expanding possibilities
in Animal Health

MILLIPLEX® Multiplex Assays
for Veterinary Medicine and
Animal Health Research

MERCK

Millipore®

Preparation, Separation,
Filtration & Monitoring Products

Table of Contents

Benefits of Using Multiplex Biomarker Detection

Immunoassays in Veterinary Medicine and Animal Research

Animal health research encompasses many different areas including veterinary medicine, animal models for laboratory studies, as well as companion and agricultural animal studies.

Multiplex biomarker detection immunoassays can save valuable time, money, and sample volume while dramatically increasing the number of data points generated from a single assay.

Comparison of MILLIPLEX® Assays vs. Traditional ELISAs

Assay Parameter	MILLIPLEX® Assay	Traditional ELISA
Number of 96-well plates	1 plate	14 plates
Total plate run time	1 hour	14 hours
Results per plate (duplicate samples)	570	40
Total volume of sample required (duplicate samples)	25 µL (1:2 sample dilution)	750 µL
Lower limit of detection	~ 1 pg/mL	~ 1 pg/mL

MILLIPLEX® Multiplex Assays for Veterinary Medicine and Animal Health Research

MILLIPLEX® multiplex assays, based on Luminex® xMAP® technology, enables scientists studying veterinary medicine, animal health, and animal models, as well as human health, to understand complex biological systems and processes. Our kit offerings span across companion, agricultural, and laboratory animal research.

MILLIPLEX® kits can analyze the following animal species:

Companion Animals

- Canine
- Feline

Agricultural Animals
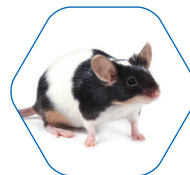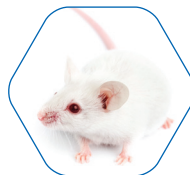
- Bovine
- Equine
- Porcine
- Ovine
- Chicken

Multi-Species

Laboratory Animals

- Mouse
- Rat
- Non-Human Primate

These highly verified assays help save time and sample volume while producing the highest quality data.

LOOK CLOSER
at Our Vet Med Panels

Examples of Cytokine Multiplex Analysis for Agricultural Animal Research

See examples of how ovine, chicken, and bovine cytokine MILLIPLEX® multiplex assays are being used in agricultural animal research.

Ovine

The MILLIPLEX® Ovine Cytokine/Chemokine Panel 1 (Cat. No. **SCYT1-91K**) is the first multiplex panel designed to analyze your choice of up to 14 ovine cytokines within the same sample. See examples of data produced using this panel below.

MILLIPLEX® Ovine Cytokine/Chemokine Panel 1
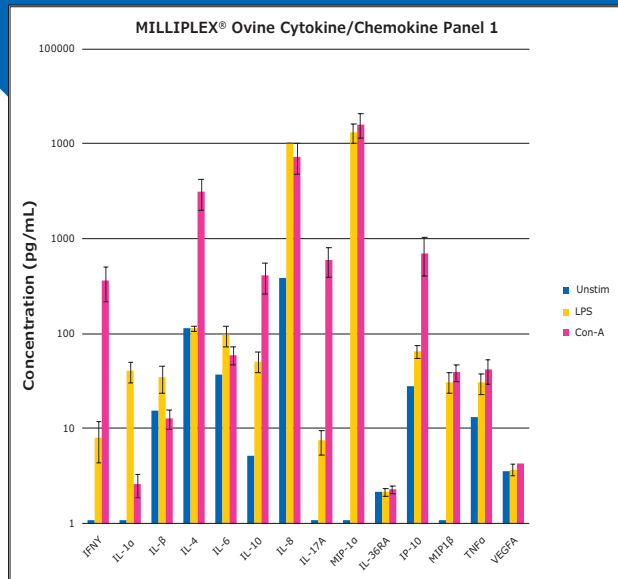
Stimulation of Ovine PBMCs

Ovine PBMCs (BioIVT, Hicksville, NY) were stimulated for 48 hours with LPS or Concanavalin A (Con-A) or left unstimulated. Cell supernatants were collected and assayed according to the protocol in the MILLIPLEX® Ovine Cytokine/Chemokine Panel 1 (n=3, mean). The analyte IL-8 reached saturation on the standard curve for this sample group.

Ovine Milk Cytokine Concentrations

Ovine Milk Cytokine Concentrations

MILLIPLEX® ovine milk samples (BioIVT, Hicksville, NY) were assayed according to the protocol in the Ovine Cytokine/Chemokine Panel 1 (n=10, mean).
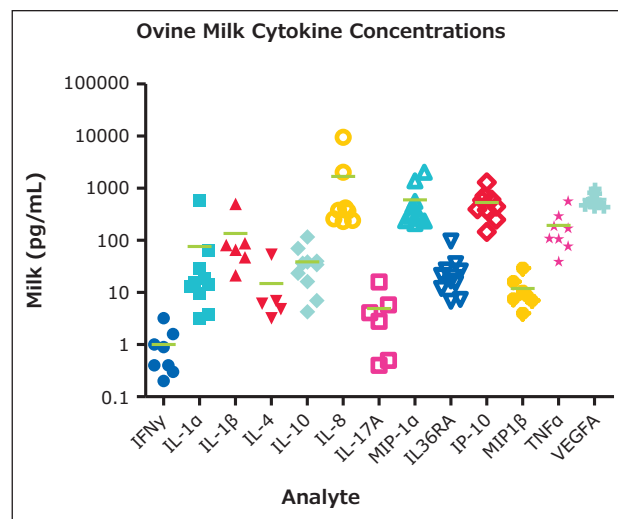
Chicken

The MILLIPLEX® Chicken Cytokine/Chemokine Panel 1 (Cat. No. **GCYT1-16K**) is the first multiplex panel designed to analyze your choice of up to 12 chicken cytokines within the same sample.

See example data using this panel below.
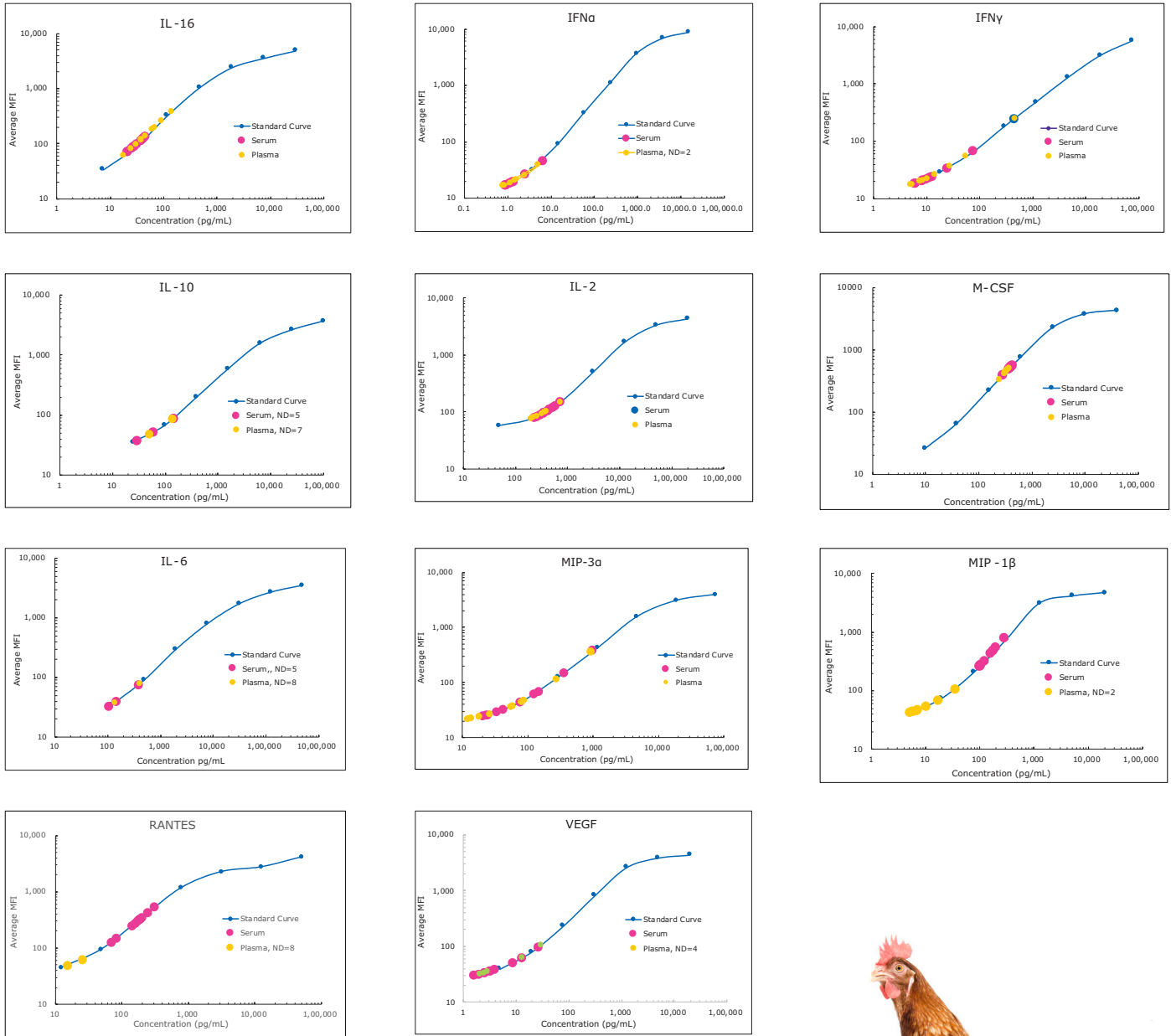
Chicken Plasma and Serum Concentrations

