abcam

ab252190

Mismatch Repair (MSH6, PMS2, MLH1, MSH2) Antibody Panel - Human

Recombinant

Key facts

Reactive species	Human
Target	MLH1

What's included?

1 Kit

Components

ab227941
Anti-MSH2 antibody [EPR21017-123]
2 x 10 µL

ab110638
Anti-PMS2 antibody [EPR3947]
2 x 10 µL

ab92471
Anti-MSH6 antibody [EPR3945]
2 x 10 µL

ab92312
Anti-MLH1 antibody [EPR3894]
2 x 10 µL

Target data

See full target information MLH1

Function	Heterodimerizes with PMS2 to form MutL alpha, a component of the post-replicative DNA mismatch repair system (MMR). DNA repair is initiated by MutS alpha (MSH2-MSH6) or MutS beta (MSH2-MSH3) binding to a dsDNA mismatch, then MutL alpha is recruited to the heteroduplex. Assembly of the MutL-MutS-heteroduplex ternary complex in presence of RFC and PCNA is sufficient to activate endonuclease activity of PMS2. It introduces single-strand breaks near the mismatch and thus generates new entry points for the exonuclease EXO1 to degrade the strand containing the mismatch. DNA methylation would prevent cleavage and therefore assure that only the newly mutated DNA strand is going to be corrected. MutL alpha (MLH1-PMS2) interacts physically with the clamp loader subunits of DNA polymerase III, suggesting that it may play a role to recruit the DNA polymerase III to the site of the MMR. Also implicated in DNA damage signaling, a process which induces cell cycle arrest and can lead to apoptosis in case of major DNA damages. Heterodimerizes with MLH3 to form MutL gamma which plays a role in meiosis.

Storage

Shipped at conditions	Blue Ice
Appropriate short-term storage conditions	Multi
Appropriate long-term storage conditions	Multi
Storage information	Please refer to protocols

Notes

Mismatch Repair (MSH6, PMS2, MLH1, MSH2) Antibody Panel - Human ab252190 contains multiple trial-sized versions of anti-human antibody clones against MSH6, PMS2, MLH1, and MSH2, specifically selected for their high performance in multiple applications including IHC. This panel contains 4 recombinant rabbit monoclonal antibodies that are all knock-out validated to ensure specificity to their targets. They are provided as a sampler panel to allow you to easily evaluate each in your required application.
DNA mismatch repair (MMR) proteins are involved in repairing mistakes that occur during DNA replication and recombination, in addition to repairing some types of DNA damage. Defects in the MMR process due to mutations in MMR genes (MSH6, PMS2, MLH1, MSH2) can result in microsatellite instability (MSI), where a DNA sequence accumulates errors and produces abnormally long or shorter microsatellites. These defects in the MMR pathway have been linked to various human cancers, such as human non-polyposis colon cancer (HNPCC) and Muir-Torre Syndrome (MTS), a subtype of HNPCC.

For guidelines on how to use each antibody within the panel, please consult the individual datasheet for each antibody.

Panel contains:

- Rabbit monoclonal [EPR3894] to MLH1 (20 µL) ab92312

- Rabbit monoclonal [EPR21017-123] to MSH2 (20 µL) ab227941

- Rabbit monoclonal [EPR3945] to MSH6 (20 µL) ab92471

- Rabbit monoclonal [EPR3947] to PMS2 (20 µL) ab110638

Explore our range of antibody sample panels designed to provide you with a variety of trial-size antibodies in a convenient and cost-effective format.
Carrier-free formulations of our recombinant antibodies are also available for easy conjugation to labels of your choice and for multiplex applications. Use our intuitive search and select carrier-free or your label of choice. For bespoke conjugations or large volumes email bespoke@abcam.com.

Our RabMAb® technology is a patented hybridoma-based technology for making rabbit monoclonal antibodies. For details on our patents, please refer to RabMAb® patents.

Supplementary info

This supplementary information is collated from multiple sources and compiled automatically.

