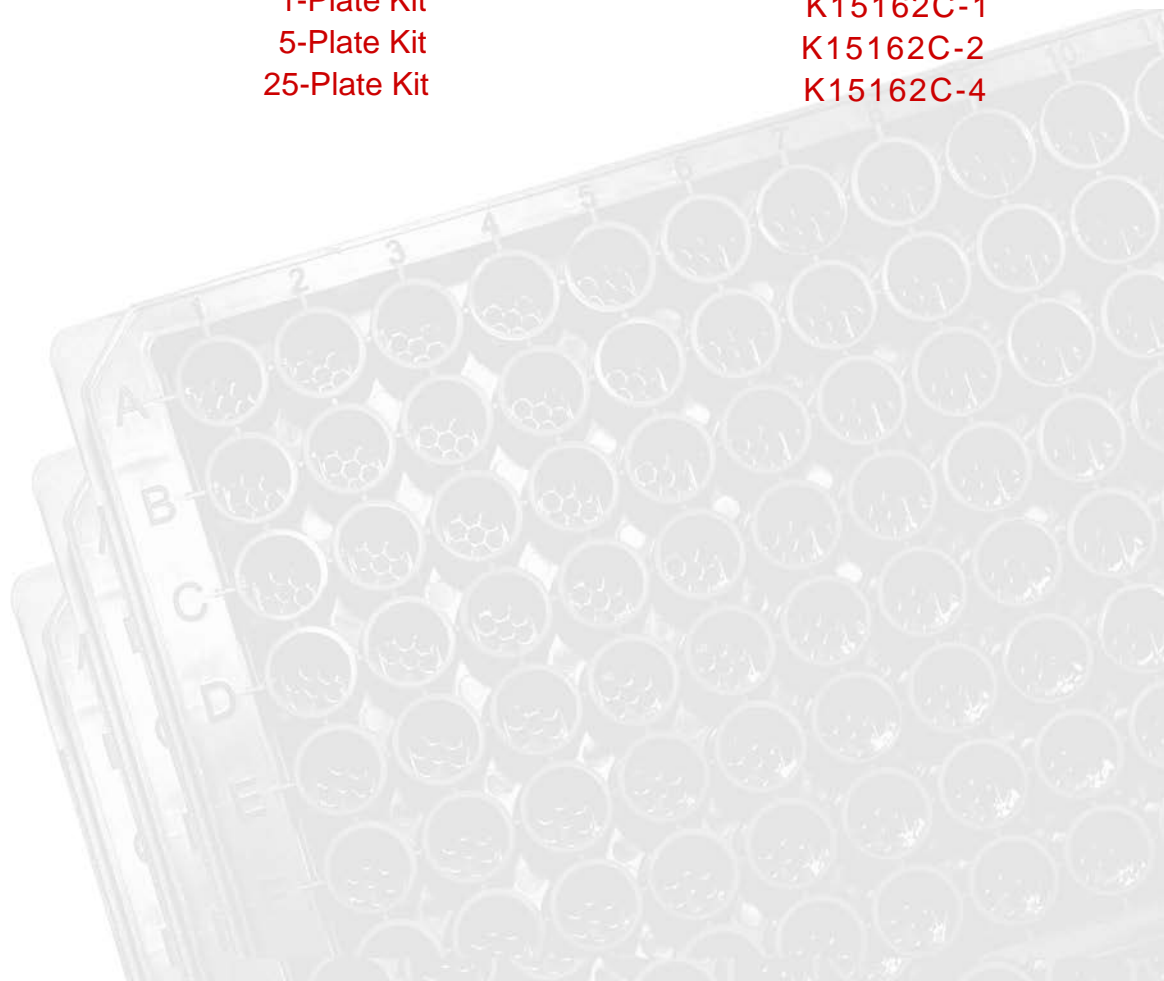


# MESO SCALE DISCOVERY

## MULTI-SPOT Assay System Kidney Injury Panel 1 (rat) Assay Kit

1-Plate Kit  
5-Plate Kit  
25-Plate Kit

K15162C-1  
K15162C-2  
K15162C-4



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# MSD Toxicology Assays

## **Kidney Injury Panel 1 (rat) Assay** **Lipocalin-2, Osteopontin, Albumin, TIM-1**

*This package insert must be read in its entirety before using this product.*

**FOR RESEARCH USE ONLY.**  
**NOT FOR USE IN DIAGNOSTIC PROCEDURES.**

### **MESO SCALE DISCOVERY®**

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# Table of Contents

table of contents

I. MSD Advantage .....	4
II. Introduction .....	5
III. Principle of the Assay .....	6
IV. Reagents Supplied .....	7
V. Required Material and Equipment – not supplied .....	7
VI. Safety .....	7
VII. Reagent Preparation .....	8
VIII. Assay Protocol .....	10
IX. Analysis of Results .....	10
X. Assay Qualification and Verification .....	11
XI. Typical Standard Curve .....	12
XII. Sensitivity .....	13
XIII. Precision .....	14
XIV. Spike Recovery .....	15
XV. Linearity .....	16
XVI. Specificity .....	17
XVII. Samples .....	17
XVIII. Assay Components .....	19
XIX. References .....	19
Summary Protocol .....	21
Plate Diagrams .....	23

## Ordering Information

ordering information

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# MSD Advantage

M S D a d v a n t a g e

MESO SCALE DISCOVERY'S MULTI-ARRAY<sup>®</sup> Technology is a multiplex immunoassay system that enables the measurement of biomarkers utilizing the next generation of electrochemiluminescent detection. In an MSD<sup>®</sup> assay, specific Capture Antibodies for the analytes are coated in arrays in each well of a 96-well carbon electrode plate surface. The detection system uses patented SULFO-TAG<sup>™</sup> labels that emit light upon electrochemical stimulation initiated at the electrode surfaces of the MULTI-ARRAY and MULTI-SPOT<sup>®</sup> plates. The electrical stimulation is decoupled from the output signal, which is light, to generate assays with minimal background. MSD labels can be conveniently conjugated to biological molecules, are stable and are non-radioactive. Additionally, only labels near the electrode surface are detected, enabling non-washed assays.

