • March 2011

The health of human communities depends upon a healthy environment.

The One Health Initiative is a global movement dedicated to improving the lives of all species—human and animal—through the integration of human medicine, veterinary medicine, and environmental science. It recognizes that we cannot have a healthy human population unless our domestic farm animals, our agricultural fields, and the broader ecosystem are also healthy. One Health is particularly relevant for Bangladesh because of Bangladesh ' s high human population density, the importance of the agriculture sector for both livelihood and nutrition, the close contact that people have with their animals and their environment, environmental pressures from population growth, changing land use, and industrial and chemical pollution. A major barrier to implementing a One Health approach in Bangladesh is the institutional separation of government ministries responsible for human health, animal health, and the environment. A multiministerial approach to outbreak investigations and response could be a first step towards institutionalizing an effective One Health collaboration within the Government of Bangladesh.

A healthy environment permits farmers to raise healthy crops and healthy animals...

The health of human communities depends upon a healthy environment. A healthy environment permits farmers to raise healthy crops and healthy farm animals. A healthy environment provides clean water and clean air for *Homo sapiens* and other species that share the planet. The One Health Initiative is a global movement dedicated to improving the lives of all species—human and animal—through the integration of human medicine, veterinary medicine, and environmental science (1) . A One Health approach advocates for a broad integrated approach to health. In contrast to a narrow perspective on health that prioritizes clinical care for sick patients, a separate veterinary system to care for sick animals, and separate efforts to preserve selected places among earth ' s fragile ecosystems, a One Health approach recognizes that these dimensions are interconnected and that consequently a combined approach is essential. A One Health approach also recognizes that earth ' s resources, including its rivers, oceans, air, plants, and animals, are shared resources that cross human political boundaries. Thus, sound management requires unprecedented cooperation between nation states.

……and a healthy environment also provides clean water and clean air.

One Health is a particularly relevant approach to public health for Bangladesh. Bangladesh has the highest population density of any country in the world that is not a small city state. Even with this high population density, the great majority of food consumed in Bangladesh is grown within Bangladesh (2) , and grown on land often treated inappropriately with pesticides (3) and increasingly contaminated with industrial wastes (4) . Shallow tube wells are the most common source of drinking water in Bangladesh, but half of all tube wells have levels of arsenic that exceed the WHO standard for safe drinking water (5) , and 40% of drinking water samples collected from tube wells are contaminated with bacteria (6) . More Bangladeshis earn their living

In Bangladesh, One Health is a particularly relevant approach to public health.

The poultry sector illustrates the connections among human, animal, and environmental health.

A major barrier to implementing a One Health approach is the institutional separation of government ministries responsible for human health, animal health, and the environment.

from agriculture than from any other sector. The Bangladeshi population has exceptionally close contact with domestic animals. For example, 61% of rural Bangladeshi households raise poultry and over half of these keep their poultry inside their homes (7).

The poultry sector illustrates the connections among human, animal, and environmental health in Bangladesh. Poultry contributes importantly to human health, since poultry meat and eggs provide essential nutrition for a population with high levels of under-nutrition (see the other article in this issue). Raising poultry also provides a critical source of income to low-income households. The number of poultry raised throughout Asia (including Bangladesh) has increased remarkably over the last 30 years. However, this huge population of domestic poultry creates an ecological niche for new pathogens. Since 1997, highly pathogenic avian influenza A virus subtype H5N1 has spread to many areas of Asia, Africa, and even Europe through the movement of infected poultry and poultry products, and possibly through wild waterfowl that cross national barriers as part of their annual migration.

Since 2007, highly pathogenic avian influenza H5N1 has caused repeated high mortality outbreaks among domestically raised chickens in Bangladesh. In fact, many poultry producers have lost their entire flocks. Humans are also at risk for infection with this particularly pathogenic strain of influenza. Among the over 500 persons worldwide who have been confirmed to be infected with H5N1 influenza virus, over half have died (8). If the H5N1 virus develops the ability to efficiently transmit from one person to another person, that is if this avian influenza virus becomes more adapted to humans, then the world could face a catastrophic global pandemic. A One Health approach strives to support poultry producers, so that they can continue to earn a living and provide essential nutrients, while simultaneously encouraging poultry raising practices that reduce the risk of avian influenza transmission between poultry and people.

There are two major barriers to implementing a One Health approach in Bangladesh. First, One Health is a new approach for Bangladesh, an approach that is not widely understood. While human health is actually primarily a product of our physical, social, and economic environment, human health in Bangladesh is most commonly thought of as an issue overseen by institutional medical care and the Ministry of Health and Family Welfare. Engagement in a One Health approach requires adopting a broader public health framework, a more holistic approach to health, and devoting attention and resources to those underlying issues that will be the most beneficial. A second barrier to implementing a One Health approach in Bangladesh is that the Ministry of Fisheries and Livestock, the Ministry of Agriculture, the Ministry of the Environment, and the Ministry of Health and Family Welfare each work separately on their own agenda with minimal communication and collaboration. The ministries are institutionally separate. This means, for example, that a district-level livestock officer has little incentive to communicate and collaborate with a district-level health officer. They have separate supervisory structures and separate incentives. Physicians working in the Ministry of Health and Family Welfare often know each other because they went to the same medical school or worked together earlier in their career, and these social connections facilitate collaborating on a variety of issues. Equivalent social connections among ministries, however, are much less common.

