

Proteome Profiler[™] Array

Human Phospho-RTK Array Kit

Catalog Number ARY001B

For the parallel determination of the relative level of tyrosine phosphorylation of human receptor tyrosine kinases (RTKs).

This package insert must be read in its entirety before using this product.
For research use only. Not for use in diagnostic procedures.

TABLE OF CONTENTS

SECTION	PAGE
INTRODUCTION	1
PRINCIPLE OF THE ASSAY	1
TECHNICAL HINTS	1
MATERIALS PROVIDED & STORAGE CONDITIONS	2
OTHER SUPPLIES REQUIRED	2
PRECAUTIONS.....	2
SAMPLE COLLECTION & STORAGE	3
REAGENT PREPARATION	3
ARRAY PROCEDURE	4
DATA ANALYSIS	6
PROFILING RTK TYROSINE PHOSPHORYLATION	7
INHIBITION	8
SPECIFICITY	10
SENSITIVITY	11
APPENDIX	12

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INTRODUCTION

The Human Phospho-Receptor Tyrosine Kinase (Phospho-RTK) Array is a rapid, sensitive, and economical tool used to detect changes in phosphorylation between samples. The development of protein array technology allows the screening of 49 different phosphorylated human RTKs without performing numerous immunoprecipitations and Western blots. Each capture antibody was carefully selected by using lysate samples prepared from ligand-treated cell lines known to express the target receptor or cell lines transfected with a cDNA encoding a particular RTK. Recombinant tyrosine phosphorylated RTKs were used to choose capture antibodies when ligand-treated lysates were not available.

PRINCIPLE OF THE ASSAY

Capture and control antibodies have been spotted in duplicate on nitrocellulose membranes. Cell lysates are diluted and incubated with the Human Phospho-RTK Array. After binding the extracellular domain of both phosphorylated and unphosphorylated RTKs, unbound material is washed away. A pan anti-phospho-tyrosine antibody conjugated to horseradish peroxidase (HRP) is then used to detect phosphorylated tyrosines on activated receptors by chemiluminescence. Refer to the Appendix for a list and coordinates of analytes and controls.

TECHNICAL HINTS

- FOR RESEARCH USE ONLY. NOT FOR USE IN DIAGNOSTIC PROCEDURES.
- This kit should not be used beyond the expiration date on the kit label.
- **Do not mix or substitute reagents with those from other lots or sources. Substitution of some high intensity chemiluminescent reagents for Chemi Reagents 1 and 2 may cause either increased background or diminished signal depending on the reagent.**
- Any variation in sample handling, buffers, operator, pipetting technique, washing technique, and incubation time or temperature can alter the performance of the kit.
- The Human Phospho-RTK Array membranes are validated for single use only.
- Always use gloved hands and flat-tipped tweezers to handle the membranes.
- Pick up the membranes from the edge on the side with the identification number avoiding the area with the printed antibodies.
- A thorough and consistent wash technique is essential for proper assay performance. Individual arrays should be washed in separate containers to minimize background. Wash Buffer should be removed completely from the membrane before proceeding to the next step.
- Do not allow the membrane to dry out. This will cause high background.
- Avoid microbial contamination of reagents and buffers.

MATERIALS PROVIDED & STORAGE CONDITIONS

Store the unopened kit at 2-8 °C. Do not use past kit expiration date.

PART	PART #	AMOUNT PROVIDED	STORAGE OF OPENED/ RECONSTITUTED MATERIAL
Human Phospho-RTK Array	894042	4 membranes	Return unused membranes to the foil pouch containing the desiccant pack. Reseal along entire edge of the zip-seal. May be stored for up to 3 months at 2-8 °C.*
Array Buffer 1	895477	1 vial (21 mL)	May be stored for up to 3 months at 2-8 °C.*
Array Buffer 2 Concentrate, 5X	895478	1 vial (21 mL)	
Lysis Buffer 17	895943	1 vial (21 mL)	
Wash Buffer Concentrate, 25X	895003	2 vials (21 mL/vial)	
Chemi Reagent 1	894287	1 vial (2.5 mL)	
Chemi Reagent 2	894288	1 vial (2.5 mL)	May be stored for up to 3 months at 2-8 °C.* DO NOT FREEZE
Anti-Phospho-Tyrosine-HRP Detection Antibody	841403	1 vial (50 µL)	
4-Well Rectangular Multi-dish	607544	1 dish	Store at room temperature.
Transparency Overlay Template	607766	1 template	

* Provided this is within the expiration date of the kit.

