

PURINA® PRO PLAN® VETERINARY DIETS CC CARDIOCARE™

# RESEARCH AND RESULTS

THE SCIENCE THAT SETS US APART

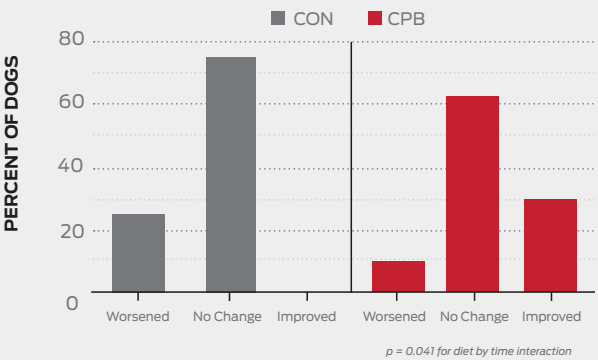
THROUGH ADVANCED METABOLOMIC AND TRANSCRIPTOMIC TECHNOLOGIES, PURINA SCIENTISTS:

- Identified **key metabolic changes** in dogs with MVD<sup>9</sup>
- Developed a **Cardiac Protection Blend (CPB)** to address these changes:
  - Amino acids
  - Omega-3 fatty acids
  - Medium-chain triglycerides
  - Magnesium
  - Vitamin E
- Demonstrated **efficacy** of the CPB at slowing the progression of mitral valve disease in dogs at early stages<sup>9</sup>
- **Validated** through a follow-up metabolomics analysis that the blend of specific nutrients in the CPB was able to improve key cardiac measures<sup>10</sup>

A six-month blinded, randomized placebo-controlled study enrolling 19 small breed dogs with early stage B1 or B2 MVD and 17 healthy small breed dogs demonstrated a diet containing the Cardiac Protection Blend helped slow the progression of early mitral valve disease (stage B1 or B2) in dogs.<sup>9</sup>

RESULTS: MITRAL REGURGITATION<sup>9</sup>

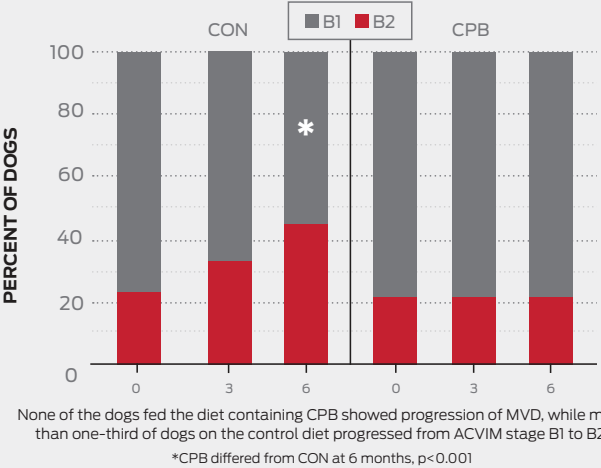
Thirty percent of CPB-fed dogs had less severe mitral regurgitation while control-fed dogs showed no improvement.



Percent of dogs that showed changes of at least one grade in mitral regurgitation after 6 months, compared with baseline.

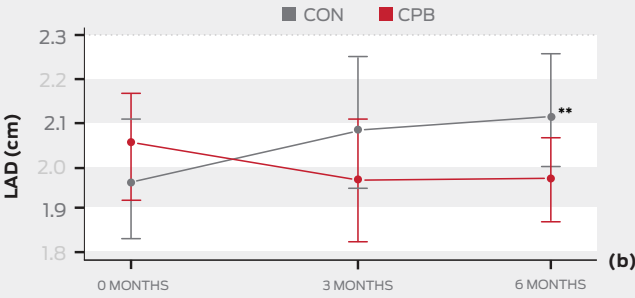
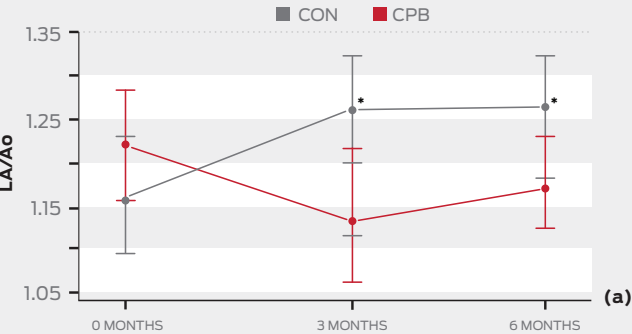
RESULTS: PROGRESSION<sup>9</sup>

Percentage of MVD dogs progressing from ACVIM Stage B1 to B2 at 0, 3, and 6 months of the study.



