STAYING AHEAD OF THE CURVE

MAGAZINE:

THE DISEASE SURVEILLANCE PLAN 2013-2018

ONTARIO ANIMAL HEALTH NETWORK

Growing Forward 2

ONTARIO ANIMAL HEALTH NETWORK

Ontario

UNIVERSITY of GUELPH

Canada

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DSP Magazine: Staying Ahead of the Curve

The Disease Surveillance Plan was possible because of the OMAFRA-University of Guelph Strategic Partnership, funded by *Growing Forward 2 (GF2)*, a federal-provincial-territorial initiative.

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Creating a Sustainable Program

Early disease detection leads to safeguarding animal and human health, improvements in food security, cultivation of public trust and "social license", protection of international trade and market access, and helps maintain industry sustainability. The partnership between the Ontario Ministry of Agriculture, Food and Rural Affairs and the AHL has increased capacity for early disease detection and management of risks through effective surveillance and emergency management systems.

Collaboration and a "One Health" approach to animal, human and ecological health play a key role here. Animal health surveillance has been strengthened through cooperation of veterinarians, livestock producers, and government partners in agriculture and public health. Through the Ontario Animal Health Network (OAHN), Ontario is taking a cohesive approach to animal disease surveillance, diagnostic testing and information sharing. I am pleased to point out that this unique relationship between academia and research institutions, veterinarians, government, industry and other organizations in Ontario is being recognised as a successful model throughout Canada.

There is proven value in the ongoing partnership between OMAFRA and the AHL and my congratulations go out to everyone involved in this program. I'm looking forward to seeing where the next five years will
take us.

Debra Sikora
Assistant Deputy Minister of Food Safety and Environment Division, Ontario Ministry of Agriculture, Food and Rural Affairs

Ontario

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Ontario is emerging as a global leader in agri-food innovation. Key to this leadership role is public confidence in the safety of our food and the health of our animals. To maintain this confidence, we must continue to work together across the agri-food sector.

I am pleased to announce that the University of Guelph's renewed partnership with the Ontario Ministry of Agriculture, Food and Rural Affairs will continue to support the Animal Health Laboratory (AHL) and its outstanding work to protect both animal and public health. The AHL's world-class diagnostic facilities and critical mass of expertise make it the epicentre of animal health and welfare and a key protector of public health in Ontario.

Best available research and diagnostic technology is only part of the equation. Through the Ontario Animal Health Network (OAHN) – a network of 10 groups that cover each major livestock species in Ontario, plus companion animals and wildlife – the AHL is uniting expertise across the province to enhance disease surveillance and responsiveness. The OAHN is emerging as a national leader in animal health and disease surveillance because it fosters collaboration and emphasizes communication.

A key mandate of the program is to share best available evidence via social media, podcasts and reports while bringing together producers, veterinarians and industry professionals to monitor animal health across Ontario. We are already seeing the benefits of this unique approach. For instance, OAHN groups have already worked to contain disease outbreaks in the poultry and swine sectors by identifying emerging threats and coordinating a sector-specific response.

I am pleased to share Staying Ahead of the Curve, which highlights the important work of the disease surveillance program and the OAHN, and I look forward to continuing our work together to keep Ontario's agri-food sector strong and vibrant.

Dr. Beverley Hale
Associate Vice President of Research, Agri-Food Partnership, University of Guelph

The Disease Surveillance Plan

The Animal Health Laboratory was awarded funding for a Disease Surveillance Plan (DSP) by the Ontario Ministry of Agriculture, Food and Rural Affairs, as part of the OMAFRA - UofG Agreement for 2013-2018. As part of the disease surveillance plan and stakeholder feedback, the Ontario Animal Health Network (OAHN) was developed.

The Ontario Animal Health Network (OAHN)

The second pillar of the Disease Surveillance Plan is to enhance Ontario animal disease surveillance. We have achieved this through the creation of the Ontario Animal Health Network (OAHN). Modeled after RAIZO (Réseau d'alerte et d'information zoosanitaire) in Quebec, OAHN is made up of 10 species networks, each of which includes OMAFRA employees, an AHL pathologist, veterinarians practicing in Ontario, OVC researchers, and sometimes industry representatives. Over the past 5 years, we have assembled functioning networks for all 10 species, including Alternative Species, Bees, Bovine, Companion Animals, Equine, Fish, Poultry, Small Ruminants, Swine, and Wildlife.

Although each network is self-directed and tackles surveillance in its own way, many of them disseminate surveys every quarter to find out what Ontario vets are seeing in practice, combine this with AHL and private lab data, then hold a quarterly teleconference in which all data are discussed, and the network experts and practicing veterinarians can share interesting cases and trends that they are seeing, and discuss followup actions.

After each meeting, an owner/producer report, veterinary report, podcast, info sheet, or some combination of these, is created, approved by the network and the project manager, and is then published on the OAHN website. The communications product is disseminated to all vets who completed the survey (for veterinary reports), and to the public and interested parties using OAHN's mailing list, social media, and sometimes physical mailouts. In addition to communications products, each network is also available if there is a disease outbreak or special animal health circumstance that needs addressing. One of the huge advantages to having the OAHN group is that there is an established network of government, academic, laboratory, and in-the-field vets ready to discover, discuss, and take action on any outbreak that occurs.

OAHN Timeline 2013 - 2018

2013

May 2013- Funding granted for the Disease Surveillance Plan from OMAFRA and *GF2*.

Sep 2013 - 1st annual stakeholder meeting, needs assessment from all commodities.

Oct 2013 - Trip to Que to review RAIZO, Queb surveillance program 20+ years upon which OAHN was modeled.

2015

Apr 2015 – OAHN Bovine network formed.

Mar 2015 - OAHN Communications Associate Hired.

Mar 2015 – OAHN Equine and Bee Networks formed.

Feb 2015- OAHN Poultry and Wildlife networks formed.

Apr 2015 – Hi-path avian influenza hits Ontario.

Apr 2015 – Mink wet lab held and Alternative Species network formed.

Apr 2015 – First Info-graphic published – Avian Influenza.

Aug 2015 – Bluetongue found in Ontario.

Sep Con netw

2018

Jan 2018 – Canine influenza found in Ontario.

Dec 2016 - Lawsonia found in Ontario horse.

Oct 2016 - Senecavirus A found in Ontario swine.

Jan 2018 - 5th annual stakeholder meeting, trade ideas between networks to develop networks to full potential

You can find out more about this topic by turning to the page number below the Timeline Entry.

2014

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Mar 2014 - McNab report on surveillance systems worldwide.

Jul 2014 - OAHN Coordinator hired.

Sep 2014 - OAHN Small Ruminant network formed.

Oct 2014 - 1st OAHN podcast.

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Oct 2014- 2nd annual stake-holder meeting, present pro-posed OAHN format and newly formed Small Ruminant network.

Dec 2014 - OAHN Facebook and Twitter feeds launched.

Oct 2014 - OAHN Swine and Fish networks formed.

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t 2015 – OAHN
mpanion Animal
work formed.

Oct 2015 – 3rd annual stakehold-er meeting, discuss needs for the newly formed networks to develop, workshop on real-time surveillance app development.

Dec 2015 – OAHN funding for network projects announced ($50,000 per network).

2016

Dec 2015 – Terrestrial rabies - found in Ontario.

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Dec 2015 - Cache Valley virus found in Ontario.