A group of interested professionals have formed an organization, One Health Bangladesh, that provides a forum for discussing the concept of One Health and its relevance for Bangladesh. Over the last two years, a diverse group of professionals from across Bangladesh have participated in six conferences (three in Chittagong and three

Collaborative investigations of disease outbreaks would be a particularly effective area to develop broader multi-ministerial collaboration.

Research has shown that diverse groups of professionals are more effective in solving difficult problems compared with even very capable professionals from a single discipline.

Satellite image of Bangladesh

A shared program with shared supervision by the respective ministries could be a first step to cross-ministerial collaboration, and thus to institutionalization of a One Health approach in Bangladesh.

in Dhaka) that discussed scientific and policy issues related to One Health. Several presentations at these conferences have explored zoonotic diseases, infectious diseases that infect both humans and other animals. In Bangladesh, recent outbreaks of avian influenza, Nipah virus, and anthrax have highlighted the linkage between animal and human health and have provided useful specific local examples to discuss better ways for diverse professionals and groups to work together. Bangladesh also hosted a regional One Health forum which convened representatives from human health and animal health from several neighboring countries to discuss sound approaches to shared concerns.

The Government of Bangladesh exerts major influence by setting policy that affects activities across the environment, agriculture, and human health in Bangladesh. For Bangladesh to benefit from a One Health approach, the approach needs some degree of institutionalization within the government. Collaborative investigations and responses to disease outbreaks are government functions that would be a particularly effective area to develop broader multi-ministerial collaboration. The Health and Science Bulletin regularly reports disease outbreaks in Bangladesh that often result from the movement of pathogens or toxins in the environment into domestic animals or crops and into people. Multi-disciplinary investigations allow a broad examination of the interrelated steps of the process that led to an outbreak. In fact, social science research has demonstrated that diverse groups of professionals are more effective in solving difficult problems compared with even very capable professionals from a single discipline（9）.

By working together on outbreak investigations, diverse professionals and diverse ministries will be more effective in understanding the underlying cause of the outbreak and identifying appropriate steps for prevention. Additionally, by working together, these government professionals will begin to develop personal and professional linkages which will make future communication, coordination, and collaboration easier. Myanmar and Thailand have established a combined program to implement outbreak investigations that includes training of both medical and veterinary epidemiologists within the same program. Such a shared program with shared supervision by the respective ministries could be a first step to cross ministerial collaboration, and thus to institutionalization of a One Health approach in Bangladesh.

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New journal addresses infection between animals and humans

Caroline Sutton

On February 11, 2011, Co-Action Publishing announced the launch of a new peer-reviewed, open-access journal, *Infection Ecology & Epidemiology*. This Medicine & Health title aims to stimulate inter-disciplinary collaborations dealing with a range of subjects, from the plethora of zoonotic infections in humans, to diseases with implications for wildlife ecology, to advanced virology and bacteriology. Contributions are welcomed from veterinarians, physicians, molecular biologists, ecologists, and environmental chemists with an interest in zoonotic infections.

Infection Ecology & Epidemiology' s goal is to stimulate interdisciplinary collaborations with the potential to increase knowledge on the emergence, spread, and effects of infectious disease in humans, domestic animals, and wildlife.

Infection Ecology & Epidemiology is published in cooperation with the Infection Ecology & Epidemiology Network based in Uppsala, Sweden, and is edited by Dr. Björn Olsen, Professor and Senior Physician in infectious diseases at Uppsala University and Uppsala University Hospital, and Leader of the IEE Network. The Journal is supported by a number of section editors to cover the various disciplines addressed, including: Sven Bergström, Umeå University; Jan Chirico, National Veterinary Institute; Mirva Drobni, University Hospital Uppsala; Åke Lundkvist, Swedish Institute for Infectious Disease Control; Åsa Melhus, University Hospital Uppsala; and Jonas Waldenström, Linnaeus University.

Chief Editor Björn Olsen says the journal offers an extension to the Network 's aims to "stimulate interdisciplinary collaborations with the potential to increase knowledge on the emergence, spread, and effects of infectious disease in humans, domestic animals, and wildlife by providing a platform upon which researchers from multiple medical and ecological disciplines can interact and create synergies. The journal will contribute to a better understanding of the consequences our way of living has, not only for the outbreak of new diseases and the return of old ones, but also for the global spread of infectious diseases we cannot control. "

Chief Editor Björn Olsen

Senior Publisher Anne Bindslev of Co-Action Publishing, says that "this year 's new outbreaks of swine flu underscore the importance of *Infection Ecology & Epidemiology* in addressing global issues that traverse scientific disciplines and require the attention of a wide body of researchers and professionals. It would be almost unethical not to make the content freely available online, and I am therefore especially pleased that the IEE Network has partnered with us on such an important journal. "

The journal will contribute to a better understanding of the consequences of our way of living.

Infection Ecology & Epidemiology can be accessed at: www.infectionecologyandepidemiology.net .

The Infection Ecology & Epidemiology Network (www.infee.se) was founded in 2010 by partners from Uppsala University, the National Veterinary Institute (SVA), the Swedish Agricultural University (SLU), and Linnaeus University. IEE is an integration concept, including several universities and governmental organizations, that wish to contribute to a sustainable intellectual platform where veterinarians, physicians, molecular biologists, ecologists, and environmental chemists with an interest in zoonotic infections can interact and create synergies.

