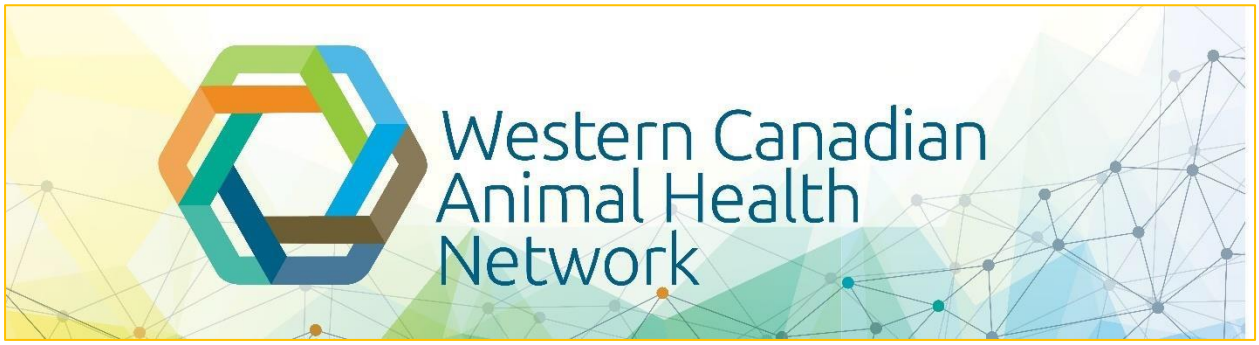


Western Canadian Animal Health Network

Year-end Summary – Spring 2024

Executive summary

Background

The Western Canadian Animal Health Network (WeCAHN) is a regional animal health surveillance system which began operations in April of 2020, with the support of the four western provinces (British Columbia, Alberta, Saskatchewan and Manitoba). WeCAHN is intended to be a permanent, sustainable framework for supporting animal health and welfare and veterinary public health in western Canada. The purpose of WeCAHN is to build an animal health surveillance system that connects producers, veterinarians, researchers and policy makers with the information needed to protect and improve animal health in western Canada (Western Canadian Animal Health Network (WeCAHN), 2021).

WeCAHN milestones in year four of operation (April 2023 – March 2024) included the hiring of a veterinary epidemiologist in shared position between WeCAHN and CAHSS, providing capacity for addition of smallholder and equine networks, launch of the WeCAHN smallholder network, and the expansion and enhancement of data analysis and visualization, including additional tabs and other upgrades to the WeCAHN clinical impressions survey dashboard.

Looking ahead, planned activities over the next four years include the addition of an equine network, enhancements to the ruminant "blister models" drafted in collaboration with the Canada West Swine Health Intelligence Network, improvements to the datasets derived from western provincial veterinary diagnostic laboratories, and improved messaging and risk communications.

Methods

A key defining function of WeCAHN is to operate as part of a broader provincial and national early warning system for disease outbreaks. To support connections with other regional and national networks, WeCAHN attends regular meetings of the regional surveillance network coordinators organized by the national group (CAHSS), as well as attending meetings of the CAHSS national sector specific networks, presenting regional information and updates. WeCAHN itself employs a structure involving the operation of multiple sector-specific networks (currently, beef cow-calf, dairy, poultry, and small ruminants).

The smallholder network launched in December of 2023 aims to help and identify and address gaps in support for small scale producers and the veterinary practitioners who serve them. WeCAHN also maintains an e-list of western veterinarians providing service to smallholder clients, and uses this to share updates on training opportunities, disease alerts, and KTT available from WeCAHN or other organizations.

The WeCAHN website functions as a conduit and virtual home for WeCAHN KTT, as well as a source of information on animal health news, and upcoming events and information. Two new features added to the website (a database of unusual cases and their diagnostics, and one of western veterinary practitioners offering service to smallholder clients are intended to address information gaps identified by the networks.

