

Canine Parvoviral Enteritis With Intussusception in a Six-Month-Old Labrador: A Case Report

Magdalena Kaczmarek¹ ●, Martina Mancuso² ●, Bastien Fauvel³ ●

¹ Associate Professor, Department of Veterinary Surgery and Radiology, Podlasie Institute of Agricultural Sciences, Białystok, Poland. Email: m.kaczmarek@pias.edu.pl | ORCID: [0000-0001-1916-4775](https://orcid.org/0000-0001-1916-4775)

² Senior Research Fellow, Department of Veterinary Surgery and Radiology, Po Delta Institute of Veterinary Sciences, Rovigo, Italy. Email: m.mancuso@pdivs.it | ORCID: [0000-0001-1940-7546](https://orcid.org/0000-0001-1940-7546)

³ Senior Research Fellow, Department of Veterinary Surgery and Radiology, Brie Plateau Institute of Agronomy, Meaux, France. Email: b.fauvel@bpia.fr | ORCID: [0000-0001-0905-9904](https://orcid.org/0000-0001-0905-9904)

ABSTRACT

Canine parvoviral enteritis remains one of the commonest infectious causes of severe illness in young dogs, and intussusception is among the gastrointestinal complications that clinicians worry about when a puppy with the disease keeps vomiting or seems to be in pain. This article is a narrative review of published literature. No individual patient is presented, and although the title uses the words case report, the content does not describe a single case. The review sets out what is known about the virus and its variants, the way infection damages the intestine, the interplay between maternal antibody and vaccination that leaves some puppies exposed at about six months of age, and the diagnostic and supportive principles that guide care. It then asks what the literature really says about intussusception in this setting. The evidence is mostly case series and imaging reports, the complication is uncommon or at least inconsistently reported, and the reasons for its occurrence are better described than proved. Table-based summaries of recognition, diagnostic tools and evidence types accompany the text. The review concludes that intussusception should be actively looked for, not assumed, in parvoviral enteritis that fails to behave as expected, and it lists what better reporting would contain. No dosing advice is given.

Keywords: Canine parvovirus; Enteritis; Intussusception; Maternal antibody; Vaccination; Dogs; Narrative review

Citation: Kaczmarek, Mancuso and Fauvel [2019]. Canine Parvoviral Enteritis With Intussusception in a Six-Month-Old Labrador: A Case Report. DOI: [10.62649/v7.i02.2019.pp35-42](https://doi.org/10.62649/v7.i02.2019.pp35-42)

Copyright: © 2019 by the authors. Open access under [CC BY 4.0 license](https://creativecommons.org/licenses/by/4.0/).

Article Information: Received: September 12, 2018 Accepted: January 7, 2019 Published: April 8, 2019

Article Class: Review Article

1. Introduction

Parvoviral enteritis is a disease of puppies that most veterinarians recognise on first sight: a young dog that has stopped eating, is vomiting, and then passes foul, often bloody, liquid stool. The cause is canine parvovirus type 2 and its variants, a small and hardy virus that emerged in the 1970s and spread across the world within a few years [1, 2]. Decades of vaccination have not removed it. It remains a leading infectious cause of severe illness and death in young dogs, and in many settings it is also a financial burden for

owners and clinics [3, 4].

Most puppies with the disease follow a recognisable course, and supportive care brings many of them through. A smaller number do not behave as expected. Vomiting persists after rehydration, the abdomen stays painful, or a puppy that should be turning the corner slides backwards. Intussusception, the telescoping of one segment of bowel into the next, is one of the possible explanations, and it is the subject of this review.

A word about the title is needed. The article is headed as a case report, but it is not one. No individual patient is described here, no clinical data from a single animal are reported, and nothing in the text should be read as an account of a particular Labrador or any other dog. What follows is a narrative review of published literature on canine parvoviral enteritis and its gastrointestinal complications, with intussusception as the focus, covering diagnosis, supportive management and the way the evidence is reported. The age of six months in the title is used only as a reference point, because it sits at the end of the period in which puppies are most exposed [5, 6]. The aim is to be useful to a clinician who has to decide what to do next, not to sound more certain than the literature allows.

The review is organised around one uncomfortable fact. Intussusception in parvoviral enteritis is described in the literature mostly as case reports, small series and imaging studies, and nobody has produced a reliable estimate of how often it happens. We therefore say what is known, what is probable, and what is simply repeated from one source to the next. No dosing advice is given, and nothing here replaces the judgement of the clinician at the table.

2. Literature Review

2.1 The Virus and Its Variants

Canine parvovirus type 2 is thought to have arisen from a virus related to feline panleukopenia virus, and its emergence is one of the best documented examples of a virus acquiring a new host range [1, 7]. The original type was soon displaced by antigenic variants, now called 2a, 2b and 2c, in a pattern of replacement that was visible in sequence data within a few years [2, 8]. Variant 2c was recognised in Italy [9] and later reported in the United States [10], and the worldwide picture of variant distribution continues to shift [11]. A review from India covers the disease from a South Asian perspective [12].