Caroline Sutton is the press contact for Co-Action Publishing.

CII -- Responding to Emerging Threats

Daniela Hernandez, PhD

Given recent risks to public health, a strong focus on surveillance has become increasingly important.

Earlier this year, principal investigators, project coordinators, and technicians at the Center for Infection and Immunity (CII) at Columbia's Mailman School of Public Health were bustling around the lab, getting ready for the exercise that was to take place that night. Their job was to decipher what pathogens were present in unknown samples. They were not told what was in them. Their only instructions were to detect, as quickly as possible, the microbes that were responsible for diseases described in the tip sheet and to collaborate with other labs performing the same tests.

"The ultimate goal is to be prepared to identify potential biothreats."

Although this may seem daunting, scientists at CII do this type of microbe hunting every day using various multiplex assays that they have at their disposal. "The ultimate goal is to be prepared to identify potential biothreats," said Meera Bhat, a coordinator at CII.

These days, those threats are plentiful: outbreaks of avian and swine flus, SARS, anthrax, measles, Ebola, antibiotic-resistant *E.coli*, and even bubonic plague have made headlines recently. Given these risks to public health, a strong focus on surveillance is increasingly important.

A deep appreciation for the way that changes in habitat affect cross-species transmission of disease is still lacking.

CII Director Ian Lipkin, photograph courtesy of Columbia Technology Ventures

This very point became vividly clear to CII Director Ian Lipkin while he was working as a resident at the University of California, San Francisco during the start of the AIDS epidemic in the 1980s. "Nobody knew why people were ill. There were no diagnostic tests, no way to know who was infected or how to prevent disease. That experience was transformative," he said, "and it became clear that there had to be a better way to monitor and manage new diseases."

Sooty mangabey
Courtesy Kathelijne Koops
Primate Info Net

At the time that HIV emerged, the idea that it could have zoonotic origins was not a leading theory.

At the time that HIV emerged, its origins were unclear. Now, scientists suspect that HIV jumped from chimpanzees and sooty mangabeys to humans due to consumption of bushmeat. The emergence of HIV took the scientific and medical community by surprise, and at the time that it surfaced, the idea that it could have zoonotic origins was not a leading theory.

"The bellwether for zoonotic diseases really came much later, in 1999, when we began to see West Nile Virus, Nipah, and Hendra. It was then that people really

began talking about these threats. HIV didn't do it, now in retrospect should it have? Of course," commented Lipkin.

CII Director Ian Lipkin speaks with Dr. Mady Hornig, director of translational research.

Photo by Christopher Dawes, copyright C. Dawes 2008

When West Nile first emerged in the United States, people initially thought it was St. Louis encephalitis, a disease that causes brain inflammation and, like West Nile, is transmitted by infected mosquitoes. As cases of human encephalitis were mounting around New York, crows also began to die. Because clinicians and veterinarians did not readily speak with each other, the connection between these two seemingly unrelated events went unnoticed. It was only after the convergence of two independent lines of investigation led by Tracey McNamara, a pathologist at the Bronx Zoo and Wildlife Conservation Society, and Lipkin, then at the University of California, that West Nile was identified as the causative agent.

Lipkin described the emergence of West Nile, which had never been documented in the Western Hemisphere, as a zeitgeist that created a paradigm shift in the way people viewed zoonotic and vector-borne diseases. As a result, the public became more aware of the potential threats of these types of infections. However, a deep appreciation for the way that changes in habitat affect cross-species transmission of these viruses is still lacking.

A deep appreciation for the way that changes in habitat affect cross-species transmission of viruses and other pathogens is still lacking.

Over the last decade, CII has led a series of projects that focus on monitoring wildlife viruses and changes in habitat to study viral evolution and, more importantly, to identify the next pandemic threat. "We already know that regions are primed for emergence of disease when habitats are disturbed," Simon Anthony, a post-doctoral fellow who works on this line of research, said.

Dr. Simon Anthony in Mexico
Photo courtesy
Dr Nadine Lamberski, DVM.

In collaboration with USAID PREDICT and the EcoHealth Alliance, Anthony is currently working with a group of scientists in Mexico to monitor thick-billed parrots, an endangered species that lives in the Sierra Madre mountains in Northern Mexico. The birds' habitat used to extend into the southwestern United States, but destruction of its habitat, the drug trade, human contact, and mosquitoes have resulted in drastic population drops. Education of local populations is crucial for successful conservation efforts and for comprehensive surveillance of potential health threats. To that end, he is traveling this summer to South America to teach local scientists how to properly collect and analyze samples, some of which will eventually be sent back to CII to test for novel pathogens.

Over the last decade, CII has led a series of projects that focus on monitoring wildlife viruses and changes in habitat …….

....to identify the next pandemic threat.

Other investigators at CII are also working on similar issues. Working with colleagues Ana Negredo and Antonio Tenorio of the National Center of Microbiology in Madrid, Spain, Gustavo Palacios, an Assistant Professor, recently discovered an Ebola-like virus in bats in a cave in Spain. Earlier this year, Palacios and colleagues Michael Cranfield and Linda Lowenstine of UC Davis showed that wild mountain gorillas living in natural parks in Rwanda were most likely exposed to Human Metapneumonic Virus (HMPV) due to increased ecotourism. Two of these endangered gorillas died, highlighting the importance of educating tourists to the concept that cross-species infection is, as Palacios put it, "a two-lane highway."