Activity summary	The proteins MSH2 PMS2 MLH1 and MSH6 play significant roles in the mismatch repair (MMR) pathway. MSH2 also known as MutS Homolog 2 has a molecular mass of approximately 100 kDa and commonly pairs with MSH6 to form a complex. These proteins are expressed in various tissues and are critical components for recognizing and repairing mismatches during DNA replication. These components are essential for maintaining genomic stability and preventing mutations from accumulating.
Biological function summary	MSH2 and related proteins assemble into essential heterodimeric complexes for the mismatch repair system. MSH2 pairs with MSH6 to form the MutSα complex while MLH1 partners with PMS2 to create the MutLα complex. Together these complexes identify and initiate repair of DNA base mismatches that can arise during replication. This precise operation ensures that the DNA's faithful transmission occurs from one generation of cells to the next highlighting the importance of maintaining integrity in diseases where genome instability is a factor.
Pathways	These mismatch repair proteins are pivotal in the cell cycle control and DNA damage response pathways. The MMR pathway is closely associated with the p53 pathway which detects damage and can promote apoptosis if the mutation burden is high. MSH2 plays an important role in recognizing mutation-inducing errors and it directly interacts with other proteins like MLH1 to maintain this checkpoint. These pathways collectively guard the cell against tumorigenesis by facilitating accurate DNA repair or triggering cell death in the face of irreparable damage.
Associated diseases and disorders	Defects in mismatch repair proteins including MSH2 correlate strongly with Lynch syndrome also known as hereditary nonpolyposis colorectal cancer (HNPCC). This condition arises due to inherited mutations that impair the MMR system. In this context MSH2 mutations frequently co-occur with MLH1 mutations significantly elevating the risk of colorectal and endometrial cancers. Determining the status of MMR proteins using immunohistochemistry (IHC) such as the MMR IHC panel assists in diagnosing these disorders and guiding therapeutic decisions.

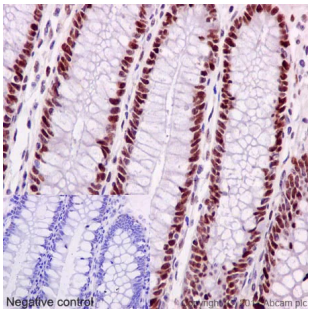
Product promise

We are dedicated to supporting your work with high quality reagents and we are here for you every step of the way should you need us.

In the unlikely event of one of our products not working as expected, you are covered by our product promise.

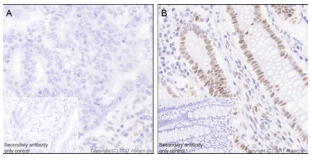
Full details and terms and conditions can be found here:
Terms & Conditions.

8 product images



Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) - Mismatch Repair (MSH6, PMS2, MLH1, MSH2) Antibody Panel - Human (ab252190)

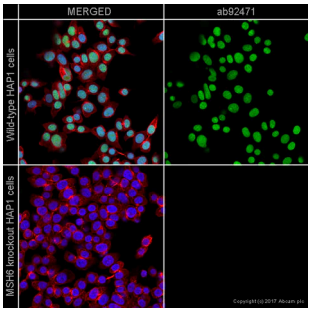
Immunohistochemical staining of paraffin embedded human colon with purified ab92471 at a dilution of 1/500. A pre-diluted HRP polymer for rabbit/mouse IgG was used as the secondary antibody and the sample was counter-stained with hematoxylin. Antigen retrieval was perfomed using Tris-EDTA buffer, pH 9.0. PBS was used instead of the primary antibody as the negative control, and is shown in the inset.



Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) - Mismatch Repair (MSH6, PMS2, MLH1, MSH2) Antibody Panel - Human (ab252190)

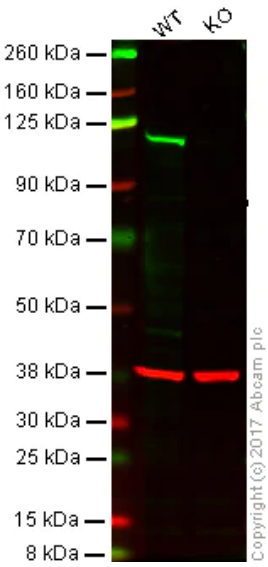
Immunohistochemical analysis of paraffin-embedded human colon cancer tissue labeling MSH2 with ab227941 at 1/8000 dilution, followed by a ready to use Goat Anti-Rabbit IgG H&L (HRP). Nuclear staining in para-carcinoma colonic epithelium (image B) or stromal cells (both image A and B) and loss of expression in the paired colon cancer (image A) (PMID: 24710284). Counter stained with Hematoxylin.
Secondary antibody only control: Used PBS instead of primary antibody, secondary antibody is a ready to use Goat Anti-Rabbit IgG H&L (HRP).