One of the advantages of MSD assays is the minimal sample volume required as compared to a traditional ELISA, which is also limited by its inability to measure more than a single analyte. With an MSD assay, ten different biomarkers can be analyzed simultaneously using as little as 10-25  $\mu$ L of sample. These assays have high sensitivity, up to five logs of linear dynamic range, and excellent performance in complex biological matrices. Combined, these advantages enable the measurement of native levels of biomarkers in normal and diseased samples without multiple dilutions. Further, the simple and rapid protocols of MSD assays provide a powerful tool to generate reproducible and reliable results. The MSD product line offers a diverse menu of assay kits for profiling biomarkers, cell signaling pathways, and other applications, as well as a variety of plates and reagents for assay development.

# Introduction

## introduction

Traditional clinical markers for kidney injury such as BUN and serum creatinine are not sensitive enough to detect subtle kidney damage and often do not correlate to damage measured by histopathology. This product insert describes multiplex panels of traditional and novel biomarkers for kidney injury that can overcome these shortcomings.

**Lipocalin-2** belongs to calycin superfamily of proteins and also known as Neutrophil Gelatinase-associated Lipocalin (NGAL). It is a 25 kDa glycoprotein that acts as transport protein carrying small hydrophobic molecules such as steroid hormones, vitamins and metabolic products. Lipocalin-2 is expressed in most tissues and is induced in epithelial cells upon inflammation. In the kidney, Lipocalin-2 may be implicated in both progress and protection from renal injury.

**Osteopontin (OPN)** is a secreted acidic and phosphorylated glycoprotein that is involved in bone metabolism, immune regulation, cell survival and tumor progression. OPN is mostly expressed in bone, kidney and epithelial tissues.

**Albumin** is the most abundant serum protein that acts as a transport protein for hemin and fatty acids. Albumin is produced in the liver and secreted in the bloodstream. Damage to the kidney can lead to albuminuria, secretion of albumin into the urine.

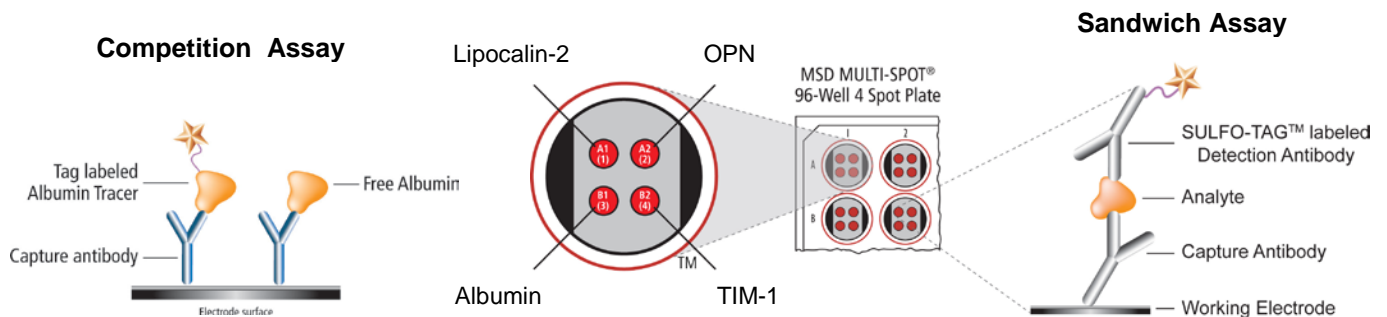
**TIM-1** (T cell immunoglobulin and mucin domain containing molecule 1) also known as *KIM-1* (Kidney Injury Molecule-1) or *HAVCR* (Hepatitis A Virus Cellular Receptor 1) is a type 1 transmembrane glycoprotein found on CD4+ T cells and renal proximal tubule epithelial cells. The extracellular domain of TIM-1 is made of an immunoglobulin-like domain topping a long mucin-like domain, suggesting a possible role in cell adhesion. TIM-1 is released upon certain types of acute kidney injury and can be measured in urine, serum, or plasma.



