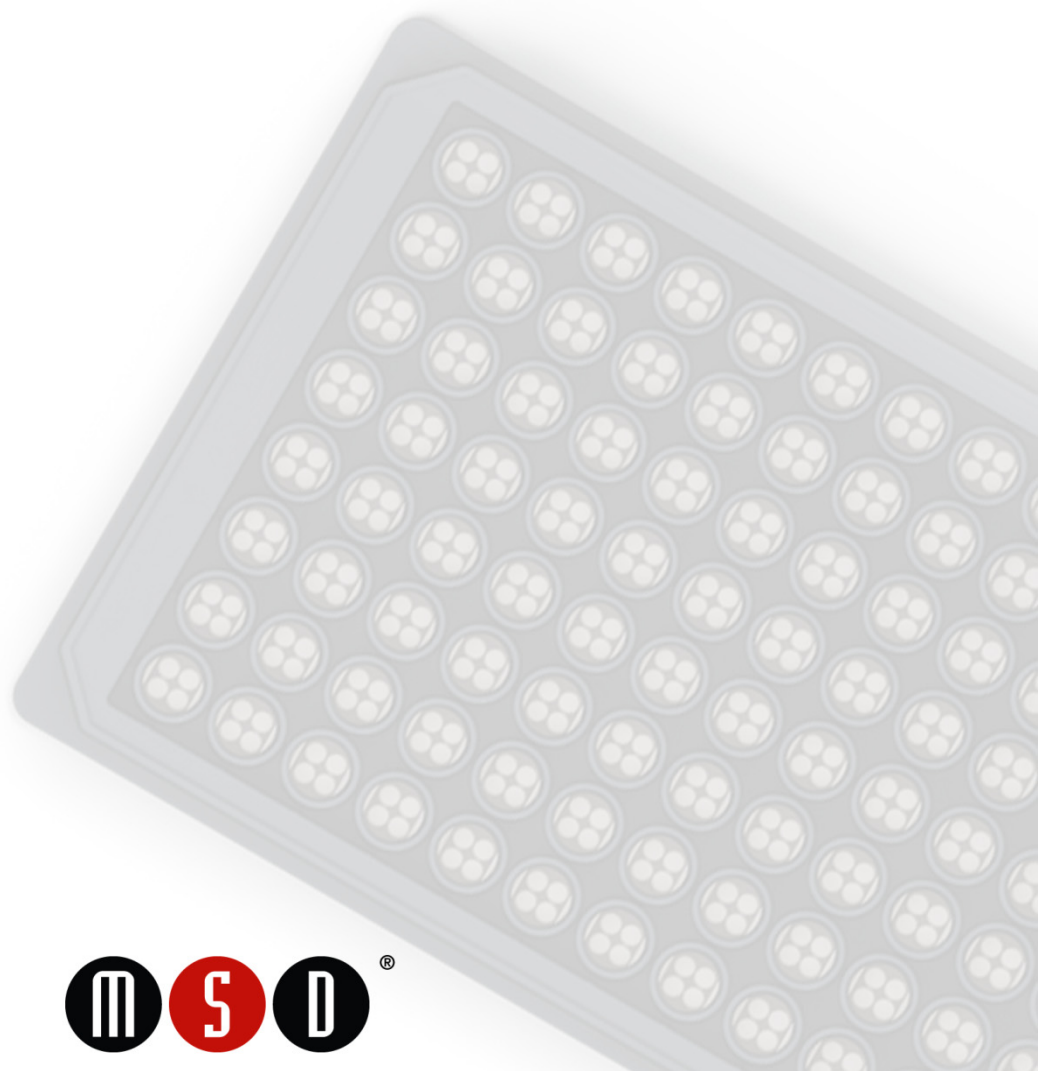


MSD[®] MULTI-SPOT Assay System

Human Factor VII Kit

1-Plate Kit	K151OKD-1
5-Plate Kit	K151OKD-2
25-Plate Kit	K151OKD-4



MSD Biomarker Assays

Human Factor VII Kit

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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Ordering Information

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Introduction

Coagulation factor VII (50 kDa) is a vitamin-K dependent plasma glycoprotein produced by the liver and is one of many proteins that are essential for blood clotting in the coagulation cascade.^{1,2} Blood clotting in response to a vascular injury is initiated by factor VII in conjunction with the cell surface receptor tissue factor. Tissue factor is normally sequestered out of the luminal area of the vessel but becomes exposed to the bloodstream and circulating factor VII concurrent with vessel injury. Tissue factor binds to factor VII and promotes its proteolytic activation to factor VIIa by a number of different plasma proteases including thrombin (factor IIa), factors IXa, Xa, XIIa, or the factor VIIa-tissue factor complex itself.^{3,4} Once activated, the factor VIIa/tissue factor complex catalyzes the proteolytic conversion and activation of factor IX to factor IXa and factor X to factor Xa. This serves as the initiation of the extrinsic pathway of blood coagulation.