Similarly, Thomas Briese, Associate Professor and Co-Director of CII, found HMPV, along with Human Respiratory Syncytial Virus (HRSV) among habituated chimpanzees that died during outbreaks of respiratory infections at Taï National Park in Côte d'Ivoire in the late 1990s and early 2000s. This discovery marked the first known instance of viral transmission from humans to wild apes. The strains that Briese found

among these chimpanzees, like those found by Palacios in gorillas, were closely related to strains involved in human epidemics, suggesting that people introduced the virus to great ape populations.

Thomas Briese, Associate Professor and Co-Director of CII, discovered the first known instance of viral transmission from humans to wild apes.

Altogether, researchers at CII have characterized over 400 viruses. Assistant Professor Amit Kapoor, who discovered gorilla boca virus, the first non-human primate bocavirus, recently identified canine hepacivirus, which is very closely related to human

Thomas Briese & Kirsi Honkavuori discuss data.

Photo by Christopher Dawes, copyright C. Dawes 2008

Dr.Thomas Briese completing RNA extraction, New York, NY.
Photo by Christopher Dawes, copyright C. Dawes 2008

Many of the Center for Infection and Immunity's projects are rooted in the philosophy of One Health.

Hepatitis C. Visiting Professor Amadou Sall, who founded the International Course on Arboviruses and Viral Hemorrhagic Fever Diagnosis, Prevention, Control, and Outbreak Management, is pursuing field outbreak investigations in Africa; postdoctoral fellow Kirsi Honkavuori studies avian diseases and has discovered novel picornaviruses and bornaviruses; and her colleague Nicole Arrigo is developing *in vivo* animal models for pathogen discovery and characterization.

These and other projects are rooted in the philosophy of One Health, which was pioneered by German physician Rudolf Virchow who coined the term "zoonosis," and are an integral part of CII's mission.

"We are best known for our work in pathogen discovery," Lipkin says, "but our larger commitment is to integrated global surveillance, conservation of habitats and natural resources, and to building awareness of the continuity of life on earth."

"Our larger commitment is to integrated global surveillance, conservation of habitats and natural resources, and to building awareness of the continuity of life on earth."

Dr. Daniela Hernandez is a science writer at the Center for Infection and Immunity. She has worked at the Michael J. Fox Foundation for Parkinson's Research and National Geographic Channel and recently completed a AAAS Mass Media Fellowship at the Los Angeles Times.

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Human studies might benefit zoo animals

Research on third-shift workers could help nocturnal primates

Spencer Hunt

Scientists have studied how artificial light and night-shift hours affect nurses.

These studies could hold the key to improving the health of nocturnal zoo animals.

The pygmy slow loris, a nocturnal primate, is displayed at zoos during daytime hours. Courtesy Case Western Reserve University

Work is being done at the Cleveland Metroparks Zoo to find the right mix of lighting that won't disrupt primate melatonin production.

When scientists studied how artificial light and night-shift hours affect nurses and sailors, they were looking for ways to improve the health of third-shift workers. But their research might help others as well. Zoos are looking for better ways to care for primates - including pottos, bush babies, and lorises - which are nocturnal. Because zoos are closed at night, they typically keep such primates in dimly lighted buildings during day-time hours so that visitors can see them in an active state. At night, the lights are turned up so the animals will go to sleep. But what does this do to the animals? Does it affect their health? Reproduction?

Grace Fuller, a Case Western University graduate student, is looking for the right wavelengths and intensity of light to keep the primates healthy and the visitors happy. "These animals are really poorly studied in the wild and in captivity," said Fuller, who is studying animal behavior and physiology. "We don't know what's best for them."

To do this, she's looking at human studies. That makes Fuller's work a rarity in science. Scientists typically test animals, including lab rats and mice, to simulate how something would affect humans.

In this case, studies that linked hormones to health problems in humans who work at night could hold the key to improved health for zoo animals. The studies focus on melatonin, a hormone produced by the pineal gland in the human brain. It's seen as a marker and precursor to normal sleep patterns.

"It has been linked to sleepiness, but it's not a sleeping pill," said Mariana Figuiero, an associate professor at the Rensselaer Polytechnic Institute's Lighting Research Center in Troy, N.Y. "It's a timing signal that tells you it's time to go to bed." Figuiero studies light-wave frequencies and how they affect melatonin production in people, including sailors who serve on Navy submarines.

"In humans, [melatonin] starts rising in the blood and saliva about two hours prior to bedtime," she said. "It reaches a peak in the middle of the night and starts going down in the morning."

Research has found that artificial light at night suppresses melatonin, which in turn is linked to chronic fatigue, depression, reproductive problems and even cancer. A 2001 study of 7,035 women in Denmark found that night-shift workers had a 50 percent higher incidence of breast cancer. A decade-long study of 80,000 nurses who worked rotating night shifts that was published in 2001 also found a higher incidence of breast cancer.

Inspired by those studies, Fuller said she wants to find the right mix of lighting that won't disrupt primate melatonin production. She has spent the past 12 months working out a system to obtain and measure melatonin from three pygmy slow lorises and two pottos at the Cleveland Metroparks Zoo. First, she trained the animals to suck diluted honey from swabs placed at the end of a long pole. Then she developed a

method to measure the melatonin in the saliva they left behind. It wasn't easy, she said. "They are really, really shy animals, because they are prey species."