Perform heat mediated antigen retrieval using ab93684 (Tris/EDTA buffer, pH 9.0).



Immunocytochemistry/ Immunofluorescence - Mismatch Repair (MSH6, PMS2, MLH1, MSH2) Antibody Panel - Human (ab252190)

ab92471 staining MSH6 in wild-type HAP1 cells (top panel) and MSH6 knockout HAP1 cells (bottom panel). The cells were fixed with 4% formaldehyde (10min), permeabilized with 0.1% Triton X-100 for 5 minutes and then blocked with 1% BSA/10% normal goat serum/0.3M glycine in 0.1% PBS-Tween for 1h. The cells were then incubated with ab92471 at 1µg/ml and ab195889 at 1/250 dilution (shown in pseudocolour red) overnight at +4°C, followed by a further incubation at room temperature for 1h with a goat secondary antibody to Rabbit IgG (Alexa Fluor® 488) (ab150081) at 2 µg/ml (shown in green). Nuclear DNA was labelled in blue with DAPI.
Image was taken with a confocal microscope (Leica-Microsystems, TCS SP8).



Western blot - Mismatch Repair (MSH6, PMS2, MLH1, MSH2) Antibody Panel - Human (ab252190)

Lane 1: Wild-type HAP1 whole cell lysate (30 µg)
Lane 2: PMS2 knockout HAP1 whole cell lysate (30 µg)

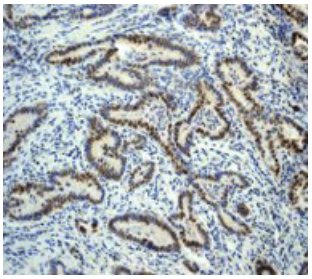
Lanes 1-2: Merged signal (red and green). Green - Anti-PMS2 antibody [EPR3947] (ab110638) observed at 120 kDa. Red - loading control, ab8245, observed at 37 kDa.
ab110638 was shown to specifically react with PMS2 in wild-type HAP1 cells. No band was observed when PMS2 knockout samples were used. Wild-type and PMS2 knockout samples were subjected to SDS-PAGE. ab110638 and ab8245 (Mouse anti GAPDH loading control) were incubated overnight at 4°C at 1/1000 dilution and 1/20000 dilution respectively. Blots were developed with Goat anti-Rabbit IgG H&L (IRDye® 800CW) preabsorbed ab216773 and Goat anti-Mouse IgG H&L (IRDye® 680RD) preabsorbed ab216776 secondary antibodies at 1/20000 dilution for 1 hour at room temperature before imaging.

All lanes:
Western blot - Anti-PMS2 antibody [EPR3947] (ab110638) at 1/1000 dilution

Lane 1:
Wild-type HAP1 whole cell lysate at 30 µg

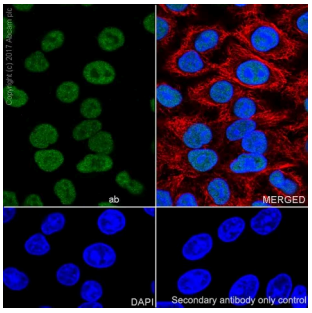
Lane 2:
PMS2 knockout HAP1 whole cell lysate at 30 µg

Predicted band size: 96 kDa



Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) - Mismatch Repair (MSH6, PMS2, MLH1, MSH2) Antibody Panel - Human (ab252190)

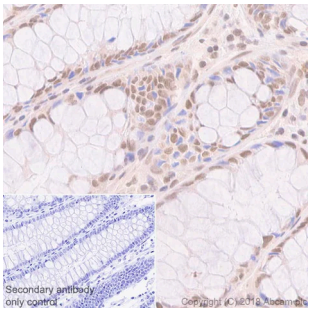
ab110638 at 1/100 dilution staining PMS2 in Human colonic adenocarcinoma by Immunohistochemistry, Paraffin-embedded tissue.