Elevated factor VII activity is an independent risk factor for fatal outcomes of coronary heart disease in men. Factor VII deficiency leads to a variety of bleeding disorders.

Principle of the Assay

MSD biomarker assays provide a rapid and convenient method for measuring the levels of protein targets within a single, small-volume sample. Human Factor VII is a sandwich immunoassay (Figure 1). MSD provides a plate pre-coated with capture antibodies. The user adds the sample and a solution containing detection antibodies conjugated with electrochemiluminescent labels (MSD SULFO-TAG™) 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 detection antibodies by the bound analytes completes the sandwich. The user adds an MSD buffer that provides the appropriate chemical environment for electrochemiluminescence and loads the plate into a SECTOR® Imager where a voltage applied to the plate electrodes causes the captured labels to emit light. The instrument measures the intensity of emitted light to provide a quantitative measure of analytes in the sample.

1. Factor VII
2. BSA blocked
3. BSA blocked
4. BSA blocked

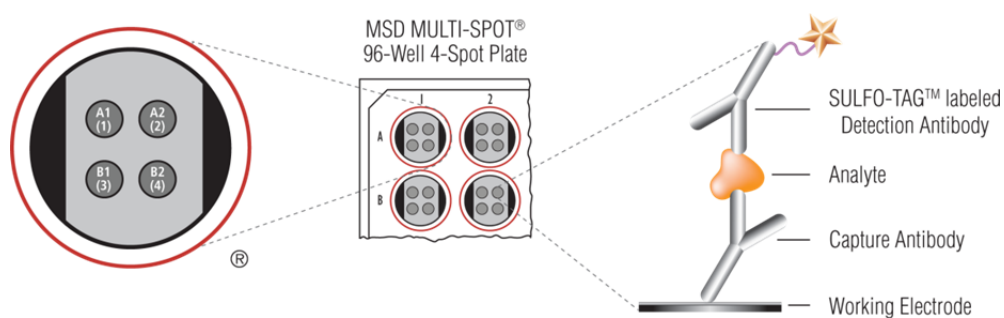


Figure 1. Spot diagram showing placement of analyte capture antibodies. The numbering convention for the different spots is maintained in the software visualization tools, on the plate packaging, and in the data files. A unique bar code label on each plate allows complete traceability back to MSD manufacturing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

Reagents Supplied

Product Description	Storage	Quantity per Kit		
		K1510KD-1	K1510KD-2	K1510KD-4
MULTI-SPOT 96-Well, 4-Spot Human Factor VII Plate N4510KA-1	2–8°C	1 plate	5 plates	25 plates
SULFO-TAG Anti-hu Factor VII Antibody ¹ (50X)	2–8°C	1 vial (75 µL)	1 vial (375 µL)	5 vials (375 µL ea)
Human Factor VII Calibrator (20X)	≤-70°C	1 vial (60 µL)	5 vials (60 µL ea)	25 vials (60 µL ea)
Diluent 100 R50AA-2 (200 mL)	2–8°C	1 bottle (200 mL)	2 bottles (200 mL ea)	10 bottles (200 mL ea)
Diluent 3 R51BA-4 (5 mL), R51BA-5 (25 mL)	≤-10°C	1 bottle (5 mL)	1 bottle (25 mL)	5 bottles (25 mL ea)
Blocker A Kit (Blocker A [dry] in 250 mL bottle and 50 mL bottle of 5X Phosphate Buffer) R93AA-2 (250 mL)	RT	1 kit (250 mL)	1 kit (250 mL)	5 kits (250 mL ea)
Read Buffer T (4X) R92TC-3 (50 mL)	RT	1 bottle (50 mL)	1 bottle (50 mL)	5 bottles (50 mL ea)

Required Material and Equipment (not supplied)

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

Safety

Use safe laboratory practices and wear gloves, safety glasses, and lab coats when handling kit components. Handle and dispose of all hazardous samples properly in accordance with local, state, and federal guidelines.