The next phase of the study will involve keeping the primates in a dark room without any artificial lights to determine normal melatonin production. Fuller will then measure how melatonin levels change under different colors and intensities of light. Chris Kuhar, curator of primates and small mammals at the Cleveland zoo, said the results could lead to a mix of lighting that would improve the health of nocturnal primates housed in 40 zoos nationwide. There are 72 pygmy slow lorises, for example, at 23 of those zoos, Kuhar said.

Researchers collect saliva from a potto. Courtesy Cleveland Metroparks Zoo

Results could lead to a mix of lighting that would improve the health of nocturnal primates housed in 40 zoos nationwide.

"By looking at the melatonin, we'll basically have a marker to see what's going on in the animals," Kuhar said. "I would hope in the long run that we could get results in the next six months to a year that we could share with other institutions."

The Cincinnati Zoo and Botanical Garden is home to two breeding pairs of pottos. Terri Roth, the zoo's vice president of conservation and science, said better lighting also might help with reproduction. "Whatever (Fuller) can learn from it could help us manage the animals better, both for our visitors and the animals' well being."

Spencer Hunt is a Science/Environment reporter for The Columbus Dispatch.

Often traditional practices are found to be rooted in hard scientific principles.

Traditional Approaches to Beating the Heat in India

Shravya Reddy, NRDC and Dr. Gulrez Shan Azhar, MBBS, MD, MPH

Based in Ahmedabad city in the West Indian state of Gujarat and facing the annual heat wave, we wonder how traditionally our forefathers were able to face such challenges without the help of modern science, while we find it increasingly difficult to face this adverse climatic situation even with increasing technological development . We had a workshop in which we discussed this topic (among others) -- how people can adapt to and strengthen their resilience against extremely high temperatures -- and heard many comments that captured our imaginations. Across the world, and in a wide spectrum of fields, customary practices provide valuable information to scientists and researchers. Traditional knowledge is, in fact, often found to be rooted in hard scientific principles. Heat-related resilience and adaptation is no different, and we found a plethora of examples of such community wisdom in Ahmedabad, most of them passed down for ages. Such traditional practices are often the only recourse for the poorest, most vulnerable sections of society, such as casual laborers and hand cart pullers, who can afford neither artificial cooling nor medical care.

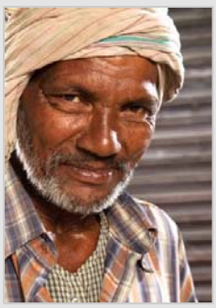
Narrow lanes kept neighborhoods cool because direct sunlight reached the street for barely a few hours per day.

Traditional design and architectural concepts

Historically, all homes were built with a north-south orientation to avoid direct sunlight. They were also built in narrow lanes which kept most neighborhoods cool because direct sunlight reached the street for barely a few hours per day. Furthermore, traditional houses were built with thick walls and high ceilings made of low conductivity materials (such as clay and wood), and the walls were whitewashed with slaked lime (calcium hydroxide) and chalk in order to keep the interior cool.

Many Gujaratis traditionally made their outdoor plans for later at night in the cool air.

Diet also plays a role in protecting against heat stress.



Traditional dress styles emphasized covering the head.

Cultural practices

Local traditions to combat the heat include the distribution of free cold water to passers-by from temporary roadside dispensing stations (*piau*), the provision of resting places for laborers, and an accepted norm of an afternoon break or siesta for construction workers and laborers--when they rest their bodies in the shade during peak afternoon heat and then recommence work in the early evening after the temperature starts to dip. In fact, the daily schedule of many Gujaratis once included an afternoon siesta to reduce physical activity in the afternoon when the body is most prone to exhaustion. Similarly, many Gujaratis traditionally made their outdoor plans for later at night in the cool air, after dinner. In fact, even now, there are outdoor shopping areas that open at 8:00 pm and conduct business until 11:00 pm.

Cuisine

Diet too plays a role in protecting against heat stress. Ahmedabadis traditionally eat sorghum, raw onion, and raw sour mangoes to combat a heatstroke, and drink a thin, yogurt-like, buttermilk drink called *chhaas*. To rectify the body's acid balance and restore equilibrium after losing a lot of salt through sweat, many people also traditionally enjoyed salty and spicy drinks like "*jal jeera,*" a cold drink of rock salt, cumin powder, coriander powder, black pepper, mint, and lemon juice. Today, the proliferation of soda shops bears testimony to the continuing popularity of cold drinks as a means to beat the Heat.

Dr. Mavalankar, IIPH-G, ordering a refreshing drink from a roadside vendor.
Courtesy Anjali Jaiswal, NRDC, during the March 2011 Heat Stress Workshop, Ahmedabad

Clothing

In the summer, people dress in lighter-colored clothing, and in thin Indian cottons that allow the body to breathe and absorb sweat, while keeping the body cool. Traditional dress styles emphasized covering the head -- turbans for men and stoles (or *dupattas)* for women. A fascinating local apparel innovation was the "**sola hat**," which was popular in the region during the 18th century. It was a safari-helmet made of Indian cork (*shola*) that became ubiquitous in colonial India, used both by the British as well as local government employees and civilians.

Such traditional practices are now dying out, and being replaced by more westernized diet, attire, and building styles. Not all of what is being adopted is conducive to Ahmedabad's hot, dry climate; thus, this phenomenon could lead to a decrease in resilience. While evolution in cultural practices is natural, it is important to ensure that trends and innovations remain relevant to climate and geography so that they do not add societal costs in the form of poor health.

