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SALMONELLA - THE DILEMMA

Every veterinarian in the U.S. has had to treat and offer consultation in the prevention of salmonellosis in animals. We should all be aware of the difficulties associated with this challenge. From the standpoint of the diagnostic laboratory, we have isolated Salmonella spp. and associated the microorganism with disease in all species of mammals, birds, and reptiles from aardvarks to zebras. There is no infectious agent that has more omnipotence than the salmonella genera of bacteria.

Obviously, this disease is too complex to discuss in a short article, but I would like to list some features of the organism and its pathogenic characteristics.

1. Salmonella spp. are mainly intracellular pathogens, which creates an important barrier for certain antimicrobials.
2. Most salmonella infections in animals are of the enteric form; septicemia is rare except in the immature animal.
3. Transmission is most commonly initiated from a carrier animal which may become stressed or coinfecting with another infectious agent; thereby triggering a shedding of high numbers of Salmonella spp., thus exposing contact animals.
4. Carriers may be detected only by fecal culture. An accepted practice in horses is to culture suspects daily for 5 days. If all specimens are negative, the animals are not shedding salmonella at that time. If 1/5 is salmonella positive, the animal may be considered a transient carrier which was exposed but probably not persistently infected. Another series may be advised at a later date. If 2/5 are salmonella positive (with the same serotype), the animal may be considered to be a persistent carrier and should be segregated and periodically recultured. A 5-10 gram quantity of feces is recommended for tetrathionate enrichment cultures. Screw cap, 4 oz. urine collection containers are preferred for transport and all samples can be kept refrigerated and then mailed to the laboratory at the same time.
5. Feed is usually the source of infection only when contaminated with feces from a clinical or carrier animal, except when unprocessed or improperly processed rendered meat is a component of the diet. The feeding of raw meat by-products to kennel dogs presents an important source of exposure to Salmonella spp.
6. Salmonella spp. possess adherence factors important to colonization of the large and small intestine. The region of the GI tract colonized and infected may vary with both the animal species and the bacterial serotype (there are over 2000 salmonella serotypes). Consequently, from 2 to 5 sections of the GI tract should be cultured for adequate isolate attempts. In the horse, a section of the upper and lower small intestine should be cultured in one pool and sections of the dorsal and ventral colon along with the cecum should be cultured in another pool.
7. Fecal cultures should be collected at the first signs of diarrhea before antimicrobial therapy is instituted.
8. Variation in pathogenicity is dependent on many factors, one of which is serotype surface O antigens. The OADDL microbiology laboratory groups all salmonella isolates according to O antigens into groups A,B,C,D, etc. This poly O typing is useful as a predictive value in assessing the pathogenic potential of the isolate, determining if multiple isolates are of the same serotype, guiding the use of salmonella bacterins, relating to human isolates in zoonotic conditions, etc. All

isolates are forwarded to The National Veterinary Service Laboratory for H antigen and final serotyping. Morbidity and mortality data from the group of animals exposed is important for collection of state and national epidemiology.

9. Cytotoxins and enterotoxins are important causes of damage to the intestinal mucosa. Cellular injury to the intestinal mucosa allows systemic invasion by endotoxins causing endotoxemia and various physiologic changes which are common manifestations of enteric salmonellosis in animals.
10. Septicemia is uncommon with most serotypes but invasion of the blood and internal organs is very common with some serotypes such as S. dublin and S. choleraesuis.
11. Visible bloody diarrhea is very uncommon in uncomplicated salmonellosis in animals. However, salmonella infections often occur concurrently with cryptosporidia, coccidia, BVD, parvovirus, Campylobacter spp. etc., whereby there may be a hemorrhage diarrhea.
12. Salmonellosis is often a stress-related disease and is more prevalent in immature animals. The use of antibiotics or chemicals that alter the normal intestinal microflora will predispose to salmonella infection. Numerous studies have shown a direct correlation between antimicrobial therapy and incidence of salmonella. Also, research has established that the use of antibiotics to treat salmonella infections in man and horses will prolong the carrier status. --**Oklahoma Animal Disease Diagnostic Laboratory Newsletter, August, 1991, as reported in Animal Health Beat, Vol. 8, No. 7, July 1992, University of Nevada--Reno.**

GROUND WATER

Contrary to popular belief, ground water does not form underground "rivers". Instead, it fills the tiny spaces between individual sediment grains. Ground water moves very slowly, at a typical rate of 2 feet per day in the water-table aquifer. As a result, water could remain in this aquifer for several decades, and as long as centuries in the underlying confined aquifers. --**Are Fertilizer and Pesticides in the Groundwater?** by Pixie A. Hamilton and Robert J. Shedlock, U.S. Geological Survey, as reported in *Water News*, Vol. 23, No. 7, 1992, VPI & SU.

