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Animal Health Centre

Ministry of Agriculture, Food and Fisheries

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From the Director

RJ Lewis:

As everyone is well aware, there have been significant changes in government over the last several months. A major change to the Animal Health Branch is the movement of the Health Management and Regulatory section from Animal Health into the new Food Safety Branch. The Animal Health Centre did not lose any positions as a result of re-structuring; however, two employees (Garland Thiele, bacteriology and Bob Hornidge, necropsy) have retired. We have been fortunate in hiring a second Animal Health technician for the Necropsy area and will be interviewing this week for the vacant position in Bacteriology. Unfortunately, Wanda Fiessel of Bacteriology has resigned and we plan to interview soon for this position.

The Animal Health Centre is one of only two laboratories in Canada accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD) as a full-service diagnostic laboratory. Accreditation results from a successful and intensive on-site review by members of the AAVLD Accreditation Committee. Our certification must be renewed in 2003. Stimulated by that impending review, we are presently working on developing and formalizing our Standard Operating Procedures for all tests in all sections of the laboratory. This is a very time-consuming and labour-intensive exercise requiring the full commitment of all staff to produce several manuals detailing all analytical procedures and references. The end result will be a renewed confidence by our submitters that our procedures have met quality control standards in all areas.

Following almost a year of development, we are approaching the final phase of testing our new Laboratory Information Management System (LIMS). Among other things, this will extend the capability to search our database for specific information, speed up reporting results, and will allow for electronic mailing of laboratory reports. If you would like to be added to our list to receive reports electronically please telephone our front office with this request.

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From the Director

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We continue to improve testing procedures and to replace older techniques as better or more accurate methods become available. Molecular diagnostic tests continue to be added and the use of a new on-site gene sequencer allows for very specific identification of some bacterial strains or serotypes. This technology will improve bacterial identification and aid in disease investigation. As you will note elsewhere in this newsletter, toxicology has recently validated and made available two new tests that will help producers and veterinarians to manage the transition cow. Should you require information regarding the availability of any specific test(s), please do not hesitate to call the Animal Health Centre directly or refer to our new address **(http://www.agf.gov.bc.ca/ahc/index.htm)** Web site. We have a terrific group of knowledgeable and dedicated staff in all areas who will do their best to assist you.

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Please note: new Animal Health Centre (AHC) Web site address. Please update your book marks. **http://www.agf.gov.bc.ca/ahc/index.htm**

Primate Submissions:

Occasionally the Animal Health Centre receives requests to examine a non-human primate. Usually, these are spider monkeys, marmosets or another species of New World monkey. We will continue to accept these animals for pathology and bacteriology *only* but will not perform any virus cultures or provide mineral and vitamin analyses on samples from these animals.

Due to the potential of disease transmission to our staff and to reaffirm our existing policy, we will not accept any Old World primates such as macaques (rhesus monkeys), chimpanzees or baboons.

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Ornithobacterium rhinotracheale (ORT) diagnosed in a BC turkey flock:

– V Bowes, avian pathologist

On April 26 and 30, 2002, acutely dead turkeys from a flock of 2500 were submitted to the Animal Health Centre for diagnostic work-up. Lesions consisted of facial swelling and severe fibrinous pneumonia. A fowl cholera-like bacterial organism called ***Ornithobacterium rhinotracheale (ORT)*** was isolated from the affected tissues.

ORT was first described as a respiratory pathogen in Germany in 1994. This agent has never previously been isolated from a British Columbia poultry flock. Although this disease is not provincially reportable, we want to ensure the poultry industry is aware of its presence. As with any communicable infectious organism, strict **biosecurity** procedures are essential to prevent its spread into susceptible poultry flocks (turkeys and chickens).

Any sudden increase in mortality or unexplained respiratory disease should be investigated by a poultry veterinarian.

West Nile Virus surveillance in British Columbia:

– V Bowes, avian pathologist

West Nile Virus (WNV), a mosquito transmitted disease that affects the central nervous system of humans, crows and horses, has recently been confirmed in crows in Ontario. WNV was first identified in the New York City area in 1999 with subsequent spread northward. Although the virus has not been detected west of Ohio, the specific mosquito vector essential for spread as well as the wild bird reservoir species are both present in British Columbia. Currently, the relative risk for the introduction of WNV into British Columbia is considered to be low.

Active surveillance will be important for the early detection of WNV. From June to September, 2002 (the mosquito season), four volunteer regional field coordinators will collect and submit a random sample of corvid (crow and jay) carcasses to the diagnostic lab at the Canadian Cooperative Wildlife Heath Centre in Saskatoon, SK, to specifically test for WNV.

The proposed active surveillance is intended to ensure the early detection of the virus should a viremic migratory bird introduce WNV into the highly susceptible corvid population.

An information factsheet has been made available for distribution to wildlife rehabilitators, naturalists, veterinarians and conservation officers through their governing organization publications.

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Poultry items of interest:

(i) Broiler Breeder news:

Mortality due to J-strain myeloid leucosis has become quite rare suggesting that the attempts at eradicating this infection from the primary breeders has been at least partially successful. Farms on which there continues to be a problem tend to be those with other management challenges.