While evolution in cultural practices is natural, it is important to ensure that trends and innovations remain relevant to climate and geography so that they do not add societal costs in the form of poor health.

Local officials, public health groups, non-profit community organizations, and the media should try to promote traditional practices to identify the processes by which these effectively protect against heat stress, so as so add validation where possible.

Women commuters in Ahmedabad cover their head and face to protect from direct sun. *Courtesy Anjali Jaiswal, NRDC, during the March 2011 Heat Stress Workshop, Ahmedabad*

As Ahmedabad grapples with its second (and certainly not its last) heat wave this season, we will continue to devise strategies for preparedness, adaptation, and resilience for the city's most vulnerable populations. Experts at the workshop -- organized by the Public Health Foundation of India, the Indian Institute of Public Health Gandhinagar, the Natural Resources Defense Council, and with the support of the Indo US Science and Technology Forum -- are actively engaged with the progressive leadership at the Ahmedabad Municipal Corporation to bring the best of science, technology, and tradition together into the preparedness plan.

Roadside billboard in English and local language (Gujarati) emphasizing the importance of global warming. *Courtesy Gulrez Shah Azhar, IIPH-G, during the March 2011 Heat Stress*

The wisdom from the ages can offer clues to how we can all stay healthy and productive in a rapidly changing world.

As we do so, we will ensure that the future of Ahmedabad, a period certain to bring increased temperatures due to climate change, finds strength from the past. This wisdom from the ages can offer clues to how we can all stay healthy and productive in a rapidly changing world.

Dr. Gulrez Shah Azhar is Senior Lecturer at the Indian Institute of Public Health Gandhinagar.

Shravya Reddy is India Analyst for the National Resources Defense Council, New York.

A longer version is available online on One Earth website at http://www.onearth.org/blog/grandma-knows-best-traditional-approaches-to-beating-the-heat-offer-succor-to-ahmedabad-india

Helping Animals Cope with Heat

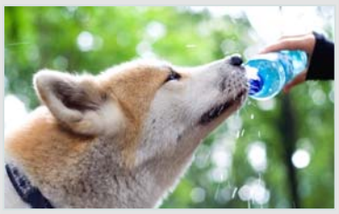
Extreme heat is not only a problem for people. Many of the safety concerns we have for ourselves during the hottest months of the year also apply to our pets.

Heat Safety for Pets

Pet owners need to be aware of the risks so they can take some simple precautions to keep their companion animals cool, safe, and happy. The following tips for keeping pets safe during hot weather have been adapted from educational materials available on The Humane Society of the United States and the ASPCA websites.

Preventing heat stroke and injury

Pets are much less efficient at cooling themselves and more susceptible to overheating than people are. The sweat glands on dogs' noses and the pads of their feet are inadequate for cooling during hot days. Panting and drinking water helps cool them, but if they only have overheated air to breathe, dogs can suffer brain and organ damage after just 15 minutes.



- **Shade and water are a must.** Anytime your pet is outside, make sure they have plenty of fresh, cool water and a cool, shady place to get out of the sun. (A doghouse does not provide relief from heat.)
- **Limit exercise on hot days.** Animals need exercise even when it is hot, but adjust the intensity and duration of exercise in accordance with the temperature. The most important thing is to monitor your pet. Does he look tired? Is he panting fiercely? Are his gums getting red? If you see these things, it's time to stop. And be sure to offer your pet fresh water every 10-15 minutes or so while he is actively exercising. On very hot days, limit exercise to early morning or evening hours, when it is cooler. Asphalt gets very hot and can burn your pet's paws, so walk your dog on the grass if possible.

Never leave your pet alone in a parked car.

- **Never leave your pets in a parked car.** People can roll down windows, turn on the air conditioner, or exit the vehicle when they become too hot; pets cannot. Do not leave your pet unsupervised in a car, even for just a moment. Most people don't realize that the temperature inside a vehicle can skyrocket to dangerous levels after just a few minutes.

  Parking in the shade or leaving the windows cracked does little to alleviate this pressure cooker. On an 85 degree day, the temperature inside a car with the windows opened slightly can reach 102 degrees within 10 minutes. After 30 minutes, the temperature will reach 120 degrees. Your pet may suffer irreversible organ damage or die. If you see an animal in distress in a parked car, contact the nearest animal shelter or police immediately.

Recognize the signs of heatstroke.

It's important to be able to identify the symptoms of heat stress caused by exposure to extreme temperatures. Heatstroke can be fatal for pets as well as people. Some signs of heatstroke are: heavy panting, glazed eyes, a rapid heartbeat, restlessness, excessive thirst, lethargy, fever, dizziness, lack of coordination, drooling or profuse salivation, vomiting, a deep red or purple tongue, and unconsciousness. When in doubt, contact your veterinarian immediately.

Heatstroke is a medical emergency.

Take immediate action to save your pet's life.

Take Action. If you suspect your pet is suffering from heat stroke, take steps immediately to gradually lower her body temperature and contact your veterinarian.

Follow these tips, and you could save your animal's life:

- Move the animal into the shade or an air-conditioned area.
- Apply ice packs or cold towels to her head, neck, and chest or immerse her in cool (not cold) water.
- Let her drink small amounts of cool water or lick ice cubes.
- Take her directly to a veterinarian.