The WeCAHN staff (coordinator and veterinary epidemiologist) have regular discussions with the WeCAHN network participants, other surveillance networks such as OAHN, RAIZO, the

Canadian Animal health Surveillance System (CAHSS), the Canada West Swine Health Intelligence Network (CWSHIN), and AMRNet. Regular meetings are also held with industry groups such as the western Canadian cattle associations, and agricultural extension workers, as well as other stakeholders (e.g. the Western Canadian Certified Hoof Trimmers' Association), to share successes and challenges, identify surveillance gaps to which WeCAHN might contribute, and identify potential additional data sources, as well as emerging concerns. One of the best parts of WeCAHN staff work is discussing animal health issues with individual veterinary practitioners and producers as they contact WeCAHN on various matters, and this too is an important facet of maintaining connections in the western Canadian animal health early warning system.

Results

The primary activities of WeCAHN occur within the context of the individual networks (currently beef cow-calf, dairy, poultry, and small ruminants). The main activity of each network is the quarterly network meeting. Participants at the network meetings include: veterinary practitioners from each western province active in the pertinent sector (e.g. beef cow-calf); representatives from each of the four veterinary diagnostic laboratories; provincial veterinarians representing their respective ministries of agriculture, faculty from the two western veterinary colleges; representative of CIPARS, where pertinent; industry representatives, and other researchers. Each network participant contributes data, information or intelligence as they are able, to the network dataset collated by the coordinator prior to the network meeting. This forms the basis for the network meeting discussion of animal health events during the three month period under discussion. Notes summarising the discussion are added to the dataset to create communications in summary and longer report format, in parallel for both producers and veterinary practitioners. These materials as well as additional specific targeted communications arising from them are then shared with industry groups, pertinent veterinary specialist groups, and disseminated on social media and via the WeCAHN website.

Common themes in communications across specific WeCAHN networks include identifying and assessing signals of emerging disease, sharing risk communications, and drafting and sharing targeted KTT.

