



LAWSONIA INTRACELLULARIS

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Lawsonia intracellularis (*L. intracellularis*) is an obligate intracellular gram negative bacterium that is most commonly associated with disease (proliferative enteropathy) in pigs. Porcine proliferative enteropathy is a proliferative disease affecting the ileum and, in some cases, the large intestine.¹ The bacteria infect gastrointestinal mucosal cells, specifically crypt cells, resulting in the loss of normal villi architecture in affected areas. Loss of villi leads to the loss of brush-border structure resulting in malabsorption. In horses, the pathogenesis of *L. intracellularis* is similar to the pathogenesis in pigs, although disease is confined solely to the small intestine.

L. intracellularis classically affects young horses, especially weanlings. Several breeds are reported to have been affected. Classical clinical signs in affected animals include weight loss, dull demeanour, dependant oedema, rough hair coat and diarrhoea. The severity and range of clinical signs varies extensively, ranging from profuse diarrhoea and colic to dullness and weight loss with normal faeces. A retrospective review¹ of 57 confirmed *L. intracellularis* cases revealed the most common clinical signs to be oedema, diarrhoea and fever. Clinical pathology classically shows profound hypoalbuminaemia and hypoproteinaemia (all horses in the previously mentioned study were hypoalbuminaemic; 74% had albumin levels <2mg/dl (reference range 3.4-4.1 mg/dl)). An association between affected horses and exposure to pigs is not a consistent finding.

The differential diagnoses for horses presenting with hypoalbuminaemia, with or without diarrhoea include, in addition to *L. intracellularis*, parasitism, right dorsal colitis, NSAID toxicity, *Rhodococcus equi*, sand enteropathy, peritonitis, alimentary lymphosarcoma and other infiltrative bowel diseases such as lymphocytic-plasmacytic enteritis. Colitis of any form can also lead to hypoproteinaemia. It should be remembered that severe pleuritis and protein losing nephropathy can also lead to hypoproteinaemia and if there are any concerns that the urinary or respiratory systems are affected, appropriate investigation should be performed. *L. intracellularis* should be considered as an important differential in any young horse presenting with diarrhoea, weight loss or chronic colic and hypoproteinaemia. Further diagnostics should be carried out to more definitively diagnose the cause of clinical signs.

Standard work-up for a case presenting with hypoproteinaemia (with or without diarrhoea/weight loss) might include abdominal ultrasonography, abdominocentesis, rectal exam, faecal exam and faecal culture and rectal biopsy. A glucose tolerance test may also be indicated if weight loss is the predominant sign. The most useful diagnostic test for the diagnosis of *L. intracellularis* is abdominal ultrasonography.

- Abdominal ultrasonography in classical cases of *L. intracellularis* reveals marked thickening of the small intestinal wall. It is impossible to visualise the entire length of the small intestine using ultrasound, thus the identification of normal small intestine on ultrasonographic exam does not exclude *L. intracellularis* as a cause of disease.



Ultrasonographic image of thickened loops of small intestine in a horse suffering from *L. intracellularis*. Image kindly provided by Dr. Joann Slack



Diffuse thickening and corrugation of the small intestine mucosa in *L. intracellularis*. Image kindly provided by Dr. Perry Habecker,

- Abdominocentesis would be expected to be within normal limits in *L. intracellularis*.
- Faecal culture should be performed to test for *Salmonella* and *Clostridial* species. Due to the intermittent shedding of *Salmonella* in infected animals, 3-5 cultures should be performed. Faecal floatation to identify parasites should also be conducted. Cyathostomiasis and tapeworm infestation may not be detected using this technique. Testing can also be performed for Rotavirus and Cryptosporidium.
- Rectal exam should be within normal limits in horses with *L. intracellularis*. Thickening of the small intestine may be palpable but the small intestine should not be distended.
- Rectal biopsy should only be performed if infiltrative enteropathy is suspected. *L. intracellularis* is limited to the small intestine thus rectal biopsy should be normal. Rectal biopsy in horses with diarrhoea should only be carried out if considered essential due to the friable nature of the rectal mucosa.