Normal healthy New Hampshire chicken plasma and serum samples (n=8 each) were sourced commercially and assayed according to the overnight protocol of the MILLIPLEX® Chicken Cytokine/ Chemokine Panel 1. "ND=n" indicates the number of samples for which the analyte was not detected in the assay. The analyte IL-21 was not detected in these samples, however, it is expected that certain disease/inflammation states will show IL-21 values in assay.

Bovine

The MILLIPLEX® Bovine Cytokine/Chemokine Panel 1 (Cat. No. **BCYT1-33K**) is the first multiplex panel designed to analyze up to 15 bovine cytokines within the same sample. See below for example analyte data from two sample types.

Stimulation of Bovine PBMCs

Bovine PBMCs (BioIVT, Hicksville, NY) were treated with LPS or Concanavalin A (Con A) for 48 hours, after which, cell-free samples were collected and assayed with the Bovine Cytokine/Chemokine Panel 1 (n=3 mean ± SEM). *Notes saturation on the standard curve for these sample groups.

Bovine Serum Cytokine Concentrations

Bovine Serum Cytokine Concentrations
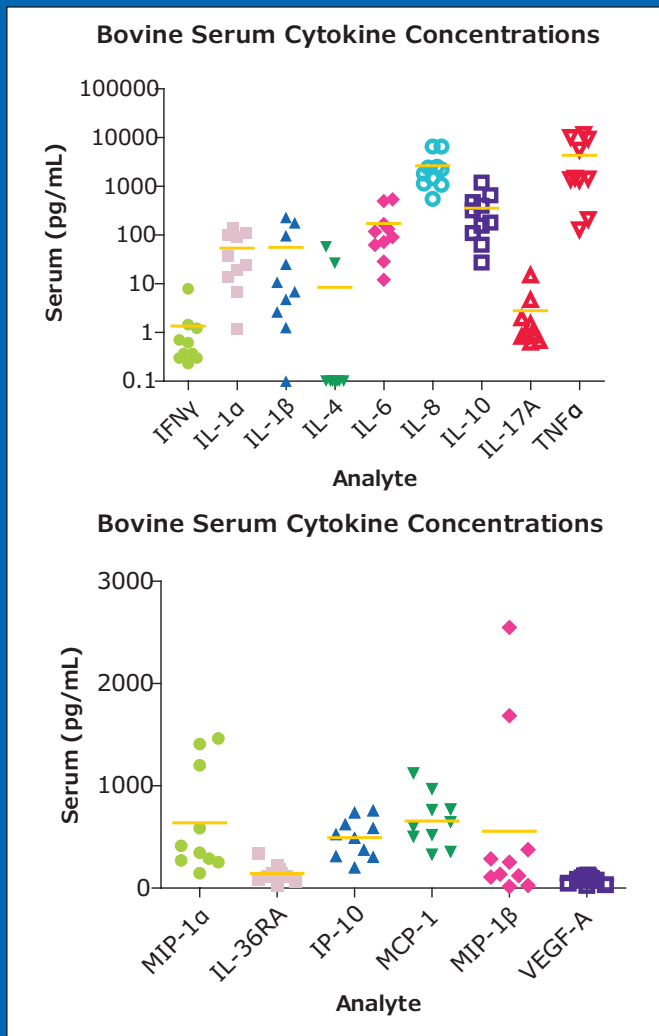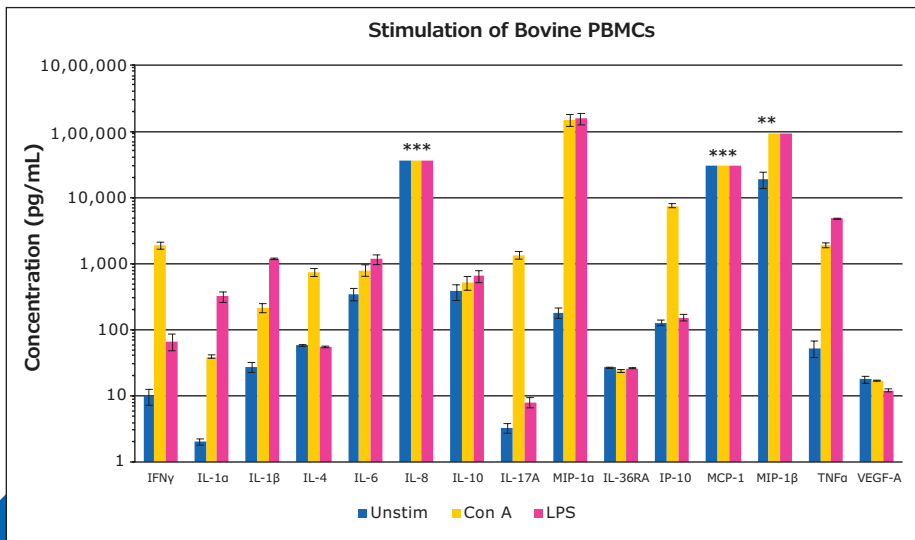
Serum samples were obtained from BioIVT (Hicksville, NY). Samples were assayed according to protocol in the MILLIPLEX® Bovine Cytokine/Chemokine Panel 1.

Example of Pituitary Hormone Multiplex Analysis for Companion Animal Research

Canine

Quantitate canine pituitary hormones in serum, plasma, and cell/tissue culture samples of up to six analytes with the MILLIPLEX® Canine Pituitary Expanded Panel (Cat. No. **CANPIT-96K**). See example analyte data below.

