

# Human CRP Instant ELISA Kit

Enzyme-linked immunosorbent assay for quantitative detection of human C-reactive protein

**Catalog Number** BMS288INST (128 tests)

**Pub. No.** MAN0016656 **Rev.** A.0 (30)

**WARNING!** Read the Safety Data Sheets (SDSs) and follow the handling instructions. Wear appropriate protective eyewear, clothing, and gloves. Safety Data Sheets (SDSs) are available from [thermofisher.com/support](http://thermofisher.com/support).

## Product description

The Human CRP Instant ELISA Kit is an enzyme-linked immunosorbent assay for the quantitative detection of human C-reactive protein levels in cell culture supernatants, human serum, plasma, or other body fluids.

## Summary

C-reactive protein (CRP) is an acute phase protein exclusively produced in the liver. It has been identified in 1930 in the plasma of pneumonia patients and was named for its ability to bind C-polysaccharide of pneumococcus. CRP belongs to the family of  $\alpha$  globulin composed of five identical subunits resulting in a molecular weight of 110-140 kD.

The physiological roles of CRP are numerous, one of the critical functions is its importance in host defense. CRP is synthesized rapidly by hepatocytes in response to cytokines released into circulation by activated leukocytes. Serum and plasma levels of CRP have been shown to rise during response to a wide variety of diseases including bacterial infections, acute phase of rheumatoid arthritis, inflammation of the bile duct. High CRP is also found in Guillain-Barre syndrome patients, in multiple sclerosis, viral infections, tuberculosis, acute infectious hepatitis, necrotic diseases, burned patients and after surgical trauma.

For literature update refer to our website.

## Principles of the test

An anti-human C-reactive protein polyclonal coating antibody is adsorbed onto microwells. Human C-reactive protein present in the sample or standard binds to antibodies adsorbed to the microwells; an HRP-conjugated monoclonal anti-human C-reactive protein antibody binds to human C-reactive protein captured by the first antibody.

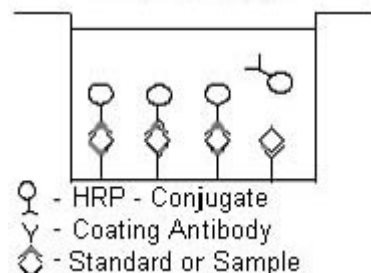


Fig. 1 First incubation

Following incubation unbound enzyme conjugated anti-human C-reactive protein is removed during a wash step and substrate solution reactive with HRP is added to the wells.

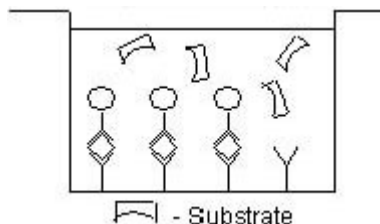


Fig. 2 Second incubation

A colored product is formed in proportion to the amount of soluble human C-reactive protein present in the sample. The reaction is terminated by addition of acid and absorbance is measured at 450 nm. A standard curve is prepared from seven human C-reactive protein standard dilutions and human C-reactive protein sample concentration determined.

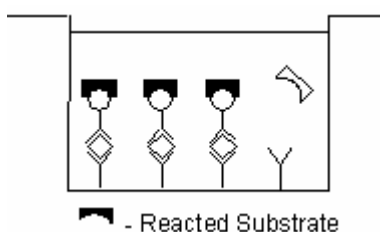


Fig. 3 Stop reaction

## Reagents provided

- 1 aluminum pouch with a Microwell Plate (12 strips with 8 wells each) coated with Polyclonal Antibody (murine) to human C-reactive protein, HRP-Conjugate (anti human C-reactive protein monoclonal (murine) antibody) and Assay Buffer, lyophilized
- 2 aluminum pouches with a human C-reactive protein Standard curve (colored)
- 1 bottle (25 mL) Wash Buffer Concentrate 20x (phosphate-buffered saline with 1% Tween 20)
- 1 vial (15 mL) Substrate Solution (tetramethyl-benzidine)
- 2 vials (5 mL) Assay Buffer Concentrate 20x (PBS with 1% Tween 20 and 10% BSA)
- 1 vial (15 mL) Stop Solution (1M Phosphoric acid)
- 2 adhesive Plate Covers

## Storage instructions

Store ELISA plate and Standard curves or whole kit at -20°C. The plate and the standard curves can also be removed, stored at -20°C, remaining kit reagents can be stored between 2° and 8°C. Expiry of the kit and reagents is stated on labels.