# Principle of the Assay

principle of the assay

MSD toxicology assays provide a rapid and convenient method for measuring the levels of protein targets within a single small-volume sample. These assays have been qualified according to the principles outlined in “Fit-for-Purpose Method Development and Validation for Successful Biomarker Measurement” by Lee, J.W. et al<sup>1</sup>. The assays are available in both singleplex and multiplex formats. In a singleplex assay, an antibody for a specific protein target is coated on one electrode (or “spot”) per well. In a multiplex assay, an array of capture antibodies against different targets is patterned on distinct spots in the same well. Our Kidney Injury Panel 1 (rat) Assay is a sandwich immunoassay (Figure 1). MSD provides a plate that has been pre-coated with capture antibodies for Lipocalin-2, Osteopontin, Albumin, and TIM-1 on spatially distinct spots. The user adds the sample and a solution containing the conjugated detection antibodies—anti-Lipocalin-2, anti-Osteopontin, anti-Albumin, and anti-TIM-1 conjugated with an electrochemiluminescent compound, MSD SULFO-TAG™ label—over the course of one or more incubation periods. Analytes in the sample bind to capture antibodies immobilized on the working electrode surface; recruitment of the conjugated detection antibodies by bound analytes completes the sandwich. The user adds an MSD read buffer that provides the appropriate chemical environment for electrochemiluminescence and loads the plate into an MSD SECTOR® instrument for analysis. Inside the SECTOR instrument, a voltage applied to the plate electrodes causes the labels bound to the electrode surface to emit light. The instrument measures intensity of emitted light to provide a quantitative measure of lipocalin-2, osteopontin, albumin, and TIM-1 in the sample.



**Figure 1.** Spot diagram showing placement of analyte capture antibody. The numbering convention for the different spots is maintained in the software visualization tools, on the plate packaging, and in the data files. A unique bar code label on each plate allows complete traceability back to MSD manufacturing records.

## IV Reagents Supplied

Product Description	Storage	Quantity per Kit		
		K15162C-1	K15162C-2	K15162C-4
MULTI-SPOT 96-well Kidney Injury Panel 1 (rat) Plate N45162A	2–8°C	1 plate	5 plates	25 plates
SULFO-TAG Anti-rat Lipocalin-2 Antibody <sup>1</sup> (50X)	2–8°C	1 vial (75 µL)	1 vial (375 µL)	5 vials (375 µL ea)
SULFO-TAG Anti-rat Osteopontin Antibody <sup>1</sup> (50X)	2–8°C	1 vial (75 µL)	1 vial (375 µL)	5 vials (375 µL ea)
SULFO-TAG Anti-rat TIM-1 Antibody <sup>1</sup> (50X)	2–8°C	1 vial (75 µL)	1 vial (375 µL)	5 vials (375 µL ea)
SULFO-TAG Albumin Tracer (200X) <sup>1</sup> Stock concentration: 50 µg/mL	2–8°C	1 vial (25 µL)	1 vial (125 µL)	5 vials (125 µL ea)
Kidney Injury Panel 1 (rat) Calibrator Blend (20X)	< -70°C	1 vial (15 µL)	5 vials (15 µL ea)	25 vials (15 µL ea)
Diluent 29 R50HA-4 (15 mL) R50HA-3 (40 mL)	≤ -10°C	1 bottle (15 mL)	2 bottles (40 mL ea)	10 bottles (40 mL ea)
Blocker A Kit R93AA-2 (250 mL)	RT	1 bottle (250 mL)	1 bottle (250 mL)	5 bottles (250 mL ea)
Read Buffer T (with surfactant), 4X R92TC-3 (50 mL)	RT	1 bottle (50 mL)	1 bottle (50 mL)	5 bottles (50 mL ea)

## V Required Materials and Equipment - not supplied

required materials and equipment — not supplied

- Deionized water for diluting concentrated buffers
- 50 mL tubes for reagent preparation
- 15 mL tubes for reagent preparation
- Microcentrifuge tubes for preparing serial dilutions
- Phosphate buffered saline plus 0.05% Tween-20 (PBS-T) for plate washing
- Appropriate liquid handling equipment for desired throughput, capable of dispensing 10 to 150 µL into a 96-well microtiter plate
- Plate washing equipment: automated plate washer or multichannel pipette
- Adhesive plate seals
- Microtiter plate shaker

## VI Safety

safety

Safe laboratory practices and personal protective equipment such as gloves, safety glasses, and lab coats should be used at all times during the handling of all kit components. All hazardous samples should be handled and disposed of properly, in accordance with local, state, and federal guidelines.

<sup>1</sup> Some SULFO-TAG conjugated detection antibodies may be light-sensitive, so they should be stored in the dark.

# VII Reagent Preparation

## reagent preparation

Bring all reagents to room temperature. The stock calibrator blend should be thawed on ice.

**Important:** Upon first thaw, separate Diluent 29 into aliquots appropriate to the size of your assay needs. The diluent can go through up to three freeze-thaw cycles without significantly affecting the performance of the assay.

### Prepare Blocker A Solution

Follow instructions included with the Blocker A Kit.

### Prepare Albumin Tracer Solution

Prepare a solution of 1X Albumin Tracer in Diluent 29. For one plate dilute the stock tracer 200-fold in Diluent 29. Approximately 40  $\mu\text{L}$  per well of this solution will be required. For one plate, add 20  $\mu\text{L}$  of stock albumin tracer to 3.98 mL of Diluent 29.

### Prepare Calibrator and Control Solutions

Calibrators for the Kidney Injury Panel 1 (rat) are supplied at 20-fold higher concentration than the recommended highest calibrator. For each assay, an 8-point standard curve is recommended with 3-fold serial dilution steps and a zero Calibrator. The Calibrators are supplied as a blend. The stock Calibrator blend should be thawed and kept on ice, but should be added into diluent at room temperature to make the standard curve solutions. For the actual concentrations of each Calibrator, refer to the certificate of analysis (C of A) supplied with the kit.