Canine Pituitary Hormone Analysis
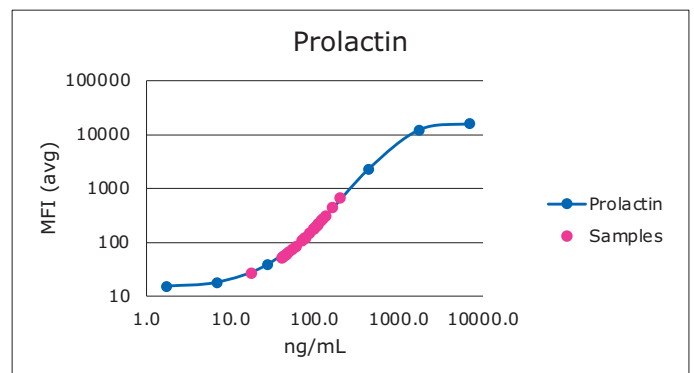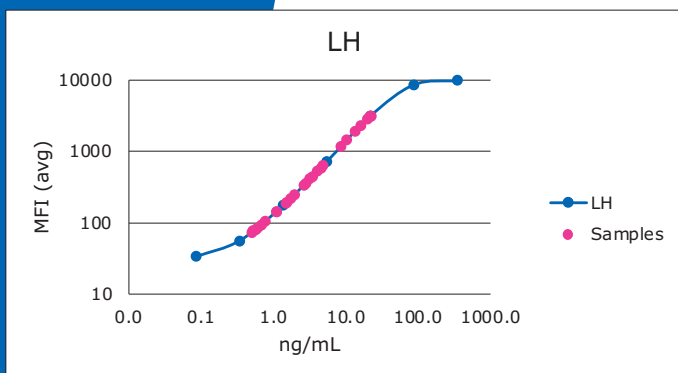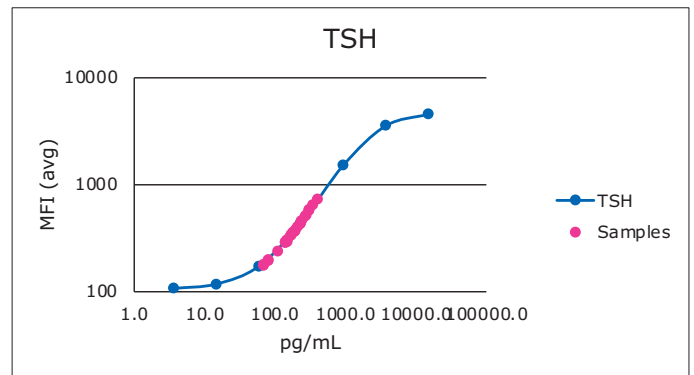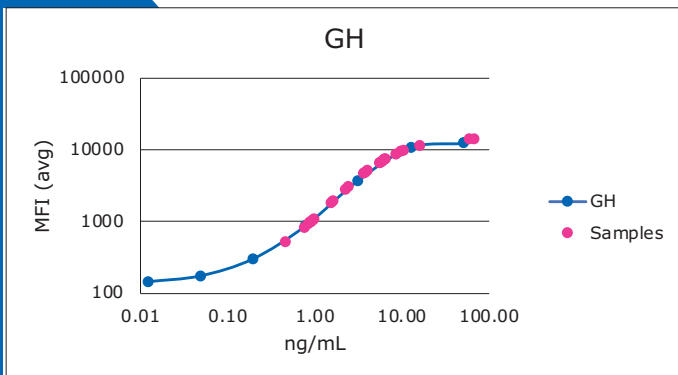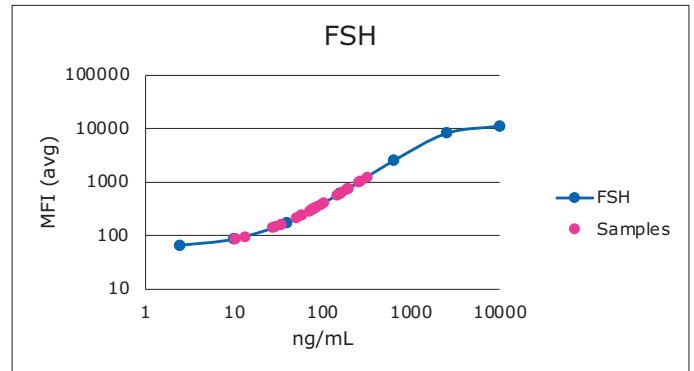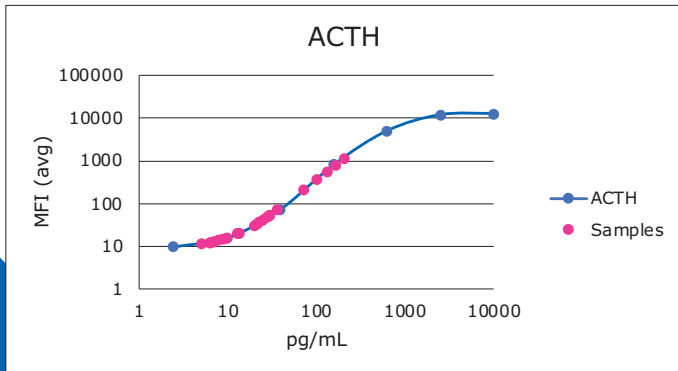
Commercially sourced normal canine serum (n=22) and plasma (n=27) samples were assayed according to protocol using the MILLIPLEX® Canine Pituitary Expanded Panel. Magenta circles show where each sample fell upon the indicated analyte standard curve.

Example of Primate Cytokine Multiplex Analysis for Laboratory Animal Research

Non-Human Primate

Analyze cytokines and chemokines from serum, plasma, tissue/cell lysate, and cell culture supernatant samples from multiple species of primates with the MILLIPLEX® Non-Human Primate Cytokine/Chemokine/Growth Factor Panel A (Cat. No. **PRCYTA-40K**).

Non-Human Primate Cytokine Analysis
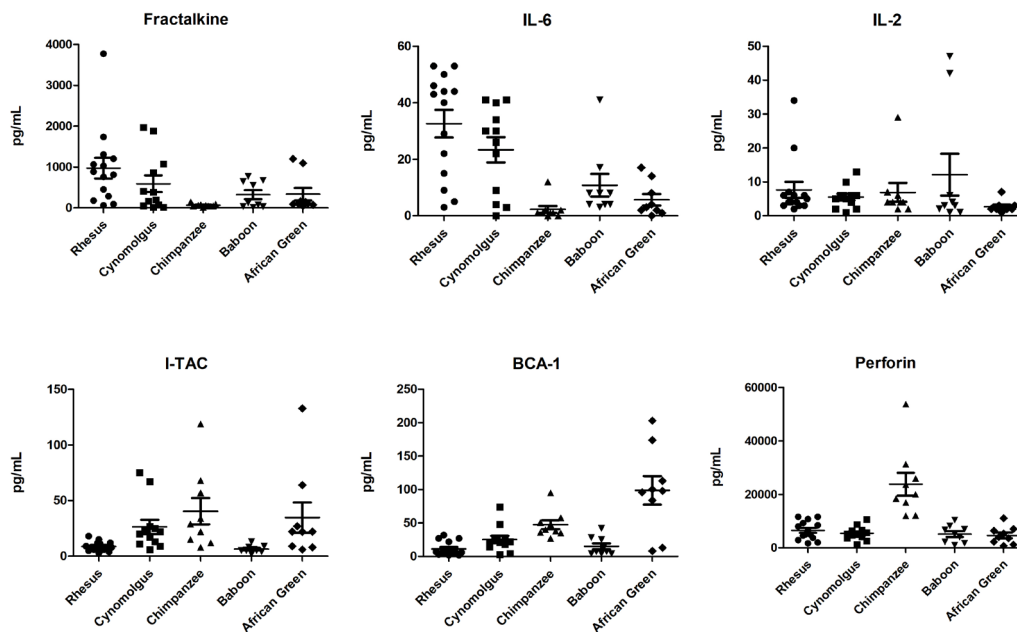
The MILLIPLEX® Non-Human Primate Cytokine/Chemokine/Growth Factor Panel A was used, according to the protocol, to test endogenous levels of six selected analytes in healthy serum/plasma samples from five non-human primate species (obtained from BioIVT), including rhesus macaques (*Macaca mulatta*, n=14), cynomolgus macaques (*Macaca fascicularis*, n=12), chimpanzee (n=9), baboon (n=9), and African green monkeys (*Chlorocebus sabaeus*, n=9).
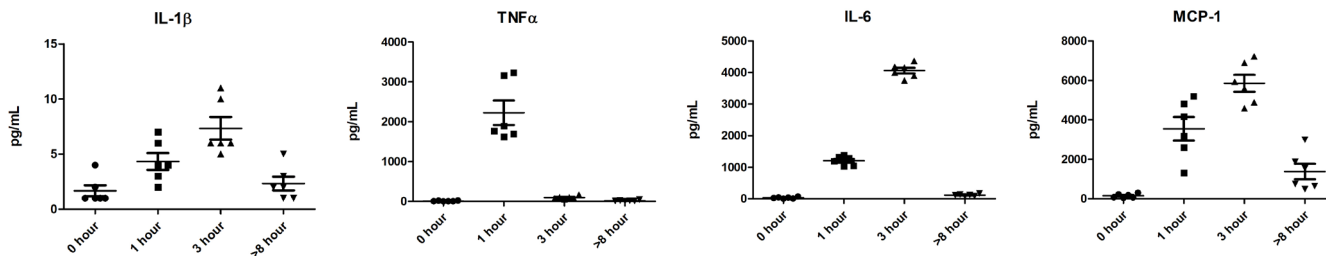
Three healthy rhesus macaques (*Macaca mulatta*) were dosed intravenously with 10 µg/kg lipopolysaccharide (LPS) in 0.5 mL saline at time zero and serum (n=3)/plasma (n=3) samples were taken at 0, 1, 3, and 8 hours (obtained from BioIVT). The samples were assayed according to protocol in the MILLIPLEX® Non-Human Primate Cytokine/Chemokine/Growth Factor Panel A. Concentrations of IL-1β, TNFα, IL-6, and MCP-1 are shown over the LPS time course.