RESULTS: LEFT ATRIAL SIZE<sup>9</sup>

Effect of diet and time on left atrial size in MVD dogs. Plots show means with standard error bars for (a) LA/Ao and (b) LAD in dogs with MVD fed the control (CON) or test (CPB) diet. There was a significant diet by time interaction (*p*<0.05) for both variables, with CON dogs increasing and CPB dogs decreasing over time. \**p*<0.05; \*\**p*<0.01



A metabolomic evaluation<sup>10</sup> of serum metabolites of dogs in the dietary study<sup>9</sup> suggests that the Cardiac Protection Blend:

- Improved fatty acid utilization and cellular metabolism
- Reduced markers of inflammation
- Reduced oxidative stress



9. Li, Q., Heaney, A., Langenfeld-McCoy, N., Boler, B. V., & Laflamme, D. P. (2019). Dietary intervention reduces left atrial enlargement in dogs with early stage myxomatous mitral valve disease: a blinded randomized controlled study in 36 dogs. *BMC Veterinary Research*, 15(1), 425.

10. Li, Q., Laflamme, D. P., & Bauer, J. E. (2020). Serum untargeted metabolomic changes in response to dietary intervention on dogs with early stage myxomatous mitral valve disease. *PLoS One*, 15(6), e0234404.

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PURINA®  
PRO PLAN®  
VETERINARY DIETS

CC  
CARDIOCARE™

MEDICAL INDICATIONS  
Multiple Indications for a Wide Range of Patients

- ✓ Mitral Valve Disease
  - Early Stages B1 and B2
  - Advanced Stages C and D (congestive heart failure)
- ✓ Cardiovascular Disease
- Conditions benefiting from moderate sodium reduction



# CANINE CARDIAC HEALTH

## INDICATION RELEVANCE

Mitral valve disease (MVD) is the most common heart disease in dogs and accounts for approximately 75% of heart disease cases seen in dogs by veterinary practices in North America.<sup>1</sup> While slowly progressive, MVD may be unpredictable, and approximately **30% of dogs with MVD will progress to heart failure and end-stage disease.**<sup>2</sup>



## OMICS FOR INSIGHTS

Through serum **metabolomics** and **transcriptomics** on cardiac tissues, Purina scientists identified several key changes in canine patients with MVD compared to healthy dogs,<sup>3</sup> then **identified functional nutrients that could address these metabolic changes.**

### NORMAL CANINE HEART<sup>4</sup>



- Cardiac muscle tissue is normally 99% aerobic
- Cardiomyocytes packed with more mitochondria than typical skeletal muscle
- Acquires up to 60% of energy from beta-oxidation of free fatty acids

### CANINE HEART WITH MVD



- Cardiac muscle tissue functions poorly under anaerobic conditions such as those observed with MVD<sup>3,4</sup>
- Observed alterations<sup>3</sup> in:
  - Energy metabolism
  - Oxidative stress
  - Inflammatory mediators

**Purina® Pro Plan® Veterinary Diets CC CardioCare™ is a novel dietary approach transforming the role of nutritional management for dogs with early stage mitral valve disease.**



- + Slows the progression of mitral valve disease at early stages
- + Helps stabilize mitral regurgitation in dogs with early stage mitral valve disease
- + Helps reduce left atrial enlargement associated with early stage mitral valve disease
- + High protein content to help maintain ideal body condition and lean body mass



1. Keene, B. W., Atkins, C. E., Bonagura, J. D., Fox, P. R., Häggström, J., Fuentes, V. L., Oyama, M. A., Rush, J. E., Stepien, R., & Uechi, M. (2019). ACVIM consensus guidelines for the diagnosis and treatment of myxomatous mitral valve disease in dogs. *Journal of Veterinary Internal Medicine*, 33(3), 1127-1140.

2. Borgarelli M., & Häggström J. Canine degenerative myxomatous mitral valve disease: natural history, clinical presentation and therapy. *Vet Clin North Am Small Anim Pract*. 2010;40:651-663.