The expiry of the kit components can only be guaranteed if the components are stored properly, and if, in case of repeated use of one component, the reagent is not contaminated by the first handling.

## Sample collection

Cell culture supernatants, human serum, and plasma (EDTA, citrate, heparin) were tested with this assay. Other biological samples might be suitable for use in the assay. Remove the serum or plasma from the clot or red cells as soon as possible after clotting and separation. Pay attention to a possible "Hook Effect" due to high sample concentrations (see "Calculation of results" on page 3). Samples containing a visible precipitate must be clarified prior to use in the assay. Do not use grossly hemolyzed or lipemic samples.

Samples must be stored frozen at  $-20^{\circ}\text{C}$  to avoid loss of bioactive human C-reactive protein. If samples are to be run within 24 hours, they may be stored at  $2-8^{\circ}\text{C}$  (refer to "Performance characteristics" on page 4). Avoid repeated freeze-thaw cycles. Prior to assay, frozen serum or plasma should be brought to room temperature slowly and mixed gently.

## Materials required but not provided

- 5 mL and 10 mL graduated pipettes
- 5  $\mu\text{L}$  to 1000  $\mu\text{L}$  adjustable single channel micropipettes with disposable tips
- 50  $\mu\text{L}$  to 300  $\mu\text{L}$  adjustable multichannel micropipette with disposable tips
- Multichannel micropipette reservoir
- Beakers, flasks, cylinders necessary for preparation of reagents
- Device for delivery of wash solution (multichannel wash bottle or automatic wash system)
- Microwell strip reader capable of reading at 450 nm (620 nm as optional reference wave length)
- Glass-distilled or deionized water
- Statistical calculator with program to perform linear regression analysis

## Precautions for use

- All chemicals should be considered as potentially hazardous. We therefore recommend that this product is handled only by those persons who have been trained in laboratory techniques and that it is used in accordance with the principles of good laboratory practice. Wear suitable protective clothing such as laboratory overalls, safety glasses, and gloves. Care should be taken to avoid contact with skin or eyes. In the case of contact with skin or eyes wash immediately with water. See material safety data sheet(s) and/or safety statements(s) for specific advice.
- Reagents are intended for research use only and are not for use in diagnostic or therapeutic procedures.
- Do not mix or substitute reagents with those from other lots or other sources.
- Do not use kit reagents beyond expiration date on label.
- Do not expose kit reagents to strong light during storage or incubation.
- Do not pipet by mouth.
- Do not eat or smoke in areas where kit reagents or samples are handled.
- Avoid contact of skin or mucous membranes with kit reagents or samples.
- Rubber or disposable latex gloves should be worn while handling kit reagents or samples.
- Avoid contact of substrate solution with oxidizing agents and metal.
- Avoid splashing or generation of aerosols.
- To avoid microbial contamination or cross-contamination of reagents or samples that may invalidate the test, use disposable pipette tips and/or pipettes.
- Use clean, dedicated reagent trays for dispensing substrate reagent.
- Glass-distilled water or deionized water must be used for reagent preparation.
- Substrate solution must be at room temperature prior to use.

- Decontaminate and dispose samples and all potentially contaminated materials as if they could contain infectious agents. The preferred method of decontamination is autoclaving for a minimum of 1 hour at  $121.5^{\circ}\text{C}$ .
- Liquid wastes not containing acid and neutralized waste may be mixed with sodium hypochlorite in volumes such that the final mixture contains 1.0% sodium hypochlorite. Allow 30 minutes for effective decontamination. Liquid waste containing acid must be neutralized prior to the addition of sodium hypochlorite.

## Preparation of reagents and samples

1. Buffer concentrate should be brought to room temperature and diluted before starting the test procedure.
2. If crystals have formed in the buffer concentrate, warm it gently until crystals have completely dissolved.

### Wash buffer (1x)

1. Pour entire contents (25 mL) of the Wash Buffer Concentrate (20x) into a clean 500 mL graduated cylinder. Bring to final volume to 500 mL with glass-distilled or deionized water. Mix gently to avoid foaming.
2. Transfer to a clean wash bottle and store at  $2^{\circ}$  to  $25^{\circ}\text{C}$ . Please note that Wash Buffer (1x) is stable for 30 days.

