MANUAL

TSA® Research Reagents

Research Use Only. Not for use in diagnostic procedures.

TSA Fluorescence Systems

Material Provided

	Format*	Catalog #	Kit Components
TSA Fluorescein	50-150 slides	NEL701A001KT	• 1X Amplification Diluent (15 mL) • Fluorescein Tyramide (dry, dissolve in 300 µL DMSO) • Streptavidin-HRP (150 µL) • Blocking Reagent (3 g)
	100-300 slides	NEL701001KT	• 1X Amplification Diluent (30 mL) • Fluorescein Tyramide (dry, dissolve in 600 µL DMSO) • Streptavidin-HRP (2 x 150 µL) • Blocking Reagent (10 g)
	100-300 slides	SAT701001EA	• 1X Amplification Diluent (30 mL) • Fluorescein Tyramide (dry, dissolve in 600 µL DMSO)
	500-1500 slides	SAT701B001EA	• 1X Amplification Diluent (2 x 75 mL) • Fluorescein Tyramide (5 tubes, dry, dissolve in 600 µL DMSO/tube)
TSA Tetramethylrhodamine	100-300 slides	NEL702001KT	• 1X Amplification Diluent (30 mL) • Tetramethylrhodamine Tyramide (dry, dissolve in 600 µL DMSO) • Streptavidin-HRP (2 x 150 µL) • Blocking Reagent (10 g)
	100-300 slides	SAT702001EA	• 1X Amplification Diluent (30 mL) • Tetramethylrhodamine Tyramide (dry, dissolve in 600 µL DMSO)
TSA Coumarin	100-300 slides	NEL703001KT	• 1X Amplification Diluent (30 mL) • Coumarin Tyramide (dry, dissolve in 600 µL DMSO) • Streptavidin-HRP (2 x 150 µL) • Blocking Reagent (10 g)
TSA Cyanine 3	50-150 slides	NEL704A001KT	• 1X Amplification Diluent (15 mL) • Cyanine 3 Tyramide (dry, dissolve in 300 µL water) • Streptavidin-HRP (150 µL) • Blocking Reagent (3 g)
	50-150 slides	SAT704A001EA	• 1X Amplification Diluent (15 mL) • Cyanine 3 Tyramide (dry, dissolve in 300 µL water)
	250-750 slides	SAT704B001EA	• 1X Amplification Diluent (75 mL) • Cyanine 3 Tyramide (5 tubes, dry, dissolve in 300 µL water)
TSA Cyanine 5	50-150 slides	NEL705A001KT	• 1X Amplification Diluent (15 mL) • Cyanine 5 Tyramide (dry, dissolve in 300 µL water) • Streptavidin-HRP (150 µL) • Blocking Reagent (3 g)
	50-150 slides	SAT705A001EA	• 1X Amplification Diluent (15 mL) • Cyanine 5 Tyramide (dry, dissolve in 300 µL water)

*The format of the kit is based on 100 - 300 µL per slide of Fluorophore Tyramide Working Solution (see page 3).

Product Information

Storage: Store kits in the dark at 4ºC.

Stability: The components in the kits are stable for a minimum of 3 months under proper storage conditions.

Application: TSA Fluorescence kits are intended for high sensitivity detection in immunohistochemistry (IHC), immunocytochemistry (ICC) and *in situ* hybridization (ISH) experiments. Final detection may be fluorescent or chromogenic (with TSA Fluorescein kits only).

FOR RESEARCH USE ONLY.

Safety Note

All reagents are classified as nonhazardous. However, it is strongly recommended to wear disposable gloves and safety glasses while working. Thorough washing of hands after handling is also recommended.

Quality Control

We certify that QC results of these reagents meet our quality release criteria.

What is TSA technology?

Tyramide Signal Amplification (TSA™) from PerkinElmer is a technology that improves sensitivity by up to 100-fold sensitivity while allowing reduced consumption of primary antibodies or probes.

TSA Fluorescence Kits use horseradish peroxidase (HRP) to catalyze covalent deposition of fluorophores directly adjacent to the immobilized enzyme. The labeling reaction is quick (less than 10 minutes) and deposited labels can then be viewed directly using standard or confocal microscopy. TSA Fluorescein may also be used in combination with anti-fluorescein enzyme conjugates and appropriate chromogenic substrates for brightfield microscopy.

