



**FluoroSpot Path:  
SARS-CoV-2 (S+NMO)  
Human IFN- $\gamma$ /IL-2**

FSP-0102-P12-1

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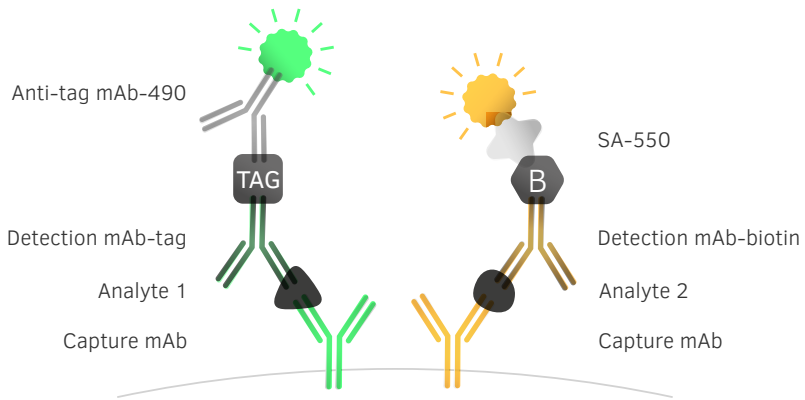
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# INTRODUCTION

## Intended use

This assay enables enumeration of cells secreting IFN- $\gamma$ , IL-2 and both cytokines in response to SARS-CoV-2 peptides. It can be used to differentiate the cytokine response to peptides derived from the spike (S) protein and peptides derived from the nucleoprotein (N), membrane (M) protein, and open reading frame (O) proteins.

## Assay principle



Monoclonal antibodies (mAbs) are coated onto a PVDF membrane in a 96-well plate. Detection of cells secreting single or multiple analytes is made possible using biotinylated and tag-labeled detection mAbs. The detection step is visualized and amplified by specific fluorophore-conjugated reagents and the resulting spots are analyzed in an automated reader.

## CONTENTS AND STORAGE

The kit is shipped at ambient temperature. All reagents, except the peptide pools, should be stored at 4-8°C upon arrival. Peptide pools should be stored at -20°C or below. Plates should be stored at room temperature. The expiry date indicates how long unopened products, stored according to instructions, are recommended to remain in use.

	Component	Concentration	1-plate kit
<b>Detection antibodies</b>	anti-IFN- $\gamma$ mAb 7-B6-1-BAM		120 $\mu$ l
	anti-IL-2 mAb MT8G10, biotinylated	0.5 mg/ml	50 $\mu$ l
<b>Fluorophore conjugates</b>	anti-BAM-490		120 $\mu$ l
	SA-550		120 $\mu$ l
<b>Co-stimulator</b>	anti-CD28 mAb CD28A	0.1 mg/ml	100 $\mu$ l
<b>Stimuli</b>	SARS-CoV-2 S defined peptide pool*		1 vial
	SARS-CoV-2 NMO defined peptide pool**		1 vial
	anti-CD3 mAb CD3-2 (positive control)	0.1 mg/ml	100 $\mu$ l
<b>Fluorescence enhancer</b>	Ready-to-use Fluorescence enhancer-II		25 ml
<b>Pre-coated plates</b>	Plate pre-coated with: mAbs 1-D1K and MT2A91/2C95		1

Anti-CD28 and anti-CD3 mAbs are supplied in sterile filtered (0.2  $\mu$ m) PBS. The detection antibodies, SA-550, and Fluorescence enhancer contain 0.002 % Kathon CG. Vials have been overfilled to ensure recovery of stated volume.

\*SARS-CoV-2 S defined peptide pool contains 100 peptides derived from the S protein

\*\*SARS-CoV-2 NMO defined peptide pool contains 101 peptides derived from the N, M, and O proteins

## ASSAY PROTOCOL

Please consult the table below for recommendations on dilutions and cell incubation time. The reagents should not be diluted in advance. For additional information, read the [Tips For A Successful Assay](#) section.

