# Animal Health Monitor

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BRITISH COLUMBIA Ministry of Agriculture

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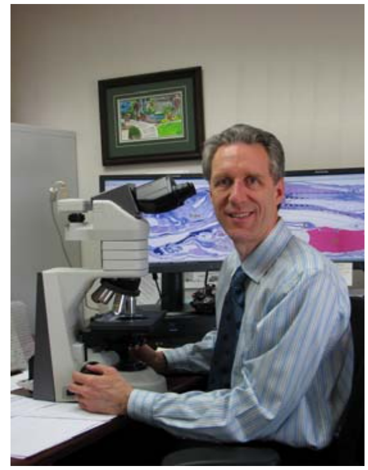


On May 7, 2013, an anti-salmon farming activist filed a lawsuit in Federal Court against a BC salmon farming company and the Canadian Minister of Fisheries, alleging that the Department of Fisheries and Oceans (DFO) had illegally authorized the transfer of fish infected with a disease agent (**piscine reovirus**, or **PRV**) from a freshwater hatchery to a marine net pen site.

While legal experts wrangle over the details, from a medical perspective this issue provides an excellent case study highlighting the difference between having a virus and having a disease.

When somebody says that they "have a virus" and need to stay home for the day, medical professionals recognize that the person actually thinks that they "have a disease caused by an infectious agent". We are pleased to have them stay home and not infect us or others.

In contrast, if a person learns that they still carry the herpes virus that caused their childhood case of chickenpox, they can report to work without concern about being infectious. In this case, the person has a virus, but it might have been decades since they had any disease associated with that virus.

Some viruses in the family Reoviridae present us with a different challenge. Reoviruses got their name because many are "respiratory and enteric orphans". In this context, "orphans" are viruses without an associated disease.

For example, according to our recently retired veterinary virologist, Dr. John Robinson, 80–100% of healthy Fraser Valley broilers (chickens) at the processing plant would test positive for an intestinal reovirus (similar to but different from PRV): the reovirus is very common in chickens but it is not associated with disease.

Even humans have a reovirus of unknown significance. According to Wikipedia, "Despite the ease of finding Reovirus in clinical specimens, their role in human disease or treatment is still uncertain."

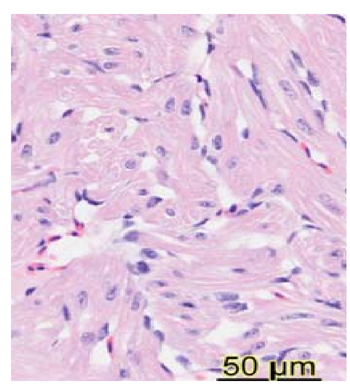
When PRV was first associated with the disease called "heart and skeletal muscle inflammation" or **HSMI** in European farmed Atlantic salmon (Palacios et al. 2010; PlosOne), I was intrigued. Based on my knowledge of reoviruses, however, I was skeptical. I diagnose unexplained heart disease as a cause of death in less than 2% of the fish that die on BC salmon farms each year, but we do not have HSMI in British Columbia.

To determine whether PRV was associated with heart disease or any other disease in BC, we tested archived samples from 625 farm salmon for PRV (samples were from 2009 and 2010). For most of these fish, I had also done histopathology, so I could determine if the test results were associated with disease. The archived samples included healthy fish, freshly dead fish with "unexplained heart disease", and freshly dead fish without "unexplained heart disease".

The prevalence of PRV was about 80% in all three groups. This finding supports the conclusion that PRV is common in BC farm salmon. However, PRV test results do not help explain either mortality or unexplained heart disease.

Additional study is ongoing, but these substantial data best support the description of PRV in BC as an "orphan" rather than a cause of disease.

Our experience with PRV and other reoviruses tells us that just because an animal has a virus, it does not mean that the animal has or will ever develop an associated disease. Interestingly, new research is finding that beneficial intestinal viruses might protect us from some bacterial diseases (Barr et al. 2013; PNAS USA). As our ability to detect viruses increases, we need to be open to the possibility that many of these new viruses might cause no disease or even be beneficial.