Discover more at
SigmaAldrich.com/milliplex-primate

MILLIPLEX® Vet Med & Animal Health Assays

Companion Animals

Canine Cytokine/Chemokine

◎ (Cat. No. **CCYTOMAG-90K**)
⑬ (Cat. No. **CCYTMG-90K-PX13**)
⑬ (Bulk Cat. No. **CCYTMAG90KPX13BK**)

GM-CSF	IL-15
IFNγ	IL-18
IL-2	IP-10/CXCL10
IL-6	KC-like
IL-7	MCP-1/CCL2
IL-8/CXCL8	TNFα
IL-10	

Canine Kidney Toxicity Expanded Panel 1
(Urine samples)

(Cat. No. **CKT1MAG-97K**)

Clusterin	MCP-1/CCL2
Cystatin C	NGAL/Lipocalin-2
IL-8/CXCL8	Osteopontin (OPN)
KIM-1	

Canine Kidney Toxicity Panel 2
(Urine samples)

(Cat. No. **CKT2MAG-97K**)

Albumin	RBP4
β-2-Microglobulin	TFF-3

Canine Gut Hormone

(Cat. No. **CGTMAG-98K**)

Amylin (total) ▶	Insulin
Ghrelin (active) ▶	Leptin
GIP (total)	Pancreatic Polypeptide (PP)
GLP-1 (active) ▶	
Glucagon	PYY (total)

Canine Pituitary Expanded Panel

(Cat. No. **CANPIT-96K**)

ACTH	LH
FSH	Prolactin
GH	TSH

Feline Cytokine/Chemokine ▼

⑲ (Cat. No. **FCYTMAG-20K-PMX**)
⑲ (Bulk Cat. No. **FCYTMAG20KPX19BK**)

NON-CONFIGURABLE KIT	
sFAS/TNFRSF6	IL-13
Flt3 Ligand	IL-18
GM-CSF	KC/GRO/CINC-1/CXCL1
IFNγ	MCP-1/CCL2
IL-1β	PDGF-BB
IL-2	RANTES/CCL5
IL-4	SCF
IL-6	SDF-1/CXCL12
IL-8/CXCL8	TNFα
IL-12 (p40)	

Agricultural Animals

Bovine Cytokine/Chemokine Panel 1

◎ (Cat. No. **BCYT1-33K**)
⑮ (Cat. No. **BCYT1-33K-PX15**)
⑮ (Bulk Cat. No. **BCYT1-33K-PXBK15**)

IFNγ	IL-36RA/IL-1F5
IL-1α	IP-10/CXCL10
IL-1β	MCP-1/CCL2
IL-4	MIP-1α/CCL3
IL-6	MIP-1β/CCL4
IL-8/CXCL8	TNFα
IL-10	VEGF-A
IL-17A/CTLA8	

Ovine Cytokine/Chemokine Panel 1

◎ (Cat. No. **SCYT1-91K**)
⑭ (Cat. No. **SCYT-91K-PX14**)
⑭ (Bulk Cat. No. **SCYT-91K-PXBK14**)

IFNγ	IL-17A/CTLA8
IL-1α	IL-36RA/IL-1F5
IL-1β	IP-10/CXCL10
IL-4	MIP-1α/CCL3
IL-6	MIP-1β/CCL4
IL-8/CXCL8	TNFα
IL-10	VEGF-A

Porcine Cytokine/Chemokine

◎ (Cat. No. **PCYTMAG-23K**)
⑬ (Cat. No. **PCYTMG-23K-13PX**)
⑬ (Bulk Cat. No. **PCYTMAG23PMX13BK**)

GM-CSF	IL-6
IFNγ	IL-8/CXCL8
IL-1α	IL-10
IL-1β	IL-12
IL-1Ra	IL-18
IL-2	TNFα
IL-4	

Chicken Cytokine/Chemokine

◎ (Cat. No. **GCYT1-16K**)
⑫ (Cat. No. **GCYT1-16K-PX12**)
⑫ (Cat. No. **GCYT1-16K-PXBK12**)

IFNα	IL-21
IFNγ	M-CSF
IL-2	MIP-1β/CCL4
IL-6	MIP-3α/CCL20
IL-10	RANTES/CCL5
IL-16	VEGF

Equine Cytokine/Chemokine

◎ (Cat. No. **EQCYTMAG-93K**)
㉓ (Cat. No. **EQCYTMG-93KPX23**)
㉓ (Bulk Cat. No. **EQCTMG93KPX23BK**)

Eotaxin/CCL11	IL-6
FGF-2/FGF-basic	IL-8/CXCL8
Fractalkine/CX3CL1	IL-10
G-CSF	IL-12 (p70)
GM-CSF	IL-13
GRO	IL-17A/CTLA8
IFNγ	IL-18
IL-1α	IP-10/CXCL10
IL-1β	MCP-1/CCL2
IL-2	RANTES/CCL5
IL-4	TNFα
IL-5	

Multi-Species

Multi-Species TGFβ – Singleplex

(Cat. No. **TGFBMAG-64K-01**)
(Bulk Cat. No. **TGFBMAG-64K-01BK**)

TGFβ1

Multi-Species TGFβ – 3 Plex ▼#

(Cat. No. **TGFBMAG-64K-03**)

NON-CONFIGURABLE KIT	
TGFβ1	TGFβ3
TGFβ2	

Multi-Species Hormone ■^

(Cat. No. **MSHMAG-21K**)

Cortisol	Testosterone
Estradiol	T3
Progesterone	T4

Laboratory Animals

Primates

Immunology

Non-Human Primate Cytokine/Chemokine Panel A NEW

◉ (Cat. No. **PRCYTA-40K**)
㊳ (Cat. No. **PRCYTA-40K-PX38**)♦
㊳ (Cat. No. **PRCYTA-40K-BK38**)♦
㊸ (Cat. No. **PRCYTA-40K-PX48**)
㊸ (Cat. No. **PRCYTA-40K-BK48**)

BCA-1	IL-15♦
sCD137♦	IL-16
CD40L♦	IL-17A♦
Eotaxin	IL-17E
sFASL♦	IL-18♦
FGF-2	IL-21♦
Fractalkine	IL-22♦
G-CSF♦	IL-23♦
GM-CSF♦	IL-28A
Granzyme A♦	IL-31
Granzyme B♦	IL-33♦
IFNα2♦	IP-10♦
IFNγ♦	I-TAC♦
IL-1α	MCP-1♦
IL-1β♦	MIG♦
IL-1RA♦	MIP-1α♦
IL-2♦	MIP-1β♦
IL-4♦	MIP-3α♦
IL-5♦	Perforin♦
IL-6♦	RANTES♦▲
IL-7♦	TGFα♦
IL-8♦	TNFα♦
IL-10♦	TNFβ
IL-12 (p70)♦	VEGF-A♦