The use of TSA reagents results in a significant increase in sensitivity over standard detection methods, while maintaining specificity and resolution. Moreover, TSA reagents allow drastically reduced consumption of primary antibody or probe.

Reagents and Materials

Critical Reagents Required but not Supplied

- Depending upon your assay, additional HRP-labelled reagent to drive the signal amplification reaction may be required. For example:
    - Anti-digoxigenin-HRP for use with digoxigenin labeled probes or antibodies (cat. no. NEF832001EA)
    - Anti-fluorescein-HRP for use with fluorescein labeled probes or antibodies (cat. no. NEF710001EA)
    - HRP-conjugated anti-species secondary antibody
        - Anti-rabbit IgG (goat) HRP (cat. no. NEF812001EA)
        - Anti-mouse IgG (goat) HRP (cat. no. NEF822001EA)
- DMSO (molecular biology or HPLC grade)
- Buffer components and detergents such as PBS, Triton-X100, Tween-20
- Blocking Reagent (cat. no. FP1012 or equivalent)

Solutions to prepare

The following buffers and reagents are required for slide preparation and signal amplification

Fluorophore Tyramide Stock Solution
Fluorophore Tyramide Reagent is supplied as a solid. Each vial must be reconstituted with DMSO or water as indicated to make Fluorophore Tyramide Stock Solution. Fluorophore Tyramide Stock Solution is stable for at least 3 months when stored at 4ºC. (Note: DMSO freezes at 4ºC; therefore, thaw Stock Solution before each use). Here are recommended dissolution volumes for stock solutions.

	Catalog #	Tyramide Stock Solution Preparation
TSA Fluorescein	NEL701A001KT	Add 300 µL DMSO to reagent tube
	NEL701001KT	Add 600 µL DMSO to reagent tube
	SAT701001EA	Add 600 µL DMSO to reagent tube
	SAT701B001EA	Add 600 µL DMSO to reagent tube
TSA Tetramethylrhodamine	NEL702001KT	Add 600 µL DMSO to reagent tube
	SAT702001EA	Add 600 µL DMSO to reagent tube
TSA Coumarin	NEL703001KT	Add 600 µL DMSO to reagent tube
TSA Cyanine 3	NEL704A001KT	Add 300 µL water to reagent tube
	SAT704A001EA	Add 300 µL water to reagent tube
	SAT704B001EA	Add 300 µL water to reagent tube
TSA Cyanine 5	NEL705A001KT	Add 300 µL water to reagent tube
	SAT705A001EA	Add 300 µL water to reagent tube

TNT Wash Buffer
0.1 M TRIS-HCl, pH 7.5
0.15 M NaCl
0.05% Tween®20
Other wash buffers (such as PBS) may be used. Substitution of 0.3% Triton X-100 for the 0.05% Tween-20 is also possible. Users should validate the use of alternative wash buffers with their own systems.

TNB Blocking Buffer
0.1 M TRIS-HCl, pH 7.5
0.15 M NaCl
0.5% Blocking Reagent (available separately, catalog number FP1012)
Add Blocking Reagent slowly in small increments to buffer while stirring. Heat gradually to 55°C with continuous stirring to completely dissolve the Blocking Reagent. (This should take no longer than 30-60 minutes.) The solution will appear milky. Bring to room temperature before using. Aliquot and store at -20°C for long term use.

Fluorophore Tyramide Working Solution
Before each procedure, dilute Fluorophore Tyramide Stock Solution1:50 in 1X Amplification Diluent to make Fluorophore Tyramide Working Solution. Approximately 100-300 µL of Fluorophore Tyramide Working Solution is required per slide. Discard any unused portion of Fluorophore Tyramide Working Solution.

Recommendations

- Do not let slides dry out between steps.
- A humidified chamber is recommended for all incubation steps (i.e., a damp paper towel in a covered box).
- Drain off as much of the incubation solutions as possible, before the addition of the next solution, to prevent reagent dilution and uneven staining. Blot area around, but not on, tissue section using a tissue.
- Be sure to use enough volume of each reagent to completely cover sections or cells.
- Optional: Use of coverslips may reduce reagent evaporation, especially during steps which require long incubation at elevated temperatures (such as probe hybridization). However care must be taken upon removal to prevent damage to tissues or cells.
- If your assay includes streptavidin conjugates, check for endogenous biotin which may be a source of non-specific background.
- If there is too much signal, dilute the primary antibody, probe or HRP conjugate further. TSA kits are designed for use at 1:50 dilution of the tyramide reagent for optimal results.
- First time users should apply TSA to a proven system.

