

CVER

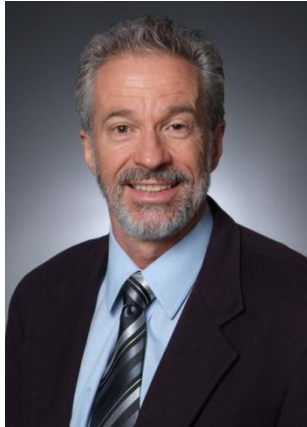
Annual Report

2013

Table of Contents

1. Message from the Outgoing Director
 Message from the Incoming Director
2. Partners
 - 2.1. Canada Excellence Research Chair (CERC)
 - 2.2. Centre for Aquatic Health Sciences (CAHS)
 - 2.3. Maritime Quality Milk (MQM)
 - 2.4. The Canadian Regulatory Veterinary Epidemiology Network (CRVE-Net)
 - 2.5. Sir James Dunn Animal Welfare Centre (SJDAWC)
 - 2.6. Shellfish Research Group (SRG)
 - 2.7. Smallholder Dairy Research Group (SDRG)
3. New Faculty
4. Special Guests
5. Awards and Recognition
6. Graduate Program Highlights
7. Outreach
8. Peer-Reviewed Journal Publications
9. Books/Book Chapters

1. Message from the Outgoing Director



2013 marked the last year of my 2-year commitment to be CVER Director following Ian Dohoo's retirement in 2011. I am very grateful to John VanLeeuwen for agreeing to take over the position for the next 2 years, and for his help in developing a succession plan for future Directors involving a 2-year rotation. This new strategy will ensure the continuing success of CVER research and educational activities while ensuring that the leadership role is more widely shared among members.

2013 was another successful year with many of the details provided in subsequent pages. Highlights for 2013 were the completion of 3 Epi-on-the-Island courses, the hiring of Javier Sanchez as a full-time tenure-track faculty member at the Atlantic Veterinary College, numerous awards among faculty and graduate students, and most importantly, the graduation of many PhD and MSc students located within various CVER partner groups, thanks to the mentoring and commitment to excellence of my CVER colleagues. Finally, I would like to thank Leanne Newson for 4 years of dedicated service to CVER, CERC, and CRVENet, and I wish her success in her new role in the UPEI Climate Change Lab.

Best wishes,

Ian Gardner

Message from Incoming Director

I would like to heartily thank Ian Gardner for his fine leadership as CVER Director during the last couple of years. He has worked hard to ensure that CVER remains strong during the post-Dohoo transition. Fortunately, we still have Ian Dohoo as part of the CVER team part-time, as a Professor Emeritus. It is indeed an honour to follow "The Ians" as Director of CVER, as we continue to have among the best and most successful Veterinary Epidemiology programs worldwide. With a fantastic CVER team, we will continue to grow and flourish as very bright lights in an eye-catching research constellation at UPEI. We hope you enjoy reading some details below.



Cheers!

John VanLeeuwen

2. Partners:

2.1. Canada Excellence Research Chair – by Dr. Ian Gardner

In 2013, the CERC in aquatic epidemiology continued to build capacity through the addition of 2 post-doctoral fellows (Annette Boerlage and Juan Aguirre Garcia), and based on plans mapped out at our October visioning meeting, CERC will add the following positions in 2014: an e-learning coordinator, a research scientist in shellfish/crustacean epidemiology, and 2 more post-docs with a focus in molecular epidemiology and disease ecology of wild aquatic animals. Two AVC faculty members, Mark Fast and Javier Sanchez, joined the CERC team, contributing their research expertise in infectious diseases and risk analysis. I am indebted to Leanne Newson, our previous Administrative Project Manager, for her valuable contributions to organizational, financial and logistical management during the first 2.5 years of the CERC program; she greatly helped to ensure that the program had a strong start and continued growth, despite early challenges.