Milestones April 2023- March 2024

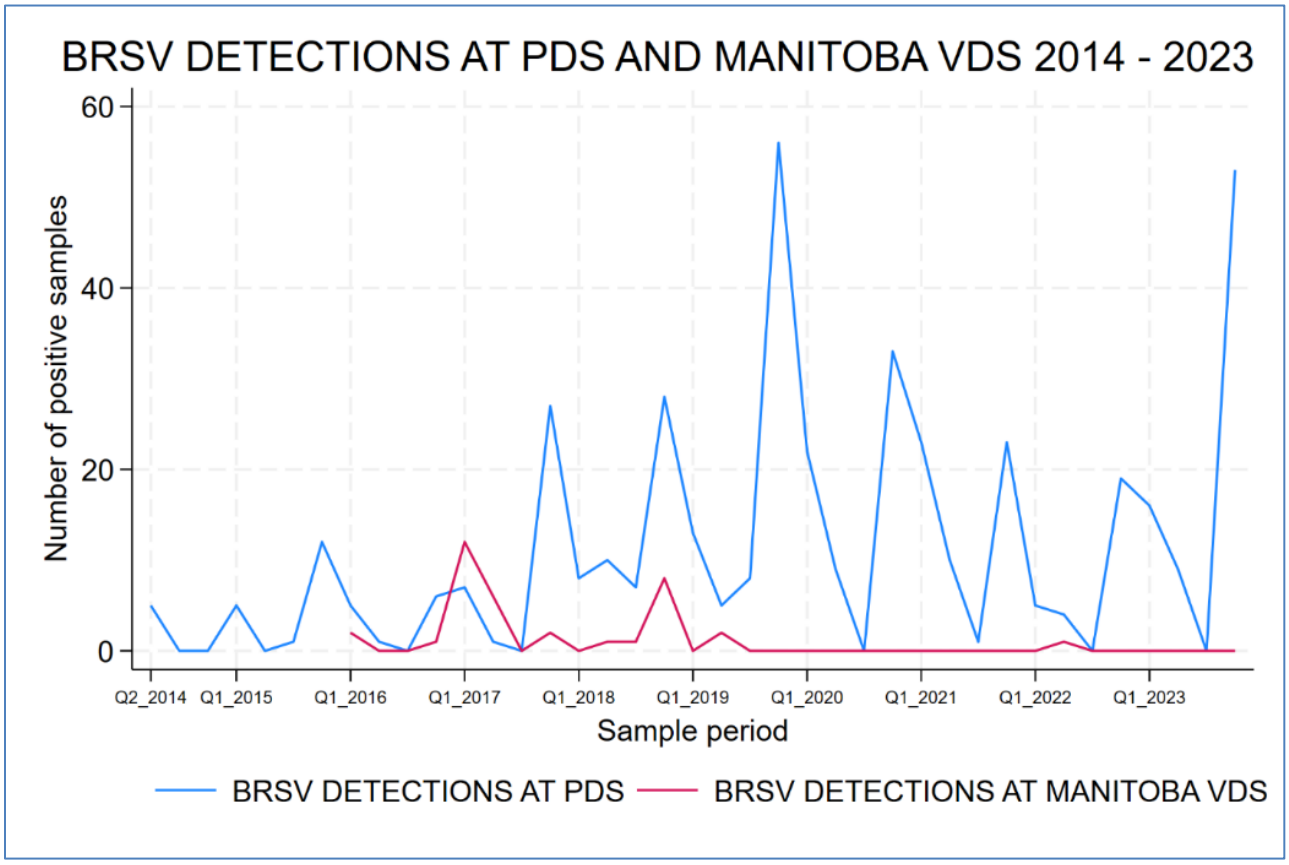
Beef network

The impacts of extreme weather on cattle health continued to be major topics of discussion at beef network meetings. These include a range of health problems, dominated in year four by reduced pregnancy rates in many western cow-calf herds. Consensus at successive beef network meetings is that this observation in fall of 2023 likely reflects the impact of successive years of drought on body condition scores. After the December 2023 beef network discussion and writeup on the topic of reduced pregnancy rates, network veterinarians were interviewed in a Beef Cattle Research Council (BCRC) blog on the topic.

Three recent outbreaks of Yersiniosis in feeder or breeding cattle in southern Saskatchewan have been reported to veterinarians and industry; sources of the bacteria are currently unclear.

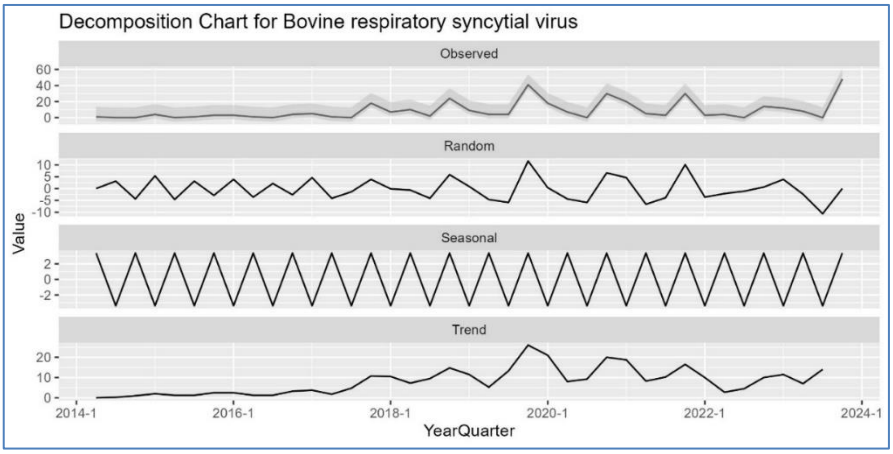
Given the prioritization of emerging disease as the outcome of greatest interest to the network, time series analysis of the laboratory data continues to be a work in progress.

Fig. 1. BRSV detections at Prairie Diagnostic Services (PDS) and MB VDS, Q2 2014 – Q4 2023