Quenching Endogenous Peroxidase

Activation and covalent binding of TSA reagent is catalyzed by peroxidase. Endogenous peroxidase will be a source of background, and should be quenched if present. Users should establish the need for doing this and optimal methodology specific to the tissues or cells being stained. Options include:

- 0.3% H_2O_2 to 3% H_2O_2 in PBS, incubation for 10 to 60 minutes
- 0.3% H_2O_2 to 3% H_2O_2 in Methanol, incubation for 10 to 60 minutes

For paraffin-embedded tissues, quenching can be done after dewaxing and alcohol rehydration but before the protease digestion step. For frozen tissue or cell preps, quenching can be done following fixation and before the protease digestion step. After quenching wash with TNT or 1X PBS buffer for 5 minutes. See Li *et al* from references section for more suggestions.

TSA-ISH Optimization

Inadequate optimization of probe and HRP conjugate dilution may be a source of high background and reduced signal.

TSA is ideal for detection of targets that have weak signals using standard detection methods. If the signal is strong with standard detection methods, dilute the probe until the signal begins to disappear and then proceed with TSA optimization.

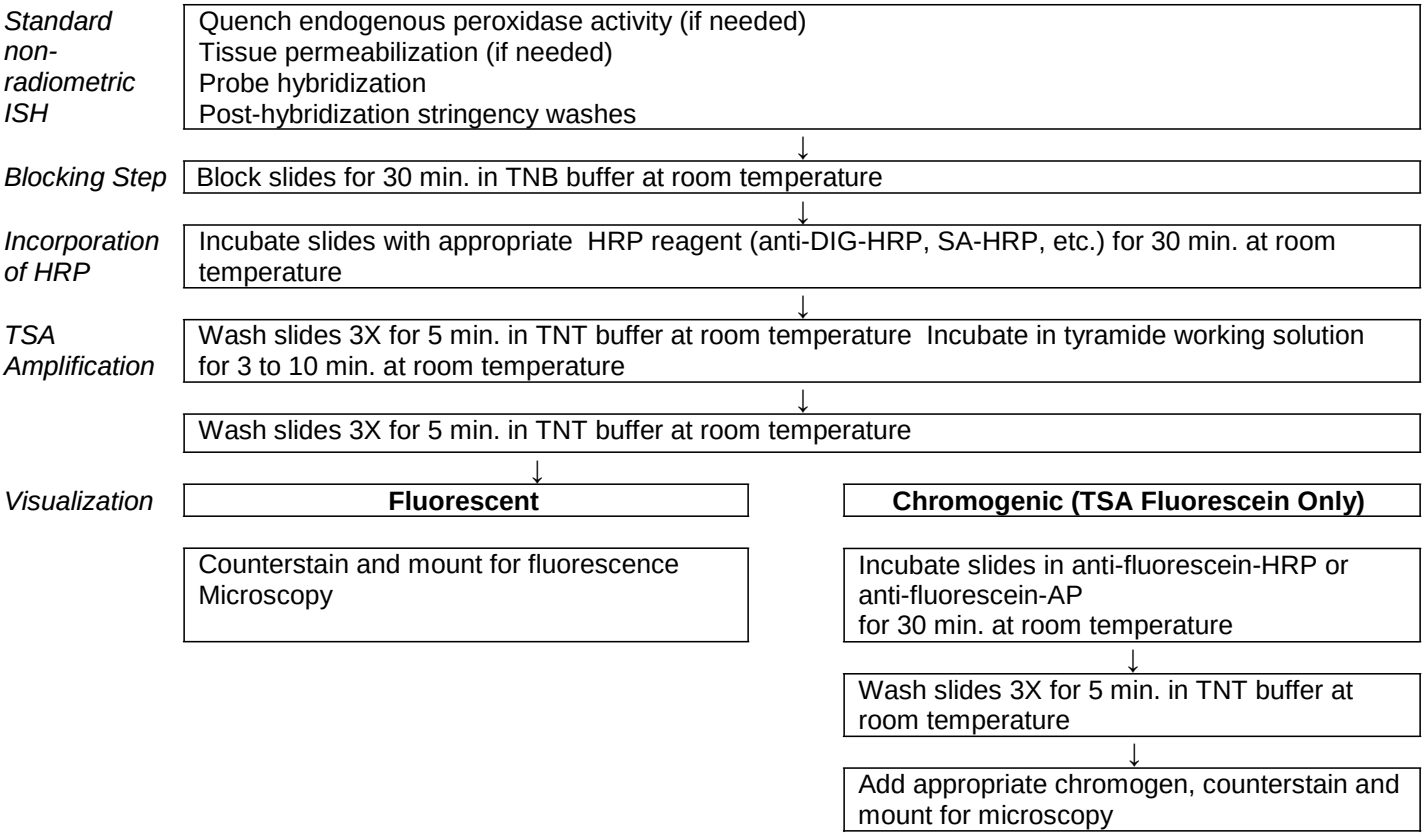
Probe Optimization

- Slide 1: use same probe dilution as standard method.
- Slide 2: 5-fold dilution from slide 1
- Slide 3: 2-fold dilution from slide 2 (further dilution may be necessary)
- Slide 4: negative control (probe omitted)

HRP Conjugate Dilution

- SA-HRP included with TSA Systems: 1:100 dilution
- Streptavidin-HRP (catalog number NEL750001EA): 1:250-1:1000 dilution
- Anti-fluorescein-HRP (catalog number NEF710001EA): 1:100-1:500 dilution
- Anti-DNP-HRP (catalog number FP1129): 1:100-1:500 dilution
- Anti-digoxigenin-HRP (catalog number NEF832001EA): 1:500-1:5000 dilution
- HRP reagents from other manufacturers: Begin with recommended range for slide applications. Further dilution may be needed

TSA-ISH Protocol Overview



Step by Step TSA-ISH Protocol

Step 1: Slide Preparation
Prepare tissues or cells using standard fixation and embedding techniques. Dewax and rehydrate slides according to standard procedures.

Step 2: Standard Non-radioactive ISH