A presumptive diagnosis of *L. intracellularis* can be made based on signalement, clinical pathology and abdominal ultrasound findings. Definitive diagnosis requires demonstration of *L. intracellularis* organism in the wall of the small intestine, requiring *post mortem* examination or surgical biopsy. In most clinical cases diagnosis must be made using less invasive tests. A PCR is available that detects *L. intracellularis* organisms in faeces. This test has good specificity; however false negatives are possible due to intermittent organism shedding and decreased shedding with antimicrobial treatment.² Serological testing is can also be used to identify antibodies against *L. intracellularis* in recently exposed horses. In pigs, serology is considered more sensitive than PCR; this has not been investigated in equines. PCR testing is available at the Scottish Agricultural College. Serological testing is not currently available in the UK but can be performed at the Veterinary Diagnostic Laboratory, University of Minnesota.

L. intracellularis was first demonstrated to be a cause of equine disease in 1996³ (the first case was actually described in 1982⁴, but was not identified as *L. intracellularis* for several years). The disease has since been reported in Europe, Canada and Australia. The incidence of the disease appears to be increasing however this may be due to increased awareness of disease and increased availability of diagnostic tests. The true prevalence of *L. intracellularis* in horses is unknown.



The epidemiology of *L. intracellularis* has not been fully investigated and questions remain about the mechanism of transmission between horses. Infected animals shed organisms in their faeces resulting in contamination of soil. Studies in pigs have revealed that the *L. intracellularis* would not be expected to survive for longer than 2 weeks in the environment⁵. Cases on horse farms are often seen with longer periods between clinical cases or after there have been no horses present on a premise for several years. These findings suggest an environmental reservoir may exist, possibly in the wild deer population. Further work is needed in this area.

L. intracellularis infection can be fatal in equines if no treatment is instituted, however properly managed cases appear to have a high survival rate (in a referral hospital population, 93% of treated cases survived¹). Treatment recommendations focus on elimination of *L. intracellularis* from the gastrointestinal tract using antimicrobial therapy, colloidal support and general supportive care. Antimicrobials must achieve and maintain high intracellular concentrations in order to be effective against *L. intracellularis*. Commonly used therapies include erythromycin² (with or without rifampin) and oxytetracycline⁶. Licensing laws and potential side effects must be taken into account when deciding on which antimicrobial is most suitable. Readers should specifically remember that due to the high incidence of colitis in weaned horses treated with erythromycin, this drug should be used with great care. In the author's opinion, the use of this drug is contraindicated in animals over one year old due to the potential for fatal colitis. Oxytetracycline is a nephrotoxic drug thus appropriate fluid therapy should be initiated in hypovolaemic or dehydrated animals receiving treatment. Prolonged therapy is often essential in *L. intracellularis* cases (4-6 weeks) and the use of oral doxycycline in place of oxytetracycline has been described.⁶

Colloidal support is indicated in animals where albumin concentration is very low. Plasma transfusions or the use of synthetic colloids (i.e. pentastarch) help transiently alleviate the severe bowel oedema and peripheral oedema that can develop. Colloid administration can provide significant benefit early in the course of treatment. Further supportive care that may be indicated includes fluid therapy (if necessary due to dehydration caused by diarrhoea), nutrition and general supportive care. Protein and albumin levels should be monitored during treatment, however rapid increases should not be expected.

The long term outcome for young animals affected by *L. intracellularis* has not been studied, however current knowledge suggests that animals that survive do not have significant long term problems with growth, abdominal disease or performance. Further work is needed in this area, along with further investigation of the epidemiology of this disease and potential preventative measures.

¹ How to diagnose and treat *Lawsonia intracellularis* Frazer ML

Proceedings of the 53rd annual convention of the AAEP, Florida, 2007 pp236-239

² Equine proliferative enteropathy: a cause of weight loss, colic, diarrhea and hypoproteinaemia in foals on three breeding farms in Canada

Lavoie JP, Drolet R, Parsons D *et al* *Equine Vet J* 2000 ;32 :418-425

³ Proliferative enteropathy in a foal caused by *Lawsonia intracellularis*-like bacterium.

Williams NM, Harrison LR, Gebhart CJ. *J Vet Diagn Invest.* 1996 Apr;8(2):254-6.

⁴ Intestinal adenomatosis in a foal

Duhamel GE, Wheeldon EB *Vet Pathol* 1982;19:447-450

⁵ An outbreak of *Lawsonia intracellularis* infection in a standardbred herd in Ontario

Kimberly M, McGurrian J, Vengust M *et al* *Canadian Vet J* 2007;48:927-930

⁶ Tetracycline therapy of *Lawsonia intracellularis* enteropathy in foals.

Sampieri F, Hinchcliff KW, Toribio RE. *Equine Vet J.* 2006 Jan;38(1):89-92