Post-Doc Annette Boerlage exploring research opportunities on a oyster farm in Halong Bay, Vietnam (photo taken by Larry Hammell)

The CERC program continues to grow in Canada with collaborative projects on both coasts. On the west coast, collaborations with the Department of Fisheries and Oceans and the salmon industry include work on pathogen exchange between wild and farm fish, and on sea lice management plans, including use of hydrodynamic modeling of sea lice infestations. On the east coast, the focus in salmon aquaculture has been epidemiologic studies of sea lice, infectious salmon anemia, and bacterial kidney disease. The CERC has funded research on the production and health of oysters and mussels in PEI to supplement the ongoing activities of Jeff Davidson and Sophie St-Hilaire. Through the CRVENet program (see that section in this report), funding has been used to collaborate with the CFIA aquatic surveillance and epidemiology section for projects on syndromic surveillance methods and risk pathways applied to investigations on the introduction and spread of Multinucleate Sphere X (MSX) in PEI.

Internationally, the CERC has contributed research and graduate student/postdoctoral funding to support sea lice research in Norway and Chile, salmon rickettsial syndrome in Chile (Gabriel Arriagada and Derek Price, graduate students), and aquatic epidemiology in China (Jia Beibei, PhD student). In Vietnam and Thailand, the CERC has explored research opportunities in finfish and shrimp disease epidemiology, and is working toward establishing research projects in 2014. Finally, 10 seed grants funded in 2012 are nearing completion, and an additional round of funding is scheduled in March 2014 focusing on high-risk high-reward projects that have the potential to garner extramural funding and include mentoring of early-career scientists by UPEI faculty members.



Jia Beibei interviews a grass carp farmer in Hubei Province, China as part of her research

2.2. Centre for Aquatic Health Sciences (CAHS) – by Dr. Larry Hammell

The Centre for Aquatic Health Sciences at the Atlantic Veterinary College is a centre of expertise in aquatic epidemiology and disease intervention for the finfish aquaculture industry. It leads multi-stakeholder projects using epidemiological techniques to improve the long-term health management practices for farmed fish. In addition, AVC-CAHS provides evidence-based health management analysis to guide policy decisions for all levels of government, and internationally. It operates two field research sites located in St. Alban's, NL and St. George, NB.



This past year has been another remarkable year for the organization. The group continues to work in both New Brunswick (NB) and Newfoundland and Labrador (NL), engaged in the monitoring of sea lice population, field trials for sea lice treatments, as well as a clinical field trial to identify risk factors associated with disease occurrence, specifically Bacterial Kidney Disease (BKD) and Infectious Salmon Anemia (ISA). The retrospective analysis of farm production and health records that was initiated in the fall 2012 continued through 2013 and is focused on the identification of risk factors and control of BKD and ISA across the Atlantic Canada region over the past 5-7 years.

The field trials of commercial vaccines under NL production conditions continued in 2013. Our group implanted passive integrated transponder (PIT) tags in an additional population of 6,000 Atlantic salmon in a NL hatchery destined for offshore marine sites. These fish were randomized to 7 different vaccines; including a bacterial kidney disease (BKD) vaccine. These study fish were transferred to NL marine sites in June 2013 where they are being monitored by our group in collaboration with NL Department of Fisheries and Aquaculture (DFA) until their harvest in late 2014.

The CAHS-developed FishiTrends (FIT), an evidence-based-epidemiological database platform used to monitor fish health and sea lice pest management programs in the Bay of Fundy, reached another milestone this year. The production version: “Fish-i-Trends.com,” has been accepted by aquaculture producers in Newfoundland and Labrador, and in summer 2013, the Newfoundland Aquaculture Industry Association, along with NB fish farmers, signed a 3-year agreement to utilize the “Fish-i-Trends.com” platform throughout their member farms.



Researchers continue to work on a follow-up version of the software platform with enhanced geographic information system (GIS) capabilities, upgrades to supporting software, and the integration of aquaculture production sites in Nova Scotia. These capabilities support the CAHS mission of providing sound science to inform fish health policy decisions based on near real-time inputs. It is anticipated that the upgraded platform will provide decision support across a spectrum of fish health management activities for the finfish aquaculture industry throughout Atlantic Canada by the end of 2014.

The CAHS-delivered “Sea Lice Identification Course and Certification” continues to be a popular offering for producer companies and site workers. In 2013, CAHS delivered this hands-on course to 35 aquaculture farm staff in a series of small-group one-day seminars and labs.