Marek's Disease is still seen occasionally in birds around the time of peak production. The affected birds still die due to multiple lymphoid tumors in the liver, heart, spleen, kidney, brain and sciatic nerves. One method to differentiate Marek's Disease from lymphoid leukosis tumours is to examine the cell characteristics microscopically. Alternatively, the diagnostic laboratory in Manitoba offers a polymerase chain reaction (PCR) test to detect the specific viral DNA in tumour tissue.

Lameness and leg problems are a common recurrent complaint on certain breeder farms. Most often this is due to bacterial arthritis caused by *Staphylococcus aureus*, but occasionally may be caused by ruptured hock tendons, presumed to be inititiated by reovirus infection. It is thought that reovirus infection causes scarring of the tendons which becomes an inherently weak point that is susceptible to rupture once the bird reaches full body weight. Birds with ruptured tendons can no longer extend their legs and will simply sit and dehydrate. Birds with bacterial arthritis can still get around with difficulty and will have prominent swelling of the joints which contain purulent exudate.

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Poultry Items

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(ii) Layers:

The majority of disease problems in layers are nonspecific (cannablism, emaciation/ dehydration, salpingitis) or metabolic (fatty liver, cage layer fatigue).

Marek's Disease is still a problem in pre-production pullets despite widespread vaccination programs. The early form, around 10-12 weeks of age, involves paralysis due to cellular infiltration of the sciatic nerves and brain. The later form is due to tumour infiltration of abdominal organs. Mortality due to Marek's Disease generally subsides by the time of peak production.

Manitoba recently reported an outbreak of coccidiosis in 20-25 week layers in cages, an uncommonly late age to be having problems with this disease.

A multi-age flock of 30,000 layers in Saskatchewan was depopulated following a diagnosis of infectious laryngotracheitis (ILT) that was related to the introduction of out-of-province replacement pullets. The outbreak of ILT seen in year 2000 within BC's Fraser Valley has subsided, most likely due to the effectiveness of modified vaccination programs and heightened biosecurity. One significant finding from Dr. Nancy DeWith's epidemiological study on positive farms and control farms, was that a larger farm was more likely to have a case of ILT than a smaller farm. Other factors thought to contribute to the spread of virus are inadequate on-farm biosecurity and inappropriate litter management such as the spread of untreated manure on nearby berry farms.

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Diagnosis of malignant catarrhal fever (MCF) in the Fraser Valley and an overview of cases presented to the Animal Health Center, 1992-2002:

– S A Raverty

On March 23, 2002 a local producer observed a recumbent heifer with runny feces and reddened eyes. An injection of *Trivetrin* (25 mL) was administered by the owner. With no clinical improvement after 24 hours, their veterinary practitioner was called to examine the animal. Clinical examination disclosed generalized malaise, bloody diarrhea, hematuria (bloody urine), and excessive lacrimation (tear production) with pus. The animal's breath was fetid, and there were numerous erosions and ulcerations throughout the oral mucosa. The animal died the following morning.

The heifer was presented to the Animal Health Center for post-mortem examination. The animal was in good body condition. The most salient gross lesions were numerous solitary to confluent mucosal erosions and ulcers throughout the oropharygnx, esophagus, trachea. Similar though less extensive lesions were observed within the distal small intestine and colon. Along the entire length of the trachea and extending to varying levels of multiple bronchi, the mucosa was overlaid by variable amounts of mucus and pus. Prescapular and retropharyngeal lymph nodes were markedly enlarged. The thymus was moderately enlarged and edematous with numerous punctate foci of acute hemorrhage. Kidney tissue revealed multiple wedge-shaped infarcts with occasional depression of the overlying cortical contour. Excessive tear formation with encrusted exudate was noted at the canthus of each eye, and bright yellow flocculent material was observed within the ocular anterior chambers.

Prime differentials for the oropharyngeal and respiratory lesions included bovine viral diarrhea (BVD), infectious bovine laryngotracheitis (IBR), and, based on the history of recent lambing at the facility, malignant catarrhal fever (MCF).

Histopathology of the oral, tracheal and esophageal mucosa disclosed numerous erosions and ulcerations characterized by occasional intramucosal bullae and clefts, and overlaid by variable amounts of fibrinoserous exudate. Scattered superficial accumulations of coccobacilli were also present. There were perivascular accumulations of lymphocytes (perivasculitis) within the submucosa and occasional vascular fibrinoid necrosis; fewer lymphocytes were seen infiltrating the lamina propria and muscularis. The submucosa of the small intestine also demonstrated a perivasculitis accompanied by infarction of the overlying mucosa. Similar changes were noted within the kidney. Multiple lymph nodes revealed expansion of the cortical and paracortical regions by a homogeneous population of lymphoblasts.

Routine bacteriology yielded moderate growth of *Escherichia coli* from multiple viscera. Serology for IBR and BVD were negative. Based on pathological findings and historical information, the sheep-associated form of MCF was considered a prime differential. Molecular-DNA studies via the polymerase chain reaction (PCR) were conducted and proved positive.