Note: Additional wash buffer is available for purchase ([R&D Systems®](#), # WA126).

OTHER SUPPLIES REQUIRED

- Aprotinin ([Tocris™](#), # 4139)
- Leupeptin hemisulfate ([Tocris](#), # 1167)
- Pepstatin A ([Tocris](#), # 1190)
- Pipettes and pipette tips
- Gloves
- Phosphate-Buffered Saline (PBS) ([R&D Systems®](#), # RB01)
- Deionized or distilled water
- Rocking platform shaker
- Microcentrifuge
- A plastic container with the capacity to hold 50 mL (for washing the arrays)
- Plastic transparent sheet protector (trimmed to 10 cm x 12 cm and open on three sides)
- Plastic wrap
- Paper towels
- Absorbent lab wipes
- Autoradiography cassette
- Film developer
- X-ray film
- Flat-tipped tweezers
- Flatbed scanner with transparency adapter capable of transmission mode
- Computer capable of running image analysis software and Microsoft® Excel

PRECAUTIONS

Chemi Reagents 1 and 2 contain Boric Acid which is suspected of damaging fertility or the unborn child.

Some components in this kit contain a preservative which may cause an allergic skin reaction. Avoid breathing mist.

Wear protective gloves, clothing, eye, and face protection when using these reagents. Wash hands thoroughly after handling. Refer to the SDS on our website prior to use.

SAMPLE COLLECTION & STORAGE

The sample collection and storage conditions listed below are intended as general guidelines. Sample stability has not been evaluated.

Since the Human Phospho-RTK Array detects relative phosphorylation levels of individual analytes, it is important to include appropriate control samples.

Note: Sample amount may be empirically adjusted to attain optimal sensitivity with minimal background. Suggested starting range for cell lysates is 100-300 µg.

Cell Lysates - Rinse cells with PBS, making sure to remove any remaining PBS before adding lysis buffer. Solubilize the cells at 1×10^7 cells/mL in Lysis Buffer 17 prepared with protease inhibitors. Pipette up and down to resuspend and rock the lysates gently at 2-8 °C for 30 minutes. Microcentrifuge at 14,000 x g for 5 minutes, and transfer the supernate into a clean test tube. Quantitation of sample protein concentrations using a total protein assay is recommended. Lysates should be used immediately or aliquoted and stored at ≤ -70 °C. Avoid repeated freeze-thaw cycles. Thawed lysates should be kept on ice prior to use.

REAGENT PREPARATION

Bring all reagents to room temperature before use.

Human Phospho-RTK Array - Four nitrocellulose membranes each containing 49 different anti-RTK antibodies printed in duplicate. **Handle arrays only with gloved hands and flat-tipped tweezers.**

Anti-Phospho-Tyrosine-HRP Detection Antibody - 50 µL of mouse anti-phospho-tyrosine antibody conjugated to HRP. Immediately before use, dilute the Detection Antibody to the working concentration specified on the vial label using 1X Array Buffer 2. Prepare only as much Detection Antibody as needed to run each experiment.

Lysis Buffer 17 - Add 10 µg/mL Aprotinin, 10 µg/mL Leupeptin hemisulfate, and 10 µg/mL Pepstatin A to the volume of Lysis Buffer 17 required for cell lysate preparation. **Prepare fresh for each use.**

1X Array Buffer 2 - Add 2 mL of Array Buffer 2 Concentrate to 8 mL of deionized or distilled water. **Prepare fresh for each use.**

1X Wash Buffer - If crystals have formed in the concentrate, warm the bottles to room temperature and mix gently until the crystals have completely dissolved. Add 40 mL of Wash Buffer Concentrate to 960 mL of deionized or distilled water to prepare 1000 mL of Wash Buffer.