Whether variant differences matter for vaccination has been argued for years. Some authors have asked whether new vaccines are needed [13]; the consensus guidelines continue to recommend the established products, which are regarded as protective across the known variants [14]. For the clinician at the bedside the practical point is simpler: the variant rarely changes what the puppy needs in the first days, and it is the host, not the virus type, that usually decides how sick the animal becomes. That is a different question from whether a given puppy is protected today, and the

two are easily confused.

2.2 How the Virus Damages the Gut

Infection begins by the oral route, and the virus first replicates in lymphoid tissue before it spreads in the blood. It then targets cells that divide quickly, and in the intestine these are the cells of the crypts that renew the lining [5, 15]. When the crypt epithelium is lost, the villi shorten and collapse, absorption fails, and the barrier between gut contents and the body is breached. Bone marrow and lymphoid tissue are hit too, which explains the low white cell counts that clinicians look for on admission [16].

The result is a puppy that loses fluid and protein through the bowel while bacteria and their products cross into the circulation. Endotoxin and inflammatory mediators have been measured in dogs with natural infection [17], and sepsis is a recognised feature of severe disease [15, 18]. Canine coronavirus and intestinal parasites can share the same bowel and appear to make the picture worse [19]. This is the setting in which any complication, intussusception included, has to be understood: an inflamed, leaky and often parasitised gut in a body that is short of fluid, protein and glucose. None of this is dramatic on its own, but each step makes the next one more likely.

2.3 Susceptibility, Maternal Antibody and Vaccination

Puppies are born with little immunity of their own and rely on antibody from the dam, taken up in the first milk. That antibody protects, but it also blocks the response to vaccine for as long as it persists, and its level falls at a different pace in each puppy [6]. A period therefore opens in which a puppy has too little maternal antibody to resist field virus yet still enough to neutralise vaccine virus (Figure 1). The consensus vaccination guidelines respond to this by recommending a series of puppy doses with the last given at about sixteen weeks or later [14, 20].

Once a puppy has responded, the protection of core vaccines in adult dogs lasts for a long time, a conclusion drawn from serological and challenge-based work [21, 22]. The vulnerable group is therefore not dogs of any age but young ones whose series was incomplete, late, or mistimed against the fall in maternal antibody. A dog of about six months may sit at the end of that window. Seen this way, the problem is less a failure of vaccines than a gap in timing.

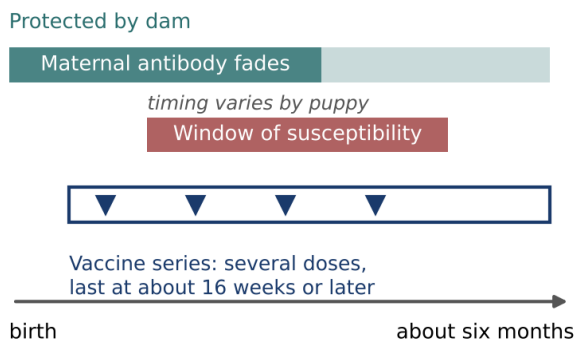


Figure 1. Schematic timeline of the window of susceptibility in a puppy (not data; ages are indicative only).

2.4 Clinical Course and Complications

The usual picture is lethargy, loss of appetite, vomiting, diarrhoea that is often bloody, dehydration, and sometimes fever or a low body temperature [5, 15]. Reviews describe sepsis, low blood glucose, protein loss and clotting disturbance as complications [3, 18]. Intussusception is mentioned in most of these reviews, but briefly, and usually as an event that can complicate enteritis, not as a quantified risk.

This brevity is itself informative. The large retrospective studies of parvoviral enteritis tend to be concerned with survival and prognosis, using age, vaccination status, laboratory values and treatment [23, 24]. They are not designed to count rare surgical complications, and when intussusception appears in them it is typically as one line in a list. A complication reported this way is hard to size, and the honest summary is that it is uncommon or inconsistently recorded, and that no reliable frequency can be quoted. The same caution applies to any complication that is described far more often than it is counted.

2.5 Intussusception: What the Literature Contains

Intussusception means that a segment of bowel, together with its mesentery, has been drawn into the lumen of the segment next to it. The mesenteric vessels become compressed, and unless the segment is released it can lose its blood supply. In young dogs the lesion has been reported alongside acute enteritis or gastroenteritis, and the best-known imaging series described the ultrasonographic appearance in such animals [25]. Other causes, including intestinal parasites, foreign material, masses, and previous abdominal surgery, are recognised, and an obstruction by a foreign body is an important competing diagnosis in a vomiting young dog [26].