	Component	Dilution	Step
<b>Detection antibodies</b>	anti-IFN- $\gamma$ mAb 7-B6-1-BAM	1:200	<b>C2</b>
	anti-IL-2 mAb MT8G10, biotinylated	1:500	<b>C2</b>
<b>Fluorophore conjugates</b>	anti-BAM-490	1:200	<b>C4</b>
	SA-550	1:200	<b>C4</b>
<b>Co-stimulator</b>	anti-CD28 mAb CD28A	1:1000	<b>B1</b>
<b>Stimuli</b>	SARS-CoV-2 peptide pools	see below	<b>B1</b>
	anti-CD3 mAb CD3-2 (positive control)	1:1000	
<b>Cell incubation time</b> overnight			<b>B2</b>

### A. Plate preparation (sterile conditions)

1. Remove the plate from the sealed package and wash the plate three times with sterile PBS (200  $\mu$ l/well).
2. Block/condition the plate by adding cell incubation medium containing 10% fetal calf serum (200  $\mu$ l/well). Incubate for at least 30 minutes at room temperature.

### B. Cell incubation (sterile conditions)

1. Dissolve the peptide pools by addition of 40  $\mu$ l DMSO to each vial, then add 85  $\mu$ l PBS. The concentrations of these stock solutions are 200  $\mu$ g/ml of each peptide. Aliquot the pools and store at -20°C or below.

Empty the plate and add 50  $\mu$ l/well of peptides or controls, followed by 50  $\mu$ l cell suspension/well. Alternatively, mix cells and stimuli before addition of 100  $\mu$ l/well. The final peptide concentration should be 2  $\mu$ g/ml of each peptide. Stimulate cells with the SARS-CoV-2 S defined peptide pool and the SARS-CoV-2 NMO defined peptide pool separately. Anti-CD28 can be included at a final concentration of 0.1  $\mu$ g/ml. Anti-CD3 is recommended as a positive control at a dilution of 1:1000.

2. Incubate the cells in the plate at 37°C in a humidified incubator with 5% CO<sub>2</sub>. Approximate incubation time is indicated above and can be further optimized by the user. Do not move the plate during incubation and avoid evaporation, for example by wrapping the plate in aluminum foil.

## C. Detection

1. Remove the cells by emptying the plate and then wash the plate five times with PBS (200µl/well).
2. Dilute the detection antibodies in PBS containing 0.1% BSA (PBS-0.1% BSA) according to the table above. If more than one analyte is analyzed, dilute the detection antibodies in the same tube. Add 100 µl/well and incubate for 2 hours at room temperature.
3. Wash the plate five times with PBS (200 µl/well).
4. Dilute the fluorophore-conjugates in PBS-0.1% BSA to the concentrations as shown in the table above. If more than one analyte is analyzed, dilute the conjugates in the same tube. Add 100 µl/well and incubate for 1 hour at room temperature. Protect the plate from light throughout the assay.
5. Wash the plate five times with PBS (200 µl/well).
6. Empty the plate, add Fluorescence enhancer (50 µl/well), and leave for 5-15 minutes at room temperature.
7. Empty by flicking the plate to remove the Fluorescence enhancer. Do not wash. It is important that the plate is not tapped against paper towels since dust particles may interfere with the assay.
8. Remove the underdrain (the soft plastic drain under the plate), for example using pliers. Dry the plate protected from light. The plate should be completely dry before analysis. Store plate in the dark at room temperature.
9. Spot analysis is performed with an automated FluoroSpot reader equipped with filters for the fluorophores used. Filters should have high specificity to avoid bleed-through artifacts.

Analyte	Required filter
IFN-γ	Excitation 490 nm/emission 510 nm (FITC)
IL-2	Excitation 550 nm/emission 570 nm (Cy3)

## TIPS FOR A SUCCESSFUL ASSAY

### Buffers

PBS for washing and dilution should be filtered (0.2  $\mu\text{m}$ ) to remove any particles. We do not recommend the inclusion of Tween or other detergents in the washing and incubation buffers.

### Washing

Plates can be washed using a multi-channel micropipette. A regular plate washer can be used in washing steps when sterile conditions are not required, provided that the washing head is adapted to ELISpot/FluoroSpot plates.

