

Elbert JA, Rissi DR. Neuropathologic changes associated with systemic bacterial infection in 28 dogs

Supplemental Table 1. Signalment, clinical signs, and clinical outcome in 28 cases of systemic bacterial infection with neurologic involvement in dogs.

| Case | Age | Sex | Breed | Clinical signs | Clinical outcome |
|------|------|-----|--------------------|---|------------------|
| 1 | 6 y | SF | MB | Acute onset seizures | D |
| 2 | 9 y | SF | German Shepherd | 3-mo history of seizures | E |
| 3 | 2 wk | F | German Shepherd | None reported | D |
| 4 | 1 y | M | MB | 2-mo history of lameness, fever, vomiting | D |
| 5 | 2 mo | M | Newfoundland | Sudden death | D |
| 6 | 1 wk | M | Chihuahua | None reported | D |
| 7 | 6 y | CM | Chihuahua | 10-d history of vomiting and lethargy | D |
| 8 | 11 y | CM | Blue Heeler | Acute hemiparesis and depression after a fight with another dog | D |
| 9 | 9 y | SF | MB | Progressive, unspecified clinical signs | D |
| 10 | 3 d | M | MB | None reported | D |
| 11 | 5 y | CM | Great Dane | 4-wk history of anorexia after limb amputation (osteosarcoma) | D |
| 12 | 16 y | M | MB | Acute onset seizures and depression | E |
| 13 | 2 y | M | Weimaraner | 1-mo history of lethargy | E |
| 14 | 5 mo | F | Great Dane | Acute respiratory distress and lethargy | E |
| 15 | 13 y | SF | MB | Painful right hip due to fractured femoral head | D |
| 16 | 8 y | M | Yorkshire Terrier | Acute onset seizures | D |
| 17 | 2 mo | M | Great Dane | Acute hematemesis | D |
| 18 | 10 y | CM | Labrador Retriever | Acute onset fever and depression | D |
| 19 | 2 wk | F | Labrador Retriever | 2-d history of diarrhea | D |
| 20 | 10 y | CM | MB | Acute depression | D |
| 21 | 1 mo | M | Labrador Retriever | Depression and seizures | E |
| 22 | 6 y | M | English Bulldog | Acute onset fever and depression | E |
| 23 | 11 y | M | MB | Sudden death | D |
| 24 | 8 y | SF | Boxer | Acute onset depression, vomiting, and diarrhea | E |
| 25 | 10 y | SF | Golden Retriever | Weakness due to advanced lymphoma | E |
| 26 | 12 y | F | Golden Retriever | None reported | E |

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|----|-------|----|--------------------|--------------------------------|---|
| 27 | 9 y | CM | Labrador Retriever | None reported | E |
| 28 | 10 mo | CM | MB | Acute onset lateral recumbency | E |

CM = castrated male; D = spontaneous death; E = euthanasia; F = female; M = male; MB = mixed breed; SF = spayed female.

Supplemental Table 2. Gross neuropathology, extraneural lesions, putative primary site of infection, and etiology in 28 cases of systemic bacterial infection with neurologic involvement in dogs.

| Case | Gross neuropathology | Associated extraneural lesions | Presumed primary site of infection | Bacterial culture (tested tissue) |
|------|---|---|------------------------------------|---|
| 1 | Left ventricular empyema | Suppurative metritis | Metritis | <i>Streptococcus</i> sp. (brain) |
| 2 | None reported | Suppurative mitral valve endocarditis with bacterial cocci; renal infarcts | Undetermined | <i>Staphylococcus intermedius</i> (brain) |
| 3 | None reported | Suppurative omphalophlebitis; hepatocellular necrosis with bacterial cocci | Omphalo-phlebitis | <i>Staphylococcus intermedius</i> (liver) |
| 4 | None reported | Suppurative mitral valve endocarditis with bacterial cocci; renal infarcts | Undetermined | <i>Streptococcus</i> sp. (mitral valve) |
| 5 | None reported | Fibrinous pneumonia with bacterial cocci; suppurative myocarditis | Undetermined | Not performed |
| 6 | None reported | Suppurative bronchopneumonia; hepatocellular necrosis | Broncho-pneumonia | <i>Staphylococcus intermedius</i> (lung) |
| 7 | Meningeal hemorrhages (left occipital lobe) | Necrotizing dermatitis and panniculitis; fibrinous pneumonia | Dermatitis and panniculitis | <i>Escherichia coli</i> (lung) |
| 8 | Meningeal hemorrhages (brainstem) | Suppurative and hemorrhagic dermatitis | Cutaneous lesions (fight wounds) | <i>Klebsiella pneumoniae</i> (lung) |
| 9 | Meningeal hemorrhages (left frontal lobe) | Suppurative mitral valve endocarditis with bacterial cocci; myocardial and splenic infarct; suppurative panophthalmitis | Undetermined | <i>Staphylococcus pseudintermedius</i> (mitral valve) |