The 2012 rainbow trout (RBT) study population grew well in the marine conditions and was successfully harvested in fall 2013, providing a useful dataset (currently being analyzed).

Activities under the Integrated Sea Lice Monitoring Project in NB were completed in March 2013, and the project was not funded for the 2013-14 research season. In its four seasons of activity, this project provided industry-leading assessments of sea lice population trends across

the New Brunswick aquaculture industry, and independent monitoring of the effectiveness trends for bath and in-feed treatments. This project was a success, and the data captured using the DSS platform provided important evidence to support decisions on emergency release and eventual registration of chemotherapeutic and pesticide products for use in the NB aquaculture industry. This monitoring program also contributed to the detection of sub-optimal conditions leading to further sea lice burdens at a site or area level.

After two years of Government of NB support, CAHS discontinued its program of audits of sea lice prevalence at active finfish production sites in the Bay of Fundy. Results in both 2012 and 2011 were similar, with producers continuing to demonstrate significant commitment to self-management and accurate sea lice reporting. Expansion of the program to NL has been proposed, and a preliminary data quality assessment review was completed in 2013. Any decision on an audit program in NL will await the full deployment of the FishiTrends platform.

2.3. Maritime Quality Milk (MQM) – by Dr. Greg Keefe

Maritime Quality Milk (www.milkquality.ca) is the dairy research and service program of the Atlantic Veterinary College for the Atlantic Canadian provinces. MQM focuses on milk quality and infectious disease research. By integrating research and service capacity, MQM has become one of the leading dairy health centers in Canada. The past year was a very successful one for the program. Several long-term projects continued to generate excellent outcomes, new projects with tremendous potential were initiated, and a number of proposals were funded and will begin over the next several years.

The largest single project of 2013 was the Atlantic Johne's Disease Initiative (AJDI) (www.atlanticjohnes.ca). This program is co-funded by the four Atlantic Dairy Boards, the four regional ADAPT Councils (AAFC) and UPEI/AVC/MQM through the Innovation Research Chair program, for a total of 1.2 million dollars over 3 years. The program is the most successful of all the Johne's initiatives across Canada, with 70% of herds voluntarily participating. AJDI is industry driven with a steering (oversight) committee representing the funding partners, and a scientific committee of University scientists and private veterinary practitioners. Seven people from AVC work on the program full or part-time, and approximately 50 veterinarians and veterinary technicians provide contract services around the region. The program provides data for one PhD graduate student (Dr. Karen MacDonald-Phillips). The success of AJDI has motivated the regional dairy industry to sponsor a more comprehensive health monitoring and planning initiative called "Atlantic Health Herds" (below).



Building on the success of the AJDI program, in 2013, the three Maritime dairy boards sponsored a research program for Bovine Leukemia Virus (BLV). This program has partner funding by AAFC through the ADAPT/CAPP program and provides data for the graduate program of Dr. Omid Nekouei. His research indicates that the rising prevalence of BLV represents an increasing challenge to the regional industry and could further damage our dairy genetics industry if left unchecked.

MQM continues to work on non-antibiotic based dry cow therapy protocols. The graduate student on this project, Dr. Marguerite Cameron, is nearing completion of her PhD program. Results indicate that cows treated with a non-antibiotic alternative to dry cow antibiotics had a similar new infection rate to antibiotic treated animals.

In the past year, MQM completed a major contract for the Dairy Farmers of Canada (through the mastitis network) on variation in bulk milk iodine. For this project, Dr. Greg Keefe led a team of 8 researchers from 5 Universities and Agriculture and Agri-food Canada, examining risk factors for elevated milk iodine in the Canadian milk supply. Dr. Kimberley MacDonald was a part-time post-doctoral fellow coordinating the project.



Dr. Carrie Lavers successfully defended her PhD in 2013. Her project has revolutionized how we make herd classification of Johne's infection risk and is highly supportive of the model employed by AJDI. Dr. Emilie Laurin is a PhD graduate student on a second project focused on cow-level Johne's testing. Her data provides interesting insights into cow shedding (culture) and antibody production (ELISA) for known infected cows over a year period. The project has provided some excellent data on the relative value of blood ELISA, milk ELISA, fecal culture and fecal PCR.