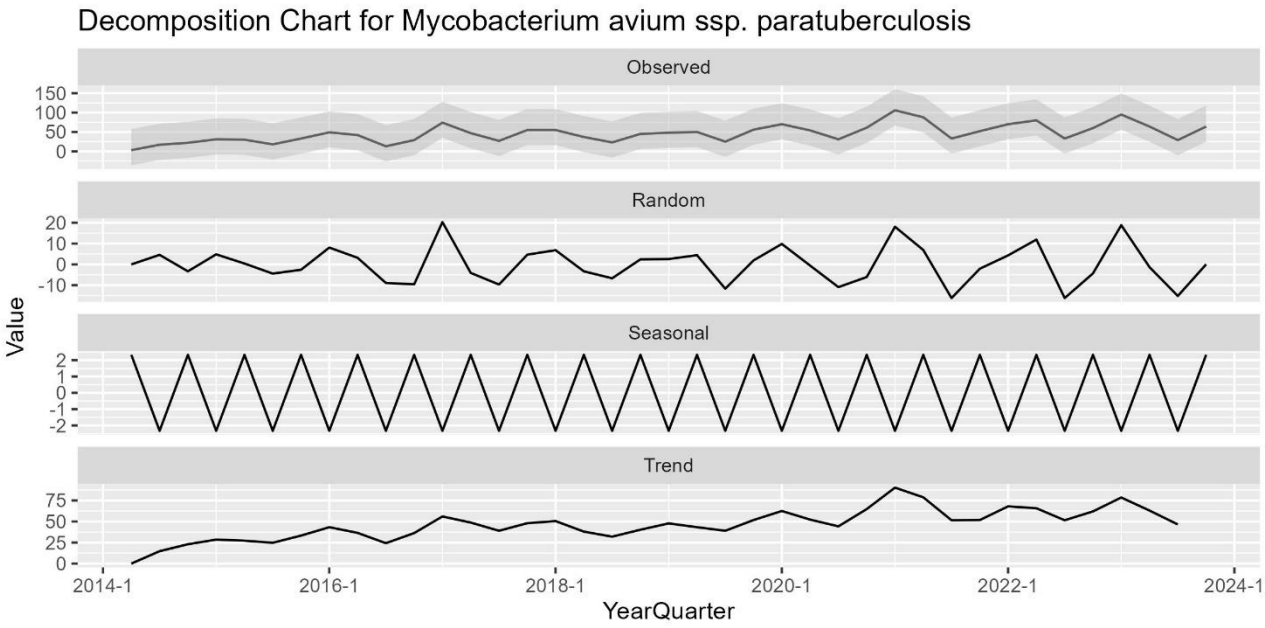
As well as plotting the number of pathogen isolations or detections per 3 month period, it's possible to de-compose these raw data plots (top row of above figure) into their various components using the R programming language. The following graphic presents the raw data (numbers of isolates testing resistant over a 3 month period, in the top row), remaining differences between raw data points and the sum of their modeled trends, or "residuals" (row # 2), a seasonal trend (row # 3), and a long-term trend calculated using a moving average (row 4). Decomposition plots make trends in the data easier to see.

The fourth or trend line od this decomposition plot also shows a gradual increase from 2017, peaking in 2019, declining, and trending up again in 2023 (below).