*Normal heart histology*

## Biosecurity for Canadian Dairy Farms National Standard

### by Tom Droppo, Industry Specialist—Dairy and Pork

At the July 2012 Annual General Meeting (AGM) of the Dairy Farmers of Canada (DFC), a proposed program known as 'proAction Initiative' was unveiled. The primary objective of 'proAction' is to provide for a uniform integration of six key program areas across every province on every dairy farm in Canada. Those program areas include milk quality, food safety, environment, traceability, animal welfare, and biosecurity.

Before adopting the 'proAction Initiative' as a national dairy program, DFC gave the industry a 12-month window to allow extensive dialogue among dairy farmers and stakeholders across Canada. At DFC's July 2013 AGM, delegates will vote on the acceptance of the 'proAction Initiative' in its present form or with some minor modifications.

During the 'proAction Initiative' review and approval process, the industry has continued to develop outlines for each program area, field-testing and piloting those programs, and setting out schedules for on-farm implementation. Each of the six program areas is at various stages of development and implementation. The overall goal is to have all six areas implemented and functioning under the 'proAction Initiative' across Canada by 2020.

With respect to the biosecurity program area, in February 2013, the *Biosecurity for Canadian Dairy Farms National Standard* was released. This national standard was developed over the past two years through a partnership with DFC and the Canadian Food Inspection Agency (CFIA), in collaboration with dairy farmers, the Canadian Veterinary Medical Association (CVMA), academia, provincial governments, and provincial marketing boards.

The national standard is a set of risk management practices. The national standard presents an approach for the preparation of farm-based biosecurity plans and focuses on four biosecurity control areas that include:

1. Animal Health Management;
2. Animal Additions and Movement;
3. Premises' Management and Sanitation; and
4. Personnel, Visitors, Vehicles and Equipment.

Within each of the four control areas, there is a set of strategies that are designed to achieve the target outcomes of the national standard. To assist in the development of a farm's biosecurity plan, an accompanying document known as the *Biosecurity for Canadian Dairy Farms Producer Planning Guide* is available. The Guide provides additional details in the form of best management practices (BMP) for each strategy included in the plan.

The primary focus in developing the national biosecurity standard was on managing risk and preventative practices designed to:

- EXCLUDE disease from entering the farm;
- MANAGE the spread of disease within the farm; and
- CONTAIN disease to prevent its spread to other farms.

To ensure widespread acceptance and adoption of the national standard as an effective farm-level biosecurity plan on each dairy, it was understood that the plan had to be flexible, simple, require minimal paperwork, open to new scientific knowledge and technology as they became available, and it had to be results-oriented.

The steps in developing individual farm-specific biosecurity plans will likely be as follows:

1. Conduct an intensive on-farm risk assessment for disease presence, magnitude, and likelihood of occurrence;
2. Establish goals for production and animal health;
3. Create a diagram of the farm's layout, identifying production areas and animal movement pathways;
4. Assign risk levels to the various production and management areas to determine areas of greatest concern and vulnerability;
5. Identify specific diseases of concern;
6. Determine the risk tolerance or intolerance to losses from infectious disease;
7. Outline prevention and control BMPs; and
8. Adopt the farm biosecurity plan.

Assuming that the 'proAction Initiative' is approved at DFC's AGM in July, work will continue in the development of on-farm risk assessment and training tools with a target completion date of 2014-15, and a national implementation schedule that will stretch from 2016-20.

The majority of strategies and BMPs inherent in the national biosecurity standard are not new to the dairy sector. Most well managed dairies have already incorporated many of these into their operations. By having a national standard with a baseline of BMPs to adopt, it ensures that all dairies across Canada adhere to a common denominator of farm practices to ensure the production of quality milk by healthy cows.

## Rodenticide Poisoning in an Urban Coyote by Dr. Chelsea Himsworth, Veterinary Anatomic Pathologist

In January 2013, a dead juvenile coyote was found in an urban park in Vancouver, British Columbia. The coyote was examined by pathologists at the Plant and Animal Health Centre, British Columbia Ministry of Agriculture, and was diagnosed with anticoagulant rodenticide toxicity. Tissue testing revealed the presence of three different rodenticides: brodifacoum, bromadiolone, and difethalone.