MCF is a generalized lymphoproliferative disease caused by one of two species of gammaherpesvirus: (i) alcephaline herpesvirus 1 (AHV-1), which naturally infects wildebeests and (ii) ovine herpesvirus-2 (OvHV-2), reported worldwide in sheep. In this case, molecular studies confirmed the sheep-associated variant. This disease has been reported in both domestic and captive artiodactyla (even-toed ungulates), including cattle, water buffalo, pigs, deer and other species. Infection is generally transmitted by inhalation of aerosol droplets containing the virus, or by ingestion of contaminated feed or forage. In extremely susceptible animals, there may be explosive epizootics, but in this case only 2 additional animals of 40 cattle developed clinical signs that resolved with conservative medical care. Control of the disease in this particular case required removal of reservoir sheep and segregation of clinically affected animals from healthy stock. Efforts are currently underway to develop a serology test at the Animal Health Centre for MCF.

Since 1992, there have been 21 cases of MCF diagnosed at the AHC:

	# of Cases		# of Cases
1992	2	1998	7
1993	1	1999	0
1994	2	2000	0
1995	2	2001	1
1996	0	2002	2
1997	4		

Most cases had been diagnosed between August and November of each respective year. There have been 6 cases involving buffalo or bison (from the Fraser Valley and Dawson Creek districts, together with 2 out-of-province submissions), 1 Rocky Mountain goat, 4 dairy cattle (3 from the Fraser Valley and 1 case from the North Peace River), 2 black-tailed deer, 5 Pere David deer, and 2 white-tailed deer. With the exception of three juveniles and one specimen of unrecorded age, all animals were adults.

While this condition has not been commonly reported or recognized within dairy production facilities in British Columbia, a history of close association with sheep and prominent oropharyngeal lesions should prompt MCF as a diagnostic consideration.

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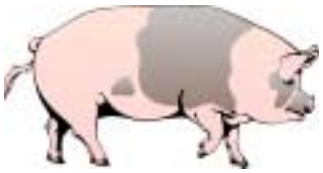
Short cuts from the post mortem room:

J Coates,
Veterinary Pathologist



(i) Pyelonephritis in a mature sow:

Severe bilateral pyelonephritis (inflammation of the kidneys) was diagnosed in a mature 4 year-old multiparous sow that had recently farrowed. The animal had died acutely, without being observed ill. The renal pelvic area of each kidney and the ureters that descend to the urinary bladder were distended with foul-smelling purulent material. The bladder mucosa was inflammed (cystitis), hemorrhagic and thickened, and urine appeared purulent and bloody.

Pyelonephritis is more common in sows kept in confinement than those kept in open pens or on pasture. According to Radostits et al (*Veterinary Medicine* 9th ed), clinical disease is almost entirely restricted to female pigs that have been bred, and venereal transmission is believed to be the primary if not sole method of infection in the sow. In a heavily pregnant animal, reduced activity or mobility, coupled with the possibility of increased urinary stasis, are also contributing factors worth considering. Differences in feeding patterns and exercise that occur with different management systems can influence the frequency and volume of urine intake. Infection within male pigs leads to the disease in sows. Inadequacies in water intake are considered a major risk factor.

Organisms isolated in cases of sow pyelonephritis can vary widely, with *Eubacterium suis (Corynebacterium suis*) and *E coli* frequently of concern; streptococci and *Proteus* are at times identified. In the particular case described here, exudate and fluids within the kidney pelvic area yielded a heavy growth of an alpha streptococcus (not *Strep suis*), likely of fecal origin.

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(ii) Proliferative hemorrhagic enteropathy in sows:

Proliferative hemorrhagic enteropathy was diagnosed on necropsy in a two year-old sow, one of five animals that had suffered from acute bloody diarrhea and subsequent death over a period of 10 days. Necropsy revealed typical cerebriform, proliferative lesions in the distal ileal portion of the small intestine which had assumed a rope-like, thickened appearance. Frank blood together with fibrinous casts and blood clots were present within the intestinal lumen. No blood loss or similar lesions were detected within the stomach or more anterior portions of the small intestine. Warthin-Starry silver stain revealed numerous seagull-shaped bacterial rods typical of *Lawsonia intracellularis* within the distal cytoplasm of ileal crypt enterocytes. The polymerase chain reaction procedure (PCR) was also positive for *L intracellularis*. Bacterial cultures from the intestine were negative for *Campylobacter spp.* and for *Salmonella spp*.

According to Radostits et al (*Veterinary Medicine,* 9th ed), risk factors that predispose to this syndrome are poorly understood. The method of transmission of the offending organism (*L intracellularis*) is assumed to be the fecal-oral route, but no information is presently available to support this (*Vet Med*, 9th ed). The character of the vascular lesion resembles an acute bacterial infection and type I hypersensitivity reaction. The key microscopic feature is the presence of proliferating immature epithelial cells which line the greatly elongated crypts, in which the offending organisms are readily visible utilizing special stains.