CANINE DISTEMPER FACTS

Canine distemper (CD) virus can infect a wide range of carnivores, including members of the Canidae (dog, coyote, wolf, jackal, fox, dingo); the Procyonidae (raccoon, coatimundi, panda); the Mustelidae (ferret, mink, skunk, otter, weasel); but not other carnivores such as the Hyaenidae (hyenas) or the Ursidae (bears). Felidae (cat family) may harbor inapparent infections. Twenty-five to 75% of susceptible dogs develop subclinical infection and shed the virus. Clinical signs vary according to virulence of infecting CD virus strain, age, immunocompetence, and body systems affected. Mild cases may show listlessness, dehydration, anorexia, fever and weight loss while more severe forms may show ocular and nasal discharge, cough, dyspnea, diarrhea and vomiting.

Dogs surviving a severe case of CD disease may progress to a more significant clinical disease. Neurologic signs and intensification of other classical signs are commonly seen with this progression. The CD virus affects the white and grey matter of the CNS. The signs associated with infection may include behavioral changes; seizures; cerebellar (tremors, hypermetria) and vestibular (head-tilt, ataxia, nystagmus) signs; visual defects; paresis; paralysis; and myoclonus. --**Abstracted from Shell L.G. in the Compendium (1990) p. 173-179, as reported in Animal Health Beat, Vol. 8, No. 4, April 1992, University of Nevada--Reno.**

DOMESTIC FERRET PREVENTATIVE HEALTH

Ferrets are becoming increasingly popular pets in the United States. It is estimated that there are now at least five million pet ferrets in the United States, and the number is growing. The ferrets kept as pets are domesticated relatives of wild ferrets and have become gentler and more compatible with humans through years of captive breeding.

Examination: Handle ferrets without protective gloves. Most are gentle enough to do this. Lay the ferret's abdomen on your forearm, put the index and middle finger of the same hand on either side of the neck and the rest of the fingers behind the forelegs. This leaves your other hand free to palpate and manipulate. If the ferret is too squirmy to hold this way, try picking it up by the scruff of the neck in the same manner a mother cat picks up her kittens. Support the hind legs with your other hand. You may need an assistant to restrain the ferret while you are performing the examination

Many ferrets will have ear mites and show no clinical signs, so use an ear swab to sample and look for mites and eggs. If the infestation is heavy, a bright light may be used to see the mites in the ear. Holding the ferret by the scruff of the neck is the best restraint method for ear swabs and examinations. The author recommends using injectable Ivermectin topically to treat the ear mites. She uses 0.50 mg/kg, divided into two doses, each of which is massaged into an ear. Repeat the treatment in two weeks. Bathe the ferret 24 hours after each treatment and wash the cage and bedding.

Vaccinations: Canine distemper is nearly 100% fatal in ferrets. Vaccinate against canine distemper using vaccine that is **NOT** of ferret origin. The author recommends Fromm D. (Salvay) because it contains only the MLV canine distemper virus, and it is safe and effective. If the dam was vaccinated, start vaccinating the kits at eight weeks of age. Repeat the vaccination at two-week intervals until they are 12 to 13 weeks of age. Booster annually. Restraint by the scruff works well when administering injections. Hold a treat or some Nutrical (Evsco) in front of the ferret's nose for distraction.

Rabies vaccine is given at three months of age. Pitman Moore's Imrab has been approved for use in ferrets. It is a killed product and can be given subcutaneously. Booster annually.

Ferrets do not have to be immunized against feline distemper or parvovirus.

Heartworms: Ferrets are natural hosts for heartworms. Put them on heartworm preventative if you live in a heartworm prone area. Ivermectin is administered monthly at the same dose as in the dog. The injectable form is given orally after proper dilution. Some practitioners use one 68 mcg Ivermectin tablet pre ferret per month with no adverse side effects.

