Western Economic Diversification Invests in Prairie Diagnostic Services

Prairie Diagnostic Services Inc. (PDS) is very pleased to announce a $549,278 investment in laboratory equipment from the Government of Canada through Western Economic Diversification Canada (WD). The investment was announced March 3rd by Brad Trost, Member of Parliament for Saskatoon Humboldt and is a matching contribution agreement for new equipment that will expand and modernize PDS’s diagnostic testing capacity.

The new equipment will expand testing capacities, increase efficiencies for the laboratory, as well as improve turnaround time on a number of test results to veterinarians, grain and livestock producers, food processors, and public agencies across Western Canada.

Key pieces of new instrumentation include the following:

- A new MALDI-TOF MS (Matrix Assisted Laser Desorption/Ionization –Time of Flight mass spectrometer) introduces a new technique to support the bacteriology service. Rather than using growth or no growth on numerous selective media to identify bacteria, a technique which has been in use for the past 75 plus years, the MALDI-TOF mass spectrometer uses a laser to vaporize bacterial cell components and analyzes the resulting molecular spectra using mass spectrometry to determine the identity of bacteria to the species level. The MALDI-TOF improves the accuracy of bacterial identification and decreases reagent costs. Turnaround times for identification will be improved.

- Addition of a new ICP-MS (Inductively Coupled Plasma mass spectrometer) to our toxicology service will allow PDS to update older technology for performing mineral analysis. The new equipment has improved detection limits and a Helium collision cell that reduces interferences seen in some of our current applications. It is fitted with an auto sampler that allows for improved utilization of technologist time.

- An additional LC-MS (Liquid Chromatography mass spectrometer) instrument and industrial sized grinding equipment along with additional support equipment expands our capacity testing for ergot and mycotoxin contamination in grain and forage samples. This will support existing surveillance studies underway to help identify new areas in Western Canada affected by these toxins. PDS will also be expanding our repertoire of organic chemicals we can quantitate. For example, we are currently looking at the development of a new assay for Monensin.

- VIDAS® rapid automated bacterial analysis equipment provides the ability to perform rapid testing for Salmonella, Campylobacter and E. coli O157 in food products. The VIDAS uses proprietary bacteriophage based technology to quickly and accurately determine the presence of these organisms in a variety of food products. The equipment is accredited for specific testing by Health Canada. PDS will leverage its ISO/IEC 17025 status along with this equipment to perform accredited testing for a variety of clients.

- A hydraulic tilting necropsy table is being installed in the high containment section of our Necropsy laboratory which is used to segregate testing for a variety of higher risk organisms such as CWD, Rabies and Anthrax. The table will be used to maintain large animals at proper dissection height for the variety of staff, faculty and students working in this laboratory.

This is the second major investment from WD in the laboratory. The WD support is key in furthering PDS’s ability to expand and build on specialized testing services to support veterinary diagnostics in Western Canada.
Premise Identification: getting our ducks (and other livestock) in a row

By: Anatoliy Trokhymchuk (Disease Surveillance Veterinarian, PDS)

Premise identification (PID) is the process of setting up a unique code for a physical land location where livestock are residing. PID greatly facilitates linking livestock and poultry to geographic locations for planning, addressing animal health issues, and emergency response. Together with individual animal identification and recording of animal movement, premise identification numbers (PIDs) are becoming a critical part of the national livestock traceability system. As with any nation-wide endeavour, developing a livestock traceability system takes a significant amount of time, effort, and resources. However, in our complex world of global market economy such a system has become essential.

PID programs are managed by individual provinces and territories and there are some differences between jurisdictions. In Western Canada, Alberta and Manitoba chose to make PID program participation mandatory for all commercial livestock and poultry producers, while Saskatchewan and British Columbia programs are operating on a voluntary basis. Detailed information on each individual jurisdiction situation can be found here: http://support.canadaid.ca/?p=1949.