Anticoagulant rodenticides are a group of poisons that kill rodents by impairing their ability to stop bleeding. They are part of many poison rodent baits available for sale to pest control professionals and to the general public. Unfortunately, rodenticides often poison non-rodent species who either eat the poison or who feed on rodents that have consumed poison.

Rodents are an important food source for urban coyotes, and we suspect that consumption of poisoned rodents is how this coyote became poisoned. The presence of more than one rodenticide in the coyote's tissues suggests that it may have consumed several poisoned rodents from different sources. Pesticide incidents involving wildlife should be reported to Health Canada (www.hc-sc.gc.ca) so that they can be recorded and tracked.

## A Veterinary Student's Take on Public Practice by Jenny Kenyon, Final year vet student at the Univ of Sydney, Australia, who recently completed a Public Practice Externship at the PAHC under the supervision of Dr. Nancy de With

It's hard to believe my practicum at the Plant and Animal Health Centre has already come and gone. I have had the opportunity to be exposed to a completely different side of veterinary medicine and have met some great people along the way.

My month was packed with activity including necropsies, bee inspections, dairy inspections, and working on my own project involving use of antimicrobial products in aquaculture.

I started my practicum with a quick tour of the labs including an N95 mask fitting by Joaquin Cue-Gonzalez (photo). After that, it was straight to the necropsy room with Dr. Chelsea Himsworth, where I usually spent a few hours each day trying to absorb the mountain of knowledge she has.

Some highlights of my necropsy experiences were the horse necropsies (including a spectacular shipping fever and different colics) and the wildlife cases (a skunk and a Bighorn sheep). I also got to spend time in the bacteriology, virology and histology labs so I got a good picture of the entire process from start to finish.

It was evident how many skills are required to process cases and have the labs run smoothly.

The second week of practicum took me on adventures in the Fraser Valley. First, with Bee Inspector Scott Gordon, and a few days later with Dairy Technologist, Roger Pannett.

Being someone who knows nothing about beekeeping, I was amazed at the intricacies of bees and their health. I saw the difference in behaviours in colonies, bee mite infestations (*Varroa destructor*), and suspected *Nosema apis* (a gastrointestinal disease). My day doing dairy inspections was both eventful as well as informative.

We managed to get the necessary samples despite a few hiccups including milk in tanks being too low to get samples (and my failure at convincing Roger to let me hold his feet while he reached down into the tank) and having a hoof trimmer come around the corner of a shed with a gun! I learned a lot, as well as gained more appreciation of how active the Ministry's role is in the apiary and dairy industries.

My third week of practicum was predominantly spent working on my project about antimicrobial usage in BC salmon aquaculture. After sifting through literature, Dr. Nancy de With, Dr. Brian Radke and I came up with a method that fit our data. I was able to analyze and interpret trends in antimicrobial usage in various fish sizes from 2004 to 2011. I found this project both challenging and very interesting.

I have had a great experience over the past month and have some new insights into the roles of veterinarians in public practice. I can't thank everyone enough for all the support and enthusiasm teaching me this past month.

## Test for PED at the Plant and Animal Health Centre
### by Dr. Nancy de With, Epidemiologist

Porcine epidemic diarrhea (PED) is a disease of swine that has been found recently in the United States. This is the first time this disease has been seen in either North or South America. PED ***has not*** been identified in Canada. This disease only affects pigs.

PED is endemic in parts of Europe and Asia; it was first identified in Great Britain in 1971. It is not clear how the PED virus made its way to the United States. Over 100 farms in at least four mid-western states have been affected, and these include both sow and grower-finisher herds.

PED is caused by a coronavirus, and has clinical signs that are similar to transmissible gastroenteritis (TGE). The PED virus is most commonly spread through fecal-oral contact with infected swine, but may also be spread by contaminated equipment, fomites, or personnel. Producers are encouraged to strengthen their biosecurity measures on farm and to consult with their veterinarian if any pigs are showing signs of illness.

