

Probe Enhancer (RNA)

ISH Diluent Reagent
901-6024-042224

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Available Product Formats	
Catalog Number	Volume
BRI6024G10	10 mL

Intended Use:

For *in vitro* Diagnostic Use

The Probe Enhancer (RNA) is intended for laboratory professional use in the dilution of molecular probes targeting RNA sequences, as part of an *in situ* hybridization (ISH) procedure of formalin-fixed, paraffin-embedded (FFPE) tissues performed manually or on Biocare Medical's ONCORE Pro Automated Slide Stainer and visualized by light microscopy. 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:

Probe Enhancer (RNA) is an ancillary reagent that is used as a diluent for RNA targeting probes in an ISH procedure. Probe Enhancer (RNA) facilitates spreading of probes and reduces drying of RNA during hybridization reactions. Effective hybridization may facilitate enhanced staining and reduce artifacts.

Principle of Procedure:

This Probe Enhancer (RNA) may be used for *in situ* hybridization (ISH) testing of formalin-fixed, paraffin-embedded tissue sections. Chromogenic *in situ* hybridization (CISH) permits the visual identification of specific mRNA nucleic acid sequences in tissues. Following pretreatment of the FFPE tissue and the application of the probe, the presence of a target nucleic acid is visualized by the sequential application of a secondary reagent that binds the digoxigenin labeled probe, followed by a tertiary enzyme antibody conjugate, and a chromogen reagent, to produce a colored reaction product that is visible by light microscopy.

Materials and Methods:

Reagents Provided:

Kit Catalog No.	Component Description	Quantity x Volume
BRI6024G10	Probe Enhancer (RNA)	1 x 10 mL

Reconstitution, Mixing, Dilution, Titration:

The Probe Enhancer (RNA) kit reagent(s) are optimized and ready to use with Biocare ISH probes and ancillary reagents. No reconstitution, mixing, dilution, or titration is required.

Known Applications:

in situ hybridization (formalin-fixed paraffin-embedded tissues)

Supplied As:

Buffered hybridization solution with less than 0.1% sodium azide preservative. See Safety Data Sheet for additional details.

Materials and Reagents Required but Not Provided:

Microscope slides, positively charged
Positive and negative tissue controls
Desert Chamber* or similar Drying oven (optional)
Xylene (Could be substituted with xylene substitute*)
Ethanol or reagent alcohol
Decloaking Chamber* or similar pressure cooker (optional)
Deionized or distilled water
Wash buffer* (TBS)
Pretreatment reagents* (optional)

Enzyme digestion* (optional)
Peroxidase block* (optional)
Protein block* (optional)
ISH Probe*
Negative control reagents*
ISH Detection Reagents*
Chromogens*
Hematoxylin* (counterstain)
Bluing reagent*
Mounting medium*
Coverglass
Light Microscope (40-400X magnification)
ONCORE Pro Automated Slide Stainer*

* 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 products are stable to the expiration date printed on the 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 probe 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.^{1,2}

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) and ISH has been shown to minimize inconsistency and standardize staining.^{4,5,6,7}

Warning and Precautions:

- Kit reagent(s) contain less than 0.1% sodium azide. Concentrations less than 0.1% are not reportable hazardous materials according to U.S. 29 CFR 1910.1200, OSHA Hazard communication and EC Directive 91/155/EC. Sodium azide (NaN₃) used as a preservative is toxic if ingested. Sodium azide may react with lead and copper plumbing to form highly explosive metal azides. Upon disposal, flush with large volumes of water to prevent azide build-up in plumbing. (Center for Disease Control, 1976, National Institute of Occupational Safety and Health, 1976)⁸
- 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.^{9,10}
- 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 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.¹¹



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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 Probe Enhancer (RNA) kit reagent(s) are optimized and ready to use with Biocare ISH probes and ancillary reagents. Refer to the ISH probes 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.

Instructions for Use:

The Probe Enhancer (RNA) reagent(s) are optimized and ready to use with Biocare ISH probes and ancillary reagents. Refer to the ISH probe and other ancillary reagent instructions for conditions for use. Incubation times and temperatures will vary depending on the probe and test design.

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

Heat Probe Enhancer (RNA) prior to each use by placing in a 60°C oven for 5-7 minutes to reduce solution viscosity. Be sure the reagent vial is tightly closed before placing in the oven. Invert the vial several times and shake the reagent down after preheating. Delayed start of the staining process is not recommended for ISH procedures.

Quality Control:

Refer to CLSI Quality Standards for Design and Implementation of Immunochemistry Assays; Approved Guideline-Second edition (I/LA28-A2) CLSI Wayne, PA USA (www.clsi.org). 2011¹²

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 probe sensitivity from instability or problems with the ISH 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 ISH probe for demonstration of the target RNA, 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 ISH's 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 probe with a section of each patient specimen to evaluate nonspecific staining and allow better interpretation of specific staining at the RNA site. Ideally, a negative reagent control contains a probe produced and prepared (i.e., diluted to same concentration using same diluent) for use in the same way as the probe but exhibits no specific reactivity with human tissues in the same matrix/solution as the Biocare probe. 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 probe.

When panels of several probes are used on serial sections, the negatively staining areas of one slide may serve as a negative/nonspecific binding background control for other probes. 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 a probe or staining system in a diagnostic procedure, the user should verify the probe'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 Program¹³ for Immunohistochemistry and/or the NCCLS IHC guideline¹⁴ and In Situ Hybridization (ISH) guidelines⁶. These quality control procedures should be repeated for each new probe lot, or whenever there is a change in assay parameters.

Troubleshooting:

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

Interpretation of Staining:

An ISH probe works in conjunction with ancillary reagents to produce a colored reaction at the RNA sites localized by the probe. Diluent ancillary reagents assist with providing a pH buffered environment to facilitate probe binding in the probe-RNA 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 probe 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.¹⁵

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:

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The negative tissue control should be examined after the positive tissue control to verify the specificity of the labeling of the target RNA by the probe. The absence of specific staining in the negative tissue control confirms the lack of probe 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 probe 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 RNA was not detected, not that the RNA was absent in the cells/tissue assayed. If necessary, use a panel of probes to identify false-negative reactions.

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

Limitations:

General Limitations:

1. For *in vitro* diagnostic (IVD) Use
2. This product is for professional use only; *in situ* hybridization 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 ISH 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, probe trapping, or false negative results. Inconsistent results may be due to variations in fixation and embedding methods, or to inherent irregularities within the tissue.¹⁶
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 ISH probes, reagents, and methods to interpret all the steps used to prepare and interpret the final ISH preparation.
7. The optimum protocols for a specific application can vary. These include, but are not limited to fixation, heat-retrieval method, incubation times, probe dilution, tissue section thickness and detection kit used. Refer to the probe 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.¹⁷
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

RNA expression in neoplasms, or other pathological tissues.¹⁸ 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.¹⁶
13. A negative result means that the <DNA/RNA> was not detected, not that the RNA was absent in the cells or tissue examined.

Product Specific Limitations:

Heat Probe Enhancer (RNA) prior to each use by placing in a 60°C oven for 5-7 minutes to reduce solution viscosity. Be sure the reagent vial is tightly closed before placing in the oven. Invert the vial several times and shake the reagent down after preheating.

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:

1. No staining of any slides – Check to determine appropriate positive control tissue, probe, 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, probe, 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 probe 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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