Under the Part XV of the Health of Animals Regulations, all movements of cattle, bison, sheep, and pigs must be reported. This requirement has come into effect gradually. For example, reporting of farmed pig movement became mandatory July 1, 2014 and the same requirement comes into effect for farmed wild boar July 1, 2015. This means that even though it is still not mandatory to have a PID for a farm with these types of animals in Saskatchewan, the owner will need a PID in order to report animal movement in and out of the farm.

All three elements of the national livestock traceability system (animal ID, premise ID, and movement reporting) offer multiple benefits; besides making the CFIA’s job of securing access to international markets and safeguarding national animal agriculture from exotic and emerging diseases easier, there are numerous management efficiencies that individual farmers, producer groups, and animal agriculture service industries can utilise.

In order to recognize the changing regulations and to provide a more comprehensive level of service for our clients and stakeholders, Prairie Diagnostic Services has started to encourage recording of the premise ID for all farmed animal laboratory submissions. Initially we are encouraging the use of the “Animal location” field in our existing species-specific submission forms to record premise ID with each submission. New submission forms, including new electronic submission forms slated for future development, will have a specific input for PID.

Besides improving reporting accuracy for all of our users, the inclusion of PID is especially beneficial to larger production units involving numerous animal locations. Use of a PID, within PDS’s new Laboratory Information Management System (LIMS) allows the laboratory or practitioners, the opportunity to perform in-depth diagnostic data analysis by location. The system can track inputs and results from each location with a designated premise ID, providing the opportunity to track diagnostic results, types, and outcomes of submissions, and other key data over time.

If you have any questions regarding your laboratory data analysis and how premise ID can enhance information for your herd health management, please contact Anatoliy Trokhymchuk, PDS Disease Surveillance Veterinarian at anatoliy. trokhymchuk@pds.usask.ca.

Interpretation of Fusarium Mycotoxin Concentrations in Animal Feeds

By: Vanessa Cowan, Taylor Grusie, Jaswant Singh and Barry Blakley (Toxicology Centre and Veterinary Biomedical Sciences, WCVM) and John McKinnon (College of Agriculture and Bioresources, U of S)

Fusarium fungi produce a wide variety of potent mycotoxins. Feed contamination by these mycotoxins has historically been a major concern in Manitoba. However, in the past two years extensive contamination has been identified throughout Saskatchewan. ‘Fusarium Head Blight’, ‘Fusarium Damaged Kernels’, and ‘Tombstone Disease’ are common descriptors for Fusarium contamination. Cereal grains are important substrates for Fusarium infection. Grains typically farmed in Canada, like barley, oats, rye, sorghum, and wheat, are commonly contaminated. Fusarium species produce a variety of mycotoxins across the Prairie Provinces, including: deoxynivalenol (DON), 3-acetyl-deoxynivalenol, 15-acetyl-deoxynivalenol, diacetoxyscirpenol (DAS), T-2 Toxin, HT-2 Toxin, zearalenone, α-zearalenol, and β-zearalenol. The production of these mycotoxins in pre- and post-harvest conditions is largely dependent on environmental conditions. Clinical disease associated with these mycotoxins is often vague and intermittent. Feed refusal, dermal necrosis, gastrointestinal disturbance, high calf mortality, infertility, and abortion may be reported. These mycotoxins may act synergistically to cause disease. In response to concerned grain and livestock producers, a Fusarium panel has been developed by the Toxicology laboratory of Prairie Diagnostic Services to test for all mycotoxins in forage and feed samples.

Culturing molds in a laboratory setting is...
useful for identification, but is of little value to quantify mycotoxins in feed. Fungal growth is a poor indicator of mycotoxin content, although nutritional content of the grain will be compromised. Laboratory analysis is essential to assess mycotoxin content in feed intended for livestock consumption.

Zearalenone and its zearalenol derivatives have been associated with estrogenic effects. Pigs are the most susceptible species, and, in particular, prepubertal gilts. Concentrations exceeding 0.3 ppm (mg/kg), total mycotoxin content, may be problematic in gilts1. Concentrations ranging from 1-2 ppm may be tolerated in older pigs and cattle. Upon removal of the contaminated feed, clinical manifestations disappear rapidly. Zearalenone contamination of feed at clinically relevant concentrations has been seen in limited amounts during the past year in Saskatchewan.