There are two recognized forms of the disease: PED Type I only affects growing pigs, while PED Type II affects all ages from piglets to mature sows. The incubation period is approximately 2 days, and the virus is shed for 7-9 days. Symptoms can range from mild "loose" feces to acute watery diarrhea with dehydration and vomiting. Morbidity is high, often reaching 100%. The mortality is generally low in older animals, but may be high in piglets (40-100%).

Although PED and TGE may appear quite similar, the tests for TGE will not detect the PED virus. The Plant and Animal Health Centre has developed a RT-PCR (reverse transcription polymerase chain reaction) test for use on clinical suspects that test negative for TGE. Diagnosis of PED can be made on feces or intestines from acutely affected pigs. For further information on sample submission, please contact the Plant and Animal Health Centre at 604-556-3003.

PED is ***not*** a reportable or immediately notifiable disease in Canada, and is not a listed disease of the World Organization for Animals Health (OIE). This disease does not affect people, and is not a food safety concern.

Further reading:
American Association of Swine Veterinarians
http://www.aasv.org/aasv%20website/Resources/Diseases/PorcineEpidemicDiarrhea.php

Canadian Swine Health Board
http://www.swinehealth.ca/

The Pig Site
http://www.thepigsite.com/diseaseinfo/83/porcine-epidemic-diarrhoea-ped

## Novel Sarcocystis spp. is Associated with Mortality in Pinnipeds of the North Atlantic and Pacific Oceans
### by Dr. Stephen Raverty, Veterinary Pathologist

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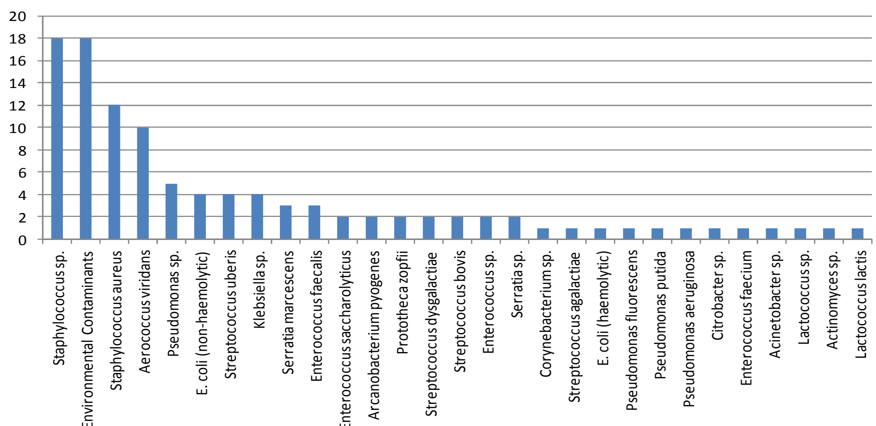
Protozoal infections are increasingly identified in stranded marine mammals and are a significant contributor to mortality throughout the western seaboard of the United States and Canada. Infections of *Toxoplasma gondii* and *Sarcocystis neurona* have been associated with severe protozoal encephalitis in stranded marine mammals in the northern Pacific Ocean. In this study we identify a novel *Sarcocystis*, initially identified in grey seals during a mortality event in the northwest Atlantic and subsequently detected in other seal and sea lion species including the endangered Hawaiian monk seal and arctic ringed seals. Sequencing of conserved (18S) and variable (ITS-1) portions of nuclear ribosomal DNA isolated from the schizont-laden livers from grey seals, ringed seals, a California sea lion, and a Hawaiian monk seal distinguished the novel *Sarcocystis* from all previously characterized species. This unique genetic signature may be indicative of a new *Sarcocystis* species, which we have tentatively identified as *S. pinnipedi*. *S. pinnipedi* has contributed to fatal, fulminant, necrotizing hepatitis in all documented cases except the ringed seals. Interestingly, mortality and associated pathology observed in *S. pinnipedi* infections are similar to those seen in *S. canis* infections in polar bears and black bears. Phylogenetic reconstruction of *S. pinnipedi* supports a close evolutionary relationship to *S. canis*. These findings document the importance of *S. canis*-like infections, such as *S. pinnipedi*, in marine mammals across the North Atlantic and Pacific oceans and further highlight the need to investigate the role of such infections on health, survival, and recovery of threatened or endangered pinniped populations.