Note: Wash Buffer Concentrate may turn yellow over time.

Chemi Reagent Mix - Chemi Reagents 1 and 2 should be mixed in equal volumes within 15 minutes of use. **Protect from light. 1 mL of the resultant mixture is required per membrane.**

ARRAY PROCEDURE

Bring all reagents to room temperature before use. Keep samples on ice. To avoid contamination, wear gloves while performing the procedures.

1. Prepare all reagents and samples as directed in the previous sections.
2. Pipette 2 mL of Array Buffer 1 into each well of the 4-Well Multi-dish that will be used. Array Buffer 1 is used as a block buffer.
3. Using flat-tip tweezers, remove each array to be used from between the protective sheets.
4. Place one array into each well of the 4-Well Multi-dish. The array number should be facing upward.

Note: *Upon contact with Array Buffer 1 the blue dye will disappear from the spots. The capture antibodies are retained in their specific locations.*

5. Incubate for 1 hour at room temperature on a rocking platform shaker. Orient the 4-Well Multi-dish so that each array rocks from end to end in its well.
6. While the arrays are blocking, prepare samples by diluting the desired quantity of cell lysate to a final volume of 1.5 mL with Array Buffer 1.
7. Aspirate Array Buffer 1 from the 4-Well Multi-dish. Add the prepared samples and place the lid on the 4-Well Multi-dish.
8. Incubate overnight at 2-8 °C on a rocking platform shaker.

Note: *A shorter incubation time may be used if optimal sensitivity is not required.*

9. Carefully remove each array and place into individual plastic containers with 20 mL of 1X Wash Buffer. Rinse the 4-Well Multi-dish with deionized or distilled water and dry thoroughly.
10. Wash each array with 1X Wash Buffer for 10 minutes on a rocking platform shaker. Repeat two times for a total of three washes.
11. Dilute the Anti-Phospho-Tyrosine-HRP Detection Antibody in 1X Array Buffer 2 using the dilution factor on the vial label. Pipette 2 mL into each well of the 4-Well Multi-dish.
12. Carefully remove each array from its wash container. Allow excess buffer to drain from the array. Return the array to the 4-Well Multi-dish containing the diluted Anti-Phospho-Tyrosine-HRP and cover with the lid.
13. Incubate for 2 hours at room temperature on a rocking platform shaker.

ARRAY PROCEDURE *CONTINUED*

14. Wash each array as described in steps 9 and 10.

Note: *Complete the remaining steps without interruption.*

15. Carefully remove each membrane from its wash container. Allow excess Wash Buffer to drain from the membrane by blotting the lower edge onto paper towels. Place each membrane on the bottom sheet of the plastic sheet protector with the identification number facing up.

16. Pipette 1 mL of the prepared Chemi Reagent Mix evenly onto each membrane.

Note: *Using less than 1 mL of Chemi Reagent Mix per membrane may result in incomplete membrane coverage.*

17. Carefully cover with the top sheet of the plastic sheet protector. Gently smooth out any air bubbles and ensure Chemi Reagent Mix is spread evenly to all corners of each membrane. Incubate for 1 minute.

18. Position paper towels on the top and sides of the plastic sheet protector containing the membranes and carefully squeeze out excess Chemi Reagent Mix.

19. Remove the top plastic sheet protector and carefully lay an absorbent lab wipe on top of the membranes to blot off any remaining Chemi Reagent Mix.

20. Leaving membranes on the bottom plastic sheet protector, cover the membranes with plastic wrap taking care to gently smooth out any air bubbles. Wrap the excess plastic wrap around the back of the sheet protector so that the membranes and sheet protector are completely wrapped.