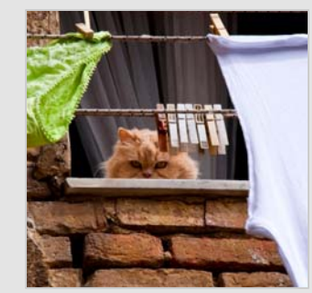
Other Hot Weather Hazards

- **Sun protection**

  Pets can get sunburned too, and your pet may need sunscreen on his or her nose and ear tips. Pets with light-colored noses or light-colored fur on their ears are particularly vulnerable to sunburn and skin cancer. Talk to your veterinarian about choosing a sunscreen and be sure that any product you use on your pets is labeled specifically for use on animals.

- **"High-Rise Syndrome"**

  During warmer months, veterinarians typically see an increase in injured animals as a result of High-Rise Syndrome, which occurs when pets (mostly cats) fall out of upper-story windows and are seriously or fatally injured. Taking some simple precautions can prevent these tragedies: keep all unscreened windows or doors in your home closed and make sure the screens on your windows are tightly secured.



A candidate for "High-Rise Syndrome"

- **Water safety**

  Do not leave pets unsupervised around a pool—not all dogs are good swimmers. If you have a pool, keep in mind your dog might jump in and not be able to figure out how to get out. Prevent free access to pools and always supervise a pet in a pool. This is especially true if you have a pool cover on, because pets can get caught under it.

"If I jump in the pool, will I be able to get back out?"

Hot Weather Tips for Livestock

Guidelines for Livestock Owners to Manage Heat Stress from the Tennessee Government website.

- Observe livestock frequently during hot days.
- Signs of heat stress in goats, sheep, and cattle are: heavy panting, slobbering, lack of coordination, and trembling.
- Provide an abundant amount of accessible clean cool drinking water. Water consumption may increase by as much as 50 percent during periods of extreme heat.
- Provide shade for animals and use temporary structures if needed. If kept indoors, be sure there is good ventilation. Use fans if necessary to keep the air circulating and animals more comfortable.
- If necessary, use sprinklers or foggers to wet livestock to dissipate heat thru evaporation.
- Consider feeding more at night rather than during the heat of the day.
- Avoid the transport or working of livestock on hot days, and if absolutely necessary transport or work livestock in the early morning hours.
- Control flies and biting insects.

First Students Graduate from the DVM/MPH Joint Degree Program at the University of Florida

Tara Anderson, D.V.M., M.P.H., Ph.D.

Every University of Florida graduation is special, but on May 28 nine students had the distinction of being the first graduates of UF's Doctor of Veterinary Medicine/ Master of Public Health joint degree program.

Offered through the colleges of Veterinary Medicine and Public Health and Health Professions, the joint degree program reflects the concept of "One Health."

The inaugural class of D.V.M./M.P.H. graduates: Amanda-Jo Joswig, Laura Kotinsley, Meredith Swart, Jessica Mack, Sara Kaplan-Stein, Jessica McAlpin, Asha George, Laura Diem, and Van Brass with Dr. Mary Peoples-Sheps, PHHP's senior associate dean for public health. *Courtesy Sarah Carey.*

Tara Anderson and Traci Krueger performed the initial needs assessment that helped move the D.V.M./M.P.H. program from an idea to reality.

Tara C. Anderson, DVM, MPH, PhD

Offered through the colleges of Veterinary Medicine and Public Health and Health Professions, the joint degree program reflects the concept of "One Health" — the recognition that human health and animal health are closely intertwined. With their expertise in domestic animal and wildlife health, veterinarians are uniquely qualified to work alongside other health professionals in infectious disease investigation, food production and protection, health education and policy, and global health. The D.V.M./M.P.H. students' final projects focused on a wide range of subjects, including a study of the prevalence of the bacteria *Brucella suis* in Florida cattle, implications of a Japanese encephalitis virus outbreak in the United States, and a West Nile virus outbreak investigation, to name a few.

UF's joint degree program was spearheaded by Paul Gibbs, Ph.D., BVSc, FRCVS, the College of Veterinary Medicine's associate dean for students and instruction, and Mary Peoples-Sheps, Dr.P.H., PHHP's senior associate dean for public health. The joint degree students' graduation was also gratifying for Tara Anderson, D.V.M., M.P.H., Ph.D., and Traci Krueger, D.V.M., M.P.H., since they both are UF College of Veterinary Medicine alumni and graduate students in the M.P.H. program and performed the initial needs assessment that helped move the D.V.M./M.P.H. program from an idea to reality. Anderson served on the D.V.M./M.P.H. program committee and helped draft the original program proposal. Krueger now serves as the program coordinator.

"Both colleges are very proud of this first cohort of D.V.M./M.P.H. students. Not only did they enthusiastically take on the challenge of completing an additional degree, but they also contributed greatly to the success of the joint program, " said Anderson, a postdoctoral research associate at the College of Veterinary Medicine.

"The D.V.M./M.P.H. students established the Public Health and Service Club in order to inform other students about veterinary public health, learn more about current public health issues, offer networking opportunities, and provide disaster response training, " said Krueger, a clinical assistant professor in the department of epidemiology. " Current and future D.V.M./M.P.H. students will no doubt continue to benefit from and expand upon their efforts with this organization. "

Traci Krueger, DVM, MPH

For more information about the DVM/MPH joint degree program at the University of Florida, please visit http://www.mph.ufl.edu/programs/collaborative/vet.htm.