### Assay buffer (1x)

Pour the entire contents (5 mL) of the Assay Buffer Concentrate 20x into a clean 100 mL graduated cylinder. Bring to final volume of 100 mL with distilled water. Mix gently.

## Test protocol

### Note:

- Use plate immediately after removal from  $-20^{\circ}\text{C}$ .
  - Do not wait until pellets have completely dissolved before applying samples - the binding reaction in the standard strips starts immediately after addition of water!
  - Do not try to dissolve pellets by pipetting up and down in the wells - some parts of the pellet could stick to the tip creating high variation of results
  - Perform the washing step with at least 400  $\mu\text{L}$  of washing buffer as stated in the manual or fill the wells completely - otherwise any pellet residues sticking to the rim of the well will not be removed and create high variation of results
  - Allow the washing buffer to sit in the wells for a few seconds before aspiration
  - Remove covers of the standard strips carefully in order that all the lyophilised pellets remain in the wells
1. Prepare your samples before starting with the test procedure. Dilute serum or plasma samples 1:500 with Assay Buffer according to the following dilution scheme:
    1. 10  $\mu\text{L}$  Sample + 490  $\mu\text{L}$  Assay Buffer
    2. 50  $\mu\text{L}$  prediluted sample + 450  $\mu\text{L}$  Assay Buffer

- Determine the number of microwell Strips required to test the desired number of samples plus microwell Strips for blanks and standards (colored). Each sample, standard, blank, and optional control sample should be assayed in duplicate. Remove extra microwell Strips from holder and store in foil bag with the desiccant provided at -20°C sealed tightly. Place microwell strips containing the standard curve in position A1/A2 to H1/H2 (see Table 1).

**Table 1** Example of the arrangement of blanks, standards and samples in the microwell strips:

	1	2	3	4
A	Standard 1 5000 pg/mL	Standard 1 5000 pg/mL	Sample 1	Sample 1
B	Standard 2 2500 pg/mL	Standard 2 2500 pg/mL	Sample 2	Sample 2
C	Standard 3 1250 pg/mL	Standard 3 1250 pg/mL	Sample 3	Sample 3
D	Standard 4 625 pg/mL	Standard 4 625 pg/mL	Sample 4	Sample 4
E	Standard 5 313 pg/mL	Standard 5 313 pg/mL	Sample 5	Sample 5
F	Standard 6 156 pg/mL	Standard 6 156 pg/mL	Sample 6	Sample 6
G	Standard 7 78 pg/mL	Standard 7 78 pg/mL	Sample 7	Sample 7
H	Blank	Blank	Sample 8	Sample 8

- Add distilled water to all standard and blank wells as indicated on the label of the standard strips (A1, A2 to H1, H2).
  - Add 50 µL of distilled water to the sample wells.
  - Add 100 µL of each 1:500 prediluted Sample, in duplicate, to the designated wells and mix the contents.
  - Cover with a Plate Cover and incubate at room temperature (18°C to 25°C) for 2 hours on a microplate shaker at 400 rpm.
  - Remove Plate Cover and empty wells. Wash the microwell strips 3 times with approximately 400 µL Wash Buffer per well with thorough aspiration of microwell contents between washes. Take care not to scratch the surface of the microwells.
- After the last wash, tap microwell strips on absorbent pad or paper towel to remove excess Wash Buffer. Use the microwell strips immediately after washing or place upside down on a wet absorbent paper for no longer than 15 minutes. Do not allow wells to dry.
- Pipette 100 µL of TMB Substrate Solution to all wells, including the blank wells.
  - Incubate the microwell strips at room temperature (18° to 25°C) for about 10 min. Avoid direct exposure to intense light.

The color development on the plate should be monitored and the substrate reaction stopped (see point 10. of this protocol) before positive wells are no longer properly recordable. Determination of the ideal time period for color development has to be done individually for each assay.

It is recommended to add the stop solution when the highest standard has developed a dark blue color. The color development can be monitored by the ELISA reader at 620 nm. The substrate reaction should be stopped as soon as Standard 1 has reached an OD of 0.9 – 0.95.