## Mastitis Culture Results by Dr. Jane Pritchard, A/Director, Plant and Animal Health Branch

January 1-May 31, 2013 – Results of milk cultures sorted by frequency of isolation.

BC AGRI Plant and Animal Health Centre




Between January 1 and May 31, 2013, 208 milk samples (39 submissions) were received for culture and sensitivity at the Plant and Animal Health Centre. Out of the 208 samples submitted, no bacteria were isolated in 109 samples.

The resistance results of the 5 most frequently isolated organisms during this period are presented in the chart below.

| Resistance by Isolate | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | amp | kf | ob | e | xnl | p10 | pyr | sxt | tet | # of isolates tested |
| Staphylococcus sp. | 6% | 0% | 11% | 0% | 0% | 6% | 11% | 0% | 6% | 18 |
| Staphylococcus aureus | 25% | 0% | 0% | 0% | 0% | 25% | 8% | 0% | 0% | 12 |
| Aerococcus viridans | 10% | 0% | 50% | 0% | 0% | 0% | 10% | 20% | 50% | 10 |
| Pseudomonas sp. | 80% | 80% | 80% | 60% | 40% | 80% | 80% | 60% | 40% | 5 |
| Klebsiella sp. | 25% | 0% | 25% | 25% | 0% | 25% | 25% | 0% | 0% | 4 |
| E. coli (non-haemolytic) | 75% | 50% | 75% | 75% | 50% | 75% | 75% | 0% | 50% | 4 |
| Streptococcus uberis | 0% | 0% | 50% | 25% | 0% | 0% | 0% | 0% | 50% | 4 |

| | | | | |
|---|---|---|---|---|
| amp – ampicillin | ob – cloxacillin | xnl – excenel | pyr – pirlimycin | sxt – sulfamethoxazole/trimethoprim |
| kf – cephalothin | e – erythromycin | p10 – penicillin | tet – tetracycline | |

## Overwintering Snowy Owl Mortality: A Multi-Agency Investigation by Dr. Victoria Bowes, Avian Pathologist

The Plant and Animal Health Centre plays a key role in determining the cause of death in wild birds in BC. In partnership with the local Canadian Wildlife Service and the BC Ministry of Environment, the pathologists at the PAHC perform necropsies and diagnostic testing to determine the cause of death in wild birds which have been reported to the **BC Interagency Wild Bird Investigation Plan** reporting line (1-866-431-BIRD) by members of the public. Wild bird submissions also come directly from BC Wildlife Rehabilitators, the Conservation Officer Service and occasionally from members of the public.

Since 2006, the PAHC has committed to examining 300-400 wild birds annually as part of the **National Wild Bird Avian Influenza Surveillance Program**, in which birds are tested for AI and a cause of death is determined. These results are reported to the national database and any detections of H5/H7 Influenza A are forwarded to the National Centre for Foreign Animal Disease (NCFAD) in Winnipeg for genetic sequencing. Capturing the sequencing data is important in understanding the bird sources of AI outbreaks in poultry.

In the winter of 2011, and again in 2012, an unexpected record number of overwintering Snowy Owls arrived along the southern coast of BC, especially along Boundary Bay. Large numbers were also reported in the Prince George area. The birds were arriving from the high Arctic already in poor body condition, and over a short period of time many of the weakened birds were admitted to local wildlife rehabilitators. Others weren't so lucky and were found dead or dying. Biologists believed that the large number of thin owls were the result of either a crash in the Arctic lemming population or that the rodents may have been overabundant, creating a population boom of young owls with limited food supply. Many excited birders flocked to the area to see these magnificent birds but concern over the effect of the additional stress of close human activity prompted distancing warning signs to be posted.