Follow standard non-radioactive in situ hybridization techniques. Include tissue permeabilization (if needed) and quenching of endogenous peroxidase activity (if needed). Probe hybridization (with digoxigenin, biotin, DNP, or fluorescein-labeled probes) should be done using at concentration determined in optimization studies followed by post-hybridization stringency washes.
NOTE: Always run an unamplified control slide and an amplified negative control slide with each experiment.

Step 3: Blocking Step
Cover tissue sections with TNB buffer (or other validated blocking buffer) and incubate slides in a humidified chamber for 30-60 minutes at room temperature or at 4ºC overnight.

Step 4: Introduction of HRP
Incubate slides for 30 minutes at room temperature or at 4ºC overnight in a humidified chamber with appropriate HRP-labeled reagent. Use adequate reagent volume to cover the tissue section, generally 100-300 µL per slide.

- For DIG-labeled probes, use anti-digoxigenin-HRP (catalog number NEF832001EA) diluted in TNB Buffer (or other validated blocking buffer) to concentration determined in optimization studies.
- For biotin-labeled probes, use SA-HRP (catalog number NEL750001EA) diluted in TNB Buffer (or other validated blocking buffer) to concentration determined in optimization studies.
- For fluorescein-labeled probes, use anti-fluorescein-HRP (catalog number NEF710001EA) diluted in TNB Buffer (or other validated blocking buffer) to concentration determined in optimization studies.
- For DNP-labeled probes, use anti-DNP-HRP (catalog number FP1129) diluted in TNB Buffer (or other validated blocking buffer) to concentration determined in optimization studies.

Step 5: Wash
Wash the slides 3X for 5 minutes each in TNT Buffer (or other validated wash buffer) at room temperature with agitation.

Step 6: Amplification
Pipette Fluorophore Tyramide Working Solution onto each slide. Use enough working solution to completely cover the tissue section, generally 100-300 µL per slide. Incubate the slides at room temperature for 3 to 10 minutes.

Step 7: Wash
Wash the slides 3X for 5 minutes each in TNT buffer (or other validated wash buffer) at room temperature with agitation.

Step 8: Visualization of Deposited Fluorophores

For fluorescent detection, counterstain and mount for fluorescence microscopy. (See page 10 table, Fluorophore Excitation and Emission Maxima.)

For chromogenic detection with TSA Fluorescein, incubate slides with anti-fluorescein-HRP (NEF710001EA) or anti-fluorescein-AP (NEF709001PK) followed by detection with an appropriate chromogenic substrate.