Metabolism/Endocrinology

Non-Human Primate Metabolic Hormone

(Cat. No. **NHPMHMAG-45K**)
Amylin (active)
C-Peptide
Ghrelin (active)
GIP (total)
GLP-1 (active)
Glucagon
IL-6
Insulin
Leptin
MCP-1/CCL2

Non-Human Primate Pituitary Panel 1

(Cat. No. **NHPPT1MG-46K**)
ACTH
Agouti-Related
Protein (AgRP)
CNTF
FSH
GH
LH
TSH

Mouse

Immunology

Mouse Cytokine/Chemokine Panel 1

◉ (Cat. No. **MCYTOMAG-70K**)
㉕ (Cat. No. **MCYTOMAG-70K-PMX**)♦
㉕ (Bulk Cat. No. **MCYTMAG70PMX25BK**)♦
㉜ (Cat. No. **MCYTMAG-70K-PX32**)
㉜ (Bulk Cat. No. **MCYTMAG70PMX32BK**)

Eotaxin/CCL11	IL-13♦
G-CSF♦	IL-15♦
GM-CSF♦	IL-17A/CTLA8♦
IFNγ♦	IP-10/CXCL10♦
IL-1α♦	KC/GRO/CINC-1/
IL-1β♦	CXCL1♦
IL-2♦	LIF
IL-3	LIX
IL-4♦	MCP-1/CCL2♦
IL-5♦	M-CSF
IL-6♦	MIG/CXCL9
IL-7♦	MIP-1α/CCL3♦
IL-9♦	MIP-1β/CCL4♦
IL-10♦	MIP-2/CXCL2♦
IL-12 (p40)♦	RANTES/CCL5♦
IL-12 (p70)♦	TNFα♦
	VEGF-A

Mouse Cytokine/Chemokine Panel 2

◉ (Cat. No. **MECY2MAG-73K**)
⑮ (Cat. No. **MECY2MAG-73KPX**)
⑮ (Bulk Cat. No. **MECY2MAG73KPXBK**)

Erythropoietin (EPO)	IL-20
Exodus-2/CCL21/6Ckine	MCP-5/CCL12
Fractalkine/CX3CL1	MDC/CCL22
IFNβ1	MIP-3α/CCL20
IFNγ	MIP-3β/CCL19
IL-11	TARC/CCL17
IL-16	TIMP-1
IL-17A/F	

Mouse (continued)

Mouse High Sensitivity T Cell

◎ (Cat. No. **MHSTCMAG-70K**)
⑱ (Cat. No. **MHSTCMAG-70KPMX**)
⑱ (Bulk Cat. No. **MHSTCMAG-70KPXBK**)

GM-CSF	IL-10
IFNγ	IL-12 (p70)
IL-1α	IL-13
IL-1β	IL-17A/CTLA8
IL-2	KC/GRO/CINC-1/CXCL1
IL-4	LIX
IL-5	MCP-1/CCL2
IL-6	MIP-2/CXCL2
IL-7	TNFα

Mouse Th17

◎ (Cat. No. **MTH17MAG-47K**)
㉕ (Cat. No. **MT17MAG47K-PX25**)
㉕ (Bulk Cat. No. **MT17MAG47PMX25BK**)

sCD40L	IL-21
GM-CSF	IL-22
IFNγ	IL-23
IL-1β	IL-27
IL-2	IL-28B/IFNλ3
IL-4	IL-31
IL-5	IL-33/NF-HEV (mature)
IL-6	MIP-3α/CCL20
IL-10	TNFα
IL-12 (p70)	TNFβ/Lymphotoxin-α
IL-13	(LTA)
IL-15	
IL-17A/CTLA8	
IL-17E/IL-25	
IL-17F	

Mouse CD8+ T Cell

◎ (Cat. No. **MCD8MAG-48K**)
⑮ (Cat. No. **MCD8MAG48K-PX15**)
⑮ (Bulk Cat. No. **MCD8MAG48KPX15BK**)

sCD137/4-1BB/TNFRSF9	IL-5
sFas/TNFRSF6	IL-6
sFasL	IL-10
GM-CSF	IL-13
Granzyme B	MIP-1β/CCL4
IFNγ	RANTES/CCL5
IL-2	TNFα
IL-4	

Mouse Soluble Cytokine Receptor

◎ (Cat. No. **MSCRMAG-42K**)

sCD30	sRAGE
sGP130	sTNF RI
sIL-1RI	sTNF RII
sIL-1RII	sVEGFR1/sFlt-1
sIL-2Rα	sVEGFR2/sKDR/sFlk-1
sIL-4R	sVEGFR3/sFlt-4
sIL-6R	

Mouse MMP Panel 1
(Serum/Plasma samples)

(Cat. No. **MMMP1MAG-79K**)

MMP-2	MMP-8
MMP-3	

Mouse MMP Panel 2
(Serum/Plasma samples)

(Cat. No. **MMMP2MAG-79K**)

proMMP-9	MMP-12

Mouse MMP Panel 3
(Cell culture samples)

(Cat. No. **MMMP3MAG-79K**)

MMP-2	proMMP-9
MMP-3	MMP-12
MMP-8	

Immune Response
Mouse Immunoglobulin Isotyping

◎ (Cat. No. **MGAMMAG-300K**)

IgA	IgG2b
IgG1	IgG3
IgG2a	IgM

Mouse IgE – Singleplex

(Cat. No. **MGAMMAG-300E**)

IgE

Metabolism/ Endocrinology

Mouse Adipokine
(Serum/Plasma samples)

(Cat. No. **MADKMAG-71K**)

IL-6	PAI-1 (total)
Insulin	Resistin
Leptin	TNFα
MCP-1/CCL2	

Mouse Adipocyte
(Cell culture samples)

(Cat. No. **MADCYMAG-72K**)

Adiponectin	PAI-1 (total)
IL-6	Resistin
Leptin	TNFα
MCP-1/CCL2	

Mouse Adiponectin – Singleplex
(Serum/Plasma samples)

(Cat. No. **MADPNMAG-70K-01**)

Adiponectin

Mouse Metabolic Hormone Expanded

(Cat. No. **MMHE-44K**)

Amylin (active) ▶	Leptin
C-Peptide 2	MCP-1/CCL2
Ghrelin (active) ▶	Pancreatic Polypeptide (PP)
GIP (total)	
GLP-1 (active) †▶	PYY (total)
GLP-1 (total) †▶	Resistin
Glucagon ▶	Secretin
IL-6	TNFα
Insulin	

Mouse Myokine

(Cat. No. **MMYOMAG-74K**)

BDNF	Irisin
Erythropoietin (EPO) ★	LIF
FGF-21	Myostatin/GDF8
Follistatin-like Protein 1 (FSTL1)	Oncostatin-M (OSM)
	Osteocrin (OSTN)/ Musclin
IL-6	
IL-15	Osteonectin/SPARC

Mouse Aging Panel 1

(Cat. No. **MAGE1MAG-25K**)

CTACK/CCL27	Jag1
FGF-21	Leptin
GnRH	Notch1
IL-6	TNFα

Mouse Pituitary

(Cat. No. **MPTMAG-49K**)

ACTH	LH
BDNF	Prolactin
FSH	TSH
GH	

Cardiovascular
Mouse CVD Panel 1

(Cat. No. **MCVD1MAG-77K**)

sCD31/sPECAM-1	ProMMP-9
sE-Selectin	sP-Selectin
sICAM-1	Thrombomodulin
PAI-1 (total)	

Mouse CVD Panel 2

(Cat. No. **MCVD2MAG-77K**)

sCD40L	Oncostatin M (OSM)
CXCL16	Placental Growth Factor 2
Endocan-1 (ESM-1)	
Follistatin (FST)	Troponin I (TnI)
LIGHT	Troponin T (TnT)

Mouse (continued)

Mouse Acute Phase Panel 2

(Cat. No. **MAP2MAG-76K**)