Neutering: Female ferrets are neutered between five and six months of age to prevent fatal anemia that can accompany prolonged estrus and hyperestrogenism. Ferrets can be spayed while in heat, but if she has been in heat for more than three days, do a CBC and check for anemia first.

Male ferrets are neutered at five to six months of age to help odor control. Ferret odor is under androgen hormone control and comes from primarily the skin glands. Neutering will remove most of the skin odor. Anal glands do not have to be removed.

Hairballs: Ferrets should receive a feline hairball laxative every other day. They are prone to hairballs, but they don't vomit them up like cats will. Ferrets also love to eat small objects like rubber toys, rubber bands, and chair protectors. The laxative will help them pass through the ferret.

Geriatrics: Disease incidence goes up rapidly after a ferret passes three years of age. Neoplasia is the most common problem. Examine geriatric ferrets (> three years old) every six months to look for early signs of neoplasia. A full body radiograph (VD and lateral), CBC and chemistry profile are done at this time. All tests are done on an outpatient basis. Mask the ferret down with isoflurane and take the radiographs and blood samples. At the same time, scale the teeth and remove any small tumors on the skin. Mast cell tumors are common in older ferrets. --Dr. S. A. Brown, the *Journal of Small Exotic Animal Medicine* 1 (1)1991, as reported in *Notes from the Extension Veterinarians*, August 1992, Kansas State University, Manhattan, KS.

SACROPTES MANGE IN PET PIGS

Sarcoptes mange continues to be the most common external parasitic problem in pot-bellied pigs. Skin scrapings may or may not be diagnostic in affected young pigs. Clinical signs of pruritus and dermatitis may be the basis for a presumptive diagnosis. In at least half the calls I receive from practitioners about possible sarcoptes mange in pet pigs, the owners exhibit pruritic skin lesions on the arms or abdomen. Treatment of the pig with 1 ml/75 lbs. SC (300 mcg/kg) of 1 percent ivermectin twice, at 10-day intervals, will eliminate the mange mite. Owners with lesions should be advised to seek treatment by a physician to eliminate the tremendous pruritus they suffer and to avoid the possibility of serving as a reservoir for pig reinfestation.

Sarcoptes mange commonly develops in young pigs that have been isolated from other pigs for several weeks after purchase. Owners are concerned about the source of infestation when this occurs. In a few cases it was known that the dams had clinical sarcoptes mange and exposed the pigs before weaning. Clinical mange in the isolated pig then developed several weeks after exposure. At the same time, owners were exposed and infested with sarcoptes mange mites.

It may be prudent to routinely inject young pigs with ivermectin to eliminate external parasites, in the event they have been exposed. Preventing sarcoptes mange infestation in humans would also save owners considerable money in medical treatment. --Bruce Lawhorne, DVM, MS, *Extension Veterinarian*, Texas Agricultural Extension Service, *Veterinary Quarterly Review*, Vol. 8, No. 2, April-June, 1992.

NEOPLASMS OF THE APOCRINE SWEAT GLANDS IN DOGS AND CATS

Neoplasms of the apocrine sweat glands are generally considered to be uncommon in dogs. Such neoplasms, however, accounted for 2.0 percent and 3.6 percent, respectively, of all canine and feline skin neoplasms diagnosed during a period of three years. They occurred in dogs from six to 17 years of age of both sexes. Golden retrievers appeared to be more predisposed to these neoplasms than other breeds. They occurred in cats from six to 17 years of age but with no breed or sex predilections. In both species, the neoplasms were usually solitary and occurred anywhere on the body; they were nearly always carcinomas and histologically were usually of the solid type. No clinical measurements were made that would enable distinguishable reliably between benign and malignant lesions. No distant metastases were recorded, even though 22.5 percent of the canine carcinomas had invaded the lymphatic system. -- *Abstracted from Kalaher, K.M., et al., Vet. Record* 127 (1990), p. 400-403, as reported in *Animal Health Beat*, Vol. 8, No. 4, April 1992, University of Nevada--Reno.

MILK REPLACER FOR FOALS

Commercial milk replacer may not always be available when needed or may be too costly for the owner. The table below provides several recipes for custom, home-made products.