Oct 2016 – 4th annual stakeholder meeting – half day planning workshop.

May 2016 - Small flock poultry training held, small flock listserv launched as a subset of the Poultry network.

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OAHN Communications

OAHN uses a 5-pronged online communications approach to disseminate OAHN documents and other information from Ontario producer, veterinary, and government groups. We found that using these tools increased our audience and made it much quicker and easier to disseminate important animal health and outbreak information.

How does OAHN work in an outbreak of a federally reportable or provincially notifiable disease?

- Call OAHN groups together quickly to evaluate gaps.
- Develop rapid communication tools as needed.
- Disseminate materials on multiple platforms and be a landing spot for communications from other organizations and jurisdictions.
- Provide support to efforts of OMAFRA and CFIA.

How does OAHN work in an outbreak of an emerging disease/threat or resurgence of an endemic disease?

- Regularly evaluate trends in available data with key experts (Expert Network teleconferences).
- Review and evaluate news items globally to evaluate emerging threats to the Ontario herd/flock.
- Develop meaningful tools to communicate risk, and best actions to veterinarians and producers.
- Disseminate information to the right groups at the right time/season.

OAHN's communications tools can be broken into 2 categories:

Media tools are the tools we use to house or create communications

- Infographics,
- Podcasts,
- Info sheets,
- Reports

Promotion tools are used to raise awareness about Ontario animal health and disease. We make sure that we have a way of reaching out to

- veterinarians,
- RVTs, producers,
- general public

OAHN Communications Tools

OAHN website

The OAHN website is the hub for all OAHN information. This is where all communications are originally posted, including reports, disease alerts, and third-party announcements that we think will be valuable for animal health in Ontario. Contact information, a sign-in section for veterinarians and RVTs, and other animal health resources are available here. The website has 500 veterinarians and RVTs registered to view our veterinary reports and information, and the site sees more than 5,000 page views per month. As well, we keep a repository of all of our OAHN communications tools, including Disease Surveillance Scan articles, infographics, podcasts, social media posts, Mailing List sign-ups, resources, and other news.

Podcasts

OAHN podcasts cover everything from updates on disease outbreaks in Ontario, to biosecurity tips for producers, to continuing education for veterinarians and vet students, to disease information for pet owners. Our podcasts have been particularly important in gaining younger followers and followers from the veterinary school who will soon be entering the veterinary field, with OAHN as a main source of information. We have published more than 70 podcasts, have received around 25,000 listens, and have covered most of our species groups.

Infographics

Our infographics have been made in-house and by professional designers, and have been shared widely by pet owners, veterinary groups, and producer groups. Infographics have been a great way to visually explain complex topics such as biosecurity protocols or a new disease threat such as *Echinococcus multilocularis*. Infographics have been viewed tens of thousands of times on OAHN.ca and have been distributed physically and digitally throughout Ontario and Canada.

Social media

We focus on Twitter and Facebook for social media outreach, and this is how we promote all of our communications products. We have around 2,000 followers between the two platforms, and yearly we received upwards of 200,000 impressions on our posts. The majority of our followers are from Ontario. These channels have proven to be effective emergency preparedness tools to communicate disease information rapidly.

Mailing lists

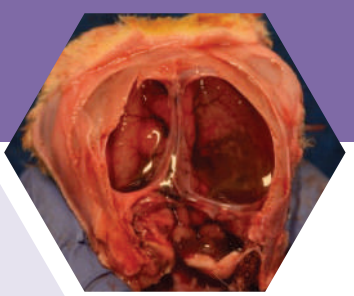
Our mailing lists have given us a way to contact nearly a thousand vets in Ontario to inform them of disease advisories, veterinary surveys, and other animal health news. Our open rates and click-through rates are far above industry averages.

Small Ruminants Network

The OAHN small ruminant network, the first to be established during OAHN's infancy in 2014, has a traditional OAHN structure, with a group of three practitioners from geographic regions in the province (south-western, northern, and eastern Ontario), an AHL pathologist, OVC specialist, and an OMAFRA co-lead. The network meets quarterly, and publishes a veterinary report and a producer report. Industry groups are consulted in advance of the calls, and participate heavily in distributing the producer reports. Producer reports are distributed within six organizations, including print magazines, and OMAFRA publications, providing solid mileage on each publication.

Examination of condemnation data from provincial abattoirs is an important part of OAHN calls for food animal networks. During one call, it was noted that condemnation rates for small ruminants were higher than other food animals. This issue was investigated and discussed with industry by the OAHN network. Challenges associated with making timely culling decisions on-farm and euthanasia methods were key issues associated with condemnations. The data and investigation was used to leverage funding for hands-on euthanasia training for 123 producers in Ontario.

During Christmas 2015, a strange presentation of abortion was noted at the Animal Health Lab by OAHN Small Ruminant Network member and pathologist, Dr. Maria Spinato. Dr. Spinato immediately sent samples away for Cache Valley virus, not previously reported in Ontario. The network was alerted, and created a disease advisory detailing the emerging pathogen, presentation, testing, and actions to take, for industry and veterinarians within one month of the diagnosis.



OAHN Small Ruminant Research Project 1:

Distance support for on-farm investigation of adult small ruminant mortalities

Project Lead: Dr. Maria Spinato
Collaborators: Dr. Paula Menzies, Dr. Andria Bitton-Jones, Dr. Jocelyn Jansen, Ms. Jeanette Cooper

Little is known about causes of mortality in adult sheep and goats, likely because of a lack of investigation into adult deaths and limited postmortem technique when an investigation does occur. The "Distance support for on-farm investigation of adult small ruminant mortalities" project was developed to investigate which diseases cause mortality in Ontario's sheep and goat populations. An online tool was designed to encourage postmortem submission and to assist in improving the technique of veterinarians performing on-farm postmortems for adult animals. To date, 48 postmortem cases have been submitted through the project, with only seven cases remaining undiagnosed. Diagnoses in sheep include: nasal tumours, copper toxicity, and hemonchosis, among many others. Focus groups are now being arranged with veterinarians and producers who have submitted a postmortem using the on-line tool.

OAHN Small Ruminant Research Project 2:

Seroprevalence & risk factors of Toxoplasma gondii exposure in small ruminants in Ontario, Canada

Project Lead: Dr. Paula Menzies (OVC)
Collaborators: Drs. Shannon Meadows (OVC), Karen Shapiro (UC Davis)

Toxoplasmosis is a zoonotic infection caused by *Toxoplasma gondii*, a protozoan parasite for which only cats serve as definitive hosts. Researchers wanted to determine the seroprevalence of *T. gondii* exposure in sheep and goats in Ontario and identify risk factors for *T. gondii* exposure in sheep and goats Researchers took a cross-sectional serologic survey of sheep and goat farms in Ontario, including 39 meat sheep, 9 dairy sheep, 28 meat goat, 30 dairy goat between August 2010 and February 2012. A questionnaire was completed on each farm to collect data on farm-level management factors. Sera were analysed using an immunofluorescent antibody test (IFAT) with 1:80 seropositivity cut-off. The high seroprevalence identified in this study suggests a significant risk to humans of contracting infection from *T. gondii* may occur from consumption of undercooked meat or unpasteurized milk from sheep and goats in Ontario flocks and herds. It also suggests that the risk of abortion and neonatal loss caused by *T. gondii* infection is high in Ontario flocks and herds. This study supports the critical need to develop a safe and effective vaccine to prevent *T. gondii* infection in small ruminants.

