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Learning

C-Reactive Protein as a Diagnostic Marker in Dogs: A Review

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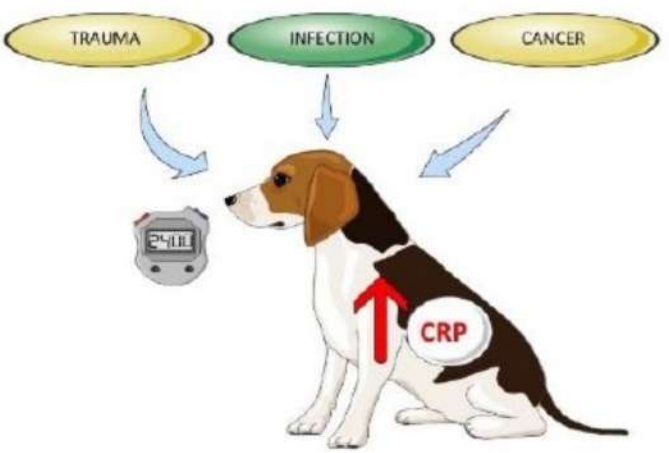
What is C-reactive protein?

C-reactive protein (CRP) is a key inflammation marker in dogs, widely used due to its sensitivity and rapid response. It increases within the first 4–24 h after the stimulus and reaches up to a 50–100-fold increase of the baseline level. It helps guide therapy decisions, like when to stop antibiotics. CRP tests are now common in routine blood panels and are elevated in diseases like pyometra, pancreatitis, and sepsis. Clinically, CRP is used to detect and monitor inflammation and treatment efficacy, being more sensitive than leukocyte counts. Its concentration increases in various disease (Summarized in Table 1).

Figure 1: Factors inducing acute phase response, including CRP.



Note: This figure is derived from "C-Reactive Protein as a Diagnostic Marker in Dogs: A Review", by Katarzyna Malin and OlgaWitkowska-Piłaszewicz, 2022, Animals (Basel). 2022 Oct 21;12(20):2888. https://doi.org/10.3390/ani12202888

Table 1: CRP concentration values have been recorded in various studies.

Disease/Pathology	Noted CRP Level
Bordetella bronchoseptica infection	720 µg/mL[2] 20 µg/mL[3]
Aspiration bronchopneumonia	Symptomatic 65.03 µg/mL[3]
Leishmaniosis (mean)	Asymptomatic 30.08 µg/mL[4]
Trypanosoma brucei	> 160 µg/mL[5]
Babesia canis	> 200 µg/mL[6]
Dirofilaria immitis	69.9 µg/mL[7]
Parvovirus enteritis	Survivors—100.6 µg/mL Non-survivors—146.3 µg/mL[8]
Discospondylitis	100.7 µg/mL[9]

(continued on next page)

Immune-mediated hemolytic anemia-related systemic inflammatory response syndrome	Up to 435.1 μg/mL on day of admission[10]
Immune-mediated hemolytic anemia	11.70 ± 48.18 μg/mL[11]
Immune-mediated thrombocytopenia	11.55 ± 26.55[11]
Immune-mediated polyarthritis	1.90 ± 7.00 μg/mL[11]
Steroid-responsive meningitis arthritis	85–327.1 μg/mL[10-13]
Inflammatory bowel disease	13.6 ± 7.6 μg/mL[14] 1.53–67.69 μg/mL[15]
Dietary responsive diarrhea	11.5 ± 3.9 μg/mL[14]
Antibiotic responsive diarrhea	13.8 ± 1.7 μg/mL[14]
Spontaneous acute pancreatitis	56.1 ± 12.7 μg/mL[16]
Pyometra	200.28 ± 93.51 μg[17]
Cystic endometrial hyperplasia	53.51 ± 66.24 μg/mL[17]

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For CRP in Healthy Dogs

Small changes in CRP over time are important for diagnosis and prognosis. It's recommended to establish a baseline CRP level in a healthy individual for future comparison. If this isn't done before illness, monitor CRP levels over time during follow-up visits. CRP levels in dogs do not vary with age so far. However, CRP may not effectively diagnose inflammation in dogs younger than 3 months because their inflammatory response is much lower than in older dogs.

Applications of CRP

Bacterial and Viral Etiology Diseases:

- Bacterial and viral infections can cause strong inflammation, resulting in high CRP levels. However, CRP levels alone are not enough to identify the exact cause of inflammation or confirm a bacterial or viral infection. It's crucial to conduct additional tests, such as pathogen susceptibility testing, for accurate diagnosis and treatment.
- CRP proves to be useful in guiding antibiotic therapy and allows one to determine when it should be discontinued.

Parasitic Etiology Diseases:

CRP changes have been studied in various parasitic diseases. It can predict symptomatic periods in diseases like leishmaniasis, Neosporosis, Toxocariasis, demodicosis, Trypanosomiasis, Dirofilariasis, and Anaplasmosis. CRP also helps guide effective treatment doses.

Surgery:

CRP levels typically rise within 24 hours after surgery or injury, regardless of the cause. Anaesthetic protocols don't affect post-surgical CRP levels. CRP is useful for early detection of post-surgical complications, but less invasive procedures like ovariohysterectomy (OH) in female dogs don't impact CRP levels. Single CRP measurements are not very useful for assessing post-surgical inflammation and prognosis.

Autoimmune Diseases:

CRP levels increase in immune-mediated conditions like systemic inflammatory response syndrome (SIRS). Dogs with immune-mediated hemolytic anemia (IMHA), immune-mediated thrombocytopenia (IMTP), and immune-mediated polyarthritis (IMPA) have high CRP values when admitted, which usually decrease with treatment. CRP also can help differentiate between severe cases of pemphigus foliaceous and superficial pyoderma but is not useful for predicting or tracking treatment success in canine atopic dermatitis.

Neoplasia:

CRP levels increase in cancer patients due to inflammation or immune responses, not the tumor itself. Higher CRP levels are linked to advanced cancer stages, metastasis, and complications like ulcers and immune suppression. Tumors like hemangiosarcoma, nasal adenocarcinoma, and lymphoma significantly raise CRP levels. However, CRP changes should only be used as a supplementary tool for predicting outcomes.

Other disease:

CRP can help differentiate pyometra from cystic endometrial hyperplasia (CEH). Pyometra, which involves infection, results in higher CRP levels, while CEH does not cause systemic inflammation and thus shows lower CRP levels.

Conclusions and precautions

Canine CRP has a short half-life and rises very shortly after the initial inflammatory factor affects homeostasis. High CRP levels alone can't determine the cause of inflammation or bacterial infection. Its value is limited by patients' varying disease stages at presentation. Research shows that a decrease in CRP over time, rather than its absolute value, maybe a better prognostic factor, especially in sepsis. However, in some cases, a rapid decrease in CRP can be a negative sign, as seen in dogs with acute abdomen who did not survive. Multiple measurements of CRP until recovery are probably of much higher value than a single measurement. Monitoring CRP levels during follow-ups helps distinguish between responsive and non-responsive dogs. Thus, CRP should not be used alone but as part of a comprehensive diagnostic approach.

♦ Reference

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AmiShield CRP Disc

The AmiShield CRP disc can quantitatively detect CRP in lithium heparinized whole blood, plasma or serum to assist the veterinarian in diagnosing Infectious, inflammatory diseases, tissue injury, inflammatory bowel disease, allergic, and immune mediated disease.

Here is the reference range table:

	Common Units	SI Units
CRP	0.1 - 20.0 mg/L	1 - 190 nmol/L