MQM provides both scientific and administrative support to a project examining use of infrared technology in immunoglobulin-based diagnostics. Dr. Ibrahim Elsohaby is the dairy PhD student on the project. Ibrahim has generated excellent results for the system in stored bovine serum.

Internationally, MQM continues to work with researchers in Colombia on milk quality challenges in that country. Dr. Julian Reyes, who has stipend funding from Innovation PEI and the Colombian government, is the PhD student on the project, which is examining the epidemiology of *Streptococcus agalactiae*.

MQM is a substantial partner on 3 successful Dairy Farmers of Canada/AAFC Dairy Cluster program applications which will span 2013-2018. MQM will lead one project on diagnosis of coagulase negative staphylococci and participates in five more for the Canadian Bovine Mastitis

Research Network. Additional cluster projects will see MQM oversee validation of an on-farm cow comfort analysis system in the Maritimes in collaboration with colleagues in British Columbia. MQM is also a core member of a national dairy disease biosurveillance project lead by the University of Guelph.

Based on the success of the AJDI program, the four Atlantic Dairy organizations supported the development of a broader "Healthy Herds" program for the region. The initial phases (2014-2018) of Atlantic Healthy Herds will incorporate research and control programs for 6 health issues within the dairy industry: Johne's, Bovine Leukemia Virus, Bovine Viral Diarrhea, Lameness, Calf Health and Internal Parasites. Program funding is currently under review.

In addition to our more academically driven pursuits, MQM does contract research for the local, national and international dairy industries. Two highlights in 2013 were the initiation of a regulatory trial for an international dairy equipment and supply company, and a study of milk casein in bulk tank milk for Amalgamated Dairies Limited (ADL) and the Dairy Farmers of PEI. Casein is important for optimizing cheese quality and quantity. Cheese production is a core business of ADL, which is a key contributor to the provincial economy.

MQM continues to provide web-based access to regulatory quality, and payment data to all farms in the Maritimes through its graphical analysis program. In 2013, the program was upgraded for Smartphone-based applications for the system. The MQM laboratory supports our research and service mandate. The laboratory maintains USDA-proficiency accreditation for 5 different testing methods for Johne's disease (*Mycobacterium paratuberculosis*). It is the only lab in Canada to have all 5 of these certifications.

2.4. The Canadian Regulatory Veterinary Epidemiology Network (CRVE-Net) – by Dr. Javier Sanchez

Led by CVER, the Canadian Regulatory Veterinary Epidemiology Network (CRVE-Net) links Canada's five veterinary schools, and contributes to the development of research and training programs at the five universities. CRVE-Net was originally funded for a three year term in 2009 and then renewed for a one-year extension of funding from the Canadian Food Inspection Agency (CFIA). Given the importance and accomplishments obtained during those early years, in 2013, CRVE-net was renewed for another three years with \$450,000. Terms of reference outlining the governance of the network going forward has been created and approved by CFIA. In 2013, CRVE-Net implemented an Expert Advisory Committee in Aquatic Animal Health (EACAAH) and an Expert Advisory Committee in Terrestrial Animal Health (EACTAH), at the request of our funder.

In September 2012, a new graduate course in quantitative risk analysis was developed by CRVE-Net, under the leadership of Dr. Javier Sanchez. Following its delivery, an on-line version of this course was proposed and accepted by the Department of Health Management at AVC. This on-line course was first offered during the Fall of 2013, and it is expected to now be offered twice a year. It covers the basic models and approaches to developing a quantitative risk model applied to animal health and food safety risks. This course addresses CFIA's goal for more expertise in quantitative risk assessment among veterinary epidemiologists in Canada.

CRVE-net is also working very closely with the CERC program to support surveillance and risk modeling activities of interest to CFIA in aquatic epidemiology.

In addition, five other proposals related to "One Health" and zoonotic diseases have been approved for CRVE-Net activities at the other four Canadian veterinary schools.

2.5. Sir James Dunn Animal Welfare Centre (SJDAWC) – by Dr. Michael Cockram

The SJDAWC promotes animal welfare through research, service and education. The 9th annual Animal Welfare in Practice conference was held on Companion Animal Behaviour in September.