- Stop the enzyme reaction by quickly pipetting 100 µL of Stop Solution into each well, including the blank wells. It is important that the Stop Solution is spread quickly and uniformly throughout the microwells to completely inactivate the enzyme. Results must be read immediately after the Stop Solution is added or within one hour if the microwell strips are stored at 2 - 8°C in the dark.
- Read absorbance of each microwell on a spectro-photometer using 450 nm as the primary wave length (optionally 620 nm as the reference wave length; 610 nm to 650 nm is acceptable). Blank the plate reader according to the manufacturer's instructions by using the blank wells. Determine the absorbance of both the samples and the human C-reactive protein standards.

**Note:** In case of incubation without shaking the obtained O.D. values may be lower than indicated below. Nevertheless the results are still valid.

## Calculation of results

- Calculate the average absorbance values for each set of duplicate standards and samples. Duplicates should be within 20 per cent of the mean.
- Create a standard curve by plotting the mean absorbance for each standard concentration on the ordinate against the human C-reactive protein concentration on the abscissa. Draw a best fit curve through the points of the graph.
- To determine the concentration of circulating human C-reactive protein for each sample, first find the mean absorbance value on the ordinate and extend a horizontal line to the standard curve. At the point of intersection, extend a vertical line to the abscissa and read the corresponding human C-reactive protein concentration.
- Samples have been diluted 1:500, thus the concentration read from the standard curve must be multiplied by the dilution factor (x 500).

**Note:** N.B: There is a common dilution factor for samples due to the conjugate which must then be included in the calculation. The samples contribute 100 µL to the final volume per well. These 100 µL are composed of 100 µL of the 1:500 prediluted sample. This is a 1:500 dilution.

The remaining 50 µL to give 150 µL are due to the addition of 50 µL conjugate to all wells.

50 µL conjugate results in 50 µL reconstitution volume, addition of 100 µL 1:500 prediluted sample (= 1:500 dilution)

- Calculation of samples with a concentration exceeding standard 1 will result in incorrect, low human C-reactive protein levels (Hook Effect). Such samples require further external predilution according to expected human C-reactive protein values with Assay Buffer (1x) in order to precisely quantitate the actual human C-reactive protein level.
- It is suggested that each testing facility establishes a control sample of known human C-reactive protein concentration and runs this additional control with each assay. If the values obtained are not within the expected range of the control, the assay results may be invalid.

- A representative standard curve is shown in Figure 4. This curve cannot be used to derive test results. Every laboratory must prepare a standard curve for each group of microwell strips assayed.

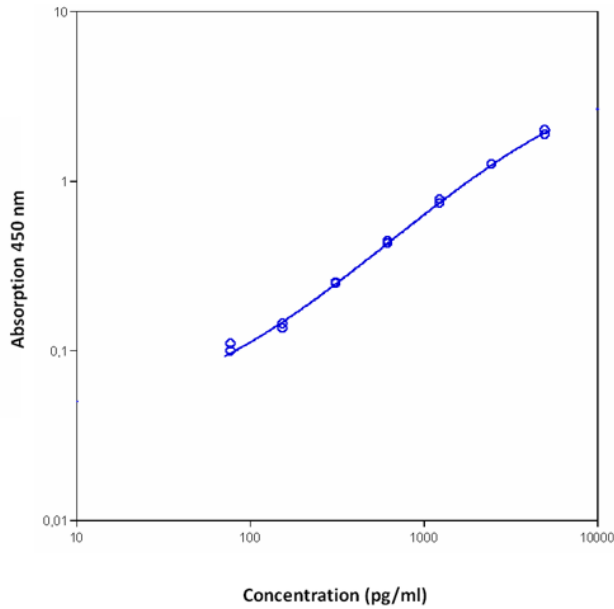


Fig. 4 Representative standard curve for the Human CRP Instant ELISA Kit. Human C-reactive protein was diluted in serial 2-fold steps in Assay Buffer, each symbol represents the mean of 3 parallel titrations. Do not use this standard curve to derive test results. A standard curve must be run for each group of microwell strips assayed.