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(iii) Death in young lambs due to the stomach worm *Haemonchus contortus:*

A four month-old lamb weighing 39 kg was submitted for necropsy. The animal had been found dead at pasture with no premonitory signs observed by the owner. Other animals in the flock evidently showed no illness.

Necropsy revealed the animal to be severely anemic, with pale musculature, lungs, and other tissues. There was an accumulation of clear fluid under the jaw and at the brisket, indicative of hypoproteinemia. The abomasum or glandular stomach was distended with coffee-brown coloured fluid, and there were myriad small thread-like worms present, consistent with the abomasal worm *Haemonchus contortus*. Flotation of feces for parasite eggs revealed a very heavy level of trichostrongyle eggs, and a moderate level of *Trichuris sp*. A heavy concentration of coccidial oocysts was also observed on fecal examination.

H contortus is a particularly aggressive worm that establishes itself in the animal's glandular stomach and proceeds to withdraw blood from mucosal capillary vessels. If there is heavy exposure to ingested parasite eggs, blood loss and subsequent severe anemia incompatible with life will follow.

It was urgently recommended to the owner that his remaining sheep be dewormed immediately to minimize additional losses. Pasture rotation was also recommended, so that dewormed animals would be turned onto relatively clean ground after treatment. The owner was cautioned that worming sheep once or twice over the summer and fall periods is not sufficiently frequent, especially where pasture rotation is not possible or available acreage is limited. For a comprehensive sheep worming programme to suit your flock's needs, consult your veterinarian.

Heavy numbers of coccidial eggs or oocysts were also found in the feces of this animal on parasite examination. Keep in mind that coccidiois is not a worm, but a protozoal intestinal parasite, and will not respond to treatment with deworming agents. Anti-coccidial chemotherapeutic agents are required. Both types of intestinal parasites are often found together in the same group of animals.

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(iv) Coronavirus, Rotavirus, and *Cryptosporidium spp* identified in fecal submissions from calves (dairy and beef):

In several submissions of scouring (diarrhoeac) dairy and beef calves of approximately 10 days to a month of age, coronavirus and at times rotavirus have been detected by electron microscopy (EM). When suitably fresh-fixed colon samples are submitted for histopathology from suspected cases of coronaviral enteritis, lesions typical of coronaviral colitis may be found.

These agents may be influencing the intestinal tract of these animals singly or in conjunction with other agents such as pathogenic strains of *E coli*. *Cryptosporidium spp* have also been observed in case submissions via direct fecal examination and by histopathology, usually in calves 10-12 days of age or older.

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Short Cuts

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(v) Listeriosis in domestic cattle and in humans – recent AHC cases of this zoonotic agent:

Listerial meningoencephalitis (*Listeria monocytogenes*) was diagnosed in a 300 kg, female Holstein that had died unexpectedly. Clinical signs reported by the owner evidently had been minimal. Typical lesions were observed microscopically within the animal's brain, indicative of listerial encephalitis and later confirmed by bacterial culture. In another case, listerial abortion was diagnosed via bacterial culture in an aborted dairy foetus where there had been recent abortions in the herd. Microscopically, there was evidence of widespread dissemination of the organism throughout the placenta and other foetal tissues, indicative of septicemia. Foetuses aborted from listerial infection frequently have numerous small, necrotic, greyish-white foci throughout the liver, which can be recognized by veterinary practitioner on gross examination.

Listeria monocytogenes is a significant bacterial pathogen among domestic farm animals. The organism is primarily a disease of ruminants, particularly among sheep, goats and cattle in the Fraser Valley of British Columbia. In bovine abortion cases, the history often (not always) reveals that aborting ruminants have been fed poorly preserved silage. Alakaline pH is thought to enhance the multiplication of *L monocytogenes* in silage (Kirkbride: *Laboratory Diagnosis of Livestock Abortion*, 3rd ed). Occasional septicemic disease has been reported in horses and pigs (Radostits et al: *Vet. Med.,* 9th ed.).

L. monocytogenes is widespread in nature and has characteristics that allow its survival and growth in a wide variety of environments. The organism is susceptible to common disinfectants (*Veterinary Medicine*, 9th ed.). *L monocytogenes* is a zoonotic agent – that is, it is capable of being transmitted from animals to humans.

In British Columbia, there have been recent cases of human illness and abortion following the ingestion of a cheese product contaminated with *Listeria monocytogenes* subsequent to the pasteurization process. A farm investigation of this case was undertaken by Dr Josh Waddington of the Animal Health Centre (Animal Health Centre), Abbotsford; bacterial culture studies were carried out at the Animal Health Centre laboratory. The Vancouver Centre for Disease Control was actively involved in the investigation of this disease outbreak among humans.