The presentations (available at www.awc.pe/ca) focused on common behaviour issues, their impact on welfare, and the importance of positive interactions in the prevention and management of problems. National Farm Animal Care Council Codes of Practice for the Care and Handling of Equines and Sheep received input from the

SJDAWC and were published in 2013. Animal welfare research projects received input from CVER members: Drs. Dohoo, Revie and Stryhn and graduate student projects continue on the transport of broiler chickens and horses. Jackie Ellis received the Gold award for Animal Health Research for her presentation on cat welfare at the AVC Annual Graduate Studies and Research Day and Ketan Dulal received the Bronze award for his presentation on broiler chicken handling and transport. Dr. Radi Ali Mohamed Ali was a post-doctoral visitor from Kafrelsheikh University, Egypt. Whitney Kelly-Clark and Meghan Woodland received graduate degrees based on work funded by the SJDAWC. Please see www.upei.ca/awc for more information and the 2013 annual report.



2.6. Shellfish Research Group (SRG) – by Dr. Jeff Davidson

In 2013, the Shellfish Research Group completed a number of research projects including CERC funded projects: “Evaluation of relay stations for reducing Norovirus and male-specific coliphage in oysters grown in Prince Edward Island” led by Dr. Jeff Davidson; “Characterization of shellfish movements in Prince Edward Island for risk simulation model” led by Dr. Javier Sanchez; and “Animals, water and public health in Vietnam” led by Drs. David Hall (U. of Calgary) and Jeff Davidson. The Vietnam project led to the funding of a large-scale project funded by Grand Challenges Canada.

Dr. Davidson continues to participate in a research project in partnership with health management officials in South and Southeast Asia, with the goal of building the capacity for research and practice in ecosystem approaches to health in Southeast Asia. The hypothesis for this project is that bringing individuals together from different countries and institutions with an array of experience and expertise in health promotion, public health, and the prevention of emerging infectious diseases (EIDs) will enable participants to investigate and respond more effectively to complex ecosystem health issues, with a particular focus on EIDs.

Drs. McNiven and St-Hilaire completed their green crab project, funded by Innovation PEI, and published on the nutritional content and distribution of the species on PEI. Research continued into oyster production in the Hillsborough River with an Honours Biology student, Jessica Champion.

2.7. Smallholder Dairy Research Group (SDRG) – by Dr. John VanLeeuwen

The Smallholder Dairy Research Group conducts a dairy research, teaching and service program involving graduate students in epidemiology, veterinarians, veterinary students and other animal health professionals, and smallholder dairy farmers. The program is a result of partnerships among Nairobi and CVER faculty members and students, two Canadian non-governmental organizations (Farmers Helping Farmers, and Veterinarians without Borders-Canada), and dairy farmer groups primarily in Kenya. University collaborators have also included faculty members from Dalhousie and Ryerson in Canada, Bristol in the U.K, and Egerton in Kenya. Research topics have investigated methods of enhancing milk productivity (through infectious disease control and dairy health management), and how dairy farming and higher milk production have improved sustainable livelihoods and quality of life.

The past year was a very successful one for the program. A trip to Kenya in winter achieved its objectives of teaching dairy health management to Canadian and Kenyan animal health

professionals and smallholder dairy farmers. The trip was also utilized to check up on research project analyses and reports, and to disseminate research findings for knowledge transfer.

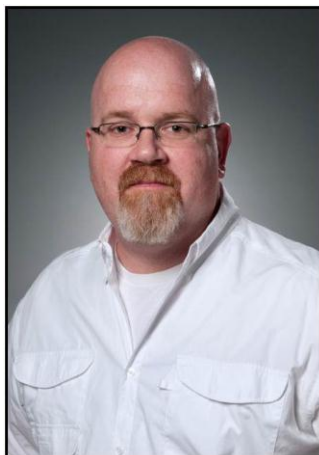


A second trip to Kenya in summer completed phase two of observational and randomized controlled trial studies on post-partum cow nutritional enhancement and neonatal calf nutritional enhancement, with and without agroforestry augmentation, involving 110 farms. A large team of 8 members worked on these studies, along with 2 other projects. With the biweekly monitoring of the trials, the team also conducted studies on the incidence rates of subclinical mastitis in post-partum cows and on the incidence rates of