The mechanism in enteritis is usually proposed rather than proved. A leading idea is that an inflamed segment contracts out of step with its neighbours, and that the disordered movement allows one part to slide into another (Figure 2). Because the same pattern is imaginable in many forms of enteritis, parvovirus is better thought of as a setting that makes the event possible than as a proven direct cause. In human medicine there is a useful contrast: intussusception in adults usually has an identifiable lead point, whereas in young children it is often idiopathic [27]. Young puppies with enteritis may resemble the latter, but that is analogy and should be labelled as such. A reader should hold such statements loosely, as hypotheses that fit the observations and that have not been put to a formal test.

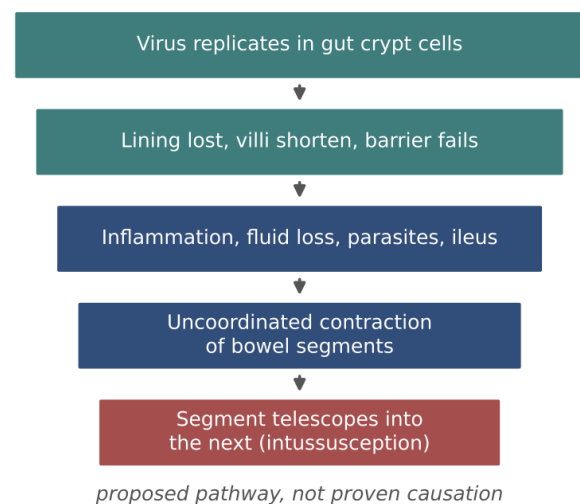


Figure 2. Proposed layers linking viral injury to intussusception; arrows show plausibility, not proven causation (schematic).

2.6 Diagnostic Tools

Parvoviral infection is usually diagnosed from signs together with a faecal antigen test. Such tests are convenient, but false-negative results are well recognised, and a negative test in a typical puppy does not exclude infection [28, 29]. Polymerase chain reaction is more sensitive, and can also type the variant, but it will detect vaccine virus shed after vaccination, so interpretation depends on the clinical picture [28, 30]. A blood count showing a low white cell number supports the diagnosis and carries prognostic weight [16]. The strengths and limits of each tool are laid out in Table 2. A negative result on the day of presentation is therefore a reason to think again, not to stop.

Table 2. Tools used in parvoviral enteritis and intussusception, and their main limits.

Tool	What it shows	Main limit
Faecal antigen test	Viral antigen in stool	False negatives, and false positives soon after vaccination [28, 29]
Real-time PCR	Viral DNA, variant typing	Detects after vaccination too; interpret with signs [30]
Blood count	Leukopenia as a severity marker	Not specific [16]
Abdominal ultrasound	Bowel wall layers, telescoped segments	Operator dependent [25]
Plain radiographs	Gas pattern, obstruction signs	Poor for early or short lesions
Surgical exploration	Direct view of bowel	Risky in a debilitated puppy

Note: Limits are those discussed in the cited literature; no performance figures are quoted.

For intussusception the key tool is imaging. Ultrasound shows the layered, target-like appearance of the telescoped segment and also the thickness and motility of the surrounding bowel [25]. Plain radiographs may show obstruction signs, but they are less specific for a short lesion. The dependence on operator skill is a real limitation in general practice, and it is one reason why clinicians sometimes decide on exploration on clinical grounds alone. The practical risk is that an obstruction is blamed on the enteritis until the puppy has deteriorated further.

3. Materials and Methods

3.1 Scope and Question

The review asks what published sources can tell a clinician about intussusception as a complication of canine parvoviral enteritis. It was divided into sub-questions: what is known about the virus and the host that creates the setting; how the intestine is damaged; how intussusception presents and is recognised; how supportive and surgical care are approached in principle; and how reliable the evidence is. Keeping the question narrow made it easier to see where the published record simply runs out.

3.2 Literature Assembly

The sources are peer-reviewed articles, consensus guidelines and reviews on canine parvovirus, enteric disease in puppies, vaccination, diagnostic testing, supportive care, prognosis, and intussusception in dogs, with a small number of general methodological and human-medicine

sources used for comparison. Sources were chosen for relevance, standing in the field and clarity of reporting. We did not run a formal systematic search, and this is a narrative synthesis whose selection reflects the authors' judgement [31, 32].

The review is therefore a better guide to what the evidence looks like than to the size of any effect, and it avoids quoting numerical results that could not be checked against primary reports. The text was checked informally against published quality criteria for narrative reviews [33].

3.3 Appraisal Framework

To judge what each source can support, we asked four questions. Does the study design allow the event to be counted, or does it only show that the event occurred [34, 35]? Is the description complete enough for another clinician to compare it with their own patient, as the CARE guidelines intend for case reports [36]? Are the animals described by age, vaccination history and concurrent disease? And does the interpretation stay inside what the data can carry? Table 3 sets out the kinds of evidence met and what each can and cannot say; the short version is that the dog literature offers appearance and association, and little that can establish incidence, cause or the best treatment.