**Table 2** Typical data using the Human CRP Instant ELISA Kit  
Measuring wavelength: 450 nm  
Reference wavelength: 620 nm

Standard	Human C-Reactive Protein Concentration (ng/mL)	O.D. (450 nm)	O.D. Mean	C.V. (%)
1	5000	1.868 1.97	1.919	3.8
2	2500	1.247 1.243	1.245	0.2
3	1250	0.734 0.771	0.7525	3.5
4	625	0.436 0.422	0.429	2.3
5	313	0.247 0.251	0.249	1.1
6	156	0.143 0.134	0.1385	4.6
7	78	0.109 0.099	0.104	6.8
Blank	0	0.023 0.029	0.026	16.3

The OD values of the standard curve may vary according to the conditions of assay performance (e.g. operator, pipetting technique, washing technique or temperature effects). Furthermore shelf life of the kit may affect enzymatic activity and thus color intensity. Values measured are still valid.

## Limitations

- Since exact conditions may vary from assay to assay, a standard curve must be established for every run.

- Bacterial or fungal contamination of either screen samples or reagents or cross-contamination between reagents may cause erroneous results.
- Disposable pipette tips, flasks or glassware are preferred, reusable glassware must be washed and thoroughly rinsed of all detergents before use.
- Improper or insufficient washing at any stage of the procedure will result in either false positive or false negative results. Empty wells completely before dispensing fresh wash solution, fill with Wash Buffer as indicated for each wash cycle and do not allow wells to sit uncovered or dry for extended periods.
- The use of radioimmunotherapy has significantly increased the number of patients with human anti-mouse IgG antibodies (HAMA). HAMA may interfere with assays utilizing murine monoclonal antibodies leading to both false positive and false negative results. Serum samples containing antibodies to murine immunoglobulins can still be analyzed in such assays when murine immunoglobulins (serum, ascitic fluid, or monoclonal antibodies of irrelevant specificity) are added to the Sample.

## Performance characteristics

### Sensitivity

The limit of detection of human C-reactive protein defined as the analyte concentration resulting in an absorbance significantly higher than that of the dilution medium (mean plus 2 standard deviations) was determined to be 3 pg/mL (mean of 6 independent assays).

### Reproducibility

#### Intra-assay

Reproducibility within the assay was evaluated in 3 independent experiments. Each assay was carried out with 6 replicates of 7 serum samples containing different concentrations of human C-reactive protein. 2 standard curves were run on each plate. Data below show the mean human C-reactive protein concentration and the coefficient of variation for each sample (see Table 3). The calculated overall intra-assay coefficient of variation was 6.9%.

**Table 3** The mean human C-reactive protein concentration and the coefficient of variation for each sample.

Positive Sample	Experiment	Human C-Reactive Protein Concentration (ng/mL)	Coefficient of Variation (%)
1	1	123	5.0
	2	128	6.0
	3	159	8.0
2	1	173	7.0
	2	222	6.0
	3	244	5.0
3	1	365	9.0
	2	310	7.0
	3	404	7.0
4	1	476	6.0
	2	506	5.0
	3	630	9.0
5	1	175	4.0
	2	164	9.0
	3	225	6.0
6	1	1791	6.0
	2	1314	6.0
	3	1849	10.0
7	1	345	10.0
	2	311	8.0
	3	436	6.0

#### Inter-assay

Assay to assay reproducibility within one laboratory was evaluated in 3 independent experiments by 3 technicians. Each assay was carried out with 6 replicates of 7 serum samples containing different

concentrations of human C-reactive protein. 2 standard curves were run on each plate. Data below (see Table 4) show the mean human C-reactive protein concentration and the coefficient of variation calculated on 18 determinations of each sample. The calculated overall coefficient of variation was 13.1%.

**Table 4** The mean human C-reactive protein concentration and the coefficient of variation calculated on 18 determinations of each sample.

Sample	Human C-Reactive Protein Concentration (ng/mL)	Coefficient of Variation (%)
1	136.8	11.0
2	212.9	13.0
3	359.5	10.0
4	537.1	12.0
5	187.8	14.0
6	1651.5	14.0
7	364.0	14.0

### Spike recovery

The spike recovery was evaluated by spiking 4 levels of human C-reactive protein into normal human serum. Recoveries were determined in 3 independent experiments. The unspiked serum was used as blank in these experiments. The overall mean recovery was 103%.

### Dilution parallelism

Four serum samples with different levels of human C-reactive protein were analyzed at serial 2-fold dilutions (1:500–1:2,000) with 4 replicates each. The recovery ranged between 84% and 109% with an overall recovery of 91%.