21. Place the membranes with the identification numbers facing up in an autoradiography film cassette.

Note: *Use an autoradiography cassette that is not used with radioactive isotope detection.*

22. Expose membranes to X-ray film for 1-10 minutes. Multiple exposure times are recommended.

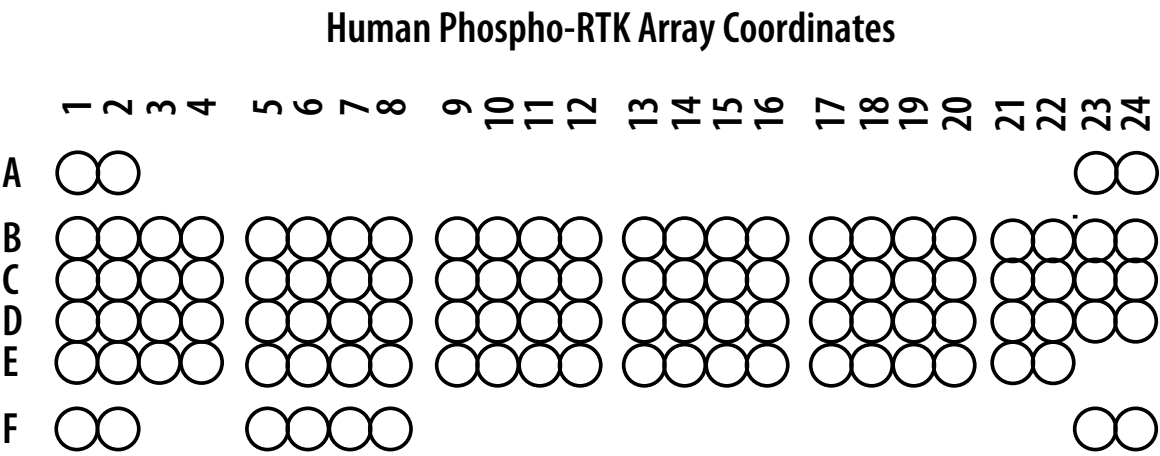
DATA ANALYSIS

The positive signals seen on developed film can be quickly identified by placing the transparency overlay template on the array image and aligning it with the pairs of reference spots in three corners of each array. The stamped identification number on the array should be placed on the left hand side. The location of controls and capture antibodies is listed in the Appendix.

Note: Reference spots are included to align the transparency overlay template and to demonstrate that the array has been incubated with Anti-Phospho-Tyrosine-HRP during the assay procedure.

Pixel densities on developed X-ray film can be collected and analyzed using a transmission-mode scanner and image analysis software.

- 1. Create a template to analyze pixel density in each spot of the array.
- 2. Export signal values to a spreadsheet file for manipulation in a program such as Microsoft Excel.
- 3. Determine the average signal (pixel density) of the pair of duplicate spots representing each RTK.
- 4. Subtract an averaged background signal from each RTK. Use a signal from a clear area of the array or the PBS negative control spots as a background value.
- 5. Compare corresponding signals on different arrays to determine the relative change in tyrosine phosphorylation if specific RTKs between samples.



This image is not to scale. It is for coordinate reference only.
Please use the transparency overlay for analyte identification.