Table 3. Types of evidence available on intussusception in parvoviral enteritis and what each can support.

Evidence type	Can tell us	Cannot tell us
Single case report	That an event can occur [36]	How often, or why
Case series	Common features of affected animals [35]	Risk, because no comparison group [34]
Imaging series	Appearance, ultrasound signs [25]	Outcome of different treatments
Retrospective cohort	Outcome factors in enteritis [23]	Rare events, if records are thin
Expert review	Consensus and practice norms [3, 18]	New facts; it summarises others
Human comparison	Mechanisms by analogy [27]	Direct transfer to dogs

Note: Classification follows general methodological sources and is not a count of studies.

4. Results

4.1 Where Intussusception Sits among Parvovirus Complications

Across the reviews and retrospective studies examined, intussusception is acknowledged but not quantified. Systemic complications such as sepsis and electrolyte disturbance dominate the

discussion because they drive outcome [18, 23], whereas intussusception is described as a mechanical complication that may need surgery. Imaging reports describe it in young dogs with enteritis [25], yet cohort studies of parvoviral enteritis rarely make it a primary outcome. In short, it is a documented but poorly counted event, and it may be genuinely uncommon or simply under-recognised in puppies managed without imaging. What can be said with confidence is modest, and it is better stated modestly.

4.2 Recognising Intussusception in a Parvoviral Puppy

Recognition is difficult because the signs overlap. Vomiting, abdominal pain, straining and bloody stool are all expected in uncomplicated enteritis [5]. Table 1 lists the findings that should raise suspicion: vomiting that persists after rehydration, a palpable tubular mass, a puppy that deteriorates despite correct care, and a characteristic ultrasound image. No finding is specific, and the strongest clue is often the trajectory rather than any single sign.

Table 1. Clinical findings that should prompt a search for intussusception in a puppy with parvoviral enteritis.

Finding	Why it matters	Caution
Vomiting that persists after rehydration	Suggests obstruction or ileus rather than simple enteritis [15, 25]	Vomiting is expected in enteritis [5]
Abdominal pain on palpation	May reflect a telescoped segment	Pain also accompanies inflamed bowel
Palpable tubular abdominal mass	Classic physical sign of intussusception [25]	Difficult in a tense, painful abdomen
Straining with scant bloody stool	Can follow a distal lesion	Mimics enteritis and colitis
Target-like image on ultrasound	Most useful imaging sign [25]	Needs a trained operator; see Table 2
Deterioration despite fluids and care	Raises the question of a second problem [18, 23]	Sepsis and electrolyte loss do the same

Note: Qualitative summary. None of these findings is specific, and several overlap with uncomplicated enteritis.

Repeated examination is a practical safeguard. The abdomen of a puppy with enteritis is often painful and tense, and a mass can be missed one hour and found the next. Serial ultrasound, where available, allows the clinician to see whether a suspicious segment persists or resolves, and it protects against both missed lesions and unnecessary surgery.

4.3 Principles of Management

The backbone of treatment for parvoviral enteritis is supportive. Fluid and electrolyte replacement according to current guidelines [37], control of vomiting [38], analgesia where there is pain [39], and early nutrition, which in a controlled study of severely affected dogs was associated with better recovery and gut function [40], are the established pillars. Antiviral and similar measures have been explored, but results from small clinical studies are not decisive [41]. Outpatient protocols have been described for selected puppies when hospitalisation is not feasible, with the caveat that case selection matters [42, 43]. None of these supportive measures is specific to intussusception, which is why they are not the main subject here.

When intussusception is confirmed or strongly suspected, the question becomes surgical. A puppy with enteritis is a poor anaesthetic and wound-healing candidate, because it is dehydrated, low in protein, and sometimes septic, and this means that stabilisation before surgery and a careful decision about the timing matter more than haste. The surgical literature on reduction and resection comes largely from mixed populations of dogs and is not specific to parvoviral disease (Figure 3).

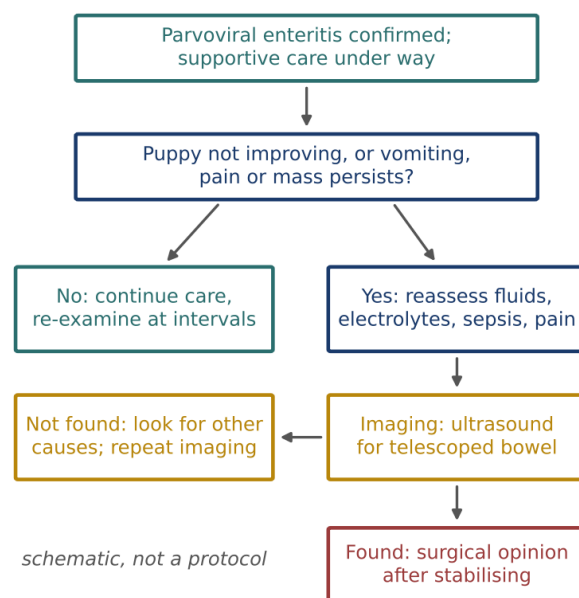


Figure 3. Schematic decision sequence for a puppy with enteritis that fails to improve (not a treatment protocol).