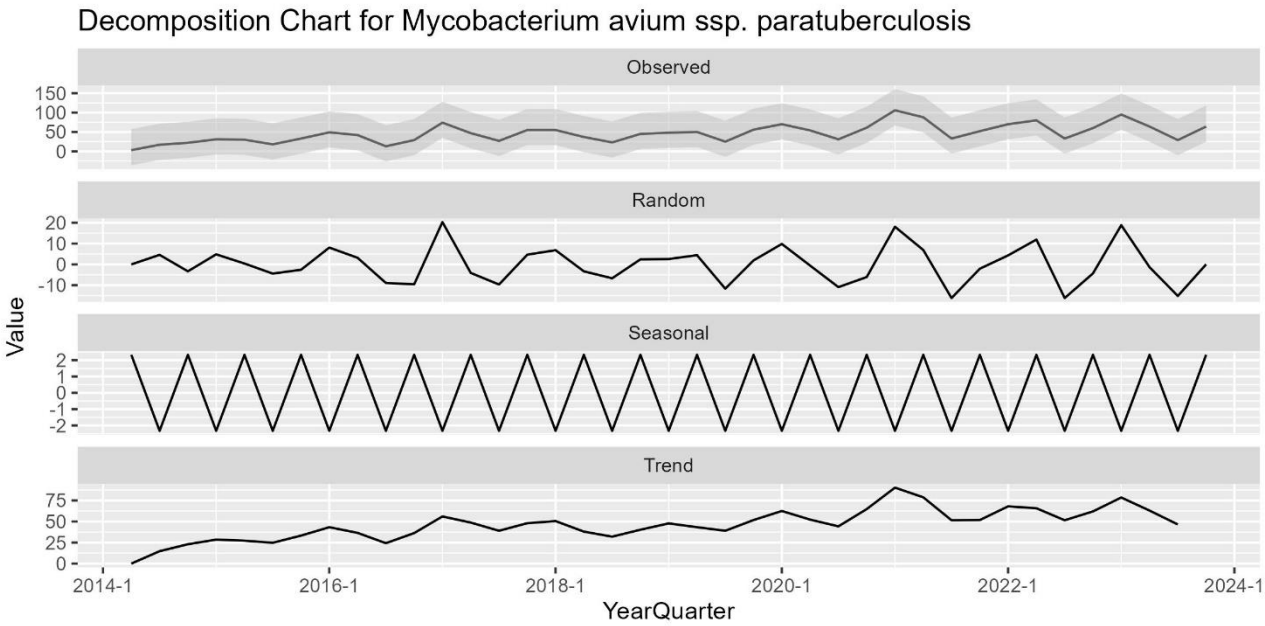


To help understand these diverging temporal patterns in BRSV detection, PDS has received funding from the Beef Cattle Research Council (BCRC) to prospectively sequence clinical beef BRD isolates. The objectives are to understand which major subgroups are circulating in western Canada, and compare these with vaccine strains. WeCAHN is supporting this initiative by providing additional complementary funding to similarly sequence and study dairy-derived isolates in western Canada.

Fig. 2. Trend Decomposition of Bovine Johnes Detections at Prairie Diagnostic Services (PDS), Q2 2014 – Q4 2023



Another prioritized outcome of the beef network is Johne's disease, caused by *Mycobacterium avium ssp. paratuberculosis*. Studying the decomposition plots of PCR detections at PDS, the underlying or global trend is to increasingly frequent detections over time.



For this reason, the beef network drafted factsheets summarizing some recent research and

identifying risk factors for herd-level positivity.

Selected prioritized outcomes such as BRD and calf diarrhea pathogen datasets have been further investigated using analytic techniques such as Auto-Regressive Integrated Moving Average (ARIMA) models (Petukhova et al., 2018), Holt-Winter seasonal smoothing (Pongdatu and Patdu, 2018) and unobserved components models (Fomby, 2008). Some model outputs such as the number of lags (observations from previous 3-month periods) significant in modeling the current observation, in an ARIMA model, or the proportion of model variance explained by modeling a cyclic pattern, in an unobserved components model, have the potential to improve our understanding of the targeted pathogen. For some outcomes of interest the model of best fit is the unobserved components model, which explicitly features cyclical variation.

Smallholder network

The WeCAHN Smallholders network was launched with the objective of providing supports to smallholder producers and the veterinarians serving them. The first two network meetings have focused on discussion of information and research gaps for veterinary practitioners, and identifying topics for targeted KTT for both producers and veterinarians. KTT was drafted on several topics identified by the practitioners: septicemia in small herd pigs, lameness in small herd pigs, and mites in small flocks.

The objective of the new WeCAHN website feature of a searchable database of practitioners willing to serve smallholders based on e-lists from the small scale medicine courses co-hosted by WeCAHN and CAHSS is to connect smallholder producers with veterinarians willing to provide veterinary service to this sector.

The objective of the new WeCAHN clinical impressions survey dashboard is to identify the disease syndromes seen most commonly by veterinarians, which has been identified by the network as a knowledge gap.

Poultry network

During the past year, the HPAI outbreak continued to be a major topic of discussion at network meetings, although broadly the impact in western Canadian flocks seems to have been less severe than in 2022.

Clinical syndromes discussed at recent network meetings included:

- Ongoing reduced quality and availability of poults
- Unusual clinical cases including tetany syndrome with mixing error in layers.

Ongoing analysis of antimicrobial resistance data from three western laboratories provides the chance to study regional differences and similarities in antibiograms of common pouotry pathogens such as *E. coli*.

Dairy network

Over the past year, the WeCAHN dairy network has discussed mastitis diagnostics including antimicrobial susceptibility testing, current diagnostic gaps, and clinical relevance of findings. This discussion has highlighted both the high level of antimicrobial stewardship shown by the network practitioners, who are selective in their use of antimicrobial therapy, and the potential value of

rapid or cow-side diagnostics to support this stewardship.