TSA-IHC Optimization

Inadequate optimization of primary antibody and HRP conjugate dilution may be a source of high background and reduced signal.

TSA is ideal for detection of targets that have weak signals with standard detection methods. It enables use of much more dilute antibody solutions for improved specificity. If the signal is strong with standard detection methods, dilute the primary antibody until the signal begins to disappear and then proceed with TSA optimization.

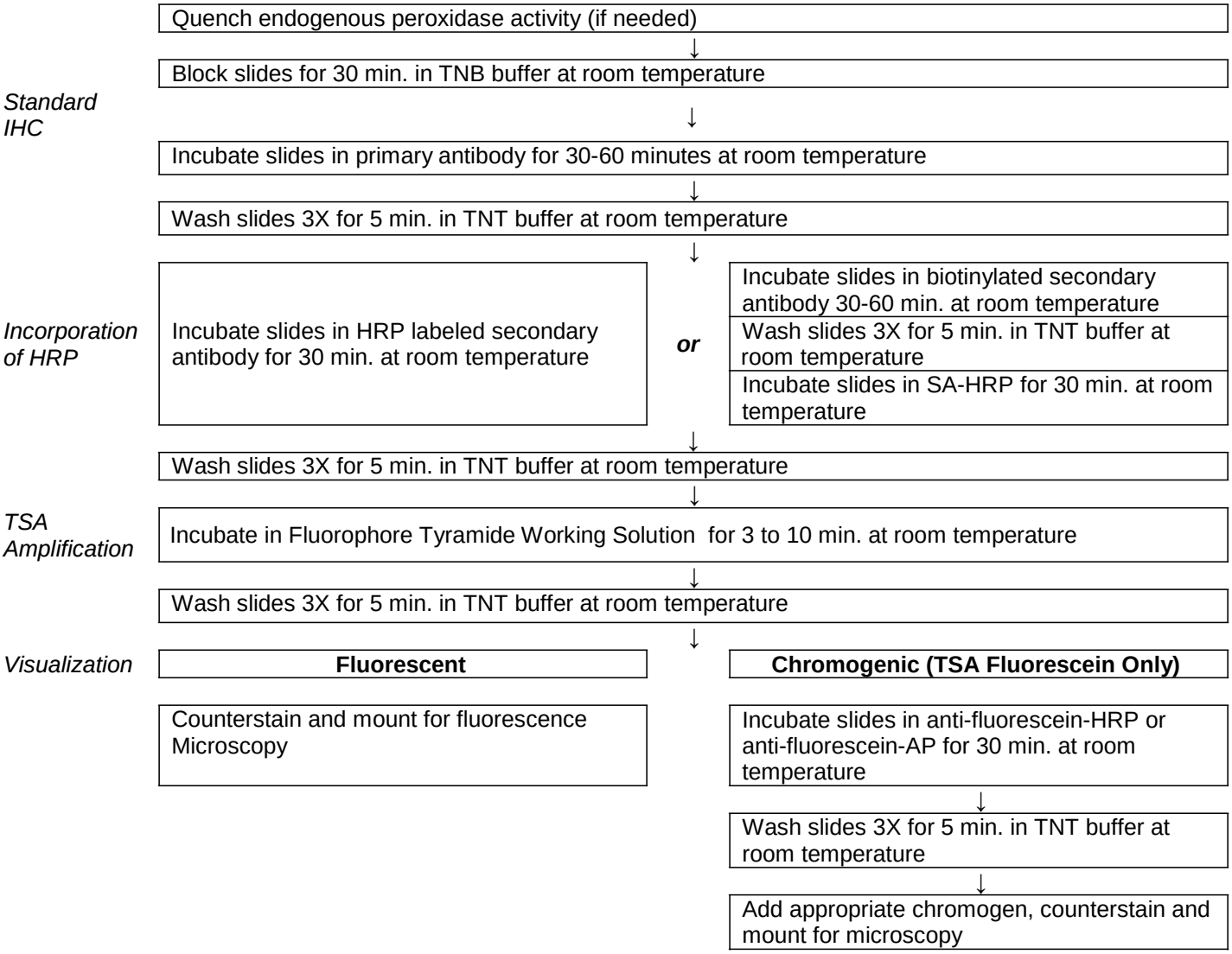
Primary Antibody Optimization

- Slide 1: use same antibody dilution as standard method.
- Slide 2: 5-fold dilution from slide 1
- Slide 3: 5-fold dilution from slide 2
- Slide 4: 5-fold dilution from slide 3 (further dilution may be necessary)
- Slide 5: negative control (primary antibody omitted)