Bovine Network

The OAHN Bovine Network has had two iterations since its inception in April, 2015. The network began as a traditional network, with members from OVC, AHL, OMAFRA, and private practice, with quarterly surveys and report. After receiving feedback regarding its quarterly reports and surveys, the network consulted with bovine practitioners throughout Ontario, and began having quarterly conference calls and communications with producers and veterinarians, without quarterly clinical impression disease surveillance surveys.

In 2015 and 2016, The Animal Health Laboratory found almost 40 isolations of *Salmonella* Dublin from Ontario herds. This form of salmonellosis had not been seen in Ontario until 2012, and it is very concerning because of the multi-drug resistance of the strain found, and because it can devastate a herd's calf population. In order to raise awareness around this disease in Ontario, the OAHN Bovine Network created a podcast series, covering *Salmonella* Dublin's clinical aspects, case studies from Quebec, a pathologist's perspective, and OAHN's calf surveillance project. This podcast series was distributed widely and had nearly 2,000 listens.

"Great way to share ideas and build my network within the industry."
Jaclyn Horenberg, Beef Farmers of Ontario

OAHN Bovine Research Project: Calf Surveillance

Project Lead: Dr. Ann Godkin (OMAFRA)
Collaborators: Drs. Andrew Brooks (AHL), Todd Duffield (OVC), Dave Kelton (OVC), Jessica Gordon (OVC), Crystal Throop (OABP & Temiskaming VS), Sherry Christie (OABP & Mildmay VS), Dave Douglas (OABP & Navan VS), Dave Renaud (OVC).

The project was divided into two parts:

- The objective of part one was to test bulk tank milk for antibodies to ***Salmonella*** **Dublin.**
- The objective of part two was to provide funding to encourage veterinarians to conduct more postmortem exams on calf mortalities among their producer clients' herds (dairy, cow-calf, and veal), with an additional benefit to the province of improving surveillance for ***Salmonella*** Dublin.

Results

Results were that 46 vets from 34 practices participated, and conducted or solicited postmortems on 108 calves. Postmortems were done on-farm (36) or referred to AH labs in Guelph or Kemptville (72). Two calves from two different operations were found to have *Salmonella* Dublin.

Of 154 bulk tank milk samples (one per herd), one was found positive. Subsequently two positive cows were identified as positive on cow serology.

Practitioner interest in this PM project was obvious. Although it takes a while to roll projects like these out, they need to run for at least 3-5 years to fully capture practitioner involvement. There were several good anecdotal responses indicating that practitioners found the outcomes very useful for making recommendations that led to targeted management changes on clients' farms.

Swine Network

The OAHN swine network is one of our oldest networks, previously existing as the Ontario node of the Canadian Swine Health Intelligence Network (CSHIN). The following team members are part of the network: OVC specialist, AHL pathologist, OMAFRA co-lead, three private practitioners, and industry partners from Swine Health Ontario, Ontario Pork, and the Ontario Swine Health Advisory Board. OMAFRA extension specialists from two branches, an AHL veterinarian, and a private laboratory specialist also participate. Calls take place quarterly, and contain a large amount of data sources including control charts based on practitioner surveys, and federal/provincial condemnation data, as well as emerging threats. Information from the OAHN call is shared on the national CSHIN surveillance call quarterly, and Ontario is a strong contributor.

In October 2016, Senecavirus A, also known as Seneca Valley virus, was found in Ontario pigs in transit going to the U.S. The disease agent had been circulating in the U.S. for some time and the OAHN Swine Network was already discussing it as an emerging threat for Ontario swine. Because the virus was found in swine in transit, the network focussed communication efforts towards swine vets and producers. The OAHN Swine Network created an information sheet informing veterinarians of Senecavirus A, and outlining what information vets should be passing to their clients about the virus. The document was distributed to veterinarians on the OASV listserv, CVO members registered as swine veterinarians, and in the AHL newsletter.

To raise awareness and educate Ontario swine veterinarians about influenza in swine, the OAHN swine network created an in-depth podcast series looking at the virus, including pathologist and practitioner perspectives, OVC research, Canadian perspective, the public health perspective, and the North American perspective. The podcast series has had nearly 3,000 listens.

Erysipelas and Influenza were identified as disease trends in consecutive quarters throughout 2017. The OAHN Swine Network tailored its clinical impressions surveys to ask veterinarians in private practice questions about these diseases with the goal of using this information to gain a better understanding of why disease was on the rise.

OAHN Swine Research Project:

The creation of a network of sentinel pig farms to enable coordinated preparedness, early detection, and response to animal disease.

Project Lead: Dr. Robert Friendship
Collaborators: Drs. Tim Blackwell, Terri O'Sullivan, Zvonimir Poljak, Vahab Farzan.

The main objective of the OAHN Swine Network Project was to create a sustainable program of demonstrated value to stakeholders. This project involved: 1) Enrolling 50 nursery barns in Ontario to act as sentinel farms representing the Ontario swine herd 2) Determining the prevalence of specific clinical signs such as coughing, lameness, diarrhea, ear necrosis, hernias etc. 3) Determining the prevalence of important swine pathogens and to explore whether the presence of certain pathogens is related to clinical signs, increased medication use, or a reduction in production performance. This project was possible due to the financial support of many organizations including the Ontario Animal Health Network (OAHN).

Many different studies have and will take place by use of the established sentinel herds. Preliminary results have revealed that the most common disease-related mortalities reported were due to streptococcal meningitis and post-weaning diarrhea. The highest morbidities reported were caused by porcine reproductive and respiratory syndrome virus (PRRSV) and influenza A virus. Varying antibiotic use was recorded on these farms that included no use, multiple drugs used to treat individual animals, and mass medication. An example of one of the studies that has taken place to date using this sentinel herd is a study on investigating different types of *Streptococcus suis* present. A total of 22 serotypes were identified with the most common typesbeing type 9 in sick pigs and type 31 in healthy pigs. Untypable isolates were found in 61% of healthy and 40% of sick pigs. We look forward to sharing the results of other studies conducted once results are compiled.

Equine Network

The OAHN Equine Network was formed in March 2015. It is composed of an OMAFRA co-lead, four private veterinarians representing southwestern Ontario, northeastern Ontario, and the Standardbred and Thoroughbred horseracing industries, a pathologist from the AHL, and a researcher from the Ontario Veterinary College. The equine network surveys equine veterinarians quarterly about trends in equine diseases, then holds a conference call to discuss these results along with laboratory test submissions resulting in the production of veterinary and owner reports, podcasts, or other educational material for both veterinarians and horse owners.

In August, 2016 a veterinarian contacted the OAHN Equine Network OMAFRA co-lead, Dr. Alison Moore, regarding an issue suspected to be the result of hoary alyssum toxicity on a farm in Norfolk County. During the same week, Dr. Moore also received an email from a second veterinarian regarding similar signs attributable to hoary alyssum toxicity in Simcoe County. The information from both incidents was sent to the OAHN Equine Network members who supported sending an alert along with information on the weed to the OAEP and CCVA list-serves. All information was disseminated through the OAHN distribution channels, which include equine veterinarians and equine industry participants.