To prepare this 8-point standard curve for up to 5 replicates:

- 1) Prepare the highest Calibrator by adding 10  $\mu\text{L}$  of the Calibrator stock vial to 190  $\mu\text{L}$  of Diluent 29 (20-fold dilution).
- 2) Prepare the next Calibrator by transferring 80  $\mu\text{L}$  of the diluted Calibrator to 160  $\mu\text{L}$  of Diluent 29. Repeat 3-fold serial dilutions 5 additional times to generate 7 Calibrators.
- 3) The recommended 8<sup>th</sup> Standard is Diluent 29 alone (i.e. zero Calibrator).

Calibrators should be prepared at room temperature no more than 20 minutes before use.

## Dilution of Samples

Some rat samples may need to be diluted prior to the assay in order to get the analyte levels into the detection range. If this is the case, Diluent 29 should be used to dilute samples. A 10X dilution of urine samples is recommended for this multiplex panel. Depending on the sample set under investigation, higher or lower dilution factors may be necessary.

## Prepare Premix of Samples and Calibrators with the 1X Albumin Tracer

Combine equal amounts of sample or standard with 1X Albumin Tracer Solution. For duplicate measurements, mix 75  $\mu$ L of diluted sample or standard with 75  $\mu$ L of 1X Albumin Tracer Solution. For triplicate measurements, mix 100  $\mu$ L of diluted sample or standard with 100  $\mu$ L of 1X Albumin Tracer Solution. These solutions should be incubated at room temperature without shaking for at least 30 minutes before addition to the assay plate.

## Prepare Detection Antibody Solution

The Detection Antibodies are provided as a 50X stock solution. The final concentration of the working Detection Antibody Solution should be at 1X.

In a 15 mL tube combine (per plate):

- 60  $\mu$ L of 50X SULFO-TAG Anti-rat Lipocalin-2 Antibody
- 60  $\mu$ L of 50X SULFO-TAG Anti-rat Osteopontin Antibody
- 60  $\mu$ L of 50X SULFO-TAG Anti-rat TIM-1 Antibody
- 2820  $\mu$ L of Diluent 29

## Prepare Read Buffer

The Read Buffer should be diluted in deionized water to make a final concentration of 1X Read Buffer T. Add 5 mL of stock Read Buffer T (4X) to 15 mL of deionized water for each plate.

## Prepare MSD Plate

This plate has been pre-coated with antibody for the analytes shown in Figure 1. The plate can be used as delivered; no additional preparation (e.g., pre-wetting) is required. The plate has also been exposed to a proprietary stabilizing treatment to ensure the integrity and stability of the immobilized antibodies.

# VIII Assay Protocol

assay protocol

## Notes

- 1. Addition of Blocker A Solution:** Dispense 150  $\mu\text{L}$  of Blocker A Solution into each well. Seal the plate with an adhesive plate seal and incubate for 1 hour with vigorous shaking (300-1000 rpm) at room temperature.
- 2. Wash and Addition of Premixed Sample or Calibrator:** Wash the plate 3X with PBS-T. Dispense 50  $\mu\text{L}$  of sample or Calibrator Blend—premixed with Albumin Tracer—into the appropriate wells of the MSD plate. Seal the plate with an adhesive plate seal and incubate for 2 hours with vigorous shaking (300-1000 rpm) at room temperature.
- 3. Wash and Addition of the Detection Antibody Solution:** Wash the plate 3X with PBS-T. Dispense 25  $\mu\text{L}$  of the 1X Detection Antibody Solution into each well of the MSD plate. Seal the plate and incubate for 2 hours with vigorous shaking (300-1000 rpm) at room temperature.
- 4. Wash and Read:** Wash the plate 3X with PBS-T. Add 150  $\mu\text{L}$  of 1X Read Buffer T to each well of the MSD plate. Analyze the plate on the SECTOR Imager. Plates may be read immediately after the addition of Read Buffer.

*Shaking a 96-well MSD MULTI-SPOT plate typically accelerates capture at the working electrode.*

*Bubbles in the fluid will interfere with reliable reading of MULTI-SPOT plate. Use reverse pipetting techniques to insure bubbles are not created when dispensing the Read Buffer.*

# VIX Analysis of Results

analysis of results

The Calibrators should be run in duplicate to generate a standard curve. The standard curve is modeled using least squares fitting algorithms so that signals from samples with known levels of the analyte of interest can be used to calculate the concentration of analyte in the sample. The assays have a wide dynamic range (3–4 logs) which allows accurate quantification in many samples without the need for dilution. The MSD DISCOVERY WORKBENCH<sup>®</sup> analysis software utilizes a 4-parameter logistic model (or sigmoidal dose-response) and includes a  $1/Y^2$  weighting function. The weighting function is important because it provides a better fit of data over a wide dynamic range, particularly at the low end of the standard curve. For the best fit of the data, the zero calibrator point should be excluded from the fit.

# X Assay Qualification and Verification

## assay qualification and verification

The performance of this Kit meets levels of consistency and robustness as determined by methods based on the principles outlined in “Fit -for-Purpose Method Development and Validation for Successful Biomarker Measurement” by Lee, J.W. et al.<sup>1</sup>

Bioanalytical and functional characterizations of calibrators, antibodies and assay components are completed to allow for bridging of reagents between lots. This includes plate coating uniformity and reagent and component specificity testing for individual kit lots.

Control samples for specific matrices are designed and tested to meet the accuracy, precision and sensitivity criteria for a Kit that has completed the qualification process. Spike recovery and dilution linearity of endogenous samples, pooled and individual matrices are tested across the assay range.