α-1-Acid Glycoprotein (AGP)	CRP
	Haptoglobin
α-2-Macroglobulin	Serum Amyloid P (SAP)
Adipsin/Factor D	

Bone

Mouse Bone

(Cat. No. **MBNMAG-41K**)

ACTH	Leptin
DKK1	Osteoprotegerin (OPG)
FGF-23	
IL-6	Sclerostin (SOST)
Insulin	TNFα

Cancer

Mouse Angiogenesis / Growth Factor Panel 1

(Cat. No. **MAGPMAG-24K**)

sALK-1	IL-6
Amphiregulin	IL-17A/CTLA8
Angiopoietin-2 ▲	KC/GRO/CINC-1/ CXCL1
Betacellulin ▲	
sCD31/sPECAM-1 ▲	Leptin
EGF	MCP-1/CCL2
Endoglin	MIP-1α/CCL3
Endothelin-1	Placental Growth Factor 2
sFasL	
FGF-2/FGF-basic	Prolactin
Follistatin (FST)	SDF-1/CXCL12
G-CSF	TNFα
HGF	VEGF-A
IL-1β	VEGF-C
	VEGF-D

Mouse Immuno-Oncology Checkpoint Protein Panel 1 `NEW`

(Cat. No. **MCKP1-110K**)
(Cat. No. **MCKP1-110K-PX28**)
(Bulk Cat. No. **MCKP1-110K-PBK28**)

4-1BBL/TNFSF9	Galectin-1
5'-NT/CD73	Galectin-3
B7-H2/ICOSL	GITR
B7-H3/CD276	Granzyme B
BCA-1/CXCL-13	HVEM
BTLA	IFNγ
CD137/4-1BB	IL-10
CD226/DNAM-1	LAG-3
CD25/IL-2Rα	PD-1
CD27	PD-L1
CD40	PD-L2
CD80/B7-1	TIM-3
CTLA-4/CD152	TLR-2
E-cadherin	TNFα

Neuroscience

Mouse Amyloid Beta

(Cat. No. **MABMAG-83K**)

Amyloid beta 1-40	Amyloid beta 1-42

Mouse Neuropeptide ■ ^

(Cat. No. **RMNPMAG-83K**)

α-MSH	Oxytocin
β-Endorphin	Substance P
Neurotensin	

Toxicity

Mouse Kidney Injury Panel 1

(Cat. No. **MKI1MAG-94K**)

β-2-Microglobulin ᵁ	Renin
IP-10/CXCL10	TIMP-1
KIM-1	VEGF-A ᵁ

Mouse Kidney Injury Panel 2

(Cat. No. **MKI2MAG-94K**)

Clusterin	NGAL/Lipocalin-2
Cystatin C	Osteopontin (OPN)
EGF	

Rat

Immunology

Rat Cytokine/Chemokine

◎ (Cat. No. **RECYTMAG-65K**)
㉗ (Cat. No. **RECYMAG65K27PMX**)
㉗ (Bulk Cat. No. **RECYMAG65PMX27BK**)

EGF	IL-10
Eotaxin/CCL11	IL-12 (p70)
Fractalkine/CX3CL1	IL-13
G-CSF	IL-17A/CTLA8
GM-CSF	IL-18
KC/GRO/CINC-1/ CXCL1	IP-10/CXCL10
	Leptin
IFNγ	LIX
IL-1α	MCP-1/CCL2
IL-1β	MIP-1α/CCL3
IL-2	MIP-2/CXCL2
IL-4	RANTES/CCL5
IL-5	TNFα
IL-6	VEGF

Metabolism/ Endocrinology

Rat Adipokine
(Serum/Plasma samples)

(Cat. No. **RADPKMAG-80K**)

IL-1β	MCP-1/CCL2
IL-6	PAI-1 (total)
Insulin	TNFα
Leptin	

Rat Adipocyte
(Cell culture samples)

(Cat. No. **RADPCMAG-82K**)

Adiponectin	MCP-1/CCL2
IL-1β	PAI-1 (total)
IL-6	TNFα
Leptin	

Rat Metabolic Hormone

(Cat. No. **RMHMAG-84K**)

Amylin (active) ▶	Insulin
C-Peptide 2	Leptin
Ghrelin (active) ▶	MCP-1/CCL2
GIP (total)	Pancreatic Polypeptide (PP)
GLP-1 (active) ▶	
Glucagon ▶	PYY (total)
IL-6	TNFα

Rat Myokine

(Cat. No. **RMYOMAG-88K**)

BDNF	IL-15
Erythropoietin (EPO)	Irisin
FGF-21	LIF
Follistatin-like Protein 1 (FSTL1)	Myostatin/GDF8
	Osteocrin (OSTN)/ Musclin
Fractalkine/CX3CL1	
IL-6	Osteonectin/SPARC

Rat (continued)

Rat Pituitary

(Cat. No. **RPTMAG-86K**)

ACTH	LH
BDNF	Prolactin
FSH	TSH
GH	

Rat Stress Hormone■

(Cat. No. **RSHMAG-69K**)

ACTH	Melatonin^
Corticosterone^	

Rat Thyroid

(Cat. No. **RTHYMAG-30K**)

T3^	TSH
T4^	

Cardiovascular

Rat Cardiac Injury Panel 1

(Cat. No. **RCI1MAG-87K**)

Cardiac Troponin I (cTnI)	FABP3
Cardiac Troponin T (cTnT)	Follistatin-like Protein 1 (FSTL1)
Creatine Kinase Muscle (CKM)	Myosin Light Chain 3 (MYL3)
	TIMP-1

Rat Vascular Injury Panel 1
(Serum/Plasma samples)

(Cat. No. **RV1MAG-26K**)

Caveolin-1	IL-6
Connective Tissue Growth Factor (CTGF)	MCP-1/ CCL2
	PAI-1 (total)
KC/GRO/CINC-1/ CXCL1	TIMP-1
	TNFα
	VEGF

Rat Vascular Injury Panel 2 (Serum/Plasma samples)

(Cat. No. **RV2MAG-26K**)

Adiponectin	sICAM-1
sE-Selectin	

Rat Vascular Injury Panel 3 (Serum/Plasma samples)

(Cat. No. **RV3MAG-26K**)

α-1-Acid Glycoprotein (AGP)	Haptoglobin
α-2-Macroglobulin (A2M)	

Bone

Rat Bone Panel 1
(Serum/Plasma samples)

(Cat. No. **RBN1MAG-31K**)

ACTH	Leptin
DKK1	Osteoprotegerin (OPG)
FGF-23	PTH
Insulin	Sclerostin (SOST)

Neuroscience

Rat Neuropeptide■^

(Cat. No. **RMNPMAG-83K**)

α-MSH	Oxytocin
β-Endorphin	Substance P
Neurotensin	

Toxicity

Rat Kidney Toxicity Panel 1 (Urine samples)

(Cat. No. **RKTX1MAG-37K**)

Clusterin	Osteopontin (OPN)
GSTα^	TIMP-1
IP-10/CXCL10	VEGF-A
KIM-1	

Rat Kidney Toxicity Panel 2 (Urine samples)

(Cat. No. **RKTX2MAG-37K**)

α-1-Acid Glycoprotein (AGP)	Cystatin C
	EGF
Albumin^	NGAL/Lipocalin-2
β-2-Microglobulin	

Rat Liver Injury

(Cat. No. **RLI1MAG-92K**)

5'NT/CD73	GSTα
ARG1	SDH
GOT1	

Symbol Index

Legend key for MILLIPLEX® kits

† Analytes which cannot be plexed together:
 – Active and total
 – Free and total

♦ Available in Cat. No. listed

▼ Premix panel only

Bulk indicates Space Saver Packaging

▲ These analytes cannot be plexed with other analytes in this panel in serum/plasma

◗ Requires a protease inhibitor during sample collection

■ Requires sample extraction

** No standard/QC; antibody levels are reported as MFIs (Median Fluorescence Intensities)

● Serum/Plasma only

★ Tissue Culture samples only

^ Competitive assay format

◉ Available for custom premix

° Analyte requires a different sample dilution from others in panel

⊙ Analyte cannot be measured in serum

Requires sample acidification

S Analyte cannot be measured in plasma

U Urine only

Custom MILLIPLEX® Assays

If you cannot find the assay you are looking for, we also offer custom assay services to help you multiplex it your way and develop the right assay for your research.