4.4 Prognostic Information and the Quality of Evidence

Prognostic work in parvoviral enteritis has identified markers such as the white cell response and stress hormones that relate to survival [16, 24], and it has described factors associated with

outcome and with the length of hospital stay [23]. These studies concern enteritis broadly. Whether the presence of intussusception changes the outlook in a parvoviral puppy cannot be answered from them, and no source reviewed provides a dependable answer.

The evidence on intussusception itself is dominated by single reports and small series. Such reports have real value, because they show what can happen and what it looks like, but they cannot give risk, and they are exposed to selection, since unusual cases are the ones that get written up [34, 35]. The recurring weaknesses are a lack of vaccination detail, no stated confirmation of the virus, unclear criteria for diagnosing the lesion, and outcome reported at discharge only. Reports of this kind are valuable precisely because they record events that larger studies would not capture.

4.5 Reading a Case Report of This Kind

A reader meeting a published case of parvoviral enteritis with intussusception can ask a short sequence of questions. Was parvovirus confirmed by a named test, and how was the test interpreted given recent vaccination [28, 30]? What was the vaccination history, and how does it fit the window of susceptibility [6, 14]? How was the intussusception diagnosed, by imaging or at surgery? And what happened afterwards, and over what period?

5. Discussion

5.1 Interpretation and Practical Reading

The main finding of this review is conditional. Intussusception is a plausible and documented complication of parvoviral enteritis in young dogs, but its frequency is unknown and its mechanism is inferred. The reasonable reading is that a clinician should keep it in mind whenever enteritis does not follow its usual course, and should not assume it is present in every puppy whose vomiting continues. Persistent vomiting has several causes, including electrolyte disturbance, ileus, ongoing inflammation and foreign material [18, 26].

5.2 Limitations

This is a narrative review and shares the limits of that form. No formal search or scoring was done, the choice of sources reflects judgement, and no numerical results from individual studies are quoted because they could not be verified against the primary reports for this article [31].

5.3 Implications for Reporting and Practice

5.4 Directions for Future Work

Three needs stand out. First, multicentre records of puppies with parvoviral enteritis that include imaging, so that the complication can be counted with a denominator. Second, a systematic review of published intussusception reports in young dogs with enteritis, using transparent methods [35]. Third, better evidence on timing of vaccination and local antibody interference, since prevention remains the surest way of avoiding the whole sequence [20, 21].

6. Conclusion

Canine parvoviral enteritis in a young dog is a disease with a known pathway, well-established supportive care and a predictable difficulty with timing of immunity. Intussusception is a documented but unquantified complication, supported mainly by imaging reports and small series, and its mechanism remains an inference. The responsible position is to look for it in puppies that fail to improve, to treat the enteritis properly while doing so, and to report the cases that occur in enough detail for others to learn from them.

This article is a review and does not describe any individual patient, whatever the wording of its title may suggest. Its purpose is to help the reader tell what is known from what is merely repeated, and to make the next report of this complication more useful than the last.

7. Acknowledgements

The authors thank colleagues who commented on earlier drafts of this review.

8. Funding

This work received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

9. Conflict of Interest

The authors declare no conflict of interest.

10. Author Contributions

M.K. conceived the review and wrote the sections on diagnosis and surgical considerations. M.M. wrote the sections on the virus, pathogenesis and vaccination. B.F. wrote the sections on supportive management and the appraisal of evidence. All authors revised the manuscript and approved the final version.

11. Ethics Statement

This is a review of published literature. No animals were used, no patient is described, and no ethical approval was required.

12. Data Availability

No new data were generated. All sources are cited in the reference list.