### Serum

Serum should be selected to support cell culture and give low background staining. We recommend the use of fetal calf serum. Alternatively, serum-free medium evaluated for cell culture can be used.

### Cells

Both freshly prepared and cryopreserved cells may be used in FluoroSpot. We recommend that cryopreserved cells are rested for at least 1 hour after thawing to allow removal of cell debris before addition to the plate. Triplicates or duplicates of 250,000 cells/well are usually recommended to assess antigen-specific responses. For polyclonal activators, the cell number should be reduced in order to avoid confluent spot formation.

### Assay controls

The number of cells responding to antigen stimulation is often compared to the number of cells spontaneously secreting cytokine which is determined by incubating the same number of cells in the absence of stimuli. It can be valuable to include cells from a SARS-CoV-2 negative individual (never infected and unvaccinated). A polyclonal activator such as anti-CD3 mAb (included in the kit) or phytohemagglutinin (1-10  $\mu\text{g}/\text{ml}$ ) is often included as a control for cell viability and functionality of the assay.

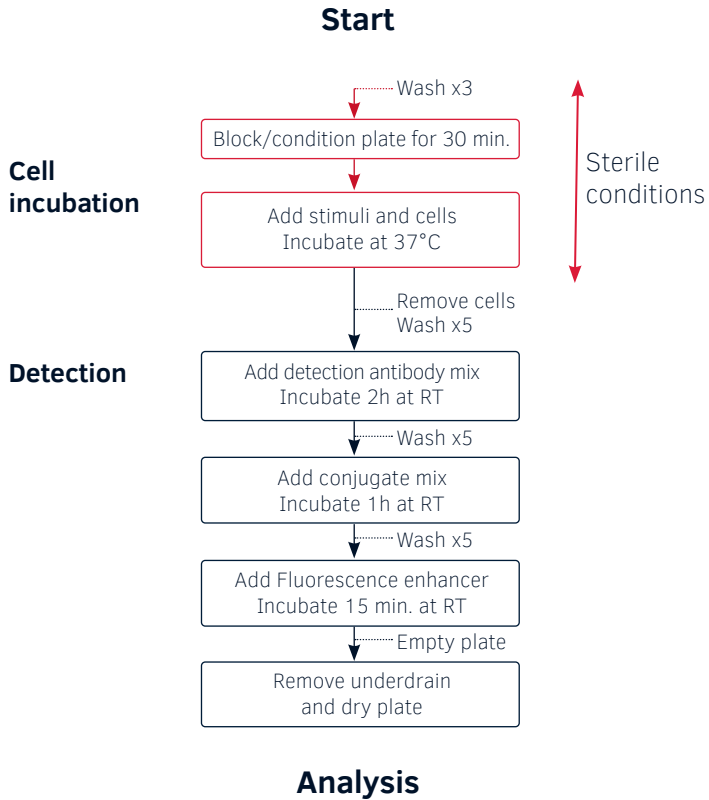
### Co-stimulation with anti-CD28

Anti-CD28 mAb provides a co-stimulatory signal to antigen-specific responses by binding to CD28 on T cells. Addition of an anti-CD28 mAb together with antigen (step B1) can be used to enhance antigen-specific responses. However, if the concentration of anti-CD28 mAb is too high, non-specific cytokine secretion may be elevated. Anti-CD28 can be used to circumvent capture effects, which can occur when different capture antibodies are coated in the same well, where absorption of one cytokine may negatively affect the secretion of another cytokine. See [www.mabtech.com](http://www.mabtech.com) for more information about capture effects.

### Analysis

An automated FluoroSpot reader with separate filters is required for analysis. The reader should be equipped with filters for the fluorophores used. Filters should be selective for the specific wavelengths to avoid bleed-through artifacts. Spots from cells secreting multiple analytes are identified by coordinates, i.e. based on spot position. In order to obtain accurate measurements of cells secreting multiple analytes, the automated reader must be able to create an overlay analysis from the filters. To avoid fading, the plates should be kept dark and should preferably be analyzed within 1 week of development.

# PROTOCOL SUMMARY



Developed and manufactured by MABTECH AB, Sweden, whose quality management system complies with the standards ISO 9001:2015 & ISO 13485:2016.



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