Other disease syndromes discussed included the digestive issues arising from incorporation of novel feedstuffs during drought, the potential significance of coronavirus infections in respiratory disease, increasing isolation of *Salmonella morbificans* in B.C., and the recent HPAI outbreak in U.S. dairy cattle.

Small Ruminants Network

In contrast with the other networks, disease syndromes and unusual cases presented tended to reflect some very basic producer ignorance of GMPs/animal health/biosecurity made unusual by the severity of the problem. Network meetings generally involve discussion of at least one area for potential KTT development and communication of these messages. Partly for this reason, we are pleased to welcome a representative from the Saskatchewan Livestock Extension Services to the network in 2024.

Disease syndromes discussed in year four include:

- Gastro-intestinal parasitism is a frequent topic of discussion. The network identified a need for a "first resource" for veterinary practitioners and producers on small ruminant parasite control. Factsheets covering ectoparasites and coccidiosis, for both producers and veterinarians have been drafted and reviewed by Drs. Menzies and Gilleard.

    - Listeriosis: the potential for increased uptake of silage feeding in small ruminants potentially increasing the risk of *Listeria* infection, given the greater susceptibility of small ruminants to *Listeria* relative to cattle. A factsheet for producers providing an overview of listeriosis clinical signs, disease transmission, control and prevention was drafted, and shared with industry partners.

- Reproductive loss and abortions, specifically associated with Cache Valley virus or Neospora.

Laboratorians

Network meetings continue to be a forum for connection and discussion amongst laboratorians, veterinarians, and producers. Between network meetings, network practitioners regularly share challenging cases with the coordinator to share with their respective network, usually particularly seeking advice from laboratorians.
These discussions have stimulated the development of several targeted genomic research projects at PDS, studying bovine coronavirus and bovine respiratory syncytial virus.

An aim for the new funding cycle is to collaborate with the western veterinary diagnostic laboratories to encourage improved completion of submission forms, thus supporting the inclusion of metadata in the time series analysis of laboratory data.

Website:

The WeCAHN website continues to be the major platform for sharing animal health surveillance information with the public, especially veterinary practitioners and livestock producers. The support from CAHSS in providing a website of this caliber (capable of supporting searchable

databases and generating targeted disease alerts to members) is crucial to WeCAHN's mission, and deeply appreciated.

In response to the identified need for practitioners to share unusual cases and get support in making diagnostic plans, two initiatives using the WeCAHN website were drafted:

i. A simple fillable form which would allow practitioners identifying new and unusual cases or syndromes, to share these via upload to the website and subsequent communications to network practitioners and the broader western veterinary community.
   This fillable form will feed inform a searchable database housed on the WeCAHN website, which could be accessed by smartphone, with basic information on these unusual cases, organized by fields of the fillable form.
ii. A database of practitioners offering service to smallholder clients consisting of participants from recent swine and small flock webinar series.

Knowledge translation and transfer

During the year, a variety of KTT materials were shared including network reports, pagers covering a variety of animal health topics identified by the networks, podcasts, and webinars. A summary of the KTT materials prepared over the year is presented in Appendix 1.

Collaboration with other networks

WeCAHN is proud to collaborate with other surveillance networks, starting with the Canadian Animal Health Surveillance system (CAHSS). This relationship dates back to the earliest days of WeCAHN, when the pressing need for a WeCAHN website was met by CAHSS extending the invitation to be a microsite on the excellent CAHSS website. WeCAHN continues to add enhancements to the website which leverage the capabilities of the CAHSS website, such as the unusual cases database and the searchable listing of smallholder veterinary practitioners.

Over the past year, WeCAHN also collaborated with CAHSS to present webinars on small flock and small swine herd medicine for veterinary practitioners, with registrations of 404 and 244 respectively.

Beginning in January of 2024 WeCAHN and CAHSS have a shared veterinary epidemiologist position. This not only provides the capacity for additional epidemiological analysis for both groups, but provides strengthens the relationship between the two, and offers some reliefe capacity should this be required.