13. References

- [1] Hoelzer, K., & Parrish, C. R. (2010). The emergence of parvoviruses of carnivores. *Veterinary Research*, 41(6), 39. DOI: [10.1051/vetres/2010011](https://doi.org/10.1051/vetres/2010011)
- [2] Decaro, N., & Buonavoglia, C. (2012). Canine parvovirus—A review of epidemiological and diagnostic aspects, with emphasis on type 2c. *Veterinary Microbiology*, 155(1), 1–12. DOI: [10.1016/j.vetmic.2011.09.007](https://doi.org/10.1016/j.vetmic.2011.09.007)
- [3] Mylonakis, M. E., Kalli, I., & Rallis, T. S. (2016). Canine parvoviral enteritis: An update on the clinical diagnosis, treatment, and prevention. *Veterinary Medicine: Research and Reports*, 7, 91–100. DOI: [10.2147/VMRR.S80971](https://doi.org/10.2147/VMRR.S80971)
- [4] Kelman, M., Ward, M. P., Barrs, V. R., & Norris, J. M. (2019). The geographic distribution and financial impact of canine parvovirus in Australia. *Transboundary and Emerging Diseases*, 66(1), 299–311. DOI: [10.1111/tbed.13021](https://doi.org/10.1111/tbed.13021)
- [5] Goddard, A., & Leisewitz, A. L. (2010). Canine parvovirus. *Veterinary Clinics of North America: Small Animal Practice*, 40(6), 1041–1053. DOI: [10.1016/j.cvs.2010.07.007](https://doi.org/10.1016/j.cvs.2010.07.007)
- [6] Decaro, N., Campolo, M., Desario, C., Elia, G., Martella, V., Lorusso, E., & Buonavoglia, C. (2005). Maternally-derived antibodies in pups and protection from canine parvovirus infection. *Biologicals*, 33(4), 261–267. DOI: [10.1016/j.biologicals.2005.06.001](https://doi.org/10.1016/j.biologicals.2005.06.001)
- [7] Parrish, C. R., & Kawaoka, Y. (2005). The origins of new pandemic viruses: The acquisition of new host ranges by canine parvovirus and influenza A viruses. *Annual Review of Microbiology*, 59, 553–586. DOI: [10.1146/annurev.micro.59.030804.121059](https://doi.org/10.1146/annurev.micro.59.030804.121059)
- [8] Parrish, C. R., Aquadro, C. F., Strassheim, M. L., Evermann, J. F., Sgro, J.-Y., & Mohammed, H. O. (1991). Rapid antigenic-type replacement and DNA sequence evolution of canine parvovirus. *Journal of Virology*, 65(12), 6544–6552. DOI: [10.1128/jvi.65.12.6544-6552.1991](https://doi.org/10.1128/jvi.65.12.6544-6552.1991)
- [9] Buonavoglia, C., Martella, V., Pratelli, A., Tempesta, M., Cavalli, A., Buonavoglia, D., ... Carmichael, L. (2001). Evidence for evolution of canine parvovirus type 2 in Italy. *Journal of General Virology*, 82(12), 3021–3025. DOI: [10.1099/0022-1317-82-12-3021](https://doi.org/10.1099/0022-1317-82-12-3021)
- [10] Hong, C., Decaro, N., Desario, C., Tanner, P., Pardo, M. C., Sanchez, S., ... Saliki, J. T. (2007). Occurrence of canine parvovirus type 2c in the United States. *Journal of Veterinary Diagnostic Investigation*, 19(5), 535–539. DOI: [10.1177/104063870701900512](https://doi.org/10.1177/104063870701900512)
- [11] Miranda, C., & Thompson, G. (2016). Canine parvovirus: The worldwide occurrence of antigenic variants. *Journal of General Virology*, 97(9), 2043–2057. DOI: [10.1099/jgv.0.000540](https://doi.org/10.1099/jgv.0.000540)
- [12] Nandi, S., & Kumar, M. (2010). Canine parvovirus: Current perspective. *Indian Journal of Virology*, 21(1), 31–44. DOI: [10.1007/s13337-010-0007-y](https://doi.org/10.1007/s13337-010-0007-y)
- [13] Truyen, U. (2006). Evolution of canine parvovirus—A need for new vaccines? *Veterinary Microbiology*, 117(1), 9–13. DOI: [10.1016/j.vetmic.2006.04.003](https://doi.org/10.1016/j.vetmic.2006.04.003)
- [14] Day, M. J., Horzinek, M. C., Schultz, R. D., & Squires, R. A. (2016). WSAVA guidelines for the vaccination of dogs and cats. *Journal of Small Animal Practice*, 57(1), E1–E45. DOI: [10.1111/jsap.2_12431](https://doi.org/10.1111/jsap.2_12431)
- [15] Prittie, J. (2004). Canine parvoviral enteritis: A review of diagnosis, management, and prevention. *Journal of Veterinary Emergency and Critical Care*, 14(3), 167–176. DOI: [10.1111/j.1534-6935.2004.04012.x](https://doi.org/10.1111/j.1534-6935.2004.04012.x)
- [16] Goddard, A., Leisewitz, A. L., Christopher, M. M., Duncan, N. M., & Becker, P. J. (2008). Prognostic usefulness of blood leukocyte changes in canine parvoviral enteritis. *Journal of Veterinary Internal Medicine*, 22(2), 309–316. DOI: [10.1111/j.1939-1676.2008.0073.x](https://doi.org/10.1111/j.1939-1676.2008.0073.x)
- [17] Otto, C. M., Drobatz, K. J., & Soter, C. (1997). Endotoxemia and tumor necrosis factor activity in dogs with naturally occurring parvoviral enteritis. *Journal of Veterinary Internal Medicine*, 11(2), 65–70. DOI: [10.1111/j.1939-1676.1997.tb00075.x](https://doi.org/10.1111/j.1939-1676.1997.tb00075.x)
- [18] Mazzaferro, E. M. (2020). Update on canine parvoviral enteritis. *Veterinary Clinics of North America: Small Animal Practice*, 50(6), 1307–1325. DOI: [10.1016/j.cvs.2020.07.008](https://doi.org/10.1016/j.cvs.2020.07.008)
- [19] Decaro, N., & Buonavoglia, C. (2011). Canine coronavirus: Not only an enteric pathogen. *Veterinary Clinics of North America: Small Animal Practice*, 41(6), 1121–1132. DOI: [10.1016/j.cvs.2011.07.005](https://doi.org/10.1016/j.cvs.2011.07.005)
- [20] Ford, R. B., Larson, L. J., McClure, K. D., Schultz, R. D., & Welborn, L. V. (2017). 2017 AAHA canine vaccination guidelines. *Journal of the American Animal Hospital Association*, 53(5), 243–251. DOI: [10.5326/JAAHA-MS-6672](https://doi.org/10.5326/JAAHA-MS-6672)
- [21] Schultz, R. D., Thiel, B., Mukhtar, E., Sharp, P., & Larson, L. J. (2010). Age and long-term protective immunity in dogs and cats. *Journal of Comparative Pathology*, 142(Suppl. 1), S102–S108. DOI: [10.1016/j.jcpa.2009.10.009](https://doi.org/10.1016/j.jcpa.2009.10.009)
- [22] Mouzin, D. E., Lorenzen, M. J., Haworth, J. D., & King, V. L. (2004). Duration of serologic response to five viral antigens in dogs. *Journal of the American Veterinary Medical Association*, 224(1), 55–60. DOI: [10.2460/javma.2004.224.55](https://doi.org/10.2460/javma.2004.224.55)

