



Animal Health and Nutrition

Case Study: In vitro biomarker assay development for companion animal research

CHALLENGE There is a great deal of interest in the companion animal health research area, particularly related to arthritis and bone health, obesity, and renal and liver function. Despite this interest, many biomarker assays that have been established for health monitoring and pre-clinical studies have yet to be developed for use with canine or feline samples.

SOLUTION We have recently developed a panel of canine and feline renal function biomarker assays. The work began when a client requested that we assay canine and feline urine for a number of biomarkers linked to kidney function. However, none of the biomarker assays were currently available for use with dog or cat. After examining sequence alignments and determining available reagents, we initiated an assay validation plan of 35 potential renal function biomarkers for companion animal samples.

Validations were performed using client-provided blinded samples that were clinically relevant for

kidney function analyses. From the initial group of potential markers we were able to successfully develop a panel of 18 markers that have been shown to be useful for monitoring kidney function. During the validation studies we determined assay linearity, examined matrix effects, and optimized the assays for use canine and feline urine samples. We were also able to create internal control samples that ensure consistency across multiple runs of the assays over time. These 18 markers of renal function have been used for analysis of canine and feline samples for studies involving 20-40 animals in several treatment groups covering time points of up to 6 months.

RESULTS Based on the success of the urine validation studies, work continues in expanding these markers for use with other sample types. Similar projects have been undertaken to develop useful panels for both canine and feline arthritis and bone health studies, which are now available.

Biomarkers

	Canine	Feline
Collagen/Bone Markers		
ICTP (C-terminal telopeptide of type I collagen)	✓	✓
NTx (N-terminal cross-linked telopeptide of type I collagen)	✓	✓
BAP (Bone-specific alkaline phosphatase)	✓	✓
Pyd (Pyridinoline crosslinks of collagen)	✓	✓
Osteocalcin	✓	✓
Total Dpd (Total deoxypyridinoline crosslinks of collagen)	✓	✓
PIIANP (Type IIA Collagen N-Propeptide)	✓	✓
CTXI (C-terminal telopeptides of Collagen I)	✓	✓
COMP (Cartilage oligomeric matrix protein)	✓	✓
CS846 (Aggrecan chondroitin sulfate epitope 846)	✓	✓
C2C (C-terminal cleavage product of collagen type II)	✓	✓
CTXII (C-terminal telopeptides of Collagen II)	✓	✓
Keratan Sulfate	✓	✓

Metabolism/Obesity/Diabetes		
Adiponectin	✓	✓
Insulin	✓	✓
Glucagon	✓	
GLP-1 (Glucagon-like peptide-1, active)	✓	
IGF-1 (Insulin-like growth factor I)	✓	✓
Leptin	✓	
Lipoprotein lipase (LPL)	✓	✓
Ghrelin	✓	✓
Growth Hormone	✓	
Resistin	✓	

Renal and Liver Function/Lipid Peroxidation/Oxidative Stress		
8-Hydroxydeoxyguanosine (8-OHdG)	✓	
Albumin	✓	
Alkaline Phosphatase	✓	
Angiotensin II	✓	✓
Asymmetric Dimethylarginine (ADMA)	✓	✓
Aldosterone	✓	
Creatinine	✓	✓
Hexanoyl-Lysine Adduct	✓	
Hydrogen Peroxide	✓	
Isoprostane	✓	
Lactate Dehydrogenase	✓	
N-acetyl-β-D-glucosaminidase (NAG)	✓	

	Canine	Feline
Neopterin	✓	
Total Nitrate/Nitrite	✓	
Tamm-Horsfall Protein (THP)/Uromodulin	✓	✓
TBARS/Malondialdehyde	✓	
VEGF (Vascular Endothelial Growth Factor)	✓	

Inflammation/Cytokines/Chemokines		
C-reactive Protein (CRP)	✓	
High-mobility group box 1 protein (HMGB1)	✓	✓
Leukotriene B ₄ (LTB ₄)	✓	✓
Prostaglandin E ₂ (PGE ₂)	✓	✓
Serum amyloid A (SAA)	✓	✓
TNF-α	✓	✓
IFN-γ	✓	✓
TGF-β1	✓	✓
IL-1β		✓
IL-2	✓	✓
IL-4	✓	✓
IL-6	✓	✓
IL-7	✓	
IL-8	✓	✓
IL-10	✓	✓
IL-15	✓	
IL-18	✓	
GM-CSF	✓	✓
IP-10	✓	
MCP-1	✓	
KC	✓	
IgG	✓	✓
IgE	✓	✓

1000 Westgate Dr., Ste 162
 St. Paul, MN 55114
 651-641-1770
 1-888-USMDBIO toll free
 651-641-1773 fax
 info-us@mdbiosciences.com
 www.mdbiosciences.com