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(vi) Hemorrhagic pneumonia in farmed mink:

Hemorrhagic pneumonia due to the bacterial organism *Pseudomonas aeruginosa* was diagnosed in juvenile and mature mink. Lungs were severely hemorrhagic and variably firm on gross examination. Microscopically, there were dense numbers of necrotic inflammatory cells flooding affected lung tissue, and bacterial colonies at times were readily visible. Most of these animals also had lesions in the liver and spleen that were suggestive of Aleutian Disease (AD), including plasmacytic glomerulonephritis observed in kidney tissue. The presence of AD virus was confirmed in the animals via the polymerase chain reaction (PCR) test for AD-parvoviral DNA. The weather at the time of the illness outbreak had been quite changeable, becoming increasingly wet and cool, and likely contributed as an additional stressor. The presence of AD virus was undoubtedly a primary factor in the pathogenesis of the *Pseudomonas* pneumonia, as this viral disease weakens the immune response of the animals and debilitates them metabolically. The owner is now pursuing AD blood testing with vigor to detect other animals carrying the virus.

Therapeutic antibiotic treatment was helpful for some of the mink stricken with pneumonia but, in the long term, would do nothing to alleviate the progression of the underlying AD virus.

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(vii) Nutritional cardiomyopathy in a goat:

Nutritional degeneration of the heart muscle (cardiomyopathy) was diagnosed in a 2 year-old goat that was severely deficient in selenium. On toxicological analysis, liver selenium levels were so low that they were not measurable. Animals in the goatherd had not received any form of trace mineral supplementation other than iodinated salt blocks.

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Japanese pieris toxicosis in a goat herd:

J Coates

A small group of five mature dairy goat ewes, most of them pregnant, suffered signs of vomiting and acute colic with obvious distress after eating large quantities of freshly cut leaves from the plant *Japanese pieris*. The plants had been unwittingly dumped over the fence by a neighbour into the animals' feeding area. One of the pregnant animals died shortly after the incident. The remainder of the exposed does recovered. Once the owner became aware of the cause of illness and death, all animals were immediately removed from the paddock containing the trimmed branches and leaves. The survivors all received oral medication with a charcoal-based medication to reduce absorption of plant toxin.

Necropsy of the single doe that died acutely following ingestion of the plant revealed small ellipsoid leaves with finely toothed edges, typical of Japanes pieris. Large quantities of the dark green leaves were found within the distended rumen.

Japanes pieris (*Pieris japonica*) is a member of the heath family, many of which are toxic, including rhododendrons and laurel. All contain a toxin known as grayanotoxin (formerly known as *andromeda toxin*) that causes abdominal pain and vomiting when ingested. Grayanotoxins also have digitalis-like cardiotoxic effects, although they are unrelated to digitalis. Grayanotoxins also increase the permeability of nervous tissue to sodium ions, a mechanism similar to pyrethroid insecticides.

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Foot and mouth Disease and Wildlife in the UK:

"…At no time during the outbreak was there any evidence for the involvement of susceptible wildlife species, such as deer or feral pigs. The diagnostic laboratory received samples from farmed deer close to infected farms, and from deer killed by hunters or in road accidents; all were negative. This is consistent with FMD outbreaks in other regions of the world, except southern Africa, where the African buffalo is often associated with outbreaks in domestic stock. Generally, if wildlife are affected, they are unable to maintain the disease because of low stocking density or lower susceptibility, and the virus dies out – even if they were affected it would be inadvisable to attempt control because it would likely scare the wildlife involved out of the area, and thereby possibly introduce FMD into a previously free area…"

– *Management of Disease – the UK Foot and Mouth Disease Experience*; by P Kitching, Director of the National Centre for Foreign Animal Disease, Winnipeg, Man. These comments are an excerpt from a paper presented by Dr Kitching to CFIA representatives, provincial veterinarians, and MAFF staff in Victoria, British Columbia.

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Necropsy examination of a stranded adult killer whale (*Orcinus orca*) along the Olympic Peninsula, state of Washington:

Stephen A Raverty

In the early afternoon of January 2, 2002, a news-media helicopter crew observed a stranded, dead adult female killer whale (*Orcinus orca*) at the mouth of the Dungeness River, Washington. A lone surviving sub-adult male was entrapped in a spit near the dead female. While efforts to rescue and release the live male were pursued, arrangements were made to conduct a post-mortem examination on the female. The next day the dead animal was towed to a local boat launch, and then hauled from the water by a flatbed truck. Necropsy followed.

The whale was in good body condition, although post mortem decomposition (autolysis) was advanced. Multiple cutaneous abrasions and erosions along her flanks were considered terminal injuries attributed to beaching. The tongue was protuberant and mammary nipples were everted and laterally displaced. The animal was well muscled with ample subcutaneous blubber and abdominal fat stores. There were massive accumulations of interstitial gas associated with autolysis. The most remarkable gross findings were an enlarged, flaccid uterus which was possibly involuting (post-partum) and chronic mastitis (inflammation of mammary gland tissue). The remains of 2-3 juvenile harbour seals (*Phoca vitulina*) and a trichobezoar (hair ball) were observed within the stomach, together with localized ulceration of the stomach lining.

