

MACH 2 Universal HRP-Polymer Detection

Micro-polymer detection
901-M2U522MM-071824

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Available Product Formats	
Catalog Number	Volume
M2U522MM	1 L

Intended Use:

For *in vitro* Diagnostic Use

The MACH 2 Universal HRP-Polymer Detection is intended for use in either manual or automated Immunohistochemistry (IHC) staining protocols using a horseradish peroxidase (HRP) polymer one-step application method. This micro-polymer detection kit is designed for the detection of mouse and rabbit IgG primary antibodies bound to target antigens in the formalin-fixed, paraffin-embedded (FFPE) tissues during the IHC staining process. The clinical interpretation of any staining or its absence should be complemented by morphological studies and proper controls and should be evaluated within the context of the patient's clinical history and other diagnostic tests by a qualified pathologist.

Summary and Explanation:

The MACH 2 Universal HRP-Polymer Detection is designed using a one-step method for detecting mouse and rabbit primary antibodies to form an antibody-enzyme complex. This complex is then visualized using an appropriate substrate/chromogen. In the one-step method a secondary antibody directly linked to the micro-polymer is applied.

Principle of Procedure:

This micro-polymer detection kit may be used in immunohistochemistry testing of formalin-fixed, paraffin-embedded tissue sections. In general, immunohistochemical (IHC) staining techniques allow for the visualization of antigens via the sequential application of a specific antibody to the antigen (primary antibody), a secondary antibody to the primary antibody (optional link antibody/probe), an enzyme complex and a chromogenic substrate with interposed washing steps. The enzymatic activation of the chromogen results in a visible reaction product at the antigen site. The specimen may then be counterstained, and coverslipped. Results are interpreted using a light microscope and aid in the differential diagnosis of pathophysiological processes, which may or may not be associated with a particular antigen.

Materials and Methods:

Kit Catalog No.	Component Description	Quantity x Volume
M2U522MM	MACH 2 Universal HRP-Polymer Detection	1 L

Reconstitution, Mixing, Dilution, Titration:

The micro-polymer detection kit reagent(s) are optimized and ready to use with Biocare antibodies and ancillary reagents. No reconstitution, mixing, Dilution or titration is required.

Known Applications:

immunohistochemistry (IHC) on formalin-fixed paraffin-embedded tissues

Species Reactivity:

Mouse and Rabbit IgG heavy and light chains

Supplied As:

Buffered saline solution, pH 7.6-7.8, containing a protein carrier and less than 0.01% ProClin 300 and/or less than 0.5% ProClin 950 as a preservative. See Safety Data Sheet for additional details.

Materials and Reagents Required but Not Provided:

 Biocare Medical
60 Berry Drive
Pacheco, CA 94553
USA



Microscope slides, positively charged
Positive and negative tissue controls
Desert Chamber* or similar Drying oven (optional)
Xylene or xylene substitute
Ethanol or reagent alcohol
Decloaking Chamber* or similar pressure cooker (optional)
Deionized or distilled water
Wash buffer*
Pretreatment reagents* (optional)
Enzyme digestion* (optional)
Peroxidase block*
Protein block* (optional)
Primary antibody*
Negative control reagents*
Chromogens*
Hematoxylin* (counterstain)
Bluing reagent*
Mounting medium*
Coverglass
Light Microscope (40-400X magnification)

* Biocare Medical Products: Refer to the Biocare Medical website located at <http://biocare.net> for information regarding catalog numbers and ordering. Certain reagents listed above are based on specific applications and detection system used.

Storage and Stability:

Store at 2°C to 8°C. The product is stable to the expiration date printed on the vial label, when stored under these conditions. Do not use after expiration date. Storage under any condition other than those specified must be verified. The kit reagent(s) are ready-to-use and should not be diluted. The stability of user diluted reagent has not been established by Biocare.

Positive and negative controls should be run simultaneously with all patient specimens. If unexpected staining is observed which cannot be explained by variations in laboratory procedures and a problem with the antibody is suspected, contact Biocare's Technical Support at 1-800-542-2002 or via the technical support information provided on biocare.net.

Specimen Preparation:

Tissues fixed in formalin are suitable for use prior to paraffin embedding. Osseous tissues should be decalcified prior to tissue processing to facilitate tissue cutting and prevent damage to microtome blades.¹

Properly fixed and embedded tissues expressing the specified antigen target should be stored in a cool place. The Clinical Laboratory Improvement Act (CLIA) of 1988 requires in 42 CFR §493.1259(b) that "The laboratory must retain stained slides at least ten years from the date of examination and retain specimen blocks at least two years from the date of examination."³

Treatment of Tissues Prior to Staining:

Perform Heat Induced Epitope Retrieval (HIER) per recommended protocol below. The routine use of HIER prior to Immunohistochemistry (IHC) has been shown to minimize inconsistency and standardize staining.^{4,5}

Warning and Precautions:

1. Kit reagents contain less than 0.05% ProClin 300 and/or less than 1% ProClin 950. Wear gloves and protective clothing and take reasonable precautions when handling as ProClin is classified as an irritant and may cause skin contact sensitization. Avoid contact with eyes, skin, and mucous membranes.