Additional safety information is available in the product Material Safety Data Sheet, which can be obtained from MSD Customer Service.

¹ SULFO-TAG–conjugated detection antibodies should be stored in the dark.

Reagent Preparation

Bring all reagents to room temperature. Thaw the stock calibrator on ice.

Important: Upon first thaw, separate Diluent 3 into aliquots appropriate for the size of your needs before refreezing.

Prepare Blocker A Solution

Follow the Blocker A instructions included in the kit.

Prepare Standards

MSD supplies calibrator for the Human Factor VII Kit at 20-fold higher concentration than the recommended highest standard. We recommend a 7-point standard curve with 3-fold serial dilution steps and a zero calibrator blank. Signals from the blank should be excluded when generating the curve. Thaw the stock calibrator and keep on ice, then add to diluent at room temperature to make the standard curve solutions.

Standard	Human Factor VII (pg/mL)	Dilution Factor
Stock Calibrator	40 000	
STD-01	2000	20
STD-02	667	3
STD-03	222	3
STD-04	74.1	3
STD-05	24.7	3
STD-06	8.23	3
STD-07	2.74	3
STD-08	0	n/a

To prepare 7 standard solutions plus a zero calibrator blank for up to 3 replicates:

- 1) Prepare the highest standard by adding 15 μ L of stock calibrator to 285 μ L of Diluent 100. Mix well.
- 2) Prepare the next standard by transferring 100 μ L of the highest standard to 200 μ L of Diluent 100. Mix well. Repeat 3-fold serial dilutions 5 additional times to generate 7 standards.
- 3) Use Diluent 100 as the blank.

Dilute Samples

For human serum and plasma samples, MSD recommends 4000-fold dilution in Diluent 100; however, you may need to adjust the dilution factor for the sample set under investigation.

Samples should be prepared in two dilution steps as follows:

- 1) Add 10 μ L of sample to 390 μ L of Diluent 100 (40-fold dilution)
- 2) Add 10 μ L of the 40-fold diluted sample to 990 μ L of Diluent 100 (100-fold dilution).

Prepare Detection Antibody Solution

MSD provides detection antibody as a 50X stock solution. The working detection antibody solution is 1X.

For 1 plate, combine:

- ☐ 60 μ L of 50X SULFO-TAG Anti-hu Factor VII Antibody
- ☐ 2940 μ L of Diluent 3

Prepare Read Buffer

MSD provides Read Buffer T as a 4X stock solution. The working solution is 1X.

For 1 plate, combine:

- ☐ 5 mL of Read Buffer T (4X)
- ☐ 15 mL of deionized water

You may prepare diluted read buffer in advance and store it at room temperature in a tightly sealed container.

Prepare MSD Plate

MSD plates are pre-coated with capture antibodies (Figure 1) and exposed to a proprietary stabilizing treatment to ensure the integrity and stability of the immobilized antibodies. Plates can be used as delivered; no additional preparation (e.g., pre-wetting) is required.

Protocol

1. **Add Blocker A Solution:** Add 150 μ L of Blocker A solution to 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 Add Sample:** Wash the plate 3 times with 300 μ L/well of PBS-T. Add 50 μ L of sample (standards, controls, or unknowns) per well. Seal the plate with an adhesive plate seal and incubate for 2 hours with vigorous shaking (300–1000 rpm) at room temperature. You may prepare detection antibody solution during incubation.
3. **Wash and Add Detection Antibody Solution:** Wash the plate 3 times with 300 μ L/well of PBS-T. Add 25 μ L of detection antibody solution to each well. Seal the plate with an adhesive plate seal and incubate for 1 hour with vigorous shaking (300–1000 rpm) at room temperature. You may prepare diluted read buffer during incubation.
4. **Wash and Read:** Wash the plate 3 times with 300 μ L/well of PBS-T. Add 150 μ L of 1X Read Buffer T to each well. Analyze the plate on the SECTOR Imager. No incubation in read buffer is required before reading the plate.

Notes

Shaking the plate typically accelerates capture at the working electrode.

You may keep excess diluted read buffer in a tightly sealed container at room temperature for later use.

Bubbles introduced when adding read buffer will interfere with imaging of the plate and produce unreliable data. Use reverse pipetting technique to avoid creating bubbles.