HRP Conjugate Dilution

- SA-HRP included with TSA Systems: 1:100 dilution
- Anti-mouse-HRP (catalog number NEF822001EA): 1:500 to 1:2000 dilution
- Anti-rabbit-HRP (catalog number NEF812001EA): 1:500 to 1:2000 dilution
- Streptavidin-HRP (catalog number NEL750001EA): 1:1250-1:2500 dilution
- Anti-fluorescein-HRP (catalog number NEF710001EA): 1:100-1:500 dilution
- HRP reagents from other manufacturers: Begin with recommended range for slide applications. Further dilution may be needed

TSA-IHC Protocol Overview



Step by Step TSA-IHC Protocol

Step 1: Slide Preparation
Prepare tissues or cells for detection with TSA using standard fixation and embedding techniques. Dewax and rehydrate using standard protocols. Quench endogenous peroxidase activity if necessary.
NOTE: Always run an unamplified control slide and an amplified negative control slide with each experiment.

Step 2: Blocking Step
Cover tissue sections with TNB buffer (or other validated blocking buffer) and incubate slides in a humidified chamber for 30-60 minutes at room temperature or at 4ºC overnight.

Step 3: Primary Antibody Incubation
Drain off the blocking buffer and apply primary antibody, diluted in TNB Buffer (or other validated blocking buffer). Incubate the primary antibody preparation per the manufacturer's instructions regarding incubation time and temperature

requirements. Use enough volume to completely cover the tissue section (generally 100-300 µL per slide) at the concentration determined in optimization studies.

Step 4: Wash
Wash the slides 3X for 5 minutes each in TNT Buffer (or other validated wash buffer) at room temperature with agitation.

Step 5: Introduction of HRP
Incubate slides for 30 minutes at room temperature or at 4ºC overnight in a humidified chamber with appropriate HRP-labeled reagent. Use adequate reagent volume to cover the tissue section, generally 100-300 µL per slide. Options include.

- HRP labeled secondary antibody diluted in TNB Buffer (or other validated blocking buffer).
- 100-300 µL of biotinylated secondary antibody diluted in TNB Buffer (or other validated blocking buffer). Incubate 30-60 minutes in a humidified chamber. Wash the slides for 3 X 5 minutes TNT buffer at room temperature with agitation. Follow by 100-300 µL of SA-HRP diluted in TNB Buffer. Use SA-HRP at 1:100 dilution, or at 1:2000 if using PerkinElmer Cat. # NEL750001EA.
- When using alternative suppliers, reagents should be optimized for use with TSA starting with manufacturer's recommended dilutions. Incubate slides in a humidified chamber for 30-60 minutes at room temperature or at 4ºC overnight.

Step 6: Wash
Wash the slides 3X for 5 minutes each in TNT Buffer (or other validated wash buffer) at room temperature with agitation.

Step 7: Amplification
Pipette 100-300 µL of Fluorophore Tyramide Working Solution onto each slide. Incubate the slides at room temperature for 3 to 10 minutes.

Step 8: Wash
Wash the slides 3X for 5 minutes each in TNT Buffer (or other validated wash buffer) at room temperature with agitation.

Step 9: Visualization of Deposited Fluorophores

For fluorescent detection, counterstain and mount for fluorescence microscopy. (See page 10 table, Fluorophore Excitation and Emission Maxima.)

For chromogenic detection with TSA Fluorescein, incubate slides with anti-fluorescein-HRP (NEF710001EA) or anti-fluorescein-AP (NEF709001PK) followed by detection with an appropriate chromogenic substrate.