At the end of 2016, there was an increase in the number of horses diagnosed with equine proliferative enteropathy (*Lawsonia*) at the Ontario Veterinary College. This increase was also noted by equine practitioners in the OAHN Equine Network's quarterly clinical impressions survey. After the findings were discussed on a quarterly conference call, the network agreed to move ahead with a podcast series with Dr. Nathan Slovis from Hagyard Equine Medical Centre in Lexington, Kentucky and network member Dr. Memo Arroyo. The three-part series has had more than 500 listens.

OAHN Equine Research Project:

Seroprevalence of Borrelia burgdorferi and Anaplasma phagocytophilum infection in Ontario horses

Project Lead: Dr. Memo Arroyo
Collaborators: Drs. Murray Hazlett, Cathy Furness, Alison Moore

The objectives of this project were to identify the prevalence of *B. burgdorferi* and *A. phagocytophilum* seropositivity in Ontario horses; identify geographic risk factors; and compare an in-clinic SNAP test to a Lyme multiplex assay.

Veterinarians from clinics across Ontario participated in the study. Serum samples from 564 horses were submitted along with a questionnaire that evaluated demographics, clinical history, and farm management of each horse in the study.

The overall prevalence of *B. burgdorferi* exposure for all of Ontario was 14% (80/564), with pronounced regional variability. The prevalence in horses appears to be highest in eastern Ontario, where 27 of 115 (24%) samples tested positive. The prevalence in southern Ontario was 15% (40/269); central Ontario was 10% (14/146), and in northern Ontario the prevalence was found to be 6% (2/33).

Half of the horse owners surveyed reported that they regularly check their horses for ticks; however, of those, 15% reported that they had found a tick on their horse. The majority of the horses (47%) were reported to live outside 24/7 on pasture, particularly in the summer months during tick season. Not surprisingly, deer were the most commonly identified wild animals present on these farms. Further investigation into the distribution and risk factors for *B. burgdorferi* and *A. phagocytophilum* exposure will aid in the continued monitoring and prevention of the disease.

Poultry Network

Members of the OAHN Poultry Network include an OMAFRA co-lead, OVC specialist, AHL pathologist, and four private practitioners representing the four primary commodities (broiler, broiler-breeder, turkey, and egg layer). Network meetings take place quarterly, and a veterinary and producer report is produced. Distribution of the producer report takes place via the Feather Board Command Centre, and the IBH meetings (producer organization meetings that take place quarterly). OAHN information is also collated as an annual update for producers as part of the Poultry Industry Council (PIC) Producer Updates that take place across the province during the winter months, and at the Western Poultry Disease Update.

On Easter weekend, 2015, highly pathogenic avian influenza was diagnosed in a poultry flock in Ontario. Prior to this diagnosis, on the heels of the HPAI outbreak in British Columbia, OAHN held an open emergency preparedness call in December 2014 to confirm emergency roles, important phone numbers, and re-iterate clinical signs from the BC outbreak. After the diagnosis, the OAHN poultry network met to examine areas where help was required. Outreach to small flock poultry producers was identified as a key area. A podcast and infographic were released rapidly, and shared using multiple methods: conference calls, social media, Pinterest, Kijiji, small flock poultry groups, etc. to communicate key clinical signs and required actions. Outreach to non-poultry veterinarians was also completed via the provincial licensing body. The Ontario outbreak of HPAI was contained within 4 months, and involved 80,000 birds, as opposed to the outbreak in the US, which involved 49.5 million birds and cost an estimated $3.3 billion.

Infectious bronchitis virus is not a new or emerging pathogen in Ontario poultry. However, in 2017, this disease had a serious effect on several sectors within the poultry industry. A new mutation of the virus was noted on OAHN network calls and tracked via genotyping performed at the Animal Health Laboratory. In collaboration with OMAFRA's Provincial Premises Registry and the Ontario Association of Poultry Veterinarians, the positive genotypes were mapped by county by month and shared with industry and veterinarians to provide intelligence on the geographic spread in Ontario.

OAHN Poultry Research Project:

Evaluating virulence genes and antimicrobial susceptibility of avian pathogenic Escherichia coli from Ontario broiler and broiler breeder flocks

Project Lead: Dr. Michele Guerin
Project Co-Lead: Dr. Csaba Varga
Collaborators: Drs. Durda Slavic, Patrick Boerlin, Marina Brash, Emily Martin, Rachel Ouckama, Alexandru Weisz, Mike Petrik, Cynthia Philippe, Melanie Barham

Avian pathogenic *Escherichia coli* (APEC), a subgroup of extra-intestinal pathogenic *E. coli*, is the causative agent of colibacillosis in poultry. Colibacillosis can cause high morbidity, mortality, and cellulitis in broiler chicken flocks, leading to extensive economic losses. Based on surveillance data collected through the Ontario Animal Health Network, systemic bacterial infection caused by *E. coli* is very common in chickens of all ages in Ontario. Previous research has identified correlations between antimicrobial resistance and virulence in APEC isolates; however, there have been no studies conducted in Ontario evaluating virulence-associated genes and antimicrobial resistance patterns of APEC strains in broiler and broiler breeder flocks.

This study identified high frequencies of resistance to tetracycline, gentamicin, spectinomycin, and ampicillin among APEC isolates- antimicrobials that are frequently used to treat colibacillosis in broilers. The most common genes identified were *sitA, Iss, iroN, iutA, ompT,* and *etsB*. Significant associations between resistance to individual antimicrobials and virulence-associated genes were noted. Our results provide information on antimicrobial resistance and virulence gene patterns currently present on Ontario broiler chicken and broiler breeder farms that can be used as a benchmark from which to measure changes as the industry moves toward reduced antimicrobial use.

Small Flock Poultry Network

OAHN's poultry network has a sub-group that caters to non-poultry veterinarians who are called upon to deal with the 16,000 non-contract poultry growers in Ontario. The group is primarily a listserv for interested veterinarians in Ontario, with experts including full-time poultry veterinarians, the OMAFRA poultry network co-lead, and the OMAFRA poultry extension specialist, to name a few. The group was started following a one-day workshop held by OAHN in 2016. The workshop was recorded, and is a legacy course available on the OAHN website. Although the small flock subgroup does not meet, it serves multiple purposes:

- Provides a communications pathway with veterinarians who may interact with small flock poultry, important to maintain for emergency and outbreak purposes;
- Capacity building for small flock poultry veterinary knowledge in the province;
- Relief for full time poultry practitioners, many of whom field multiple questions from practitioners per week.

It is anticipated that the listserv will become more important as the new requirement for a veterinary prescription for all antimicrobials takes effect in late 2018. Information from the small flock listserv is shared with the OAHN poultry network, and reports are shared back to the small flock listserv.

Alternative Species Network

The OAHN Alternative Species network was first established in 2015, and does not have a typical OAHN species network structure. This network focuses on mink health, and is made up of two Animal Health Laboratory pathologists, an OVC researcher, and the OMAFRA Alternative Livestock Specialist. The Alternative Species network met regularly to discuss mink health with renowned American mink veterinarian Dr. Hugh Hildebrandt. The Alternative Species network differs from other networks, as there is no survey or report sent out. The network's semi-annual meetings exist as Q&A periods for Ontario vets dealing with mink.

In April 2015, the mink/alternative species network started with a wet lab at the Animal Health Laboratory. Experts from the mink field were recruited as instructors to this day-long course for any veterinarian wishing to learn about mink. Industry provided generous funding for the wet lab and lectures. 15 veterinarians from Ontario attended the lab in person, and all expressed interest in continuing as part of the OAHN group. Five additional veterinarians attended via web conference. The lectures were recorded and were made available to participants.