Learn more at SigmaAldrich.com/customassay.

Luminex® Instruments for MILLIPLEX® Assays

Instruments	xMAP® INTELLIFLEX DR-SE	xMAP® INTELLIFLEX	FLEXMAP 3D®	Luminex® 200™
Optics Hardware	Lasers/APDs/PMTs	Lasers/APDs/PMTs	Lasers/APDs/PMTs	Lasers/APDs/PMTs
Technology	Flow-based	Flow-based	Flow-based	Flow-based
Multiplexing	Up to 500	Up to 500	Up to 500	Up to 100 (80 on MagPlex® microspheres)
Dynamic Range	≥5.5 logs (RP1) ≥4.5 logs (RP2)	≥5.5 logs (RP1)	≥4.5 logs (RP1)	≥3.5 logs (RP1)
Read Time	96-well in ~20 min 384-well in ~75 min	96-well in ~20 min 384-well in ~75 min	96-well in ~20 min 384-well in ~75 min	96-well in ~45 min
Applications	Protein/nucleic acid	Protein/nucleic acid	Protein/nucleic acid	Protein/nucleic acid
Automation-Compatible Hardware	Front and side eject	Front eject only	Front eject only	Front eject only
Reporter Laser	532 nm (green) 405 nm (violet)	532 nm (green)	532 nm (green)	532 nm (green)
IQ/OQ	Yes	Yes	Yes	Yes
21 CFR Compliance	Yes	Yes	Yes	Yes
Automation	Yes	Yes	Yes	Yes
Data Analysis	Belysa® software	Belysa® software	xPONENT® basic + Belysa® software	xPONENT® basic + Belysa® software
Plate Format	96-well and 384-well	96-well and 384-well	96-well and 384-well	96-well
Footprint (Linear Bench Space, including PC)	58.4 cm x 61 cm x 6.2 cm	58.4 cm x 61 cm x 76.2 cm	110 cm x 62 cm x 63 cm	115 cm x 60 cm x 50 cm
Weight	54.4 kg (120 lbs)	54.4 kg (120 lbs)	77.1 kg (170 lbs)	49 kg (113 lbs)

DR-SE = dual reporter side eject, RP = reporter

Plate Washers

We offer everything from handheld magnetic holders for plate washing to the latest in BioTek® plate washer instruments for fast and easy processing of our MILLIPLEX® assay plates.
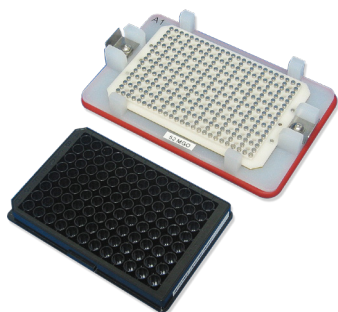
Handheld Magnetic Separator Block for 96-Well Flat Bottom or Conical Well Plates

A low-cost alternative to automated plate washers without the loss of assay performance. Simply decant or "flick" the liquid contents and blot the remainder on a paper towel. Magnetic beads are securely held in the wells by the block magnets.

Product Description	Cat. No.
Handheld Magnetic Separator Block for 96-Well Flat Bottom or Conical Well Plates	40-285
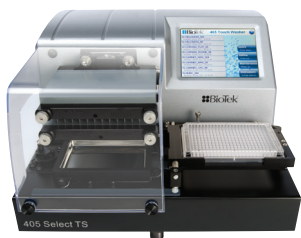
BioTek® washer advantages:

- Fast and hands-free full plate washing
- The BioTek® 405™ TS models in 96- and 384-well options include an intuitive touch-screen user interface and the Ultrasonic Advantage™ cleaning program for easy washing of the toughest sample types

BioTek® 405™ Select TS (Touch Screen) Washer

Product Description	Cat. No.
BioTek® 405™ LS Magnetic 96-Well Washer	40-094
BioTek® 405™ LS Magnetic/Vacuum Filtration 96-Well Washer	40-095
BioTek® 405™ TS Magnetic 96-Well Washer Complete with Touch Screen and Ultrasonic Cleaning	40-096
BioTek® 405™ TS Magnetic/Vacuum Filtration 96-Well Washer Complete with Touch Screen and Ultrasonic Cleaning	40-097

Belysa® Software for Data Analysis

Our Belysa® Immunoassay Curve Fitting Software allows the user to easily analyze MILLIPLEX® assay data acquired from Luminex® instruments, as well as data obtained from ELISA and other assays.

Learn more at SigmaAldrich.com/belysa.

Highlighted Publications

See how MILLIPLEX® multiplex assays are being used in veterinary medicine and animal health research.

Companion Animals

Canine

1. Solcà M da S, Arruda MR, Leite BMM, Mota TF, Rebouças MF, de Jesus MS, Amorim LDAF, Borges VM, Valenzuela J, Kamhawi S, et al. 2021. Immune response dynamics and Lutzomyia longipalpis exposure characterize a biosignature of visceral leishmaniasis susceptibility in a canine cohort. Petersen CA, editor. PLOS Neglected Tropical Diseases. 15(2):e0009137. doi:10.1371/journal.pntd.0009137.

2. Kaid C, Madi RA dos S, Astray R, Goulart E, Caires-Junior LC, Mitsugi TG, Moreno ACR, Castro-Amarante MF, Pereira LR, Porchia BFMM, et al. 2020. Safety, Tumor Reduction, and Clinical Impact of Zika Virus Injection in Dogs with Advanced-Stage Brain Tumors. Molecular Therapy. 28(5):1276–1286. doi:10.1016/j.ymthe.2020.03.004.

Feline

1. O'Halloran C, McCulloch L, Rentoul L, Alexander J, Hope JC, Gunn-Moore DA. 2018. Cytokine and Chemokine Concentrations as Biomarkers of Feline Mycobacteriosis. Scientific Reports. 8(1). doi:10.1038/s41598-018-35571-5.

2. Kopanke JH, Horak KE, Musselman E, Miller CA, Bennett K, Olver CS, Volker SF, VandeWoude S, Bevins SN. 2018. Effects of Low-level Brodifacoum Exposure on the Feline Immune Response. Scientific Reports. 8(1). doi:10.1038/s41598-018-26558-3.

Agricultural Animals

Bovine

1. Smith K, Kleynhans L, Snyders C, Bernitz N, Cooper D, van Helden P, Warren RM, Miller MA, Goosen WJ. 2021. Use of the MILLIPLEX® bovine cytokine/chemokine multiplex assay to identify Mycobacterium bovis-infection biomarkers in African buffaloes (Syncerus caffer). Veterinary Immunology and Immunopathology. 231:110152. doi:10.1016/j.vetimm.2020.110152.

Equine

1. Pavulraj S, Kamel M, Stephanowitz H, Liu F, Plendl J, Osterrieder N, Azab W. 2020. Equine Herpesvirus Type 1 Modulates Cytokine and Chemokine Profiles of Mononuclear Cells for Efficient Dissemination to Target Organs. Viruses. 12(9):999. doi:10.3390/v12090999.

2. Zak A, Siwinska N, Elzinga S, Barker VD, Stefaniak T, Schanbacher BJ, Place NJ, Niedzwiedz A, Adams AA. 2020. Effects of equine metabolic syndrome on inflammation and acute-phase markers in horses. Domestic Animal Endocrinology. 72:106448. doi:10.1016/j.domaniend.2020.106448.

Porcine

1. Fernandez J, Sanders H, Henn J, Wilson JM, Malone D, Buoninfante A, Willms M, Chan R, DuMont AL, McLahan C, et al. 2021 Apr 25. Vaccination With Detoxified Leukocidin AB Reduces Bacterial Load in a Staphylococcus aureus Minipig Deep Surgical Wound Infection Model. The Journal of Infectious Diseases. doi:10.1093/infdis/jiab219.