In addition to the grossly observed lesions, histopathology disclosed degenerative changes within the heart muscle. Although this finding is commonly recognized in stranded odontocetes (toothed whales), the precise cause of the condition remains unknown. Due to the lack of other systemic signs (such as fluid in the lungs or abdominal cavity), the whale was likely not in heart failure. Nevertheless, if this scarring process had impinged upon the heart (nerve) conducting system, it is possible that there may have been disruption of normal heart function (dysrythmias), with acute death.

Due to severe autolysis, bacterial overgrowth and lack of discernible pathogens on microscopic sections, extensive molecular studies were undertaken to screen for both exotic marine mammal diseases and those disease agents which may have been acquired from prey species (e.g., seals and sea lions). Polymerase chain reaction (PCR) was negative for a variety of parasitic, bacterial and viral agents including dolphin morbillivirus, phocid herpesvirus, influenza virus, *Toxoplasma*, *Neospora*, *Coxiella*, and *Mycoplasma spp*. However, serology of post-mortem heart blood was positive for *Brucella spp*. To our knowledge, this finding has not previously been reported in killer whales within the Pacific Northwest. Results are pending on tissue samples forwarded to the National Veterinary Laboratory at Ames, Iowa, for special bacterial culture.

Brucella spp have been recently reported in harbour seals, porpoises, and dolphins. Exposure to this genus of bacteria probably occurs following the ingestion of a carrier prey species. Because of recent reports of stranded porpoises and sea lions off the California and Washington coasts linked to algal toxins, analysis of stomach contents and urine for domoic acid were undertaken; these tests proved negative. Analysis of liver and kidney tissue for heavy metals yielded results comparable to reference ranges generated from previously evaluated killer whales.

Based on recent investigations, contaminants identified by toxicology have been reported as prime contributors in the declining populations of resident killer whales off the British Columbia and Washington coasts. Detection of antibodies to *Brucella spp* in post mortem heart blood suggests a possible mechanism for impaired reproductive performance and neonatal loss. Continued collaborations with the Canadian Department of Fisheries and Oceans and U.S. National Marine Fisheries Service in these unique natural phenomena will further promote understanding of the natural history of wild killer whale populations.

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Keeping an eye on *Salmonella* in Canada:

An update from the
Salmonella Typing Laboratory – Integrated Surveillance Initiative
and
Antimicrobial Resistance Surveillance Unit
Laboratory for Foodborne Zoonoses
Population and Public Health Branch, Health Canada,
110 Stone Road West, Guelph, ON N1G 3W4

Salmonellosis continues to be a leading cause of enteric illness in Canadians. Illness due to salmonellosis is especially dangerous for children less than 1 year of age, for seniors and for those who are immunocompromised. Treatment of salmonellosis with antibiotics is controversial because of increasing the risk of a carrier state and the possibility of inducing antimicrobial resistance. However, treatment with antibiotics may be life-saving in these high risk populations and, therefore, it is prudent to maintain a selection available for use. These dangers also suggest that prevention and control of salmonellosis is highly desirable. Surveillance programs are used by Health Canada to serve as a watchdog on the state of salmonellosis in Canada with the goal of reducing the impact of this important disease in the Canadian population.

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Salmonella

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Surveillance and research on salmonellosis have determined that a wide variety of food products (both of animal origin and non-animal origin), as well as the animals themselves, serve as a reservoir for human infection. Human salmonellosis has been noted with consumption of milk (Bezanson GS et al., 1985) and other dairy products (D'Aoust JY et al., 1985; Cody SH, et al., 1999; Villar RG, et al., 1999), eggs (Guard-Petter J, 2001), meat (Wall PG, et al., 1994; Roels TH, 1997; Delarocque-Astagneau E, 2000; Kessel AS, et al., 2001), and contact with pig ear treats (Clark C et al., 2001), calves (Wall PG, et al., 1994), horses (Schott HC, 2nd et al., 2001), reptiles (Fonseca RJ, Dubey LM, 1994; MMWR, 1999) and other pets, including cats (Wall PG et al., 1996, Geffray L, 1999). From 1983 to 1992, passive surveillance of Salmonella serovars isolated in Canada found that 6 out of the top 10 serovars isolated from both human and animal sources were common to both groups (Khakhrai R, et al., 1997). Although such a finding does not establish a direct link between animal reservoirs and the frequency of human salmonellosis in Canada, it does suggest that this relationship should be explored further. Surveillance has also detected emerging zoonotic serovars, for example S. Enteritidis, and phage types, for example *S. typhimurium* DT104, as well as emerging reservoirs of important multi-resistant Salmonella, for example, the increasing isolation of *S. typhimurium* DT104 from horses in Ontario since 1997 (Weese JS et al., 2001). In addition to watching for emerging serovars, phage types and multi-resistant antibiotic patterns or emerging reservoirs of infection, surveillance systems can also address other issues.

Surveillance information collected over time, such as years, and geographic area, such as province, can detect patterns, such as seasonality or spread. As well, the data can be used to detect outbreaks or unusual increases that warrant further investigation. Links can be made between increases in disparate geographic areas, an important consideration in the current atmosphere of national and global trade and ease of movement. Surveillance information can also be used to develop and justify intervention programs by providing scientific evidence. Continued surveillance can then monitor the effectiveness of the intervention programs put in place by industry and governments.