OAHN Alternative Species Research Project:

Developing a health and disease surveillance network for Ontario mink farms

Project Lead: Dr. Patricia V. Turner
Collaborators: Brian Tapscott, Drs. Marina Brash, Emily Martin, Davor Okjic

This project evaluated the occurrence of infectious diseases on a limited number of Ontario mink farms over a two-year period. It proved difficult to recruit producers to participate in this program. Fecal PCR shedding patterns were evaluated on 100% of Ontario mink farms for both 2016 and 2017. Mink astrovirus, hepatitis E virus, ad porcine rotavirus were detected in some samples from some farms in both 2016 and 2017, generally at modest levels. Antimicrobial resistance was also detected on three of 44 and five of 42 farms for 2016 and 2017, respectively, including on one farm in 2017 with high levels of resistance to multiple agents. Because of the concerns around biosecurity standards on mink farms, antimicrobial use should be monitored and controlled for these animals in the future.

Companion Animal Network

The OAHN Companion Animal Network is made up of an OMAFRA co-lead and private practitioner co-lead, two additional private practitioners, two OVC specialists, and an AHL pathologist. Network meetings take place and a veterinary report is produced quarterly. The Companion Animal Network distributes its reports primarily via email to veterinarians and technicians who subscribe to the network, and sends the links to veterinary groups around Ontario to reach those not yet on the network.

After a 10-year absence, raccoon-variant rabies returned to Ontario in December 2015. A raccoon that had an altercation with two large dogs tested positive for rabies. Since then almost 400 cases of raccoon-variant rabies have been detected in and around the Hamilton area. Genetic analysis of the virus strain suggests that the outbreak was the result of a rabid animal having been translocated more than 500 km from southeastern New York where the virus is endemic. OMAFRA and Public Health agencies quickly sprang into action to alert the public and local veterinarians about the increased risk in the area, while the Ministry of Natural Resources and Forestry (MNRF) immediately actioned an oral rabies vaccine (ORV) baiting campaign for wildlife. OAHN had already published two rabies podcasts for veterinarians, and had gained a small following on Facebook and Twitter by this time, as well as having a spot on its website to provide updates about rabies in Ontario. The OAHN Companion Animal network recorded an updated podcast for veterinarians, and the OAHN coordinator and communications administrator published and promoted rabies updates every week. OAHN and OAHN's social media accounts quickly became the go-to spot for information on rabies in Ontario, with local newspapers also picking up on these posts, and with social media posts being delivered to thousands of Ontario residents.

"Up to date disease alerts, particularly through social media, allowing practitioners to inform clients about emerging health issues for their pets, before they hear about them from other sources." Dr. Emma Webster, companion animal veterinarian

When canine influenza was first detected in Ontario in January 2018, the OAHN companion animal network was there to help get the word out. Utilizing the OAHN website and mailing list, which has contacts for hundreds of Ontario companion animal veterinarians, and social media accounts, which reach nearly 2,000 interested individuals, OAHN was able to quickly disseminate the news of the canine influenza cases. Before any major news organizations covered the story, OAHN's Companion Animal Network reached thousands of vets in Ontario with information about the event and resources for veterinarians.

OAHN Companion Animal Research Project 1:

Investigation of the prevalence of *Echinococcus multilocularis* and risk of infection in wild canids in Ontario, Canada

Project lead: Dr. Andrew S. Peregrine
Collaborators: Jonathon Kotwa (OVC PhD student), Drs. Claire Jardine, David Pearl, Olaf Berke, Nicola J. Mercer, Mats Isaksson, Mikael Juremalm and Eva Osterman-Lind

Echinococcus multilocularis is a small, zoonotic tapeworm that is typically maintained in a wildlife cycle. Ingestion of the eggs shed by definitive hosts (primarily wild canids) by humans and dogs can result in alveolar echinococcosis (AE), a disease that is potentially fatal when left untreated. Prior to 2012, Ontario was thought to be free of this parasite. Since then, cases of AE have been reported in five dogs, two lemurs, and one chipmunk in southern Ontario. The primary objectives of this study were to determine where in southern Ontario *E. multilocularis* occurs, and to elucidate risk factors associated with infection in wild canids.

From November 2015 to March 2017, rectal fecal samples collected from 460 wild canid carcasses (416 coyotes, 44 foxes) were analyzed for the presence of *E. multilocularis* DNA. Overall, 23% (95% confidence interval: 19-27%) of wild canids from the western, central, and eastern regions of southern Ontario tested positive. Additionally, a significant high-prevalence cluster was identified in the western-central region (Golden Horseshoe). Notably, the infection cluster coincided with areas of high human population density, suggesting that zoonotic transmission should be a public health concern. These results provide important information that can help guide public health and veterinary efforts in the development of prevention strategies, particularly in high-risk areas.

OAHN Companion Animal Research Project 2:

Companion animal infographics

Project Lead: Dr. Maureen Anderson (OMAFRA)

The OAHN Companion Animal expert network worked with a professional graphics designer to produce four separate infographics on current and emerging disease topics (Lyme disease, leptospirosis management, reducing antimicrobial use, *Echinococcus multilocularis*) for use by Ontario veterinarians. The products were released on a quarterly basis and posted on the OAHN website along with pertinent references. Links to the infographics were included in the quarterly veterinary reports and surveys. Feedback to date indicates that of those veterinarians who have accessed the products, the vast majority found them useful.

Fish Network

The OAHN Fish Network is made up of an OMAFRA co-lead and private practitioner co-lead, as well as representatives from the aquaculture industry, Ontario Ministry of Natural Resources and Forestry (OMNRF), the University of Guelph, the Animal Health Lab, OMAFRA, and the Canadian Food Inspection Agency. The Fish Network had its first meeting in the fall of 2014, and has a roundtable approach to disease surveillance, where the network will discuss current disease concerns, and will then prepare information to disseminate to the industry.

In the spring of 2017, a possibly catastrophic fish disease not previously documented in Canada was discovered in Alberta. Whirling disease is caused by *Myxobolus cerebralis*, a parasite that affects salmonid fish, including salmon, trout, and charr. The introduction of whirling disease into Ontario could devastate both commercial fisheries and aquaculture operations. Because the parasite can be spread by moving infected animals and contaminated equipment or water, the members decided to create information sheets for recreational water users and fish farmers, to help educate and prevent the spread of the disease into Ontario. The information sheets were published on-line, and distributed via social media, physical mail-outs, and newsletters.

The OAHN fish network began discussions on what may happen if a disease such as whirling disease, or another emerging pathogen, came to Ontario. Through these discussions, the network decided to initiate conversations between the Ontario Ministry of Natural Resources and Forestry (OMNRF), the Canadian Food Inspection Agency, and OMAFRA to define roles and responsibilities of each group in the event of an emerging aquatic animal disease outbreak.

OAHN Fish Research Project:

Antibiotic resistance in Ontario aquaculture

Project Lead: Dr. Marcia Chiasson (OMAFRA)
Collaborators: Dr. Veronique LePage, Steve Naylor

The objective of this study was to survey fish from aquaculture farms in Ontario to determine the prevalence of bacterial pathogens and antibiotic-resistant strains of bacteria. Additionally, the project aimed to assist in the establishment of veterinarian-client- patient relationships in the aquaculture industry.