Troubleshooting

Technical Support Resources

- **Email:** **global.techsupport@perkinelmer.com**
- **Telephone**
  - **USA toll-free** **800-762-4000**
  - **EU toll-free** **00800 33 29 0000**
  - **Finland toll-free** **999 800 33 29 0000**
  - **China toll-free** **800 820 5046**

ISH Troubleshooting

PROBLEM	REMEDY
Low Signal	• Optimize probe concentration. • Titer HRP conjugate to determine optimum concentration for signal amplification. • Add tissue permeabilization step to facilitate penetration of reagents. • Lengthen incubation time for Fluorophore Tyramide Working Solution. • Consider TSA Plus reagents for higher signal.
Excess Signal	• Decrease concentration of HRP conjugate introduced prior to amplification. • Decrease probe concentration. • Decrease Fluorophore Tyramide Working Solution incubation time. • Decrease concentration of anti-fluorescein-enzyme conjugate used for chromogenic visualization.
High Background	• Decrease probe concentration. • Decrease concentration of HRP conjugate. • Check for endogenous biotin (if using streptavidin conjugates) • Shorten chromogenic development time. • Lengthen endogenous peroxidase quenching step. • Filter buffers. • Increase number and/or length of washes. • Nonqualified or contaminated blocking reagent used. Use PerkinElmer Blocking Reagent (FP1020 or FP1012).

IHC Troubleshooting

PROBLEM	REMEDY
Low Signal	• Titer primary and/or secondary antibodies to determine optimum concentration for signal amplification • Lengthen incubation time for Fluorophore Tyramide Working Solution. • Use antigen retrieval techniques to unmask the target. • Consider TSA Plus reagents for higher signal.
Excess Signal	• Decrease concentration of primary and/or secondary antibody or HRP conjugates. • Decrease Fluorophore Tyramide Working Solution incubation time. • Decrease concentration of anti-fluorescein-enzyme conjugate used for chromogenic visualization..
High Background	• Filter buffers • Decrease concentration of primary and/or secondary antibody or HRP conjugates. • Lengthen endogenous peroxidase quenching step. • Check for endogenous biotin (if using streptavidin conjugates) • Increase number and/or length of washes. Shorten chromogenic development time. • Nonqualified or contaminated blocking reagent used. Use PerkinElmer Blocking Reagent (FP1020 or FP1012).

Selected References

A quantitative evaluation of peroxidase inhibitors for tyramide signal amplification mediated cytochemistry and histochemistry
G. Li, S. Amin, N. N. Okuhama, G. Liao, L. A. Mingle
Histochem Cell Biol (2006)
http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1713225

Dual Fluorescent In Situ Hybridization and Immunohistochemical Detection with Tyramide Signal Amplification
Aliya U. Zaidi, Hideki Enomoto, Jeffrey Milbrandt, and Kevin A. Roth
J Histochem Cytochem. (2000)
http://www.ncbi.nlm.nih.gov/pubmed/10990490

Zebrafish Whole Mount High-Resolution Double Fluorescent In Situ Hybridization
Tim Brend, Scott A. Holley J Vis Exp. (2009)
http://www.ncbi.nlm.nih.gov/pubmed/19322135

Genomic Anatomy of the Hippocampus
Carol L. Thompson, Sayan D. Pathak, Andreas Jeromin, Lydia L. Ng, Cameron R. MacPherson, Marty T. Mortrud, Allison Cusick, Zackery L. Riley, Susan M. Sunkin, Amy Bernard, Ralph B. Puchalski, Fred H. Gage, Allan R. Jones, Vladimir B. Bajic, Michael J. Hawrylycz and Ed S. Lein
Neuron. (2008)
http://www.ncbi.nlm.nih.gov/sites/entrez/19109908?dopt=Abstract&holding=f1000,f1000m,isrctn

Detection of microRNAs in frozen tissue sections by fluorescence in situ hybridization using locked nucleic acid probes and tyramide signal amplification
Asli N Silahtaroglu, Dorrit Nolting, Lars Dyrskjøt, Eugene Berezikov, Morten Møller, Niels Tommerup & Sakari Kauppinen
Nat Protoc. (2007)
http://www.ncbi.nlm.nih.gov/pubmed/17947994

Introduction of Tyramide Signal Amplification (TSA) to Pre-embedding Nanogold–Silver Staining at the Electron Microscopic Level
Seung-won Lee, Song Eun Lee, Seong Hyuk Ko, Eun Kyoung Hong, Kwang Il Nam, Kei-ichiro Nakamura, Shuhei Imayama, Yeong-Joon Park, Kyu Youn Ahn, Choon Sang Bae, Baik Yoon Kim, and Sung Sik Park
J Histochem Cytochem. (2005)
http://www.ncbi.nlm.nih.gov/pubmed/15684338

Fluorophore Excitation and Emission Maxima

Fluorophore	Excitation	Emission
Coumarin	402 nm	443 nm
Fluorescein	494 nm	517 nm
Tetramethylrhodamine	550 nm	570 nm
Cyanine 3	550 nm	570 nm
Cyanine 5	648 nm	667 nm