PROFILING RTK TYROSINE PHOSPHORYLATION

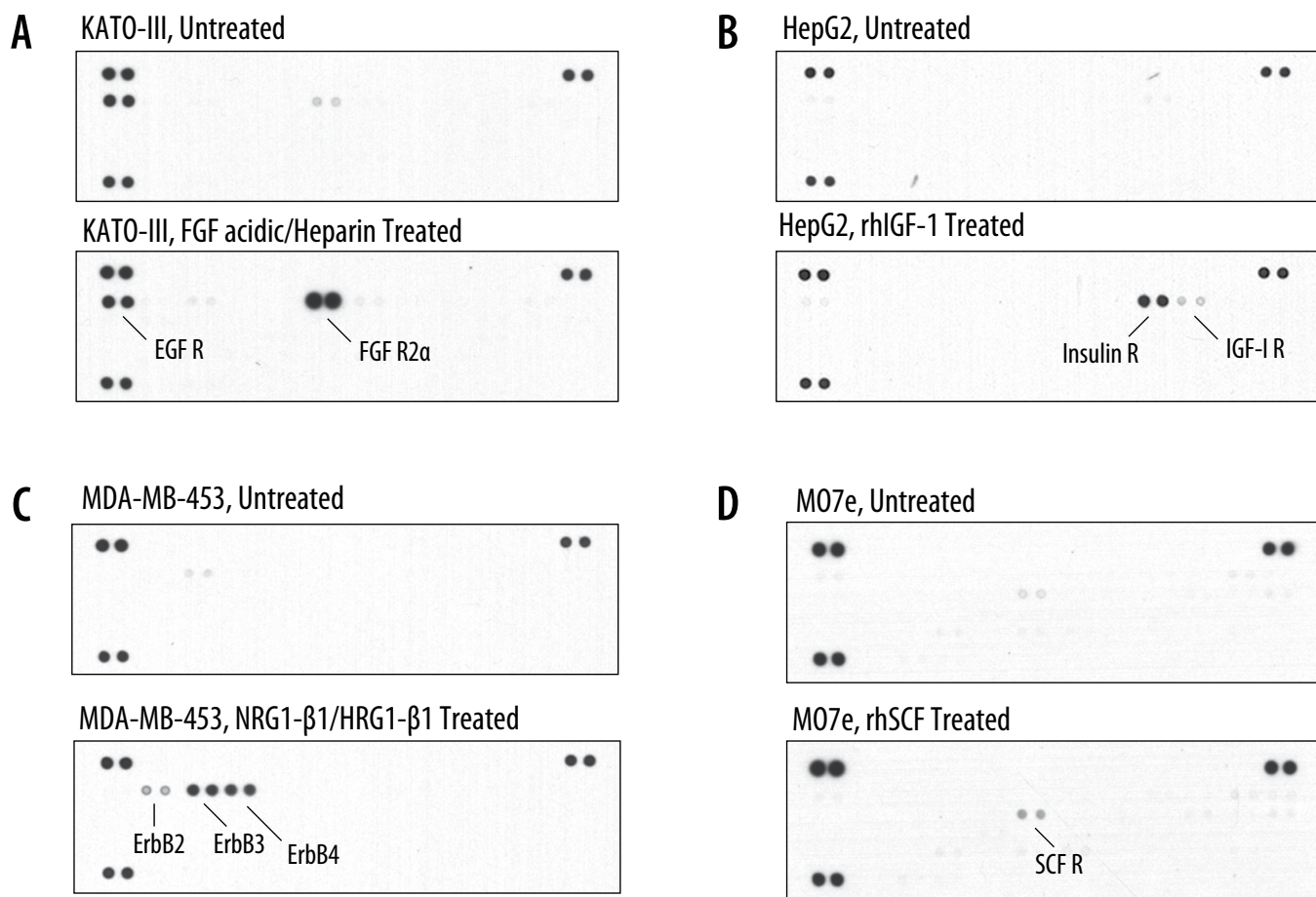


Figure 1: The Human Phospho-RTK Array detects tyrosine-phosphorylated receptors in cell lysates.

- A.** KATO-III human gastric carcinoma cells were either untreated or treated with 100 ng/mL recombinant human (rh) FGF acidic ([R&D Systems, # 232-FA](#)) and 1 µg/mL heparin for 15 minutes. 50 µg of lysate was run on each array.
- B.** HepG2 human hepatocellular carcinoma cells were either untreated or treated with 100 ng/mL rhIGF-1 ([R&D Systems, # 291-G1](#)) for 5 minutes. 300 µg of lysate was run on each array.
- C.** MDA-MB-453 human breast cancer cells were either untreated or treated with 100 ng/mL rhNRG1-β1/HRG1-β1 ([R&D Systems, # 396-HB](#)) for 5 minutes. 50 µg of lysate was run on each array.
- D.** MO7e human megakaryocytic leukemic cells were either untreated or treated with 250 ng/mL rhSCF ([R&D Systems, # 255-SC](#)) for 5 minutes. 300 µg of lysate was run on each array.