### Sample stability

#### Freeze-Thaw stability

Aliquots of serum samples (unspiked or spiked) were stored at -20°C and thawed several times, and the human C-reactive protein levels determined. There was loss of human C-reactive protein immunoreactivity by freezing and thawing.

#### Storage stability

Aliquots of serum samples (spiked or unspiked) were stored at -20°C, 2–8°C, room temperature, and at 37°C, and the human C-reactive protein level determined after 24, 48, and 96 hours. There was no significant loss of human C-reactive protein immunoreactivity during storage under above conditions.

### Specificity

To define the specificity of this ELISA several proteins were tested for cross-reactivity. No cross-reactivity was observed.

### Expected values

A panel of 8 sera from randomly selected healthy donors (males and females) was tested for human C-reactive protein. The detected human C-reactive protein levels ranged between 136 and 800 ng/mL with a mean level of 381 ng/mL and a standard deviation of 214 ng/mL.

## Reagent preparation summary

### Wash buffer (1x)

Add Wash Buffer Concentrate 20 x (25 mL) to 475 mL distilled water

### Assay buffer (1x)

Add Assay Buffer Concentrate 20 x (5 mL) to 95 mL distilled water

## Test protocol summary

1. Predilute sample with Assay Buffer 1:500
2. Place standard strips in position A1/A2 to H1/H2.
3. Add distilled water, in duplicate, to all standard and blank wells as indicated on the label of the standard strips.
4. Add 50 µL distilled water to sample wells.
5. Add 100 µL Sample to designated wells.
6. Cover microwell strips and incubate 2 hours at room temperature (18° to 25°C) on a microplate shaker at 400 rpm.
7. Empty and wash microwell strips 3 times with 400 µL Wash Buffer.
8. Add 100 µL of TMB Substrate Solution to all wells including blank wells.
9. Incubate the microwell strips for about 10 minutes at room temperature (18° to 25°C).
10. Add 100 µL Stop Solution to all wells including blank wells.
11. Blank microwell reader and measure color intensity at 450 nm.

**Note:** Samples have been diluted 1:500, thus the concentration read from the standard curve must be multiplied by the dilution factor (x 500).

## Customer and technical support

Visit [thermofisher.com/support](http://thermofisher.com/support) for the latest service and support information.

- Worldwide contact telephone numbers
- Product support information
  - Product FAQs
  - Software, patches, and updates
  - Training for many applications and instruments
- Order and web support
- Product documentation
  - User guides, manuals, and protocols
  - Certificates of Analysis
  - Safety Data Sheets (SDSs; also known as MSDSs)

**Note:** For SDSs for reagents and chemicals from other manufacturers, contact the manufacturer.

## Limited product warranty

Life Technologies Corporation and/or its affiliate(s) warrant their products as set forth in the Life Technologies' General Terms and Conditions of Sale at [www.thermofisher.com/us/en/home/global/terms-and-conditions.html](http://www.thermofisher.com/us/en/home/global/terms-and-conditions.html). If you have any questions, please contact Life Technologies at [www.thermofisher.com/support](http://www.thermofisher.com/support).



Bender MedSystems GmbH | Campus Vienna Biocenter 2 | 1030 Vienna, Austria

For descriptions of symbols on product labels or product documents, go to [thermofisher.com/symbols-definition](http://thermofisher.com/symbols-definition).

The information in this guide is subject to change without notice.

**DISCLAIMER:** TO THE EXTENT ALLOWED BY LAW, THERMO FISHER SCIENTIFIC INC. AND/OR ITS AFFILIATE(S) WILL NOT BE LIABLE FOR SPECIAL, INCIDENTAL, INDIRECT, PUNITIVE, MULTIPLE, OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH OR ARISING FROM THIS DOCUMENT, INCLUDING YOUR USE OF IT.

**Important Licensing Information:** These products may be covered by one or more Limited Use Label Licenses. By use of these products, you accept the terms and conditions of all applicable Limited Use Label Licenses.

©2019 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of Thermo Fisher Scientific and its subsidiaries unless otherwise specified. All other trademarks are the property of their respective owners.

[thermofisher.com/support](http://thermofisher.com/support) | [thermofisher.com/askaquestion](http://thermofisher.com/askaquestion)

[thermofisher.com](http://thermofisher.com)

**ThermoFisher**  
SCIENTIFIC