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| 10 | None reported | Suppurative dermatitis; neutrophilic interstitial pneumonia | Cutaneous laceration (left rear paw) | <i>Streptococcus canis</i> (lung) |
| 11 | None reported | Suppurative aortic and mitral valve endocarditis with bacterial cocci; suppurative myocarditis; splenic infarct | Undetermined | <i>Staphylococcus aureus</i> (heart, kidney) |
| 12 | None reported | Suppurative myocarditis | Undetermined | <i>Streptococcus canis</i> (brain) |
| 13 | Left ventricular hemorrhage | Suppurative aortic and mitral valve endocarditis with bacterial cocci; splenic infarct | Undetermined | <i>Corynebacterium</i> sp. (aortic valve) |
| 14 | None reported | Suppurative pleuropneumonia | Pleuro-pneumonia | <i>Escherichia coli</i> (thoracic fluid) |
| 15 | Meningeal hemorrhages (temporal, parietal, occipital lobes) | Suppurative pyelonephritis; right acetabular osteoarthritis; splenic and cardiac infarct | Acute pyelonephritis | <i>Escherichia coli</i> (brain, kidney) |
| 16 | Dark-red areas of necrosis (left telencephalon) | Ulcerative periodontitis with tooth loss; fibrinous pneumonia | Widespread periodontitis | <i>Streptococcus canis</i> (brain) |
| 17 | None reported | Suppurative bronchopneumonia with bacterial cocci | Broncho-pneumonia | <i>Streptococcus canis</i> (lung) |
| 18 | None reported | Suppurative mitral valve endocarditis with bacteria; suppurative myocarditis; splenic infarct | Undetermined | <i>Actinomyces canis</i> (mitral valve) |
| 19 | None reported | Hemorrhagic pneumonia | Pneumonia | <i>Escherichia coli</i> (lung, spleen) |
| 20 | Meningeal hemorrhage (left occipital and piriform lobe) | Suppurative mitral valve endocarditis with bacterial cocci | Undetermined | <i>Streptococcus canis</i> (mitral valve) |
| 21 | None reported | Fibrinous interstitial pneumonia | Pneumonia | <i>Streptococcus canis</i> (brain, lung) |
| 22 | Meningeal hemorrhage (cerebellum, piriform lobes) | Suppurative pyelonephritis; suppurative mitral valve endocarditis; suppurative myocarditis and panophthalmitis | Acute pyelonephritis | <i>Pseudomonas aeruginosa</i> (mitral valve) |
| 23 | None reported | Suppurative bronchopneumonia with bacterial bacilli | Broncho-pneumonia | <i>Klebsiella pneumoniae</i> (brain) |
| 24 | Meningeal hemorrhages (telencephalon) | Suppurative mitral valve endocarditis with bacterial cocci; renal infarct | Undetermined | No bacterial growth (brain) |

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| 25 | Meningeal hemorrhages (telencephalon) | Suppurative mitral valve endocarditis with bacterial cocci; suppurative myocarditis and splenitis with bacterial cocci | Undetermined | <i>Staphylococcus pseudintermedius</i> (spleen, heart) |
| 26 | None reported | Suppurative pyelonephritis; suppurative mitral valve endocarditis | Acute pyelonephritis | <i>Pseudomonas aeruginosa</i> (kidney) |
| 27 | Meningeal hemorrhages (ventral brain) | Suppurative mitral valve endocarditis; suppurative myocarditis; splenic infarct | Undetermined | Unidentified bacteria (spleen) |
| 28 | Meningeal hemorrhages (right temporal and occipital lobes) | Lymphoplasmacytic pyelonephritis | Acute pyelonephritis | <i>Enterococcus faecium</i> (brain) |