The Salmonella Typing Laboratory, Laboratory of Foodborne Zoonoses (LFZ-STL), in Guelph, Ontario, is an ISO/IEC 17025 certified laboratory (Standards Council of Canada; see Scope of Accreditation (Accredited Laboratory #265) at www.scc.ca), as well as an Office Internationale des Épizooties (OIÉ) International Reference Laboratory for serotyping of non-human Salmonella isolates, a distinction not matched by any other laboratory in Canada. This allows the LFZ-STL to be confident regarding the validity of their results as well as to harmonize with international surveillance schemes.

The LFZ-STL has serotyped and phage typed Salmonella strains for government, university and private laboratories for more than 11 years. These results, when combined with the data collected on species, sample type, and province, serve as a passive surveillance system that monitors emerging serotypes, phage types and reservoirs of infection for humans. The LFZ-STL also has access to research and epidemiological expertise in order to investigate unusual findings and interpret the data generated by the system. As part of the surveillance program, clinical isolates are also tested for their antimicrobial resistance patterns on the new Sensititre machine (microbroth dilution) thereby completing the resources required for a multi-use surveillance system of the serovars, phage types, and antimicrobial resistance patterns of Salmonella from non-human sources. Details regarding the work of the Laboratory for Foodborne Zoonoses can be viewed at www.hc-sc.gc.ca/pphb-dgspsp/lfz-llczoa/index_e.html (a version in French is also available). Reports on the surveillance

activities of the LFZ-STL, as well as other items of interest related to salmonellosis on a national and global level, are available on a quarterly and annual basis.

The passive surveillance system of the LFZ-STL is currently being upgraded to provide more useful information to people who have an interest in salmonellosis control in Canada, as well as to allow integration with a national human enteric pathogen surveillance system. An important component of the upgrading effort involves communication with producers, producer associations, veterinarians, laboratories and various government bodies in Canada to inform you of our resources, to investigate areas of mutual benefit, to explore barriers to collaboration, and finally, to solicit clinical Salmonella isolates with accompanying demographic information for the surveillance system. If you would like to find out more about this surveillance initiative or think that you can benefit as an active collaborator, please feel free to contact myself (see below), Dr. Anne Muckle, Veterinary Microbiologist, LFZ-STL Laboratory Head (519 822-3300 , anne_muckle@hc-sc.gc.ca), or Dr. Anne Deckert, Veterinary Epidemiologist, Antimicrobial Resistance Surveillance Unit (519 826-2160, anne_deckert@hc-sc.gc.ca). To be put on the mailing list for the quarterly and annual newsletters from the LFZ-STL please contact Dr. Anne Muckle.

– Our thanks go to John Coates, Editor of Diagnostic Diary, for inviting us to share our projects with you.

Yours Cordially,
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Editor's note: a complete bibliography of this article is available to anyone upon request from the submitter, Dr Klotins, or from Diagnostic Diary.

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Toxicology and Nutrition:

R. Puls

The Clinical Nutrition section has recently acquired a new clinical analyzer, an Abbott Alcyon 300. Our previous clinical analyzers had been rendered obsolete by the discontinuation of the necessary BUN reagent kits.

With the new machine, we are now able to re-commence BUN (blood urea nitrogen) and MUN (milk urea nitrogen) analyses. The BUN/MUN test is designed to detect excessive levels of readily degradable protein in the diets of cattle, which has been linked to infertility.

The new analyzer has also enabled us to add two new analyses to our livestock production panel: **b-hydroxybutyrate (HBA)** and **NEFA** (non-esterified fatty acid). Both of these tests are useful in determining the metabolic energy status of the "transition cow", during the critical six-week period centered on calving. The tests are useful in detecting and preventing sub-clinical milk fever, ketosis and fatty liver syndrome. HBA is also useful for detecting an energy deficit in horses and sheep.

These two tests are meant to serve to develop a herd profile so several samples should be submitted from different animals. EDTA or sodium citrate (not heparin) should be added to whole blood samples to allow for harvesting of plasma for analysis. For NEFA testing it is important that the blood sample be kept on ice, the plasma be harvested as soon as possible, and shipped frozen to the laboratory. Enzyme action in samples kept at room temperature can lead to false elevation of the NEFA levels.

Please contact the Animal Health Centre for prices and submission information.

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Abstract: abomasal ulcers in unweaned beef calves:

A case-controlled study involving 30 unweaned beef calves was conducted to determine whether specific species of bacteria or fungi were associated with fatal abomasal ulcer formation. Special microbiological and histological techniques were used to detect *Clostridium perfringens* type A, *Helicobacter pylori*, or *Campylobacter spp*. It has been speculated that these bacteria are potential ulcerogenic agents of unweaned calves. Calves were recruited for the study at necropsy, with those dying of either a perforating or a hemorrhagic ulcer representing the cases, and calves of a similar age dying of a disease unrelated to the abomasum representing the controls. *Helicobacter pylori* was not visualized in or cultured from any of the abomasal tissue samples. *Clostridium perfringens* type A was isolated from 78.6% of the cases and 75% of the controls. These isolates were further dichotomized into "heavy" and "light" growth; no significant association was found between ulcers and the amount of growth. A light growth of *Campylobacter spp* was recovered from three cases and from three controls. There was no compelling evidence that Clostridium perfringens type A, *Helicobacter pylori,* or *Campylobacter spp* were involved in ulcer formation."