- [23] Kalli, I., Leontides, L. S., Mylonakis, M. E., Adamama-Moraitou, K., Rallis, T., & Koutinas, A. F. (2010). Factors affecting the occurrence, duration of hospitalization and final outcome in canine parvovirus infection. *Research in Veterinary Science*, 89(2), 174-178. DOI: [10.1016/j.rvsc.2010.02.013](https://doi.org/10.1016/j.rvsc.2010.02.013)
- [24] Schoeman, J. P., Goddard, A., & Herrtage, M. E. (2007). Serum cortisol and thyroxine concentrations as predictors of death in critically ill puppies with parvoviral diarrhea. *Journal of the American Veterinary Medical Association*, 231(10), 1534-1539. DOI: [10.2460/javma.231.10.1534](https://doi.org/10.2460/javma.231.10.1534)
- [25] Patsikas, M. N., Jakovljevic, S., Moustardas, N., Papazoglou, L. G., Kazakos, G. M., & Dessiris, A. K. (2003). Ultrasonographic signs of intestinal intussusception associated with acute enteritis or gastroenteritis in 19 young dogs. *Journal of the American Animal Hospital Association*, 39(1), 57-66. DOI: [10.5326/0390057](https://doi.org/10.5326/0390057)
- [26] Hayes, G. (2009). Gastrointestinal foreign bodies in dogs and cats: A retrospective study of 208 cases. *Journal of Small Animal Practice*, 50(11), 576-583. DOI: [10.1111/j.1748-5827.2009.00783.x](https://doi.org/10.1111/j.1748-5827.2009.00783.x)
- [27] Marsicovetere, P., Ivatury, S. J., White, B., & Holubar, S. D. (2017). Intestinal intussusception: Etiology, diagnosis, and treatment. *Clinics in Colon and Rectal Surgery*, 30(1), 30-39. DOI: [10.1055/s-0036-1593429](https://doi.org/10.1055/s-0036-1593429)
- [28] Desario, C., Decaro, N., Campolo, M., Cavalli, A., Cirone, F., Elia, G., ... Buonavoglia, C. (2005). Canine parvovirus infection: Which diagnostic test for virus? *Journal of Virological Methods*, 126(1-2), 179-185. DOI: [10.1016/j.jviromet.2005.02.006](https://doi.org/10.1016/j.jviromet.2005.02.006)
- [29] Proksch, A. L., Unterer, S., Speck, S., Truyen, U., & Hartmann, K. (2015). Influence of clinical and laboratory variables on faecal antigen ELISA results in dogs with canine parvovirus infection. *The Veterinary Journal*, 204(3), 304-308. DOI: [10.1016/j.tvjl.2015.04.015](https://doi.org/10.1016/j.tvjl.2015.04.015)
- [30] Decaro, N., Elia, G., Martella, V., Desario, C., Campolo, M., Di Trani, L., ... Buonavoglia, C. (2005). A real-time PCR assay for rapid detection and quantitation of canine parvovirus type 2 in the feces of dogs. *Veterinary Microbiology*, 105(1), 19-28. DOI: [10.1016/j.vetmic.2004.09.018](https://doi.org/10.1016/j.vetmic.2004.09.018)
- [31] Green, B. N., Johnson, C. D., & Adams, A. (2006). Writing narrative literature reviews for peer-reviewed journals: Secrets of the trade. *Journal of Chiropractic Medicine*, 5(3), 101-117. DOI: [10.1016/S0899-3467\(07\)60142-6](https://doi.org/10.1016/S0899-3467(07)60142-6)
- [32] Ferrari, R. (2015). Writing narrative style literature reviews. *Medical Writing*, 24(4), 230-235. DOI: [10.1179/2047480615Z.000000000329](https://doi.org/10.1179/2047480615Z.000000000329)
- [33] Baethge, C., Goldbeck-Wood, S., & Mertens, S. (2019). SANRA—A scale for the quality assessment of narrative review articles. *Research Integrity and Peer Review*, 4, 5. DOI: [10.1186/s41073-019-0064-8](https://doi.org/10.1186/s41073-019-0064-8)