### ➤ Sensitivity, Range and Curve Fitting

- Sample range and assay sensitivity are established from 4-PL fitted calibration curves with  $1/Y^2$  weighting. Percent recovery of calibrators and controls between the upper limit of quantification (ULOQ) and lower limit of quantification (LLOQ) must have calculated concentration %CV of less than 20% and accuracy within 20% of the expected concentration.
- The limits of quantification defined in the product insert are verified for each lot as part of the lot verification and quality control release.

### ➤ Accuracy and Precision

High, mid, and low controls made in matrix (need to be defined on a kit by kit basis) are run to measure accuracy and precision.

- Qualification – Testing on multiple days (>6 days) and multiple runs per day for a total of 15-20 runs of complete kits. Precision is measured for the standard curve for intra- and inter-day CVs of less than 20%. CVs and accuracy of the controls are measured on all runs and must meet the kit specification as defined in the Certificate of Analysis (C of A). The typical calculated concentration CV specification is less than 20% and accuracy within 20% of expected concentration and a total error of less than 30%.
- Verification – A multi-day (2-3 days), multiple runs per day for a total of 6-12 plates is performed as part of the release testing for each lot. The specifications for release are provided in the C of A.

### ➤ Robustness and Stability

Freeze-thaw testing and accelerated stability studies performed during assay development (calibrators, antibodies, controls) are augmented with real-time stability studies on complete kits out to 18 months from the date of manufacture.

All acceptance criteria and verification conformance are defined in the C of A for all kit lots. Presented below are representative data from the assay qualification for this assay that meets the criteria described above. The actual kit-specific standard curve and measured limits of quantification can be found in the C of A enclosed with the kit.

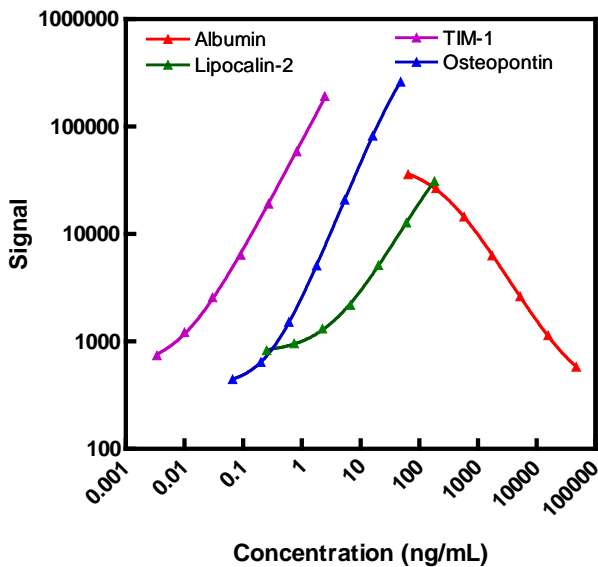
# XI Typical Standard Curve

## typical standard curve

The following standard curve is an example of the dynamic range of the assay. The actual signals may vary and a standard curve should be run for each set of samples and on each plate for the best quantification of unknown samples.

Some variation in the concentration of the top Calibrator is permissible between kit lots. Below is a table that details the acceptable range of the top Calibrator concentration. For each individual kit lot, the Calibrator concentrations are shown in the C of A.

	Highest Calibrator Concentration	
	Target	Acceptable range
Lipocalin-2 (ng/ml)	200	170 – 230
Osteopontin (ng/ml)	50	42.5 – 57.5
Albumin (ng/ml)	50000	42500 – 57500
TIM-1 (ng/ml)	2.5	2.13 – 2.88



Albumin		
Conc. (ng/mL)	Average Signal	%CV
0	42800	3.1
64.2	35810	3.1
193	26630	3.3
578	14481	3.8
1733	6303	2.7
5200	2623	4.2
15600	1140	2.3
46800	581	6.5

Lipocalin-2		
Conc. (ng/mL)	Average Signal	%CV
0	742	5.1
0.25	825	3.6
0.74	955	4.6
2.23	1313	4.5
6.70	2178	2.7
20.1	5139	3.2
60.3	12783	3.7
181	31025	5.0

TIM-1		
Conc. (ng/mL)	Average Signal	%CV
0	526	7.7
0.0034	740	4.1
0.010	1216	3.5
0.030	2564	3.6
0.091	6405	3.6
0.27	19095	2.7
0.82	58497	2.0
2.46	191919	2.9

OPN		
Conc. (ng/mL)	Average Signal	%CV
0	365	7.4
0.066	444	6.5
0.20	643	6.0
0.60	1514	5.4
1.79	5068	5.0
5.36	20862	6.1
16.1	82237	3.3
48.2	261007	4.1

# XII Sensitivity

## sensitivity

The lower limit of detection (LLOD) is measured as the concentration at 2.5 standard deviations over the background for TIM-1, NGAL, and OPN or at 80% of the maximum signal for albumin.

A multi-plate, multi-day study was performed to measure the reproducibility of the assay. The lower limit of quantitation (LLOQ) and upper limit of quantitation (ULOQ) were established from the multiple plate run.

The LLOQ is determined as the lowest concentration where the %CV of the calculated concentration is less than 20% and the percent recovery of the standard is between 80% and 120%. For Lipocalin-2, the percent recovery is between 70% and 130%.

The ULOQ is determined as the highest concentration where the %CV of the calculated concentration is less than 20% and the percent recovery of the standard is between 80% and 120%.