"The fish group has been able to create a great working group that has tackled issues relevant to TODAY. In no other group have I seen such immediate comprehensive response to challenge."

Arlen Taylor, aquaculture industry

A total of 55 fish specimens and 34 bacterial isolates were tested. Bacterial isolates were cultured from 54 of the 55 sample submissions. *Flavobacterium* spp. was isolated from 54% of the fish specimens and *Aeromonas* spp. was isolated from 29% of the samples. Other bacterial pathogens, including *Edwardsiella* spp., *Streptococcus* spp., *Vibrio* spp., and *Yersinia* spp. were detected infrequently and ranged from 1.8% to 5.5% of fish samples.

Bee Network

The OAHN Bee network is comprised of an OMAFRA co-lead and a co-lead from the Ontario Beekeepers' Association (OBA), as well as representatives from the University of Guelph, Niagara College, York University, the Animal Health Laboratory, OMAFRA, and the OBA. The OAHN Bee Network is a pragmatically focused group that meets bi-annually to discuss diseases affecting pollinators in Ontario, changes in government legislation, and chances for outreach and education. The network releases the information through written reports and podcasts.

With many beekeeper and pollinator organizations in Ontario, the OAHN bee network wanted to distinguish itself as a source for reliable information related to beekeeping and pollinator welfare in Ontario. Network members discussed the best method of sharing information with beekeepers. Beekeepers, like veterinarians, spend a lot of time driving. So, the network decided to do a series of podcasts, covering all facets of information for Ontario beekeepers, bee industry professionals, and academics. Led by the Bee Network OMAFRA co-lead, and drawing on the vast amount of experience and knowledge within the network, the OAHN bee network produced 5 podcasts covering current research being done in Ontario, laboratory resources for beekeepers, resources for new and experienced beekeepers, the beekeeping program at Niagara College, and the Honey Bee Research Centre at the University of Guelph. These podcasts were promoted through outreach at bee industry meetings, and through the OAHN website and social media accounts.

OAHN Bee Research Project:

Culture, antimicrobial susceptibility and molecular typing of Paenibacillus larvae, a causative agent of American foulbrood (AFB)

Project Lead: Dr. Durda Slavic
Collaborators: Les Eccles, Paul Kozak, Wael Haddad, Martha Fabri, Dr. Marc Schäffer

American foulbrood (AFB) is the most devastating bacterial disease of honey bee larvae. *Paenibacillus larvae*, the bacterium that causes AFB, produces spores that can survive in the environment for over 35 years. The spores can easily spread from colony to colony by adult honey bees and by different equipment used in beekeeping. This project was designed to collect and characterize *P. larvae* isolates from Ontario bee yards with AFB (clinical cases) and from bee yards without AFB (non-clinical cases). In addition, susceptibility to different antimicrobials was determined. Unlike for clinical cases for non-clinical cases, there was a very low recovery (3.2%) of *P. larvae* isolates. As only a very limited number of bee yards (13) were tested and they were pre-selected, it is likely that this number does not accurately represent the situation in the field. With over 6,500 bee yards registered in Ontario, there is a need for a larger study to determine the true prevalence of *P. larvae* in yards with no clinical AFB.

At the end of the study, 103 *P. larvae* isolates were used for susceptibility testing. At present, no isolates appear to be resistant to oxytetracycline, a drug predominantly used for preventive treatment of *P. larvae* in Ontario. However, resistance to lincomycin was detected in all isolates tested so far. This finding was not expected because lincomycin is not a drug used or approved for prevention of AFB in Ontario.

"The OAHN Surveillance Project (AFB) was excellent for giving us a picture of disease status and resistance in Ontario."

Jim Coneybeare, Ontario Beekeepers' Association"

Wildlife Network

The OAHN Wildlife Network has co-leads from OMAFRA and the Canadian Wildlife Health Cooperative at the Ontario Veterinary College, and is rounded out by members from Ontario Ministry of Natural Resources and Forestry, the OVC, and the Ontario Ministry of Health and Long-Term Care. The OAHN Wildlife Network meets three times a year and holds a roundtable discussion on issues and diseases affecting wildlife in Ontario.

In addition to the CWHC reports that are published and distributed through OAHN, the Wildlife Network also produced a Wildlife Health Surveillance infographic, which explains One Health, how humans influence Canada's wildlife, and the importance of surveillance.

"Greatly enhanced awareness of diseases affecting domestic animals, livestock and wildlife and the various efforts being taken to address them. A great resource."

Chris Heydon, Ontario Ministry of Natural Resources and Forestry

Jim Coneybeare, Ontario Beekeepers' Association"

OAHN Wildlife Research Project:

Developing and piloting a web-based reporting system to enhance wildlife disease surveillance in Ontario

Project Lead: Dr. Claire Jardine
Collaborators: Dr. Jane Parmley, Dr. Colin Robertson, Mark Reist, and Kevin Brown

The Wildlife Health Tracker (WHT) is a citizen science web-based reporting tool that allows individuals to record observations of dead and diseased wildlife they encounter across Ontario. The goal of the WHT is to improve wildlife health surveillance by making it easier for the public and groups interested in wildlife health to report sick and dead wild animals. The WHT has the potential to augment wildlife surveillance by capturing an additional subset of information not captured by traditional wildlife surveillance activities to enhance conservation efforts, and public health planning.

Mark Reist, a Masters of Public Health (MPH) candidate at the Ontario Veterinary College, is working with the CWHC to evaluate the type of data captured by the WHT compared to traditional CWHC surveillance activities, assess the WHT through survey distribution, as well as the development of promotional and educational materials on wildlife surveillance. Mark is also completing a review of wildlife health surveillance literature for publication. These activities will help to inform future wildlife health surveillance and conservation efforts.

For more information please visit: http://wildlifehealthtracker.com

Integration with National Surveillance

Canadian Animal Health Surveillance Network

The Canadian Animal Health Surveillance Network (CAHSN) is a network of federal, provincial, and university animal health laboratories that was established in 2005 through a 4-year project funded by Defence Research and Development Canada. The CAHSN is an example of how collaboration and innovation provide an improved early detection and rapid response to animal disease threats and help minimize risks to animal health, public health, and to Canada's economy.

The CAHSN provides:

- An integrated federal-provincial-university laboratory network for the detection of serious infectious diseases of animals.
- An early warning surveillance system for animal disease threats to animal health, human health, and the security of the food supply.
- A common information-sharing platform for linking federal and provincial animal health agencies and departments of human health.

Canadian Animal Health Surveillance System (CAHSS)

CAHSS is an initiative of the National Farmed Animal Health and Welfare Council. It is a self-organizing, self-governing network-of-networks involved in animal health surveillance. The role of CAHSS is to link existing networks to encourage more effective, integrated, and responsive animal health surveillance. CAHSS is inclusive of all those involved in or affected by surveillance decisions. Animal health, public health, and wildlife health are represented within the CAHSS networks and the owning members work on any diseases/issues of concern from reportable, zoonotic, and emerging to production-limiting diseases and antimicrobial use surveillance. Specific objectives are determined by the individual network groups.

OAHN members are active in the CAHSS network groups, and fully engaged as Directors of CAHSS. OAHN is a vital component of the national network-of-networks; its integration with national surveillance efforts has contributed to the success of both the Disease Surveillance Plan as well as fully supporting the shared goal of integrated, effective, responsive animal health surveillance in Canada.