infections with various neonatal calf diarrhea pathogens, along with how nutrition influenced the incidence and severity of the diarrhea and mastitis. Drs. Jeff Wichtel, Collins Kamunde, Fabienne Uehlinger (now at U of Bristol) and George Gitau (U Nairobi) are faculty collaborating on these projects. There are two other ongoing research projects: a cohort study on infectious causes and risk factors of bovine abortion, and a case-control study on factors of bovine tuberculosis. There are currently 4 Kenyan graduate students and one Canadian graduate student (Dr. Shauna Richards – see photo on left) working on these Kenyan projects.

Funding from the Sir James Dunn Animal Welfare Centre was announced in 2013 for a cow comfort observational and clinical trial project among smallholder dairy farmers in Kenya, to be conducted in 2014. Dr. Shawn McKenna is also collaborating on this project.

3. New Faculty



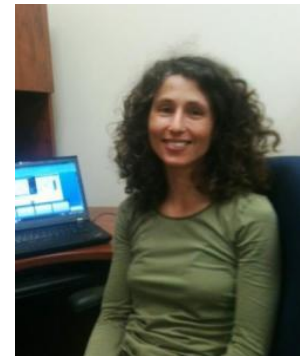
Dr. Luke Heider, a former graduate of the Atlantic Veterinary College in 1999, joined CVER and the AVC's health management team in January 2013. Dr. Heider began his career in a large dairy practice in Reedsville, Wisconsin, before he moved to mixed animal practice with a focus on dairy cattle. In 2004, he started his PhD at the Ohio State University, investigating the role of ceftiofur use on dairy farms and the emergence of Salmonella and E.coli with reduced susceptibility to ceftiofur mediated by the β -lactamase gene, CMY-2. In 2008, he was hired by Ohio State University, Department of Veterinary Preventive Medicine, as a clinical instructor to teach veterinary and undergraduate students about

dairy cattle, dairy production and veterinary public health. In 2011, he completed his PhD degree and continued with the department until he accepted his current position here at AVC as a contract assistant professor in farm service. Luke will also be mentoring graduate student Babafela Oluwasile with Dr. J McClure. Luke is married to Dr. Chelsea Martin, a veterinary pathologist in the Path/Micro department here at AVC, and he is a father to two sons, Sam and Ian. Welcome Luke!

Dr. Javier Sanchez, who has been working with CVER and Health Management as a Research Chair in Risk in Analysis, accepted a fulltime tenure-track faculty position with the Department of Health Management. Javier has played an integral role in both CRVE-net and the CVER team, and we are very pleased he will continue to do so.

4. Special Guests

CVER was very excited to welcome Dr. Ana Alba Casals, a Doctoral Research Fellow from Spain in the spring of 2013. Dr. Casals works as a Veterinary Epidemiologist in Spain, and has a special interest in designing surveillance and contingency plans, health information systems, epidemiological data analysis, epidemiological training, and geographical information systems applied to animal health of different species, including livestock, wildlife, horses, and companion animals. She visited CVER at the invitation of Dr. Crawford Revie, from early April until the end of June 2013.



It was a great pleasure to have hosted a professor on sabbatical at CVER during the fall of 2013, **Dr. Mike McGowan**, a professor of livestock medicine in the School of Veterinary Science at the University of Queensland. While here, he participated in the VHM811 Epi 1 graduate course, gave lectures to the AVC bovine club, and developed working relationships with a number of CVER faculty members for current projects of his, and for possible future projects. AVC and CVER truly benefited from his time here. We hope to see him again someday. G'day mate.

5. Awards and Recognition

In 2004, Dr. Javier Sanchez, a faculty member for CVER and Health Management received the Governor General's medal when he accepted his PhD graduate degree from the AVC. Ten years later, his first graduate student, Dr. Fernanda Dorea completed her PhD and received the same Governor General's medal for graduate studies at UPEI's convocation. Dorea has been invited by the National Veterinary Institute in Sweden to work at the Swedish Zoonosis Centre, where she is developing a similar system for early disease detection.