Immunocytochemistry/ Immunofluorescence - Mismatch Repair (MSH6, PMS2, MLH1, MSH2) Antibody Panel - Human (ab252190)

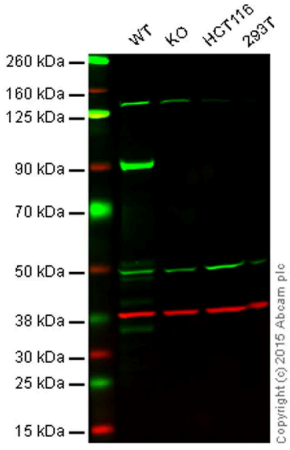
Immunofluorescent analysis of 100% methanol-fixed A549 (human lung carcinoma cell line) cells labeling MSH2 with ab227941 at 1/100 dilution, followed by Goat Anti-Rabbit IgG H&L (Alexa Fluor® 488) (ab150077) secondary antibody at 1/1000 dilution (green). Nuclear staining in A549 cell line is shown.
The nuclear counter stain is DAPI (blue). Tubulin is detected with Anti-alpha Tubulin antibody [DM1A] - Microtubule Marker (Alexa Fluor® 594) (ab195889) (red) at 1/200 dilution.

Secondary antibody only control: Used PBS instead of primary antibody, secondary antibody is Goat Anti-Rabbit IgG H&L (Alexa Fluor® 488) (ab150077) secondary antibody at 1/1000 dilution.



Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) - Mismatch Repair (MSH6, PMS2, MLH1, MSH2) Antibody Panel - Human (ab252190)

Immunohistochemistry (Formalin/PFA-fixed paraffin-embedded sections) analysis of Human colon tissue sections labeling MLH1 with Purified ab92312 at 1:250 dilution (2.9 µg/ml). Heat mediated antigen retrieval was performed using Perform heat mediated antigen retrieval using citrate (pH 6.0)ImmunoHistoProbe one step HRP Polymer (ready to use)was used as the secondary antibody.Negative control:PBS instead of the primary antibody.Hematoxylinwas used as a counterstain.



Western blot - Mismatch Repair (MSH6, PMS2, MLH1, MSH2) Antibody Panel - Human (ab252190)

Lane 1: Wild-type HAP1 cell lysate (20 µg)
Lane 2: MLH1 knockout HAP1 cell lysate (20 µg)
Lane 3: HCT116 cell lysate (20 µg)
Lane 4: 293T cell lysate (20 µg)
Lanes 1 - 4: Merged signal (red and green). Green - Anti-MLH1 antibody Anti-MLH1 antibody [EPR3894] (ab92312) observed at 88 kDa. Red - loading control, ab8245, observed at 37 kDa.

Unpurified ab92312 was shown to recognize MLH1 in wild-type HAP1 cells along with additonal cross reactive bands. No band was observed when MLH1 knockout samples were examined. Wild-type and MLH1 knockout samples were subjected to SDS-PAGE. ab92312 and ab8245 (loading control to GAPDH) were both diluted 1/1000 and incubated overnight at 4°C. Blots were developed with Goat anti-Rabbit IgG H&L (IRDye® 800CW) preadsorbed (ab216773) and Goat anti-Mouse IgG H&L (IRDye® 680RD) preadsorbed (ab216776) secondary antibodies at 1/10,000 dilution for 1 hour at room temperature before imaging.

All lanes:
Western blot - Anti-MLH1 antibody [EPR3894] (ab92312) at 1/1000 dilution

Lane 1:
Wild-type HAP1 cell lysate at 20 µg

Lane 2:
MLH1 knockout HAP1 cell lysate at 20 µg

Lane 3:
HCT116 cell lysate at 20 µg

Lane 4:
293T cell lysate at 20 µg

Predicted band size: 85 kDa