PURINA® PRO PLAN® VETERINARY DIETS CC CARDIOCARE™

# CARDIAC PROTECTION BLEND

## MEDIUM-CHAIN TRIGLYCERIDES

- Readily absorbed and digested to provide an alternative energy source for the heart<sup>5</sup>

## OMEGA-3 FATTY ACIDS

- Fish oil can help reduce inflammatory mediators,<sup>6</sup> improve cardiac cachexia,<sup>7</sup> and reduce frequency of certain cardiac arrhythmias<sup>8</sup>

## MAGNESIUM

- Decreases free radical production, regulates blood pressure



## LYSINE, METHIONINE

- Precursors for carnitine, which transports long-chain fatty acids into mitochondria for energy production

## VITAMIN E

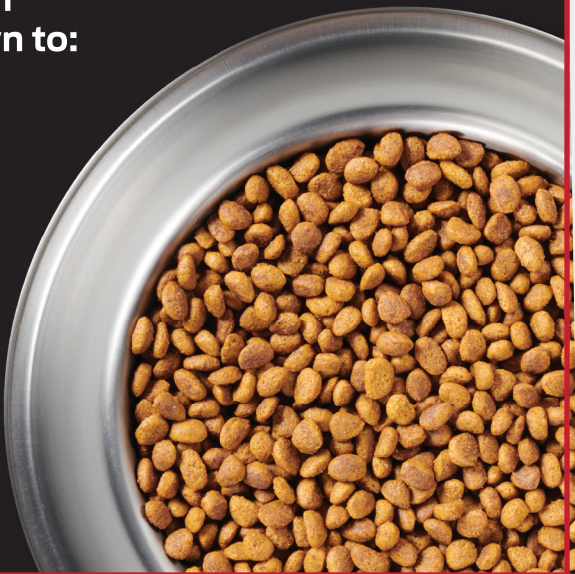
- Antioxidant to combat increased oxidative stress in heart disease

## TAURINE

- Maintains heart muscle contractility, antioxidant properties

## The Cardiac Protection Blend in Purina® Pro Plan® Veterinary Diets CC CardioCare™ has been shown to:

- ✓ Improve mitral regurgitation in 30% of dogs with early stage mitral valve disease
- ✓ Increase serum omega-3 and decrease omega-6 fatty acid concentrations to help nutritionally manage dogs with cardiac conditions
- ✓ Increase serum arginine and citrulline, precursors of nitric oxide, to promote vasodilation
- ✓ Improve energy use as signified by biomarkers of fatty acid oxidation



3. Li, Q., Freeman, L. M., Rush, J. E., Huggins, G. S., Kennedy, A. D., Labuda, J. A., Laflamme, D. P., & Hannah, S. S. (2015). Veterinary Medicine and Multi-Omics Research for Future Nutrition Targets: Metabolomics and Transcriptomics of the Common Degenerative Mitral Valve Disease in Dogs. *OMICS*, 19(8), 461-470.

4. Engelking, Larry R. Textbook of veterinary physiological chemistry, updated 2/e. Academic Press, 2010, 449-454.

5. Li, Q., Heaney, A., Langenfeld-McCoy, N., Boler, B. V., & Laflamme, D. P. (2019). Dietary intervention reduces left atrial enlargement in dogs with early stage myxomatous mitral valve disease: a blinded randomized controlled study in 36 dogs. *BMC Veterinary Research*, 15(1), 425.

6. Freeman, L. M. Beneficial effects of omega-3 fatty acids in cardiovascular disease. *J Small Anim Pract*. 2010 Sep;51(9):462-70.

7. Freeman, L. M., Rush, J. E., Kehayias, J. J., Ross, J. N. Jr, Meydani, S. N., Brown, D. J., Dolnikowski, G. G., Marmor, B. N., White, M. E., Dinarello, C. A., & Roubenoff, R. Nutritional alterations and the effect of fish oil supplementation in dogs with heart failure. *J Vet Intern Med*. 1998 Nov-Dec;12(6):440-8.

8. Smith, C. E., Freeman, L. M., Rush, J. E., Cunningham, S. M., & Biourge, V. Omega-3 fatty acids in Boxer dogs with arrhythmogenic right ventricular cardiomyopathy. *J Vet Intern Med*. 2007 Mar-Apr;21(2):265-73.