Supplemental Table 3. Neurohistologic changes in 28 cases of systemic bacterial infection with neurologic involvement in dogs.

| Case | MD | Histologic changes | | | | | Intralesional bacteria | |
|------|-------|---------------------|-------------------------------|--------------------------|-----------------|-------------|------------------------|------------------|
| | | Leptomeningitis | Polioencephalitis | Leukoencephalitis | Choroiditis | Ependymitis | H&E | GS |
| 1 | C, BS | Absent | S, LP, G | S, LP, F, G, VL, FC | S, LP | S, LP | No | No |
| 2 | T | Absent | S, H, G, PN, VL | S, H, G, PN | LP | Absent | No | No |
| 3 | T, C | LP | Absent | LP, H | Absent | Absent | No | No |
| 4 | T | MX, F, VL, TH, FC | S, NN, G | MX, H, VAC | MX | Absent | Yes | Yes (G+ cocci) |
| 5 | T | S, F, VL, TH, FC, H | S, F, VL, TH, FC, H, NN | VL, FC, H, G, VAC | Absent | Absent | No | No |
| 6 | T | MX | MX, TH | MX, TH | Absent | Absent | No | Yes (G+ cocci) |
| 7 | T | S, F, H | Absent | Absent | S | Absent | No | No |
| 8 | T, C | MX, F, VL, H | NN, G | S, F, WPN, FC, H, VAC, G | MX | S, F | No | No |
| 9 | T, C | MX, H | S, H | S | Absent | Absent | Yes | Yes (G+ cocci) |
| 10 | T | MX | Absent | Absent | Absent | Absent | Yes | Yes (G+ cocci) |
| 11 | T | Absent | S, PN | S, PN | Absent | Absent | No | No |
| 12 | T | MX, F, H | M | Absent | Absent | Absent | Yes | Yes (G+ cocci) |
| 13 | T | S, H | MX, VL, FC, H, NN, G | MX, H, PN | MX | Absent | Yes | Yes (G+ bacilli) |
| 14 | T | MX | Absent | Absent | Absent | Absent | No | No |
| 15 | T | MX, F, H | G, VAC | Absent | Absent | Absent | No | No |
| 16 | T | MX, F, VL, FC, H | S, VL, FC, H, NN, G, VAC | MX, VL, FC, H, G, VAC | Absent | Absent | No | No |
| 17 | T | MX, H | Absent | Absent | Absent | Absent | No | No |
| 18 | T | MX | MX, VL, FC | Absent | Absent | Absent | No | No |
| 19 | T | LP | Absent | Absent | Absent | Absent | No | No |
| 20 | T | MX, H | S, VL, FC, H, G, VAC | MX, VL, FC, G, VAC | Absent | Absent | Yes | Yes (G+ cocci) |
| 21 | T | MX, H | S, VL, FC, H, NN, WPN, G | S, VL, FC, H, WPN, G | S, F, VL, FC, H | S, F | Yes | Yes (G+ cocci) |
| 22 | T, C | S, H | MX, VL, FC, TH, H, NN, WPN, G | MX | Absent | Absent | No | No |
| 23 | T | S, H | S, VL, H, TH, NN | MX | Absent | Absent | No | No |

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|----|-------|---------|-------------------------|--------------------------|--------|--------|-----|----------------|
| 24 | T | MX | H, PN, WPN | Absent | Absent | Absent | No | No |
| 25 | T, BS | S, F, H | S, VL, FC, H, NN | S, VL, FC, H | Absent | Absent | No | Yes (G+ cocci) |
| 26 | T | Absent | S | Absent | Absent | Absent | No | No |
| 27 | T, C | MX, H | S, VL, FC, TH, H, NN | S, VL, FC, TH, H, VAC | LP | Absent | No | No |
| 28 | T | S, H | H | H | Absent | Absent | Yes | Yes (G+ cocci) |

BS = brainstem; C = cerebellum; F = fibrinous; FC = fibrinoid change; G = gliosis; GS = Gram stain; H = hemorrhage; LP = lymphoplasmacytic; MD = main neuroanatomic distribution; MX = mixed inflammation (lymphoplasmacytic with neutrophils and macrophages); NN = neuronal necrosis; PN = parenchymal necrosis; S = suppurative; T = telencephalon; TH = thrombosis; W = widespread; WPN = widespread parenchymal neutrophils; VAC = vacuolation; VL = vasculitis.