Ovine

1. Naylor D, Sharma A, Li Z, Monteith G, Sullivan T, Canovas A, Mallard B, Baes C, Karrow NA. 2020. Short communication: Characterizing ovine serum stress biomarkers during endotoxemia. Journal of Dairy Science. 103(6):5501–5508. doi:10.3168/jds.2019-17718.
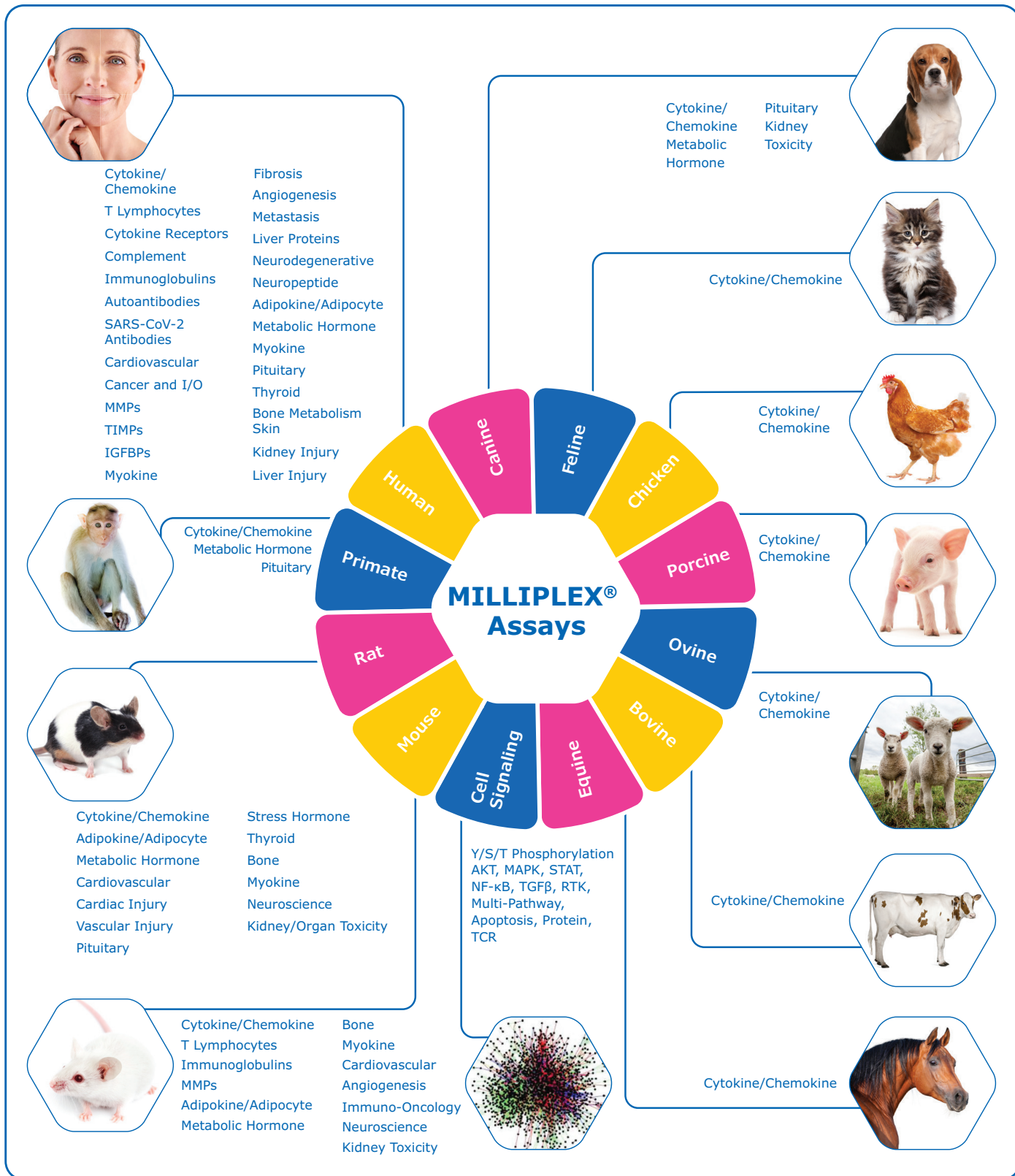
Laboratory Animal

Non-Human Primate

1. Jiao L, Yang Y, Yu W, Zhao Y, Long H, Gao J, Ding K, Ma C, Li J, Zhao S, et al. 2021. The olfactory route is a potential way for SARS-CoV-2 to invade the central nervous system of rhesus monkeys. Signal Transduction and Targeted Therapy. 6(1). doi:10.1038/s41392-021-00591-7.

2. Mooij P, Grødeland G, Koopman G, Andersen TK, Mortier D, Nieuwenhuis IG, Verschoor EJ, Fagrouch Z, Bogers WM, Bogen B. 2019. Needle-free delivery of DNA: Targeting of hemagglutinin to MHC class II molecules protects rhesus macaques against H1N1 influenza. Vaccine. 37(6):817–826. doi:10.1016/j.vaccine.2018.12.049.

Explore more at
SigmaAldrich.com/vetmed

MILLIPLEX® Assay Wheel

Human

Cytokine/Chemokine
T Lymphocytes
Cytokine Receptors
Complement
Immunoglobulins
Autoantibodies
SARS-CoV-2 Antibodies
Cardiovascular
Cancer and I/O
MMPs
TIMPs
IGFBPs
Myokine

Fibrosis
Angiogenesis
Metastasis
Liver Proteins
Neurodegenerative
Neuropeptide
Adipokine/Adipocyte
Metabolic Hormone
Myokine
Pituitary
Thyroid
Bone Metabolism Skin
Kidney Injury
Liver Injury

Primate

Cytokine/Chemokine
Metabolic Hormone
Pituitary

Rat

Cytokine/Chemokine
Adipokine/Adipocyte
Metabolic Hormone
Cardiovascular
Cardiac Injury
Vascular Injury
Pituitary

Stress Hormone
Thyroid
Bone
Myokine
Neuroscience
Kidney/Organ Toxicity

Mouse

Cytokine/Chemokine
T Lymphocytes
Immunoglobulins
MMPs
Adipokine/Adipocyte
Metabolic Hormone

Bone
Myokine
Cardiovascular
Angiogenesis
Immuno-Oncology
Neuroscience
Kidney Toxicity

MILLIPLEX® Assays

Wheel segments: Human, Canine, Feline, Chicken, Porcine, Ovine, Bovine, Equine, Cell Signaling, Mouse, Rat, Primate

Canine

Cytokine/Chemokine
Metabolic Hormone
Pituitary
Kidney
Toxicity

Feline

Cytokine/Chemokine

Chicken

Cytokine/Chemokine

Porcine

Cytokine/Chemokine

Ovine

Cytokine/Chemokine

Bovine

Cytokine/Chemokine

Equine

Cytokine/Chemokine

Cell Signaling

Y/S/T Phosphorylation
AKT, MAPK, STAT,
NF-κB, TGFβ, RTK,
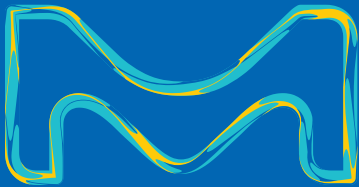Multi-Pathway,
Apoptosis, Protein,
TCR

Millipore®

Preparation, Separation, Filtration & Monitoring Products

Merck KGaA
Frankfurter Strasse 250
64293 Darmstadt, Germany

SigmaAldrich.com

To place an order or receive technical assistance in Europe, please call Customer Service:

France: 0825 045 645
Germany: 069 86798021
Italy: 848 845 645

Spain: 901 516 645 Option 1
Switzerland: 0848 645 645
United Kingdom: 0870 900 4645

For other countries across Europe, please call: +44 (0) 115 943 0840
Or visit: **SigmaAldrich.com/offices**
For Technical Service visit: **SigmaAldrich.com/techservice**