Drs. Larry Hammell and John VanLeeuwen were presented with Presidential Recognition Awards of Merit for Scholarly Endeavours in May 2013 from Dr. Alaa Abd-El-Aziz, President and Vice-Chancellor of UPEI. Drs. Elizabeth Spangler and Jeffrey Davidson were also recognized at the ceremony for 25 years of service at the AVC.

Dr. Henrik Stryhn was awarded one of three Merit Awards for Scholarly Achievement given by the UPEI Faculty Association. This award is intended to honor faculty members in scholarly research, and in doing so, inspires others to do the same. Dr. Stryhn was also presented with the Pfizer Research Excellence Award at the Graduate Studies and Research Days Awards Ceremony. This award recognizes an individual with outstanding research effort and productivity in their field of research.



Dr. Alice Crook, coordinator of the Sir James Dunn Animal Welfare Centre at AVC, received the PEI Veterinary Medical Association's Leadership Award in 2013. The award, the highest given by the PEIVMA, recognizes a veterinarian's strong career of achievement and dedication to the profession, PEI community, and health and welfare of animals.

6. Graduate Program Highlights

Dr. Shauna Richards, a CVER Ph.D. student, received the G Murray and Hazel Hagerman Scholarship, given to the student with the highest marks in graduate courses at AVC.

The Pfizer Graduate Student Award was presented to Dr. Marguerite Cameron, one of CVER's PhD students. This award goes to a student whose project is currently in progress, to help in the quest to receive his/her graduate degree in veterinary medical research.

Dr. Carrie Lavers, also a CVER PhD student, was awarded the Dr. E. Errol Hancock Scholarship which goes to the student from Nova Scotia with the highest academic standing.

The OGS Award of Distinction is to recognize a convocating graduate student from AVC who made outstanding contributions to his/her faculty, university and discipline. The 2013 recipient was also the Governor General Award winner, Dr. Fernanda Dorea.



The Dr. Ian Dohoo award, which was initiated in 2012, is granted to a student currently registered in the graduate Epidemiology/Health Management discipline at the AVC. The award will help with travel expenses for the recipient's work at national or international conferences and this year was awarded to Omid Nekouei Jahromi.

One of CVER master's students, Matthew Saab, won second prize for graduate student presentations for his oral presentation "*Selective medium increases apparent prevalence of extended-spectrum cephalosporin resistant Escherichia coli in Canadian swine herds*" at the CAVEPM conference held in Saskatoon, Saskatchewan. Matthew's supervisor is Dr. Jay McClure.

In 2013, two students successfully defended their PhDs:

Dr. Fernanda Dorea completed her PhD under the supervision of Drs. Jay McClure, Crawford Revie and Javier Sanchez. Her thesis was titled "Developing and implementing techniques to harvest surveillance information from existing veterinary diagnostic laboratory data."

Dr. David McIver completed his PhD under the supervision of Drs. John Vanleeuwen, Collins Kamunde, David Fleming (Mt. Allison U), and Judy Read Guernsey (Dalhousie U). His thesis was titled "Biomonitoring of Arsenic Species in Rural Nova Scotia Communities."

Currently, CVER has 24 graduate students, 9 enrolled in their MSc and 15 students working toward their PhD.

7. Outreach - Some examples of these key initiatives are as follows.

Epi-on-the Island

CVER hosted its annual Epi-on-the-Island conference in June at the AVC. This popular course had participants from Chile, Iran, Scotland, Nepal, Ireland, Spain, Columbia, Thailand and the USA.

This year, the conference had 3 modules. The first was an introduction to Bayesian Risk Assessment taught by Curtis L. Smith, PhD, Distinguished Staff Engineer of the Idaho National Laboratory, along with AVC's Drs. Javier Sanchez and Henrik Stryhn.



The second module was held over a 5-day period and had 23 participants engaged in a course entitled "An Introduction to Multilevel Modeling." This section was taught by the following CVER faculty members: Drs. Ian Dohoo, Henrik Stryhn, and Javier Sanchez.