2. Handle materials of human or animal origin as potentially biohazardous and dispose of such materials with proper precautions. In the event of exposure, follow the health directives of the responsible authorities where used.^{6,7}

3. Specimens, before and after fixation, and all materials exposed to them should be handled as if capable of transmitting infection and disposed of with proper precautions. Never pipette reagents by mouth and avoid contacting

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the skin and mucous membranes with reagents and specimens. If reagents or specimens come into contact with sensitive areas, wash with copious amounts of water.⁸

4. Microbial contamination of reagents may result in an increase in nonspecific staining.
5. Incubation times or temperatures other than those specified may give erroneous results. The user must validate any such change.
6. Do not use reagent after the expiration date printed on the vial.
7. The micro-polymer detection kit reagent(s) are optimized and ready to use with Biocare antibodies and ancillary reagents. Refer to the antibody and other ancillary reagent instructions for use for recommended protocols and conditions for use.
8. Follow local and/or state authority requirements for method of disposal.
9. The SDS is available upon request and is located at <http://biocare.net>.
10. Report any serious incidents related to this device by contacting the local Biocare representative and the applicable competent authority of the Member State or country where the user is located.

This MACH 2 Universal HRP-Polymer Detection kit contains components classified as indicated in the table below in accordance with the Regulation (EC) No. 1272/2008

Hazard	Code	Hazard Statement
	H317	May cause an allergic skin reaction.
N/A	H402 H412	Harmful to aquatic life. Harmful to aquatic life with long lasting effects.

Instructions for Use:

The micro-polymer detection kit reagent(s) are optimized and ready to use with Biocare antibodies and ancillary reagents. Refer to the antibody and other ancillary reagent instructions for conditions for use. Incubation times and temperatures will vary depending on the antibody and test design.

When using an automated staining instrument, consult the specific instrument operator manual and instructions for use for operating parameters.

General procedural steps for performing IHC:

1. Deparaffinization: Deparaffinize slides in Slide Brite or xylene. Hydrate slides in a series of graded alcohols to water.
2. Peroxide Block: Block for 5 minutes with Peroxidized 1.
3. Pretreatment Solution/Protocol: Please refer to the respective primary antibody data sheet for recommended pretreatment solution and protocol.
4. Protein Block (Optional): Incubate for 10-15 minutes at room temperature (RT) with Background Sniper.
5. Primary Antibody: Please refer to the respective primary antibody data sheet for incubation time.
6. Polymer: 30 minutes at RT with MACH 2 Universal HRP-Polymer Detection.
7. Chromogen: Incubate for 5 minutes at RT with Biocare's DAB.
8. Counterstain: Counterstain with hematoxylin. Rinse with deionized water. Apply Tacha's Bluing Solution for 1 minute. Rinse with deionized water.

Technical Notes:

1. Use TBS for washing steps.

Quality Control:

Refer to CLSI Quality Standards for Design and Implementation of Immunocytochemistry Assays; Approved Guideline-Second edition (I/LA28-A2) CLSI Wayne, PA USA (www.clsi.org). 2011⁹

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Positive Tissue Control:

External positive control materials should be fresh specimens fixed, processed, and embedded as soon as possible in the same manner as the patient sample(s). Positive tissue controls are indicative of correctly prepared tissues and proper staining techniques. One positive external tissue control for each set of test conditions should be included in each staining run.

The tissues used for the external positive control materials should be selected from patient specimens with well-characterized low levels of the positive target activity that gives weak positive staining. The low level of positivity for external positive controls is designed so to ensure detection of subtle changes in the antibody sensitivity from instability or problems with the IHC methodology. Commercially available tissue control slides or specimens processed differently from the patient sample(s) validate reagent performance only and do not verify tissue preparation.

Known positive tissue controls should only be utilized for monitoring the correct performance of processed tissues and test reagents, rather than as an aid in formulating a specific diagnosis of patient samples. If the positive tissue controls fail to demonstrate positive staining, results with the test specimens should be considered invalid.

Negative Tissue Control:

Use a negative tissue control fixed, processed, and embedded in a manner identical to the patient sample(s) with each staining run to verify the specificity of the antibody for demonstration of the target antigen, and to provide an indication of specific background staining (false positive staining). Also, the variety of different cell types present in most tissue sections can be used by the laboratorian as internal negative control sites to verify the antibody performance specifications. The types and sources of specimens that may be used for negative tissue controls are listed in the Performance Characteristics section.