Complementary Products

TSA Blocking Reagent	3 g	FP1020
	10 g	FP1012
Horseradish Peroxidase Reagents		
Anti-rabbit IgG (goat) HRP	1 mL	NEF812001EA
Anti-rabbit IgG (goat) HRP	100 µL	NEF812E001EA
Anti-mouse IgG (goat) HRP	1 mL	NEF822001EA
Anti-mouse IgG (goat) HRP	100 µL	NEF822E001EA
Anti-human IgG (goat)* HRP	1 mL	NEF802001EA
Anti-DNP-HRP	150 µL	FP1129
Antifluorescein-HRP	2x250µL	NEF710001EA
Streptavidin-HRP	2x250µL	NEL750001EA
Anti-digoxigigenin HRP	500 µL	NEF832001EA
Biotin Conjugates		
Anti-rabbit IgG (goat) biotin	1 mL	NEF813001EA
Anti-mouse IgG (goat) biotin	1 mL	NEF823001EA
Anti-human IgG (goat) biotin	1 mL	NEF803001EA
Anti-digoxigigenin biotin	500 µL	NEF833001EA
Labeled Streptavidin		
Streptavidin Fluorescein	1 mL	NEL720001EA
Streptavidin Texas Red®	1 mL	NEL721001EA
Streptavidin Coumarin	1 mL	NEL722001EA
Streptavidin-HRP	2x250µL	NEL750001EA
Streptavidin-AP	2x250µL	NEL751001EA
Chromogens		
BCIP/NBT Substrate	For detection of Alkaline Phosphatase	NEL937001PK
DAB Substrate	For detection of Horseradish Peroxidase	NEL938001EA
Alkaline Phosphatase Reagents		
Anti-Mouse IgG (Goat), AP-Labeled	1 mL	NEF824001EA
Anti-Rabbit IgG (Goat), AP-Labeled	1 mL	NEF814001EA
Streptavidin- AP Conjugate	2x250µL	NEL751001EA
Antifluorescein-AP Conjugate	2x250µL	NEF709001PK
Anti-DNP-AP	150 µL	FP1131

Hapten Labeled Deoxynucleotides (25 nmol, for labeling of ISH probes)		
3-Amino-3-Deoxydigoxigenin-9-dCTP	25 nmol	NEL562001EA
Biotin-11-dATP	25 nmol	NEL540001EA
Biotin-11-dCTP	25 nmol	NEL538001EA
Biotin-11-dGTP	25 nmol	NEL541001EA
Biotin-11-dUTP	25 nmol	NEL539001EA
DNP-11-dUTP	25 nmol	NEL551001EA
Fluorescein-12-dATP	25 nmol	NEL465001EA
Fluorescein-12-dCTP	25 nmol	NEL424001EA
Fluorescein-12-dGTP	25 nmol	NEL429001EA
Fluorescein-12-dUTP	25 nmol	NEL413001EA
Hapten Labeled Ribonucleotides (25 nmol, for labeling of ISH probes)		
Biotin-11-ATP	250 nmol	NEL544001EA
Biotin-11-CTP	250 nmol	NEL542001EA
Biotin-11-GTP	250 nmol	NEL545001EA
Biotin-11-UTP	250 nmol	NEL543001EA
Fluorescein-12-ATP	250 nmol	NEL439001EA
Fluorescein-12-CTP	250 nmol	NEL434001EA
Fluorescein-12-GTP	250 nmol	NEL496001EA
Fluorescein-12-UTP	250 nmol	NEL414001EA

TSA Cyanine 3 and 5 reagents and related methods are covered by U.S. Patent 5,688,966 and international equivalents thereof.

For Research use only. This product is distributed and sold for research purposes only by the end-user in the research market, and, to that extent, by purchasing this product the end-user is granted a limited license to use this product for research use only. This product is not intended for diagnostic or therapeutic use and no license or right is granted for use of this product for diagnostic or therapeutic purposes. Purchase does not include or carry any right or license to use, develop or otherwise exploit this product commercially. Any commercial use, development or exploitation of this product without the express prior written authorization of PerkinElmer is strictly prohibited and may constitute infringement of the intellectual property rights of PerkinElmer under the aforementioned patents.

TSA is a registered trademark of PerkinElmer. Other trademarks are property of their respective owners.