The third and final module featured a course entitled "Data Mining and Knowledge Discovery – an introductory course with focus on veterinary epidemiology applications", and instructed by CVER's own Drs. Fernanda Dórea and Crawford Revie.

International Teaching

Although a year into retirement, Dr. Ian Dohoo kept busy traveling to Massey University in Palmerston North, New Zealand, to teach a course in Multilevel modelling in March 2013. In April, he taught an observational study design and analysis workshop at the International Livestock Research Institute in Nairobi, Kenya. Finally he travelled to Norway in October to conduct a one-day workshop on meta-analysis.

Also in March 2013, Drs. Crawford Revie and Fernanda Dorea conducted a workshop in Madrid, Spain on Data Mining and Machine Learning: What's their relevance to a veterinary Epidemiologist? This workshop was part of the Society of Veterinary Epidemiology and Preventative Medicine (SVEPM) conference.

AVC's aquatic animal health experts who are collaborative partners with the Norwegian Veterinary Institute to form ERAAAD, the Center for Epidemiology and Risk Assessment for Aquatic Animal Diseases gave workshops in Portugal, Lebanon and Mexico on various topics related to aquatic animal diseases. The organization was also involved in the implementation of a 3-day workshop on certifying disease status for safe trade in aquaculture at the World Workshop on Evidence-Based Disease Control in Salmon Aquaculture, in Fort Collins, Colorado.

8. Peer-Reviewed Journal Publications

1. Arens AM, Puchalski SM, Whitcomb MB, Bell R, Gardner IA, Stover, S. Comparison of the use of scapular ultrasonography, physical examination, and measurement of serum biomarkers of bone turnover versus scintigraphy for detection of bone fragility syndrome in horses. *Journal of the American Veterinary Medical Association*. 2013
2. Berger JM, Spier SJ, Davies R, Gardner IA, Leutenegger CM, Bain M. Behavioral and physiological responses of weaned foals treated with equine appeasing pheromone: A double-blinded, placebo-controlled, randomized trial. *Journal of Veterinary Behavior: Clinical Applications and Research*. 2013.
3. Cameron M, Keefe GP, Roy JP, Dohoo IR, MacDonald KA, McKenna SL. Evaluation of a 3M petrifilm on-farm culture system for the detection of intramammary infection at the end of lactation. *Preventive Veterinary Medicine*. 2013.
4. Cox R, Sanchez J, Revie CW. Multi-criteria decision analysis tools for prioritising emerging or re-emerging infectious diseases associated with climate change in Canada. *Public Library of Sciences*. 2013, August 7.
5. Crafford JE, Lourens CW, Gardner IA, Maclachlan NJ, Guthrie AJ. Passive transfer and rate of decay of maternal antibody against African horse sickness virus in south African thoroughbred foals. *Equine Veterinary Journal*. 2013.
6. Dohoo C, Guernsey J, Gibson MD, Vanleeuwen J. Impact of biogas digesters on cookhouse volatile organic compound exposure for rural Kenyan farmwomen. *Journal of Exposure Science and Environmental Epidemiology*. 2013, July 31.
7. Dohoo C, VanLeeuwen J, Guernsey JR, Critchley K, Gibson M. Impact of biogas digesters on wood utilisation and self-reported back pain for women living on rural Kenyan smallholder dairy farms. *Global Public Health*. 2013.
8. Dohoo IR. Bias-is it a problem, and what should we do? *Preventive Veterinary Medicine*. 2013
9. Dórea FC, Muckel CA, Kelton D, McClure JT, McEwen BJ, McNab WB, Sanchez J, Revie CW. Exploratory analysis of methods for automated classification of laboratory test orders into syndromic groups in veterinary medicine. *Public Library of Sciences*. 2013.
10. Dórea FC, Revie CW, McEwen BJ, McNab WB, Kelton D, Sanchez J. Retrospective time series analysis of veterinary laboratory data: Preparing a historical baseline for cluster detection in syndromic surveillance. *Preventive Veterinary Medicine*. 2013.

11. Dórea FC, McEwen BJ, McNab WB, Revie CW, Sanchez J. Syndromic surveillance using veterinary laboratory data: data pre-processing and algorithm performance evaluation. *Journal of the Royal Society Interface*. 2013, April 10.
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