INHIBITION

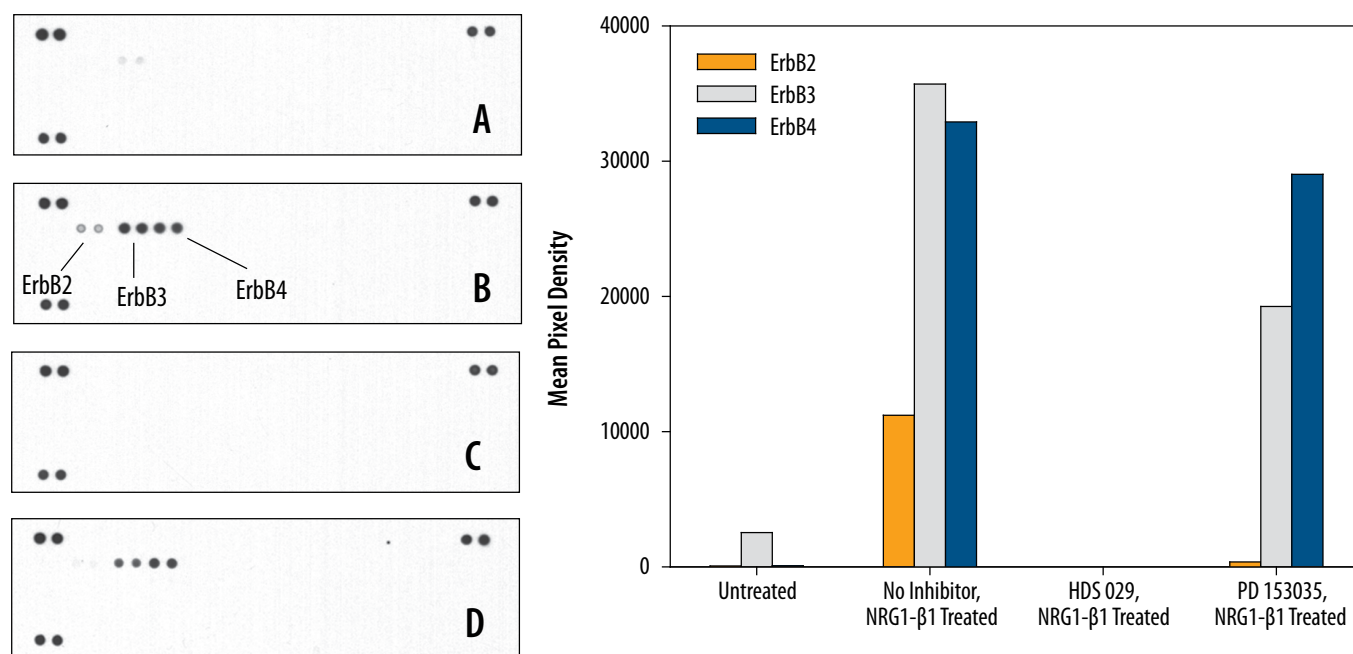


Figure 2: MDA-MB-453 human breast cancer cells were either untreated or treated with 100 ng/mL rhNRG1- β 1/HRG1- β 1 for 5 minutes. Cells for rhNRG1- β 1/HRG1- β 1 treatment received pre-treatment with the ErbB receptor family inhibitor HDS 029, or PD 153035 ([Tocris, # 1037](#)), or no pre-treatment. Data shown are from a 10 minute exposure to film.