Community for Emerging and Zoonotic Disease (CEZD)

CEZD was developed as a result of the ever increasing occurrence of global emerging and zoonotic disease outbreaks. Community members are a diverse group of professionals with expertise in animal health, animal agriculture, public health, and environmental health, from the private sector, multiple levels of government, and industry associations. The goal of CEZD is to support Canada's early warning, preparedness, and response capabilities through the gathering of information, and generation and distribution and timely intelligence reports.

OAHN is a community partner, and is actively engaged in the development of CEZD. The Canadian Food Inspection Agency (CFIA) currently funds the CEZD core team and the Public Health Agency of Canada (PHAC) provides the computer technology to support collaboration; partners contribute their expertise, time and support, and all benefit from the collaboration opportunities and networking. CEZD is a network linked within the CAHSS network-of-networks.

CEZD continues to grow and develop. New members are welcomed and are encouraged to share their ideas, and take leadership from within the community, to improve Canada's ability to identify emerging threats early, so that actions can be taken sooner.

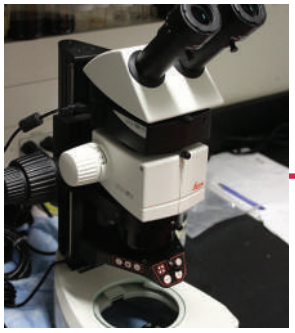
DSP equipment purchases in support of improved tools for managing risk

Roche Lightcycler 480 instrument with computer and Lightcycler 480 block kit 96 – added another thermocycler to increase our capacity in this high-volume test area.

Rees Scientific, Equipment Monitoring System (EMS) – automated temperature monitoring system installed in 127 refrigerators, freezers, and incubators throughout building 89 in order to ensure reliable temperature control of equipment that is critical to laboratory operations.

BioTek Multiflow Fx microplate washer-dispensers and BioTek BioSpa 8 automated incubator - links ELISA readers and imagers with washers and dispensers for full workflow automation for one of our highest volume tests, and as an economical replacement for our aging ELISA robot.

Pluggo Bench Top Decapper – a compact bench-top device that safely and efficiently removes original caps from blood specimen tubes, hence preventing repetitive strain injuries, such as carpal tunnel syndrome.



Leica M80 Stereomicroscope – in support of microscopy needs for microdissections and examinations, e.g., of honey bees.

Siemens Advia 2120 automated hematology analyzer – provides increased capacity and reliable backup for an existing Advia 2120

4 Upright -80°C ultra-low temperature freezers – to increase our biobank storage capacity. Grand Caravan minivan – for use in client outreach activities, including in-clinic quality assurance programs and veterinary client contacts.

Roche Flow Flex PCR Solution - automating primary sample handling and PCR (polymerase chain reaction) setup for rapid detection of a range of microbial targets; adds a pipetting instrument and the MagNA Pure 96 to our Roche qPCR systems to accomplish workflow standardization, optimal data traceability and automation, and in turn improve cost efficiency, reduced possibility of errors, and increased throughput.

Test Development in support of improved tools for managing risk

Test name - Method

- Antimicrobial susceptibility, honey bee, *P. larvae*
- Bacterial culture, honey bee, American foul brood (*Paenibacillus larvae*)
- Bacterial culture, fecal, equine
- Bacterial culture, aerobic and anaerobic, food animal
- *E. coli*, APEC (avian pathogenic) - genotyping
- *Brachyspira* spp - PCR
- Bacterial culture, honey bee, European foulbrood (*Melissococcus plutonius*)
- Bacterial culture, honey bee
- HSFP, primary and delayed secondary enrichment - Salmonella culture
- Bacterial identification - MALDI-TOF
- MIC, anaerobe
- MIC, bovine/porcine, anaerobes
- MIC, NARMS
- Amikacin - immunoturbidimetric
- Interleukin 6-ELISA
- Serum indices - photometric
- Leptin - ELISA
- Tumor necrosis factor alpha - ELISA
- IHC, lymphocyte clonality - PCR
- *Batrachochytrium dendrobatidis & B. salamandrivorans* - PCR
- Bacterial culture, non-food fish
- *Ophidiomyces ophiodiicola* - PCR
- Potomac horse fever - PCR
- Acute bee paralysis virus (ABPV) in honey bees - qRT-PCR
- *Bacillus anthracis* (anthrax) - real-time PCR
- *Apocephalus borealis* (zombie fly) in honey bees - qPCR detection
- Honey bee virus qRT-PCR
- Black queen cell virus (BQCV) in honey bees - qRT-PCR
- Honey bee tracheal mite detection
- Chronic bee paralysis virus (CBPV) in honey bees - qRT-PCR
- *Crithidia mellificae* in honey bees - qPCR detection
- CO1 mtDNA - gene sequencing and analysis for species identification
- Fish bacterial culture, farmed fish
- Deformed wing virus (DWV) in honey bees - qRT-PCR
- *Echinococcus multilocularis, E. granulosus and Taenia spp*. - PCR
- Generic DNA sequencing
- *Haemoplasma*, non-feline, non-canine - PCR
- *Mycoplasma hyorhinis* - PCR
- *Mycoplasma hyosynoviae* - PCR
- Israeli acute paralysis virus (IAPV) in honey bees - qRT-PCR
- Bacterial identification, fish - MALDI-TOF
- Infectious salmon anemia virus - PCR
- Kashmir bee virus (KBV) in honey bees - qRT-PCR
- *Lotmaria passim* in honey bees - qPCR detection
- MLST molecular typing
- *Mycoplasma meleagridis* - real-time PCR
- *Mycoplasma species* - PCR
- *Nosema apis* in honey bees - qPCR
- *Nosema ceranae* in honey bees - qPCR
- *M. hyopneumoniae* - gene sequencing typing
- Scrapie resistance PrP genotyping, codons 136, 137, 154, 171, 176 - sequencing
- *Spiroplasma apis* in honey bees - qPCR detection
- Sacbrood virus (SBV) in honey bees - qRT-PCR
- Small hive beetle (*Aethina tumida*) - PCR
- *Spiroplasma melliferum* in honey bees - qPCR detection
- Honey bee virus qRT-PCR
- *Varroa* haplotyping - PCR
- Fish viral hemorrhagic septicemia virus (VHSV) - PCR
- Vitellogenin biomarker levels in honey bees - qRT-PCR
- *Myxobolus cerebralis* (whirling disease pathogen) - PCR
- Postmortem, ORC, CT imaging
- Anthrax - Tetracore rapid test
- Fecal flotation, wildlife
- *Tritrichomonas foetus*, feline - culture
- Fecal oocysts count - modified McMaster
- Bromethalin (desmethylbromethalin) - LC-MS/MS
- Iodine, milk - ICP-MS
- Canine distemper virus sequencing - PCR
- Canid herpesvirus 1 (CaHV-1)-PCR; Canine adenovirus 2 (CAdV-2) - PCR; Canine parainfluenza virus (CPIV)-PCR
- Canine parvovirus 2/Feline panleukopenia virus sequencing
- Equid herpesvirus 1 - PCR
- Feline calicivirus/Felid herpesvirus 1 - PCR
- Avian metapneumovirus type C (AMPV type C) - PCR
- Astrovirus, avian - PCR
- Bovine neonatal enteric panel (includes Bovine coronavirus (BCoV) - PCR, Rotavirus ruminant Group A and B - PCR (rocopcr), Sucrose wet mount (sucwt), Bacterial culture, food/fiber producing animals (other than swine) (cultf, bsetup).
- Bovine abortion panel - PCR (BoHV-1/IBR, *Leptospira, Neospora caninum*)
- Bovine respiratory virus panel - PCR (BoHV-1/IBR, BPIV-3, BRSV)
- Bluetongue virus/Epizootic hemorrhagic disease virus - PCR
- Avian adenovirus - PCR
- Influenza A virus, H1N1 - HI
- Influenza A virus, H3N2 - HI
- Influenza A virus, H3N8 - HI
- Influenza A virus, H5 - PCR
- Influenza A virus, H7N7 - HI
- Influenza A virus, H7 - PCR
- IBRV/BoHV-1 – Ab ELISA
- Influenza A virus, matrix - PCR
- Influenza A virus, H - gene sequencing
- Influenza A, H1N1/H3N2 Typing - PCR
- Leptospira spp - PCR
- APMV-1 - chicken - ELISA
- APMV-1, turkey - ELISA
- Orf virus/bovine papular stomatitis virus - PCR
- Porcine coronavirus (PEDV, TGEV & PDCoV) - triplex PCR
- PEDV (Porcine epidemic diarrhea) - sequencing
- *Pasteurella multocida* toxin, swine - PCR
- Porcine respiratory coronavirus (PRCV) - PCR
- Rotavirus/coronavirus, bovine/equine - PCR. Includes Coronavirus - PCR, Rotavirus Group A and B - PCR
- Rotavirus, group A, B, C – PCR
- *Salmonella* Dublin - antibody ELISA
- Seneca Valley virus - PCR
- Anticoagulant rodenticides in tissues and other matrices - LC-MS/MS