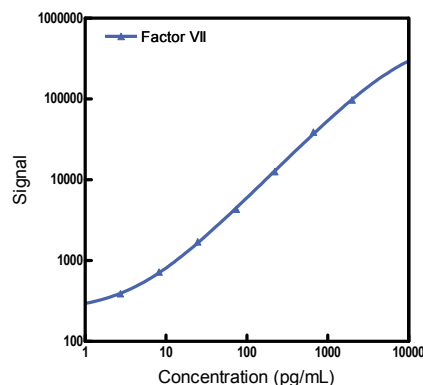
Due to the varying nature of each research application, you should assess assay stability before allowing plates to sit with read buffer for extended periods.

Curve Fitting

MSD DISCOVERY WORKBENCH[®] software uses least-squares fitting algorithms to generate the standard curve that will be used to calculate the concentration of analyte in the samples. The assays have a wide dynamic range (3–4 logs) that allows accurate quantification without the need for dilution in many cases. By default, the software uses 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.

Typical Data

The following standard curve graph illustrates the dynamic range of the assay. Actual signals will vary. Best quantification of unknown samples will be achieved by generating a standard curve for each plate using a minimum of 2 replicates of the standards.



Factor VII		
Conc. (pg/mL)	Average Signal	%CV
0	231	0.9
2.74	389	9.3
8.23	722	5.4
24.7	1704	2.2
74.1	4311	11.9
222	12 608	9.3
667	38 885	0.8
2000	97 168	11.0

Sensitivity

The lower limit of detection (LLOD) is a calculated concentration based on a signal 2.5 standard deviations above the background (zero calibrator blank). The LLOD shown below was calculated based on 2 runs.

Factor VII	
LLOD Range (pg/mL)	3.44–4.32

Assay Components

Calibrator

The assay calibrator uses recombinant factor VII protein, expressed in human cells.

Antibodies

Analyte	Source Species	
	MSD Capture Antibody	MSD Detection Antibody
Factor VII	Sheep Polyclonal	Goat Polyclonal

References

1. Nemerson Y. The reaction between bovine brain tissue factor and factors VII and X. *Biochemistry*. 1966 Feb;5(2):601-8
2. Williams WJ, Norris DG. Purification of a bovine plasma protein (factor VII) which is required for the activity of lung microsomes in blood coagulation. *J Biol Chem*. 1966 Apr 25;241(8):1847-56
3. Radcliffe R, Nemerson Y. Activation and control of factor VII by activated factor X and thrombin. Isolation and characterization of a single chain form of factor VII. *J Biol Chem*. 1975 Jan 25;250(2):388-95
4. Kisiel W, Davie EW. Isolation and characterization of bovine factor VII. *Biochemistry*. 1975 Nov 4;14(22):4928-34.

Summary Protocol

Human Factor VII Kit

*MSD provides this summary protocol for your convenience.
Please read the entire detailed protocol prior to performing
the Human Factor VII assay.*

Sample and Reagent Preparation

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

Prepare Blocker A solution.

Prepare standard solutions using the supplied calibrator:

- Dilute the stock calibrator 20-fold in Diluent 100.
- Perform a series of 3-fold dilution steps and prepare a zero calibrator blank.

Dilute samples 4000-fold in Diluent 100 before adding to the plate.

Prepare detection antibody solution by diluting stock detection antibody 50-fold in Diluent 3.

Prepare 1X Read Buffer T by diluting stock 4X Read Buffer T 4-fold with deionized water.

Step 1: Add Blocker A Solution

Add 150 μ L/well of Blocker A solution.

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

Step 2: Wash and Add Sample

Wash plate 3 times with 300 μ L/well of PBS-T.

Add 50 μ L/well of sample (standards, controls, or unknowns).

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

Step 3: Wash and Add Detection Antibody Solution

Wash plate 3 times with 300 μ L/well of PBS-T.

Add 25 μ L/well of 1X detection antibody solution.

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

Step 4: Wash and Read Plate

Wash plate 3 times with 300 μ L/well of PBS-T.

Add 150 μ L/well of 1X Read Buffer T.

Analyze plate on SECTOR Imager.

Plate Diagrams

	1	2	3	4	5	6	7	8	9	10	11	12
A												
B												
C												
D												
E												
F												
G												
H												

	1	2	3	4	5	6	7	8	9	10	11	12
A												
B												
C												
D												
E												
F												
G												
H												