In contrast, the trichothecene mycotoxins, which include DON (aka: ‘vomitoxin’) and its metabolites, T-2 toxin and its metabolite, and DAS, have become a major concern. In certain parts of the province, extensive contamination of wheat crops has been observed. Many facilities sort and remove damaged kernels or blend the contaminated grain to create “safe” concentrations. Companies also use commercially available testing kits (i.e. ELISA tests) to screen for DON. Although useful for screening purposes, these inexpensive and quick tests do not detect the remaining mycotoxin contaminants. Since all of these mycotoxins act in an additive manner, it is important to know the total trichothecene concentration. Simple summation of trichothecene mycotoxin concentrations is not possible due to substantial differences in potency. Considerable species variation also exists. For example, in swine, DON concentrations should not exceed 1 ppm2. In cattle and sheep, the corresponding tolerance values are 5 ppm, although the guideline in dairy cattle is 1 ppm. For T-2 toxin and HT-2 toxin, 0.5 ppm and 0.1 ppm are acceptable in cattle2.

In general, monogastrics such as horses and swine are most susceptible. Species, age, stage of lactation or pregnancy will alter the level of tolerance. Interpretation becomes more complex. Major clinical manifestations of DON exposure and toxicity are feed refusal, vomiting/emaesis, and, following long term exposure, anorexia, decreased weight gain, impaired nutritional efficiency, and immunosuppression1. To simplify interpretation of Fusarium mycotoxin concentrations, the creation of equivalence values can be used. For example, in cattle feed, conversion of all of the mycotoxin concentrations to DON “toxicology equivalents”, DON and its acetylated metabolites should be multiplied by one, T-2 toxin and DAS should be increased 10-fold, and HT-2 toxin, the most potent trichothecene, should be increased 50-fold. These converted values can be added to create a single tolerance value. Species sensitivity should also be factored into this calculation. It should be emphasized that these interpretations are guidelines only and not official standards. Since the mycotoxins are not uniformly present in feed samples, it is recommended to err on the side of caution and take the appropriate measures to collect representative samples. These values are based on the Total Mixed Ration (TMR). If the contaminated feed represents only a portion of the total ration, the tolerance value can be increased accordingly.

If you require additional information related to the interpretation and combined mycotoxin concentrations in feed, contact Dr. Barry Blakley at 306-966-7350 or at barry.blakley@usask.ca.

LITERATURE CITED:
1 Bryden WL. Mycotoxin contamination of the feed supply chain: Implications for animal productivity and feed security. Animal Feed Science and Technology, 2012;173;134-158.

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Interpretation of Ergot Contamination in Feed

By: Taylor Grusie, Vanessa Cowan, Jaswant Singh, and Barry Blakley (Toxicology Centre and Veterinary Biomedical Sciences, WCVM) and John McKinnon (College of Agriculture and Bioresources, U of S)

Ergot alkaloid contamination of grain and various grasses has become a major problem in Saskatchewan. Most areas of the province are infected to varying degrees. The economic impact has been felt by crop producers, feed companies and livestock producers. The fungus, Claviceps purpurea, produces a variety of alkaloids that are toxic to livestock. At the present time, Prairie Diagnostic Services has the capacity to detect 6 alkaloids including: ergocornine, ergocristine, ergocryptine, ergosine, ergotamine and ergometrine. Depending upon the plant species, one or more alkaloids tend to predominate. In most grains, ergocristine is most often reported at the highest concentration. In contrast, ergocornine and ergocryptine are the more common alkaloids identified in brome grass.