Posters and Publications

The Disease Surveillance Plan has funded research, and OAHN has been presented, evaluated, and reviewed in multiple formats. Below are the highlights of some of the publications highlights and awards.

Abstracts and posters at national and international conferences from either OAHN sponsored projects, or OAHN related activities:

Poster presentations

Andrew Brooks. Clinicopathological features of *Salmonella* Dublin infection in Ontario cattle. ACVP Conference 2016.

Conference abstracts

Megan Neely, Scott Weese, Alison Moore, Murray Hazlett, Luis Arroyo. Seroprevalence of *Borrelia burgdorferi* and *Anaplasma phagocytophilum* in horses in Ontario. Canadian Animal Health Laboratorians Network Conference, Guelph, Ontario. June 2017.

Jim Fairles, Josie Given. Overview of a milk bacteriology QA program for veterinary clinics. Canadian Animal Health Laboratorians Network Conference, Guelph, Ontario. June 2017.

Alexander Heim. Mapping of the Ontario IBV outbreak. Canadian Animal Health Laboratorians Network Conference, Guelph, Ontario. June 2017.

Leonardo Susta, Nancy Brochu, Marina Brash, Csaba Varga, Michele Guerin. Ontario small poultry flock disease surveillance: year one. Canadian Animal Health Laboratorians Network Conference, Guelph, Ontario. June 2017.

Csaba Varga, Marina Brash, Emily Martin, Rachel Ouckama, Mike Petrik, Cynthia Philippe, Alex Weisz, Elizabeth Black, Shahbaz Ul Haq, Mike Joyce, Kathleen Long, Joanne Rafuse, Lloyd Weber, Melanie Barham, Durda Slavic, Tim Pasma, Patrick Boerlin, Michele Guerin. Evaluating virulence genes and antimicrobial susceptibility of avian pathogenic Escherichia coli from Ontario broiler and broiler-breeder flocks. Canadian Animal Health Laboratorians Network Conference, Guelph, Ontario. June 2017.

Christa Arsenault, Grant Maxie, Paul Innes, George Charbonneau, Chris Byra. Overview of the Ontario Animal Health Network swine surveillance network to improve disease emergency preparedness and its linkage to the Canadian Swine Health Information Network. Canadian Animal Health Laboratorians Network Conference, Guelph, Ontario. June 2017.

Marcia Chiasson, Véronique LePage, Steve Naylor. Antimicrobial resistance in Ontario aquaculture. Canadian Animal Health Laboratorians Network Conference, Guelph, Ontario. June 2017.

Melanie Barham, Jocelyn Jansen, Maria Spinato, Paula Menzies, Rex Crawford, John Hancock, Connie Dancho. Development of a responsive surveillance network for industries and veterinarians. International Sheep Veterinary Conference. June 2017.

Melanie Barham et al. Podcasts: a tool to enhance communications, lab sample quality, continuing education, and emergency preparedness with practicing veterinarians. American Association of Veterinary Laboratory Diagnosticians, Greensboro, NC. October 2016.

Melanie Barham, Marina Brash, Csaba Varga, Leo Susta, Lloyd Weber, Elizabeth Black, Mike Petrik, Michele Guerin, Al Dam Dam, Alex Weisz. Small flock poultry diagnostics and veterinary training: a new approach to a capacity and emergency preparedness issue. American Association of Veterinary Laboratory Diagnosticians, Greensboro, NC. October 2016.

Melanie Barham et al. Development of a collaborative animal health networks to improve surveillance and emergency preparedness in Ontario, Canada. American Association of Veterinary Laboratory Diagnosticians, Providence, RI. October 2015.

Melanie Barham, Bruce McNab, Bev McEwen, Tim Pasma. Building animal health surveillance network using laboratory and field data. World Association of Veterinary Laboratory Diagnosticians, Saskatoon, SK. June 2015.

Reports

W. Bruce McNab.

- Evaluation of Current and Potential Components of the Canadian Animal Health Surveillance System. December 2016.
- A Proposed Description of the Canadian Animal Health Surveillance System and a Strategic Plan for Its Next Evolutionary Steps. June 2015.
- A Description of Needs for a Veterinary-Farm-Call Animal Health Surveillance and Pharmacological Use Data System. June 2015.
- Further Evolution of the Ontario Animal Health Network Summary v.1. March 2014. See accompanying presentation.

W. Bruce McNab et al.

- High Level Summary of Animal Health Surveillance Acitivities in Canada. July 2015.
- Collation and Analyses of Data to Improve Animal Health Surveillance in Canada: Challenges, Options, Recommendations. November 2014.

Other Presentations

Csaba Varga et al. 2015-2016 Ontario Poultry Health Update, Ontario, 2016.

Melanie Barham, Alison Moore. CAHSS Equine Surveillance Workshop, Toronto, 2016.

Melanie Barham et al. Making use of multiple data sources and communications platforms. Canadian Animal Health Surveillance System Poultry Network meeting, Ottawa, ON. Nov 2017.

Maureen Anderson. Rabies Lunch Seminar at OVC. Guelph, ON, 2017.

W. Bruce McNab. Presentation to OLPC on real time surveillance. Guelph, ON, 2015.

Melanie Barham, Tim Pasma. Building the Ontario Animal Health Network. Canadian Animal Health Surveillance Network workshop, Vancouver, BC. February 2018.

ONTARIO ANIMAL HEALTH NETWORK

STAYING AHEAD OF THE CURVE

MAGAZINE:

Growing Forward 2

ONTARIO ANIMAL HEALTH NETWORK

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