For the albumin assay, which is a competitive assay, the LLOD was set at 80% of the 0 pg/mL signal. The upper limit of albumin was based on 20% of the signal over the highest calibrator. The LLOQ for albumin is the point on the standard curve where the %CV of the standard is less than 20% and the percent recovery of the standard was between 80% and 120%.

	Lipocalin-2 (ng/mL)	OPN (ng/mL)	TIM-1 (ng/mL)
LLOD	0.317	0.0643	0.00161
LLOQ	1.56	0.390	0.020
ULOQ	150	37.5	1.88

	Albumin (ng/mL)
LLOD	76.3
LLOQ	781
Upper Limit	33171

# XIII Precision

precision

Control samples of high, mid, and low levels of each analyte were measured on each plate.

The controls were run in triplicate on each of 13 plates run across multiple days (n=4).

Average Intra-plate % CV is the average percent CV of the control replicates within an individual plate.

Inter-plate %CV is the variability of controls across 13 plates over 4 days.

Inter-lot %CV is the variability of controls across 5 kit lots.

	Control	Plates	Average Conc. (ng/mL)	Average Intra-plate %CV	Inter-plate %CV	Inter-lot %CV
Lipocalin-2	Mid	13	91.5	6.4	9.0	10.0
	Low	13	42.3	5.6	8.2	9.5
Osteopontin	High	13	15.6	5.0	6.4	8.5
	Mid	13	6.06	4.5	6.4	9.8
Albumin	High	13	12040	3.5	5.8	3.2
	Mid	13	4137	3.4	4.5	6.1
	Low	13	1765	3.1	7.2	6.2
TIM-1	High	13	0.960	3.5	4.4	8.7
	Mid	13	0.329	3.8	5.7	7.3
	Low	13	0.133	4.2	9.9	6.0

# XIV Spike Recovery

spike recovery

Normal Sprague-Dawley rat urine samples were spiked with the Calibrators at multiple values throughout the range of the assay. The samples were diluted 10-fold and then spiked with Calibrator at the levels indicated in the table below. We observed that recombinant rat Osteopontin is under-recovered when spiked into urine samples, as shown below. Osteopontin has been found to bind to calcium oxalate crystals in the urine, causing inaccurate measurements by ELISA (Thurgood, 2008).  
 $\% \text{ Recovery} = \text{measured} / \text{expected} \times 100$

Sample	Lipocalin-2				Osteopontin			
	Spike Conc. (ng/mL)	Measured Conc. (ng/mL)	Measured Conc. %CV	% Recovery	Spike Conc. (ng/mL)	Measured Conc. (ng/mL)	Measured Conc. %CV	% Recovery
Urine 1	0	77.5	9.3		0	2.70	3.8	
	4.44	89.0	0.9	109	1.11	2.71	2.5	71
	13.3	110	2.9	121	3.33	3.14	2.2	52
	40.0	135	3.2	115	10.0	3.87	2.3	31
Urine 2	0	4.88	9.5		0	0.194	10.8	
	4.44	8.99	5.6	96	1.11	0.787	0.8	60
	13.3	17.5	4.9	96	3.33	2.00	5.2	57
	40.0	41.0	3.0	91	10.0	4.25	4.1	42
Urine 3	0	6.33	3.6		0	0.419	2.0	
	4.44	11.3	3.9	105	1.11	0.878	3.0	57
	13.3	19.6	7.0	100	3.33	1.89	2.6	50
	40.0	42.0	7.9	91	10.0	4.31	1.4	41

Sample	Albumin				TIM-1			
	Spike Conc. (ng/mL)	Measured Conc. (ng/mL)	Measured Conc. %CV	% Recovery	Spike Conc. (ng/mL)	Measured Conc. (ng/mL)	Measured Conc. %CV	% Recovery
Urine 1	0	5976	3.2		0	1.79	1.4	
	1111	7538	4.1	106	0.0556	1.67	2.9	90
	3333	9577	2.9	103	0.167	1.82	1.7	93
	10000	16427	5.5	103	0.500	2.22	1.0	97
Urine 2	0	652	3.4		0	0.0545	1.9	
	1111	1723	7.7	98	0.0556	0.109	4.2	99
	3333	4168	5.1	105	0.167	0.245	1.5	111
	10000	10729	0.3	101	0.500	0.625	1.3	113
Urine 3	0	1059	2.2		0	0.126	2.6	
	1111	2185	1.8	101	0.0556	0.175	4.2	96
	3333	4136	3.8	94	0.167	0.292	3.0	100
	10000	10125	2.2	92	0.500	0.646	2.0	103

# XV Linearity

linearity

To assess linearity, urine samples were diluted 5-fold, 10-fold, 20-fold and 40-fold prior to testing. The concentrations shown below have been corrected for dilution (concentration = measured x dilution factor). Percent recovery is calculated as the measured concentration divided by the concentration measured from the previous dilution (expected).

$$\% \text{ Recovery} = (\text{measured} \times \text{dilution factor}) / \text{expected} \times 100$$