Dr. Tara Anderson is a Postdoctoral Research Associate at the University of Florida College of Veterinary Medicine.

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.

Coming Events:

Global Conference on Rabies Control: Towards Sustainable Prevention at the Source

Seoul, Republic of Korea

September 7- 9, 2011

http://www.oie.int/eng/A_rabies/intro.htm

WORLD VETERINARY CONGRESS 2011

Caring for animals: healthy communities

Cape Town, South Africa

October 10-14, 2011

http://www.worldvetcongress2011.com/

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Continued.....

Coming Events (continued):

International Conference on Responsible Use of Antibiotics in Animals

"An exchange of views on the path forward"

Egmond aan Zee, the Netherlands

November 14-16, 2011

http://www.bastiaanse-communication.com/html/rua_2011.html

The American Society of Tropical Medicine and Hygiene

60th Annual Meeting

Philadelphia, Pennsylvania USA

December 4-8, 2011

http://www.astmh.org/Home.htm

GRF One Health Summit 2012

(GLOBAL RISK FORUM)

One Health - One Planet - One Future
Risks and Opportunities

Davos, Switzerland

February 19-23, 2012

http://www.grforum.org/pages_new.php/one-health/938/1/

International Conference on Emerging Infectious Diseases

ICEID 2012

Atlanta, Georgia, USA

March 12 -14, 2012

http://www.iceid.org/index.php/registration

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Coming Events (continued):

15th International Congress on Infectious Diseases (ICID)

Bangkok, Thailand

June 13-16, 2012

http://www.isid.org/icid/index.shtml

13th ISVEE Conference, 2012

The International Society for Veterinary Epidemiology and Economics

"Building Bridges - Crossing Borders"

Maastricht, Netherlands

August 20-24, 2012

http://isvee13.org/

Recent One Health Publications:

- **Consideration of an International Society for One Health (ISOH)**, The Chatham House (London) Meeting Summary from July 2011, drafted by Professors Martyn Jeggo and John Mackenzie

http://www.chathamhouse.org/sites/default/files/public/Research/Global%20Health/0611summary.pdf

- **The need for one health degree programs**, Laura H. Kahn, Infection Ecology and Epidemiology 2011, **1**: 7919 - DOI: 10.3402/iee.v1i0.7919

http://www.infectionecologyandepidemiology.net/index.php/iee/article/view/7919

- **Ecological and Nontraditional Security Challenges in South Asia,** Dennis Pirages, Farooq Sobhan, Stacy D. VanDeveer and Li Li, NBR Reports (Jun 2011)

http://www.nbr.org/publications/issue.aspx?id=231

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Recent One Health Publications:

- **Making Sense of One Health - Cooperating at the Human-Animal-Ecosystem Health Interface,** Aline Leboeuf, PhD, Institut français des relations internationales (Ifri), Health and Environment Reports n° 7, July 31, 2011.

http://www.ifri.org/?page=contributiondetail&id=6553&id_provenance=88&provenance_context_id=13(=uk

- **Schistosoma bovis: Implications for "One Health" - Amber Kerk**, Stanford School of Medicine, Hsieh Laboratory Blog, Posted 12:29 PM, June 17, 2011, by Michael Harrison Hsieh

http://uti.stanford.edu/

- **Characterization of a canine homolog of hepatitis C virus,** Kapoor et. al., Proceedings of the National Academy of Sciences of the United States (PNAS) Journal - *PNAS* 2011 108 (28) 11608-11613

http://www.pnas.org/

- **Collaboration between Human Medicine, Veterinary Medicine, and the Environmental Sciences (One Health).** Florida Medical Association (USA) (http://www.flmedical.org/HomePage.aspx) Adopts One Health Resolution - July 31, 2011, John J. Lanza, MD, PhD, MPH, FAAP

http://onehealthinitiative.com/publications.php

- **Tick-borne encephalitis virus in dogs - is this an issue?** Martin Pfeffer, Gerhard Dobler, Parasites & Vectors 2011, 4:59

http://www.parasitesandvectors.com/content/4/1/59

- **One Health: A 21st Century "Back to the Future,"** Donald F. Smith, North American Veterinary Conference (NAVC) *Clinician's Brief,* July 2011

http://www.cliniciansbrief.com/column/matter-opinion/one-health-21st-century-back-future?ANWsxK2bqR

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Recent One Health Publications:

- **Canine Serology as Adjunct to Human Lyme Disease Surveillance,** Paul Mead, Rohan Goel, and Kiersten Kugeler, Emerg Infect Dis. 2011 Sep; [Epub ahead of print]

http://www.cdc.gov/media/eid/2011/09.html

- **Flame retardants in the serum of pet dogs and in their food,** Marta Venier, Ronald Hites, Environ Sci Technol.2011 May 15;45(10):4602-8. Epub 2011 Apr 18.

http://pubs.acs.org/doi/abs/10.1021/es1043529

- **Bats, emerging infectious diseases, and the rabies paradigm revisited** , Ivan V. Kuzmin, Brooke Bozick, Sarah A. Guagliardo, Rebekah Kunkel, Joshua R. Shak, Suxiang Tong, Charles E. Rupprecht, Emerging Health Threats Journal 2011, **4**: 7159 - DOI: 10.3402/ehtj.v4i0.7159

http://www.eht-journal.net/index.php/ehtj/article/view/7159/8773

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