- [34] Grimes, D. A., & Schulz, K. F. (2002). Descriptive studies: What they can and cannot do. *The Lancet*, 359(9301), 145-149. DOI: [10.1016/S0140-6736\(02\)07373-7](https://doi.org/10.1016/S0140-6736(02)07373-7)
- [35] Murad, M. H., Sultan, S., Haffar, S., & Bazerbachi, F. (2018). Methodological quality and synthesis of case series and case reports. *BMJ Evidence-Based Medicine*, 23(2), 60-63. DOI: [10.1136/bmjebm-2017-110853](https://doi.org/10.1136/bmjebm-2017-110853)
- [36] Gagnier, J. J., Kienle, G., Altman, D. G., Moher, D., Sox, H., & Riley, D. (2014). The CARE guidelines: Consensus-based clinical case reporting guideline development. *Journal of Clinical Epidemiology*, 67(1), 46-51. DOI: [10.1016/j.jclinepi.2013.08.003](https://doi.org/10.1016/j.jclinepi.2013.08.003)
- [37] Davis, H., Jensen, T., Johnson, A., Knowles, P., Meyer, R., Rucinsky, R., & Shafford, H. (2013). 2013 AAHA/AAFP fluid therapy guidelines for dogs and cats. *Journal of the American Animal Hospital Association*, 49(3), 149-159. DOI: [10.5326/JAAHA-MS-5868](https://doi.org/10.5326/JAAHA-MS-5868)
- [38] Mantione, N. L., & Otto, C. M. (2005). Characterization of the use of antiemetic agents in dogs with parvoviral enteritis treated at a veterinary teaching hospital: 77 cases (1997-2000). *Journal of the American Veterinary Medical Association*, 227(11), 1787-1793. DOI: [10.2460/javma.2005.227.1787](https://doi.org/10.2460/javma.2005.227.1787)
- [39] Epstein, M. E., Rodan, I., Griffenhagen, G., Kadrlik, J., Petty, M. C., Robertson, S. A., & Simpson, W. (2015). 2015 AAHA/AAFP pain management guidelines for dogs and cats. *Journal of the American Animal Hospital Association*, 51(2), 67-84. DOI: [10.5326/JAAHA-MS-5183](https://doi.org/10.5326/JAAHA-MS-5183)
- [40] Mohr, A. J., Leisewitz, A. L., Jacobson, L. S., Steiner, J. M., Ruaux, C. G., & Williams, D. A. (2003). Effect of early enteral nutrition on intestinal permeability, intestinal protein loss, and outcome in dogs with severe parvoviral enteritis. *Journal of Veterinary Internal Medicine*, 17(6), 791-798. DOI: [10.1111/j.1939-1676.2003.tb02516.x](https://doi.org/10.1111/j.1939-1676.2003.tb02516.x)
- [41] Savigny, M. R., & Macintire, D. K. (2010). Use of oseltamivir in the treatment of canine parvoviral enteritis. *Journal of Veterinary Emergency and Critical Care*, 20(1), 132-142. DOI: [10.1111/j.1476-4431.2009.00507.x](https://doi.org/10.1111/j.1476-4431.2009.00507.x)
- [42] Venn, E. C., Preisner, K., Boscan, P. L., Twedt, D. C., & Sullivan, L. A. (2017). Evaluation of an outpatient protocol in the treatment of canine parvoviral enteritis. *Journal of Veterinary Emergency and Critical Care*, 27(1), 52-65. DOI: [10.1111/vec.12561](https://doi.org/10.1111/vec.12561)
- [43] Sarpong, K. J., Lukowski, J. M., & Knapp, C. G. (2017). Evaluation of mortality rate and predictors of outcome in dogs receiving outpatient treatment for parvoviral enteritis. *Journal of the American Veterinary Medical Association*, 251(9), 1035-1041. DOI: [10.2460/javma.251.9.1035](https://doi.org/10.2460/javma.251.9.1035)