The Canada West Swine Health Intelligence Network is another extremely highly valued collaborator. While we continue to meet regularly to share challenges and best practices, over the past year we have also partnered in a more formal collaboration on the Outbreak Support Network (OSN). The OSN is a collaboration between CWSHIN and Western Canadian Animal Health Network (WeCAHN) with the purpose to establish a framework for supporting practitioners and producers dealing with cases potentially reportable to CFIA. For purposes of the project, several diseases have been selected as examples of this kind of case: "blister" or vesicular diseases in swine; avian influenza in poultry, and bovine tuberculosis. Initial steps for Dr. Althouse will include:

- Working to define potential problems by discussing experiences with interested practitioners, to learn what worked, what didn't, whether any lessons were learned.

- Identifying "hot spots" or support gaps in the process of identifying and managing these disease syndromes.

WeCAHN is proud to collaborate with the Canada West Swine Health Intelligence Network (CWSHIN) in collecting data from network veterinary practitioners quarterly capturing their observations or client conversations regarding vesicles or “blisters” which could be a clinical sign of FMD or other vesicular (vesicle-producing) diseases. The value of this type of evidence, documenting that Canadian veterinarians are “seen to be looking” could be particularly important in scenarios in which a signal was suggested present by, for example, a trading partner as opposed to Canadian producer, veterinarian, or regulatory agency.

Looking ahead: Plans for Year 5

Proposed activities for the networks in the coming year include:

- Launch of the equine network, in 2024. The WeCAHN equine network will aim to build on the excellent work performed by the CAHSS equine network in building support for diagnosis, reporting, and risk communication regarding prioritized equine health outcomes, specifically in western Canada.

- Additional work on the bovine blister model to complement the existing work being done by the Canada West Swine Health Intelligence Network.

- Improvement in reporting of metadata in laboratory submissions to support the use of covariates in time trends.

Acknowledgements

WeCAHN requires the collaboration of many different people, groups and organizations. That said, we would like to specifically extend our thanks to:

- The network practitioners, who are unfailingly enthusiastic and gracious in sharing their time and expertise, while dealing with maximal demands on their time created by the pandemic.
- The other network participants who similarly share time, data, and talents.
- Livestock producer groups in the four western provinces who similarly share WeCAHN news and materials and offer suggestions regarding potential activities and KTT.
- The existing animal health surveillance networks, especially CAHSS, C3H/PEN, and CIPARS, who have contributed substantial expertise and support.
- The WeCAHN steering and scientific advisory committees, who have offered their time, guidance and expertise in both the operation of WeCAHN and interpretation of findings.
- Prairie Diagnostic Services, led by Dr. Huang, for their steadfast support and encouragement.

References

Comprehensive R Archive Network (CRAN) 2023. The R Project for Statistical Computing. Retrieved from: https://cran.r-project.org Accessed 22 April 2023.

Comprehensive R Archive Network (CRAN), 2022. Package TStudio. Retrieved from: https://cran.r-project.org/web/packages/TSstudio/index.html Accessed 22 April 2023.

Fomby, T., 2008. The Unobservable Components Model. Retrieved from: https://s2.smu.edu/tfomby/eco5375/data/Unobservable%20Components%20Models/The%20Unobservable%20Components%20Model.pdf Accessed 22 April 2023.

Petukhova, T., Ojkic, D., McEwen, B., Deardon, R., Poljak, Z. , 2018. Assessment of autoregressive integrated moving average (ARIMA), generalized linear autoregressive moving average (GLARMA), and random forest (RF) time series regression models for predicting influenza A virus frequency in swine in Ontario, Canada. PloS One 13. doi: 10.1371/journal.pone.0198313. eCollection 2018.

Pongdatu, G.A., Patdu, Y. 2018. Seasonal Time Series Forecasting using SARIMA and Holt Winter's Exponential Smoothing. In, OP Conference Series: Materials Science and Engineering, Volume 407, International Conference on Informatics, Engineering, Science and Technology (INCITEST) Bandung Indonesia. DOI 10.1088/1757-899X/407/1/012153

Western Canadian Animal Health Network (WeCAHN), 2021. WeCAHN Terms of Reference. Retrieved from: https://www.wecahn.ca/wecahn-tools/wecahn-information-library/WeCAHN_Terms_of_Reference Accessed 22 April 2023.

Yoe, C. 2012. Principles of Risk Analysis. CRC Press. Boca Raton Florida, USA. P 61

Appendix 1.