All ergot alkaloids produce similar effects, with minor variations related to potency. Consequently, interpretation of analytical results is based on the additive total of all 6 alkaloids present. At the present time, the total mixed ration (TMR) containing more than 100-200 ppb (µg/kg) is viewed as potentially problematic. The highly contaminated ergot sclerota are not distributed uniformly in the feed. Subsequently, non-representative sample collection can result in widely variable analytical results and often flawed interpretation. Before the establishment of analytical methods, producers would visually count or weigh the sclerota to estimate the extent of contamination. Highly variable sclerota size and concentrations of ergot within each sclerota can result in erroneous estimates of ergot content. Historically, 5-20 ergot sclerota per liter or 0.1-0.3% by weight were deemed problematic; however, clinical observation in diseased livestock has clearly indicated these guidelines are outdated. The ‘fines’, very small particles found in grain, also raise concern. Although no sclerota or sclerota fractions are present in fines, clinically relevant concentrations of ergot alkaloids may still be detected.
analysis of feed samples is currently the most reliable method. Horses, sheep and swine are more susceptible than cattle. In all species, agalactia, reduced growth and feed consumption become evident when feed concentrations exceed approximately 330-700 ppb. Ergot suppresses prolactin secretion, which may adversely reduce milk production for the entire lactation. The economic impact is so dramatic that many authorities recommend that ergot-contaminated feed should not be fed to lactating or pregnant animals at any concentration. In the winter months, reduced feed consumption and growth are observed in the livestock both directly and through vasoconstrictive effects. Animals are more susceptible to cold stress and potentially gangrene due to these vasoconstrictive effects, which alter thermoregulatory mechanisms. In addition to cold stress, heat exhaustion in hot climates may also be a problem. In Saskatchewan, abortion and CNS excitation have not yet been reported. Bull fertility and spermatogenesis may be affected by altered thermoregulatory properties of ergot.

Disease associated with the consumption of contaminated feed is influenced by age, species, pregnancy, lactation, temperature and feed consumption. If you require assistance related to interpretation or ration modification related to ergot-contaminated feed, contact Dr. Barry Blakley at 306-966-7350 or at barry.blakley@usask.ca

Outbreak of Taenia hydatigena infection in a feedlot lambs

By: Chris Wojnarowicz, Veterinary Pathologist, PDS

Infection of sheep by the canine tapeworm Taenia hydatigena is fairly common in countries with a long established sheep industry but on the Canadian Prairies the condition is rare. This certainly was my first case of this kind and, at the same time, a testimony to the growing volume and significance of the sheep industry in Western Canada.

A producer in Alberta established a lamb feedlot populated with purchased lambs. The affected lambs were asymptomatic but their livers, which exhibited similar gross lesions, were condemned. The producer brought sections of affected liver to their local veterinary practitioner who then submitted formalin-fixed and fresh sections of affected liver to the PDS Necropsy laboratory for examination.

Grossly, there were multifocal to generalized, brown/black (hemorrhagic), serpiginous, short, subcapsular to deeper parenchymal tracks in the liver (Fig. 1). The liver capsule was shiny and undisturbed. Histologically, wide, blood–filled channels that did not penetrate the liver capsule (Fig. 2) randomly traversed the liver. The edge of the channels were often necrotic and infiltrated by a mixture of lymphocytes, plasma cells and eosinophils. Most of the portal areas were heavily infiltrated with a similar inflammatory infiltrate and some foci were clearly dominated by eosinophils. Some sections contained the larval form, Cysticercus tenuicollis (Fig. 3).

Taenia hydatigena is a large tapeworm (1.5 to 5 meters in length) that inhabits the small intestines and its natural host is a carnivore. Eggs containing a larval stage are ingested by small ruminant from sources contaminated by feces. After the egg’s shell is digested the larvae penetrate the wall of the intestines and migrate to the liver where they may remain or they may migrate to the surface of the liver, mesentery or omentum and develop into fluid-filled vesicles (Fig. 4).

The essential elements of Taenia hydatigena infection prevention include: frequent deworming of dogs with a taeniacide, keeping dogs away from infected sheep offal and keeping sheep away from dog feces.