Sample	Fold Dilution	Lipocalin-2			Osteopontin		
		Conc. (ng/mL)	Conc. %CV	% Recovery	Conc. (ng/mL)	Conc. %CV	% Recovery
Urine 1	5	427	5.8		4.66	7.8	
	10	663	12.5	155	10.3	6.5	222
	20	797	9.5	120	19.3	6.5	187
	40	895	10.4	112	34.7	5.1	179
Urine 2	5	46.3	26.2		< LLOQ	-	-
	10	61.4	6.7	133	< LLOQ	-	-
	20	65.0	3.6	106	< LLOQ	-	-
	40	64.1	12.0	99	< LLOQ	-	-
Urine 3	5	51.1	4.0		2.72	1.8	
	10	74.9	3.7	147	4.48	3.3	164
	20	82.6	7.4	110	< LLOQ	-	-
	40	81.7	3.4	99	< LLOQ	-	-

Sample	Fold Dilution	Albumin			TIM-1		
		Conc. (ng/mL)	Conc. %CV	% Recovery	Conc. (ng/mL)	Conc. %CV	% Recovery
Urine 1	5	42503	4.0		21.2	5.2	
	10	44591	2.7	105	25.1	2.5	118
	20	45853	7.0	103	24.9	3.8	100
	40	45996	4.3	100	24.9	5.7	100
Urine 2	5	7390	4.9		0.623	6.8	
	10	7878	4.3	107	0.643	3.6	103
	20	< LLOQ	-	-	0.632	8.6	98
	40	< LLOQ	-	-	< LLOQ	-	-
Urine 3	5	11312	1.9		1.30	2.7	
	10	11575	1.9	102	1.37	1.6	105
	20	< LLOQ	-	-	1.43	1.2	104
	40	< LLOQ	-	-	1.36	2.1	96

# XVI Specificity

## specificity

In order to assess specificity of the detection antibodies, the Kidney Injury Panel 1 (rat) was run with blended Calibrator diluted to STD-02, and single detection antibodies. The % cross-reactivity for each individual detection antibody was shown to be < 0.2 % for all assays.

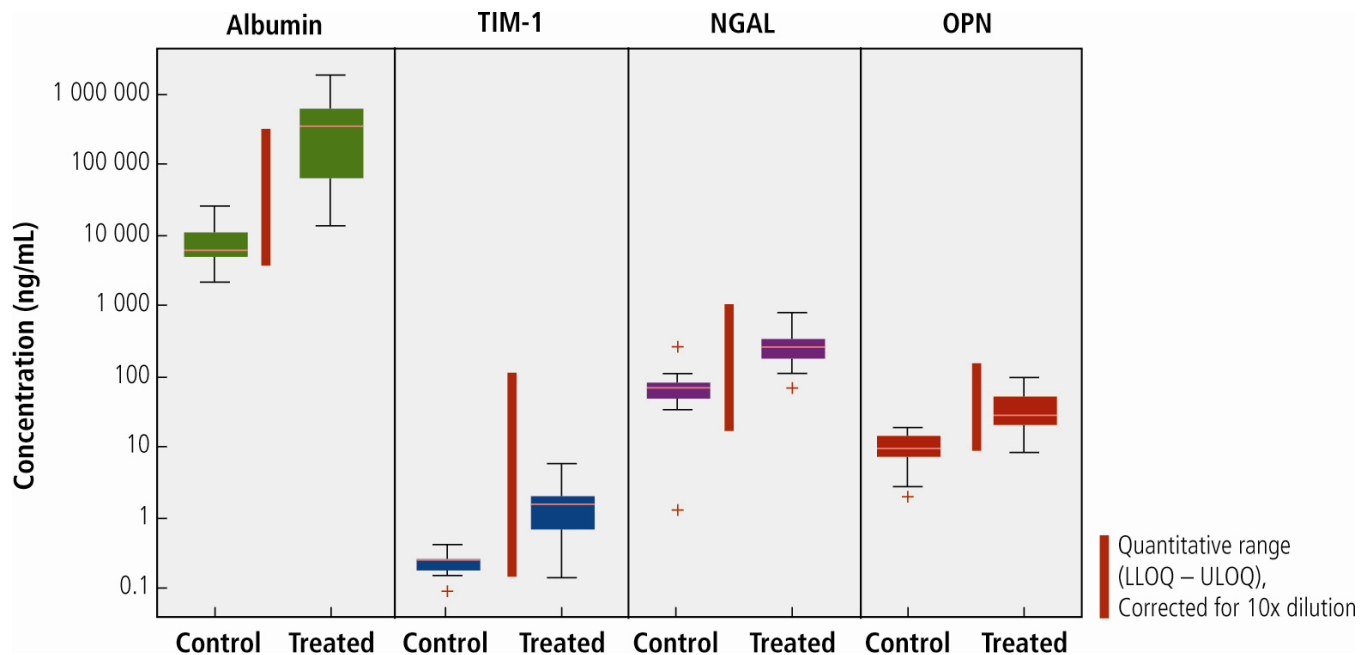
# XVII Samples

## samples

Rat urine samples were assayed at 10-fold dilution on the Kidney Injury Panel 1. The “treated” samples tested were from rats exposed to known nephrotoxicants prior to sample collection. *High Tox* designated samples that assayed above the ULOQ were assayed again at 40-fold dilution. For all of the analytes on the panel, significant correspondence between histopathology score and abundance is observed. Concentrations in gray were below the LLOQ for the analyte designated.