The fundamental assumption was that the birds were juvenile and were starving to death due to lack of food. The unanswered question was whether or not there were underlying predisposing factors that made these birds more vulnerable. In January 2013, and again in April, a team of investigators assembled at the Beaty Biodiversity Museum at UBC to examine a total of 49 Snowy Owl carcasses that had been collected over the 2012 winter season.

A commitment was made to perform the necropsy in a manner that would preserve the carcass as a taxidermy mount and to return the remains to the area from which it was collected. Most will be returned to First Nations and others will be provided to wildlife education programs (a possession permit is required).

Each bird was photographed, weighed and age and gender were estimated from the feather patterning and coloration. Fundamental measurements such as wingspan and talus length were taken and recorded. The feathers were examined and a sample of any lice or mites that were detected was harvested. A professional taxidermist made the precise skin cuts and the body was passed over to the avian pathologist. Body condition was assessed based on the amount of muscle mass, fat stores and hydration. Gender was confirmed by the visualization of the gonads and age was estimated by the presence/absence of a bursa and the stage of development of the reproductive tract. Bones were palpated for fractures and visible signs of trauma such as hemorrhage or feather-singeing were noted. The oral cavity was examined as a way to assess pallor. The chest, abdomen and visceral organs were evaluated for visible abnormalities. Tissues were harvested for bacterial culture, West Nile Virus PCR and microscopic examination. Feces was collected for Avian Influenza screening and examination for parasite ova. Subsets of liver and kidney were distributed to various researchers to support a variety of projects.

The final data analysis is still pending but it was quickly evident that the majority of birds in both necropsy sessions were emaciated adult or sub-adult males. An associated finding was carcass pallor accompanied by acute gastric and intestinal hemorrhage. Although rodenticide poisoning is a primary differential diagnosis, terminal intestinal hemorrhage has been recognized as a manifestation of severe physiologic stress in pet birds and mink.

A smaller number of the owls had alternative causes of death that included trauma (including a suspected gunshot), electrocution, fungal respiratory infection presumed to be Aspergillosis, oral Trichomoniasis (a protozoal parasite) and heavy gastrointestinal parasitism.

This was an extraordinary opportunity to work collaboratively with owl biologists, wildlife rehabilitators, an award-winning bird taxidermist, parasitologists, university students and wildlife veterinarians united over a shared concern for the welfare of these delicate creatures.

## Shortage of Honeybee Colonies for Blueberry Pollination
### by Paul van Westendorp, Apiculture Specialist

Winter constitutes the single largest stress factor experienced by honeybee colonies each year. From about October to the end of March, honeybees are confined to the hive as there is no food or other resources available. Only during warm days in the earliest part of the year bees may venture outside for short periods of time to defecate and search for the earliest pollen sources.

The additional presence of pathogens will cause colony mortality rates to rise. Long term winter mortality rates of BC colonies prior to 1990 were about 10 – 12%, but when the Varroa mite (*Varroa destructor*) was introduced in BC in 1990, average winter colony mortality rose to between 15 – 20%.

In 2006, US beekeepers began reporting large scale colony losses without apparent cause which was dubbed "Colony Collapse Disorder" or CCD. In BC, colony losses began to rise in 2007, where in 2008 the provincial average winter loss reached a high of 36%! Due to regional differences, Vancouver Island beekeepers experienced losses of over 60%. Since 2008, the winter colony losses declined slowly down to 23% in 2012 and 18% in 2013 which falls within the range of long-term average winter mortality.

No single cause of these high colony losses has ever been identified. It is widely accepted that the high colony losses were the results of a range of biotic and non-biotic agents that affected bees under certain climatic and physical conditions. While the PAHC identifies a number of bee viruses using PCR, no causal link has been established between their presence and the high colony losses. There is speculation that an un-identified bee virus may have been responsible to which the bees slowly developed resistance during the last few years.

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http://www.agf.gov.bc.ca/ahc/AHMonitor/index.html

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