– Jelinski MD et al. *The relationship between the presence of Helicobacter pylori, Clostridium perfringens type A, Campylobacter spp, or fungi and fatal abomasal ulcers in unweaned calves.* Can Vet Jour 1995; 36: 379-382.

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Minutiae:

(1) The Spendore-Hoeppli phenomenon: this effect, observed microscopically within tissues in virtually any species, is an eosinophilic granulomatous reaction in the form of concentric rings or clubs. The effect is often found surrounding helminths, bacteria, or fungi.

(2) One of the more recent name changes in a bacterial organism familiar to veterinarians is the conversion of *Pasteurella hemolytica* to *Mannheimia hemolytica*.

(3) In 1885 the first human being ever to be immunized against rabies virus was the young Josef Meister, who had been severely bitten by a rabid animal. The vaccine had been developed and was administered by Louis Pasteur.

(4) The process of milk "pasteurization" that we know today was originally developed in the 1860s by Louis Pasteur, a chemist, to control unwanted fermentation in French wines. Later adapted to the preservation of milk, the process had a profound effect on reducing the incidence of bovine tuberculosis infection in children.

(5) *Pictou Disease* was a usually fatal, debilitating condition in Nova Scotia among cattle and horses, in the later 1800s and early 1900s. The affected animals developed liver cirrhosis, jaundice, and in the case of horses, staggering, head pressing, and walking in a straight line regardless of obstructions. For nearly 20 years, the Canadian government ordered slaughter of affected herds and disinfection of premises. Finally, in 1906, it was definitely established, following feeding trials, that Pictou disease was caused by the animals eating *Senecio jacobea*, commonly referred to as tansy ragwort.

– from P Cheeke: *Natural Toxicants in Feeds, Forages, and Poisonous Plant,* 2nd ed*,* 1998*;* Interstate Publishers, Danville, Illinois.

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Rudimentary organs:

"…It is an important fact that rudimentary organs, such as teeth in the upper jaws of whales and ruminants, can often be detected in the embryo, but afterwards wholly disappear. It is also, I believe, a universal rule, that a rudimentary organ part is of greater size in the embryo relatively to the adjoining parts, than in the adult; so that the organ at this early stage is less rudimentary, or even cannot be said to be in any degree rudimentary. Hence rudimentary organs in the adult are often said to have retained their embryonic condition.

I have now given the leading facts with respect to rudimentary organs. In reflecting on them, every one must be struck with astonishment; for the same reasoning power which tells us that most parts and organs are exquisitely adapted for certain purposes, tells us with equal plainness that these rudimentary or atrophied organs are imperfect and useless…

…as rudimentary organs, by whatever steps they may have been degraded into their present useless condition, are the record of a former state of things, and have been retained solely through the power of inheritance – we can understand, on the genealogical view of classification, how it is that systematists, in placing organisms in their proper places in one natural system, have often found rudimentary organs as useful as, or even sometimes more useful than, parts of high physiological importance. Rudimentary organs can be compared with the letters in a word, still retained in the spelling, but becoming useless in the pronunciation, but which serves as a clue for its derivation. On the view of descent with modification, we may conclude that the existence of organs in a rudimentary, imperfect, and useless condition, or quite aborted, far from presenting a strange difficulty… might even have been anticipated…"

– from *The Origin of Species*, by Charles Darwin, first appearing as a lengthy essay in 1844.

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Fossils and people:

"…The fossil record shows that rates of morphological evolution have varied greatly both within and between lines of descent. Because morphology is largely determined by DNA or, in some cases, the RNA in reproductive cells, it follows that the rates of change in DNA and RNA, and therefore also the rates of change in proteins, cannot have been constant in the evolution of organisms in general. This paleontological fact thus refutes the simple, original form of the neobiological molecular-clock hypothesis. In fact, the early attempts to apply the simple hypothesis to comparisons of the compositions of one of a few proteins were questionable and did not substantiate the hypothesis…

…The concept of evolution suggests, and the fossil record confirms, that all organisms, past and present, are parts of one extremely long and extremely branching family tree. Life on earth is a single phenomenon with many millions of manifestations. From this widened point of view, *Homo sapiens* is just one small twig on the tree of life. One of the wise men of ancient Greece – some say that it might have been Thales, but no one seems to be quite sure – originated the saying *Gnothi seauton* ("Know thyself"). Certainly, the recognition that we are related to all other organisms is one of the greatest advances ever made in self-knowledge.

– Simpson GG: *Fossils and the History of Life*: pub 1983 by Scientific American Books, distributed by WH Feedman And CO, New York, NY.

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