If specific staining (false positive staining) occurs in the negative tissue control, results with the patient specimens should be considered invalid.

Nonspecific Negative Reagent Control:

Use a nonspecific negative reagent control in place of the antibody with a section of each patient specimen to evaluate nonspecific staining and allow better interpretation of specific staining at the antigen site. Ideally, a negative reagent control contains an antibody produced and prepared (i.e., diluted to same concentration using same diluent) for use in the same way as the antibody but exhibits no specific reactivity with human tissues in the same matrix/solution as the Biocare antibody. Diluent alone may be used as a less desirable alternative to the previously described negative reagent controls. The incubation period for the negative reagent control should correspond to that of the antibody.

When panels of several antibodies are used on serial sections, the negatively staining areas of one slide may serve as a negative/nonspecific binding background control for other antibodies. To differentiate endogenous enzyme activity or nonspecific binding of enzymes from specific immunoreactivity, additional patient tissues may be stained exclusively with substrate-chromogen or enzyme complexes (PAP, avidin-biotin, streptavidin) and substrate-chromogen, respectively.

Assay Verification:

Prior to initial use of an antibody or staining system in a diagnostic procedure, the user should verify the antibody's specificity by testing it on a series of in-house tissues with known performance characteristics representing known positive and negative tissues. Refer to the quality control procedures previously outlined in this section of the product insert and to the quality control recommendations of the CAP Certification Program¹¹ for Immunohistochemistry and/or the NCCLS IHC guideline¹². These quality control procedures should be repeated for each new antibody lot, or whenever there is a change in assay parameters.

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Troubleshooting:

For product assistance, contact Biocare's Technical Support at 1-800-542-2002.

Interpretation of Staining:

An antibody works in conjunction with ancillary reagents to produce a brown color reaction at the antigen sites localized by the antibody. Diluent ancillary reagents assist with providing a pH buffered environment to facilitate antibody binding in the antigen specific staining reaction. Prior to interpretation of results, the staining of controls must be evaluated by a qualified pathologist. Negative controls are evaluated and compared to stained slides to ensure any staining observed is not a result of nonspecific interactions.

Positive Tissue Control:

The positive tissue control stained with indicated antibody should be examined first to ascertain that all reagents are functioning properly. The appropriate staining of target cells (as indicated above) is indicative of positive reactivity. If the positive tissue controls fail to demonstrate positive staining, any results with the test specimens should be considered invalid.

The color of the reaction product may vary depending on substrate chromogens used. Refer to substrate package inserts for expected color reactions. Further, metachromasia may be observed in variations of the method of staining.¹²

When a counterstain is used, depending on the incubation length and potency of the counterstain used, counterstaining will result in a coloration of the cell nuclei. Excessive or incomplete counterstaining may compromise proper interpretation of results.

Negative Tissue Control:

The negative tissue control should be examined after the positive tissue control to verify the specificity of the labeling of the target antigen by the antibody. The absence of specific staining in the negative tissue control confirms the lack of antibody cross reactivity to cells/cellular components. If specific staining (false positive staining) occurs in the negative external tissue control, results with the specimen should be considered invalid.

Nonspecific staining, if present, usually has a diffuse appearance. Sporadic staining of connective tissue may also be observed in sections from excessively formalin-fixed tissues. Use intact cells for interpretation of staining results. Necrotic or degenerated cells often stain nonspecifically.

Patient Tissue:

Examine patient specimens stained with indicated antibody last. Positive staining intensity should be assessed within the context of any nonspecific background staining of the negative reagent control. As with any immunohistochemical test, a negative result means that the antigen was not detected, not that the antigen was absent in the cells/tissue assayed. If necessary, use a panel of antibodies to identify false-negative reactions.

Refer to Summary and Explanation, Limitations, and Performance Characteristics for specific information regarding indicated antibody immunoreactivity.

Limitations:

General Limitations:

1. For *in vitro* diagnostic (IVD) Use
2. This product is for professional use only: immunohistochemistry is a multistep diagnostic process that consists of specialized training in the selection of the appropriate reagents; tissue selection, fixation, and processing; preparation of the IHC slide; and interpretation of the staining results.
3. For use by physician prescription only. (Rx Only)