Animal #	Designation	Histopathology Score	Albumin (ng/mL)	TIM-1 (ng/mL)	Lipocalin-2 (ng/mL)	Osteopontin (ng/mL)
1	Control	0	6380	0.26	79.4	2.0
2	Control	0	4676	0.22	81.8	10.6
3	Control	0	5639	0.15	54.0	6.8
4	Control	0	2172	0.09	50.9	5.7
5	Control	0	7981	0.21	80.2	9.5
6	Control	0	13063	0.27	32.8	10.4
7	Control	0	4099	0.15	68.2	9.3
8	Control	0	25787	0.24	43.6	8.7
9	Control	0	6010	0.25	68.6	17.7
10	Control	0	10219	0.16	48.1	14.7
11	Mild Tox	1	24359	0.14	68.9	8.5
12	Mild Tox	1	582857	1.66	216	20.1
13	Mild Tox	1	347477	2.43	185	18.7
14	Mild Tox	2	63056	1.99	185	25.8
15	Mild Tox	2	190213	0.84	110	18.1
16	Mild Tox	3	593019	1.34	184	28.1
17	Mild Tox	2	409532	1.56	264	47.6
18	Mild Tox	2	1375229	1.92	242	59.7
19	Mild Tox	2	438888	2.00	325	53.4

Animal #	Designation	Histopathology Score	Albumin (ng/mL)	TIM-1 (ng/mL)	Lipocalin-2 (ng/mL)	Osteopontin (ng/mL)
20	High Tox	3	1398916	1.91	334	32.5
21	High Tox	3	814377	0.64	345	41.4
22	High Tox	3	1822741	1.29	308	39.5
23	High Tox	3	141078	0.37	134	17.0
24	High Tox	3	122467	0.39	144	24.0
25	High Tox	4	352434	0.45	297	24.7
26	High Tox	3	20037	3.38	689	40.8
27	High Tox	3	13009	1.18	309	75.7
28	High Tox	3	25402	5.11	493	27.8
29	High Tox	3	71925	5.76	800	67.7
30	High Tox	3	42825	4.00	665	96.0
31	Control	0	10563	0.26	261	2.7
32	Control	0	4724	0.25	51.8	12.8
33	Control	0	26265	0.18	109	7.1
34	Control	0	5412	0.27	73.2	17.4
35	Control	0	3501	0.19	96.5	8.3
36	Control	0	5178	0.25	1.3	7.9
37	Control	0	5138	0.34	56.7	12.5
38	Control	0	10322	0.41	70.1	19.0
39	Control	0	12564	0.26	41.9	15.9



# XVIII Assay Components

## assay components

### Calibrators

Recombinant rat lipocalin-2 (residues 21–198) with an N-terminal signal peptide and a C-terminal 6xHis tag was expressed in murine myeloma cells.

Recombinant rat osteopontin (full-length) with an N-terminal 6xHis tag was expressed in *E.coli*.

Recombinant rat TIM-1 (residues 18–238) was expressed in murine myeloma cells.

Albumin was isolated from the serum of Sprague-Dawley rats and treated to be essentially globulin-free.

These analytes were calibrated against internal controls, diluted, and pooled to make the Kidney Injury Panel 1 (rat) Calibrator Blend.

### Antibodies

Analyte	Source Species	
	MSD Capture Antibody	MSD Detection Antibody
Lipocalin-2	Goat Polyclonal	Goat Polyclonal
Osteopontin	Goat Polyclonal	Rabbit Polyclonal
Albumin	Rabbit Polyclonal	n/a
TIM-1	Goat Polyclonal	Goat Polyclonal

# XIX References

## references

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## Summary Protocol

### MSD 96-well MULTI-SPOT Kidney Injury Panel 1 (rat) Assay Kit

MSD provides this summary protocol for your convenience.  
Please read the entire detailed protocol prior to performing  
the Kidney Injury Panel 1 (rat) Assay.

#### Step 1 : Sample and Reagent Preparation

Bring all reagents and plates to room temperature and thaw the Calibrator on ice.

Prepare an 8-point standard curve using supplied Calibrators:

- The Calibrator Blend should be diluted in Diluent 29.
- Dilute the stock Calibrator Blend 20-fold in Diluent 29 then perform a series of 3-fold dilution steps and a no Calibrator blank.
- Dilute samples by 10-fold into Diluent 29 prior to addition to the plate.

Prepare a mix of each Calibrator or diluted sample solution with 1X Albumin Tracer by adding equal amounts of sample and tracer solutions. Incubate for 30 minutes at room temperature.

Prepare Detection Antibody Solution by diluting the 50X Detection Antibodies to a 1X final concentration of each antibody. The Detection Antibodies should be diluted in a final volume of 3.0 mL Diluent 29 per plate.

Prepare 20 mL of 1X Read Buffer T by diluting 4X Read Buffer T with deionized water.

#### Step 2 : Add Blocker A Solution

Dispense 150  $\mu$ L/well Blocker A Solution.

Incubate at room temperature with vigorous shaking (300–1000 rpm) for 1 hour.

#### Step 3 : Wash and Add Sample or Calibrator Premix Solutions

Wash plate 3 times with PBS-T.

Dispense 50  $\mu$ L/well Calibrator or Sample premix solutions.

Incubate at room temperature with vigorous shaking (300–1000 rpm) for 2 hours.

#### Step 4 : Wash and Add Detection Antibody Solution

Wash plate 3 times with PBS-T.

Dispense 25  $\mu$ L/well 1X Detection Antibody Solution.

Incubate at room temperature with vigorous shaking (300–1000 rpm) for 2 hours.

#### Step 5 : Wash and Read Plate

Wash plate 3 times with PBS-T.

Dispense 150  $\mu$ L/well 1X Read Buffer T.

Analyze plate on SECTOR instrument.



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