Formulas to use for short periods if commercial mare milk replacers are unavailable:

Formula 1 ^a	24 oz cow's milk 12 oz. saturated lime water 4 tsp. dextrose ^b
Formula 2	4 oz evaporated milk 4 oz warm water 1 tsp. of white corn syrup ^b
Formula 3	8 oz. 2% cow's milk 1 tsp. white corn syrup ^b
Formula 4	3.5 qts. cow's milk 3.5 qts. water 10 oz. wheat flour 10 oz. ground malt 2 oz. potassium bicarbonate

^aWe prefer this formula.

^bTable sugar may produce diarrhea and thus should be avoided in the mix.

Besides substituting for mare's milk, supplementary home-made mare's milk should be fed if a foal is not growing at the expected rate and inadequate milk production is suspected. When foals are to be supplemented, small quantities of mare's milk replacer can be fed from a bottle, bucket or pan. Foals can easily be taught to drink from the latter. Human baby nipples work well for foals. Cleanliness is important. When cow's milk is used, it should be pasteurized at 169 degrees F. for 15 minutes. Calf milk replacer may be adequate for foals if its analysis is 15% fat, 20% protein and less than 0.5% crude fiber. – **Abstracted from: Pugh, D.G. and Williams, M.A., Compendium Cont. Ed. 14 (1991), p. 526-532, as reported in Animal Health Beat, Vol. 8, No. 6, June 1992, University of Nevada--Reno.**

FALL CONFERENCE - BOVINE PRACTITIONERS

The 1992 annual Bovine Practitioners Conference will be held in Frederick, MD, October 29-30 at the Holiday Inn, Francis Scott Key Mall, Route 85.

For more information, contact: Dr. Douglas Carmal, VMRCVM, University of Maryland, College Park, MD 20742. Telephone (301) 935-6083.

THOUGHT FOR THE MONTH

The most unexplored and underdeveloped territory known to mankind is under your hat.

**CONTINUING EDUCATION OPPORTUNITIES
Fall 1992**

<u>Date</u>	<u>Program</u>	<u>Location</u>	<u>Contact Hours</u>
September 24	Small Animal Medicine Update	Charlottesville	4
*October 2-3	Orthopedic Surgery - Canine Hindlimb	Blacksburg	10
*October 9	Blood Banking & Transfusion Medicine	Blacksburg	5
*October 9-10	Gastrointestinal Endoscopy (Intermediate)	Blacksburg	10
*October 30-31	Acute Abdomen (Small Animal)	Blacksburg	10
*November 6-7	Anesthesiology for Practitioners	Blacksburg	8-12
*December 4-5	Practical Eye Surgery	Blacksburg	10
*December 18-19	Small Animal Dentistry	Blacksburg	10

*Limited enrollment course featuring hands-on experience.

Note: Program brochures are mailed 6-8 weeks prior to course dates. Course reservations cannot be accepted until the brochures are mailed. For CE course information, please contact:

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ANESTHESIA CE PROGRAM

A continuing education short course, Anesthesiology for Practitioners, will be offered at the College in Blacksburg on November 6-7, 1992. This is a joint effort involving faculty members from the veterinary colleges at the University of Tennessee and North Carolina State University. Three outstanding board certified anesthesiologists will present the program, Bob Paddleford, Cliff Swanson, and Chuck McGrath. They will give illustrated lectures on Friday and Saturday, November 6-7, and a limited enrollment, hands-on laboratory Saturday afternoon.

Topics to be covered include: new injectable anesthetics and antagonists, premedication, inhalation anesthetics isoflurane and halothane, low flow anesthesia, waste anesthetic gases, analgesics, supportive medication, special anesthesia, patient monitoring and complications.

Continuing education credit is eight hours for the lecture program and four additional hours for the lab. Program brochures will be mailed out in early September.

SOUTHERN MEETING

The Southern Veterinary Medical Federation will celebrate its 75th annual meeting with a Diamond Jubilee Convention in Nashville, October 18-21, 1992. Program features include a State Leadership Conference, a technicians program and sessions on Dermatology, Orthopedics, Anesthesiology, and Drug Regulations. The convention will take place at the Sheraton Music City Hotel. Contact Marie Gore (704) 743-5754, Cashiers NC for convention registration information.

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