4. Tissue staining is dependent on the handling and processing of the tissue prior to staining. Improper fixation, freezing, thawing, washing, drying, heating, sectioning or contamination with other tissues or fluids may produce artifacts, antibody trapping, or false negative results. Inconsistent results may be due to variations in fixation and embedding methods, or to inherent irregularities within the tissue.¹³
5. Excessive or incomplete counterstaining may compromise proper interpretation of results.
6. The clinical interpretation of any positive or negative staining should be evaluated within the context of clinical presentation, morphology, and other histopathological criteria. The clinical interpretation of any positive or negative staining should be complemented by morphological studies using proper positive and negative internal and external controls as well as other diagnostic tests. It is the responsibility of a qualified pathologist who is familiar with the proper use of antibody, reagents, and methods to interpret all the steps used to prepare and interpret the final IHC preparation.
7. The optimum protocols for a specific application can vary. These include, but are not limited to fixation, heat-retrieval method, incubation times, antibody dilution, tissue section thickness and detection kit used. Refer to the antibody and other ancillary reagent instructions for use for recommended protocols and conditions for use. The data sheet recommendations and protocols, where available, are based on exclusive use of Biocare products. Ultimately, it is the responsibility of the investigator to determine optimal conditions.
8. This product is not intended for use in flow cytometry. Performance characteristics have not been determined for flow cytometry.
9. Tissues from persons infected with hepatitis B virus and containing hepatitis B surface antigen (HBsAg) may exhibit nonspecific staining with horseradish peroxidase.¹⁴
10. Reagents may demonstrate unexpected reactions in previously untested tissues. The possibility of unexpected reactions even in tested tissue groups cannot be completely eliminated due to biological variability of antigen expression in neoplasms, or other pathological tissues.¹⁵ Contact Biocare's Technical Support at 1-800-542-2002, or via the technical support information provided on biocare.net, with documented unexpected reaction(s).
11. Normal/nonimmune sera from the same animal source as secondary antisera used in blocking steps may cause false-negative or false-positive results.
12. False-positive results may be seen due to non-immunological binding of proteins or substrate reaction products. They may also be caused by pseudo peroxidase activity (erythrocytes), endogenous peroxidase activity (cytochrome C), or endogenous biotin (e.g., liver, breast, brain, kidney) depending on the type of immunostain used.¹³
13. A negative result means that the antigen was not detected, not that the antigen was absent in the cells or tissue examined.

Product Specific Limitations:

Performance Characteristics:

Staining was performed and evaluated using internally standardized protocols, across a range of normal and neoplastic tissue types during product development.

Reproducibility:

The reproducibility of Biocare's detection systems and system reagents is verified through a measurement of intermediate precision in which various reagent lots were tested over an extended period of time using various operators, analysts, reagent lots, tissue samples, and equipment. The staining obtained for each detection reagent evaluated was consistent and performed as expected.

Troubleshooting:

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1. No staining of any slides – Check to determine appropriate positive control tissue, antibody, and detection products have been used. Check for incomplete or improper wax removal or pretreatment.
2. Weak staining of all slides – Check to determine appropriate positive control tissue, antibody, and detection products have been used.
3. Excessive background of all slides – There may be high levels of endogenous HRP activity converting chromogen to colored end product (use peroxidase block), or excess non-specific protein interaction (use a protein block, such as serum- or casein-based blocking solution).
4. Tissue sections wash off slides during incubation – Check slides to ensure they are positively charged.
5. Specific staining too dark – Check protocol to determine if proper antibody titer was applied to slide, as well as proper incubation times for all reagents. Additionally, ensure the protocol has enough washing steps to remove excess reagents after incubation steps are completed.

References:

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5. Taylor CR, et al. *Biotech Histochem*. 1996 Jan;71(5):263-70.
6. Occupational Safety and Health Standards: Occupational exposure to hazardous chemicals in laboratories. (29 CFR Part 1910.1450). Fed. Register.
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8. Clinical and Laboratory Standards Institute (CLSI). *Protection of Laboratory Workers from Occupationally Acquired Infections; Approved Guideline-Fourth Edition* CLSI document M29-A4 Wayne, PA 2014.
9. CLSI *Quality Standards for Design and Implementation of Immunohistochemistry Assays; Approved Guideline-Second edition (I/LA28-A2)* CLSI Wayne, PA USA (www.clsi.org). 2011
10. College of American Pathologists (CAP) Certification Program for Immunohistochemistry. Northfield IL. [Http://www.cap.org](http://www.cap.org) (800) 323-4040.
11. O'Leary TJ, Edmonds P, Floyd AD, Mesa-Tejada R, Robinowitz M, Takes PA, Taylor CR. *Quality assurance for immunocytochemistry; Proposed guideline*. MM4-P. National Committee for Clinical Laboratory Standards (NCCLS). Wayne, PA. 1997;1-46.
12. Koretzik K, Lemain ET, Brandt I, and Moller P. *Metachromasia of 3-amino-9-ethylcarbazole (AEC) and its prevention in Immunoperoxidase techniques*. *Histochemistry* 1987; 86:471-478.
13. Nadji M, Morales AR. *Immunoperoxidase, part I: the techniques and its pitfalls*. *Lab Med* 1983; 14:767.
14. Omata M, Liew CT, Ashcavai M, Peters RL. *Nonimmunologic binding of horseradish peroxidase to hepatitis B surface antigen: a possible source of error in immunohistochemistry*. *AmJ Clin Path* 1980; 73:626.
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