A. Untreated

B. No inhibitor, rhNRG1- β 1/HRG1- β 1 treated

C. 1 mM HDS 029 for 3 hours, rhNRG1- β 1/HRG1- β 1 treated

D. 200 nM PD 153035 for 3 hours, rhNRG1- β 1/HRG1- β 1 treated

INHIBITION CONTINUED

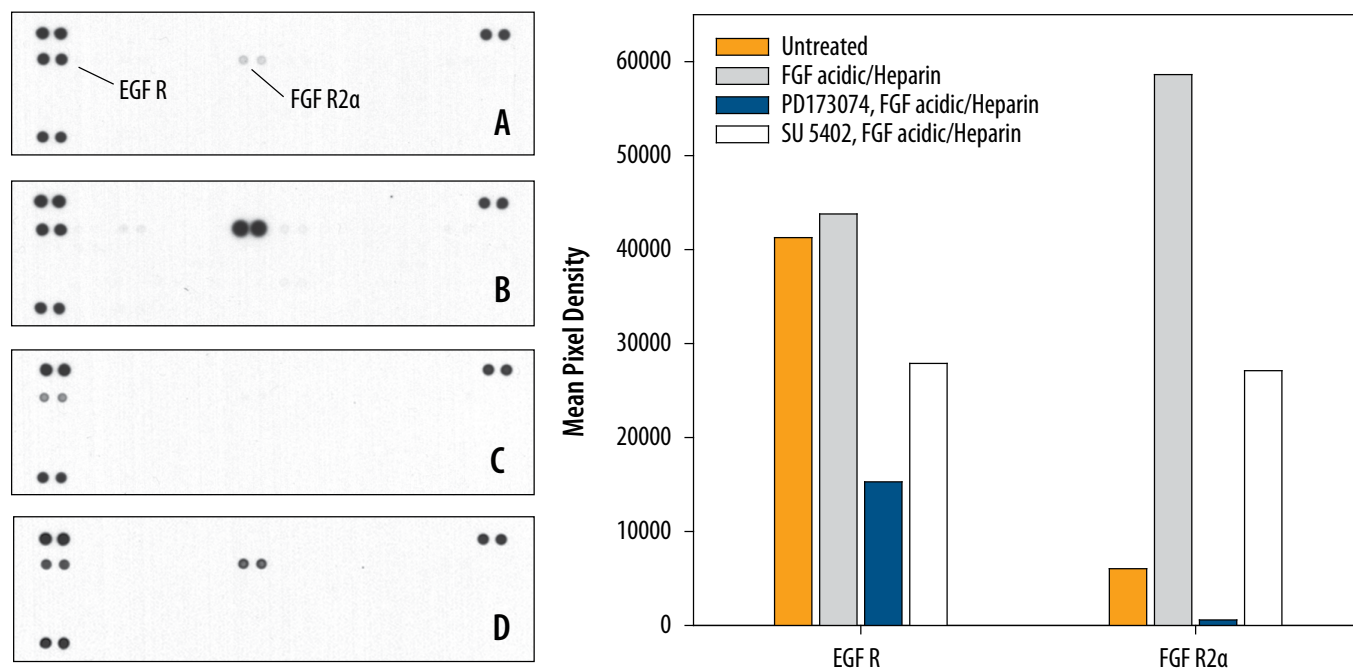


Figure 3: KATO-III human gastric carcinoma cells were either untreated or treated with 100 ng/mL rhFGF acidic and 1 µg/mL heparin for 15 minutes. Cells for rhFGF acidic/Heparin treatment either received pre-treatment with the reversible FGF R and VEGF R inhibitor PD 173074 ([Tocris™, # 3044](#)), or with the FGF R-specific tyrosine kinase inhibitor SU 5402 ([Tocris, # 3300](#)), or no pre-treatment.

A. Untreated

B. No inhibitor, FGF acidic/heparin treated

C. 1 µM PD 173074 for 3 hrs, FGF acidic/Heparin treated

D. 1 µM SU 5402 for 3 hours, FGF acidic/Heparin treated

SPECIFICITY

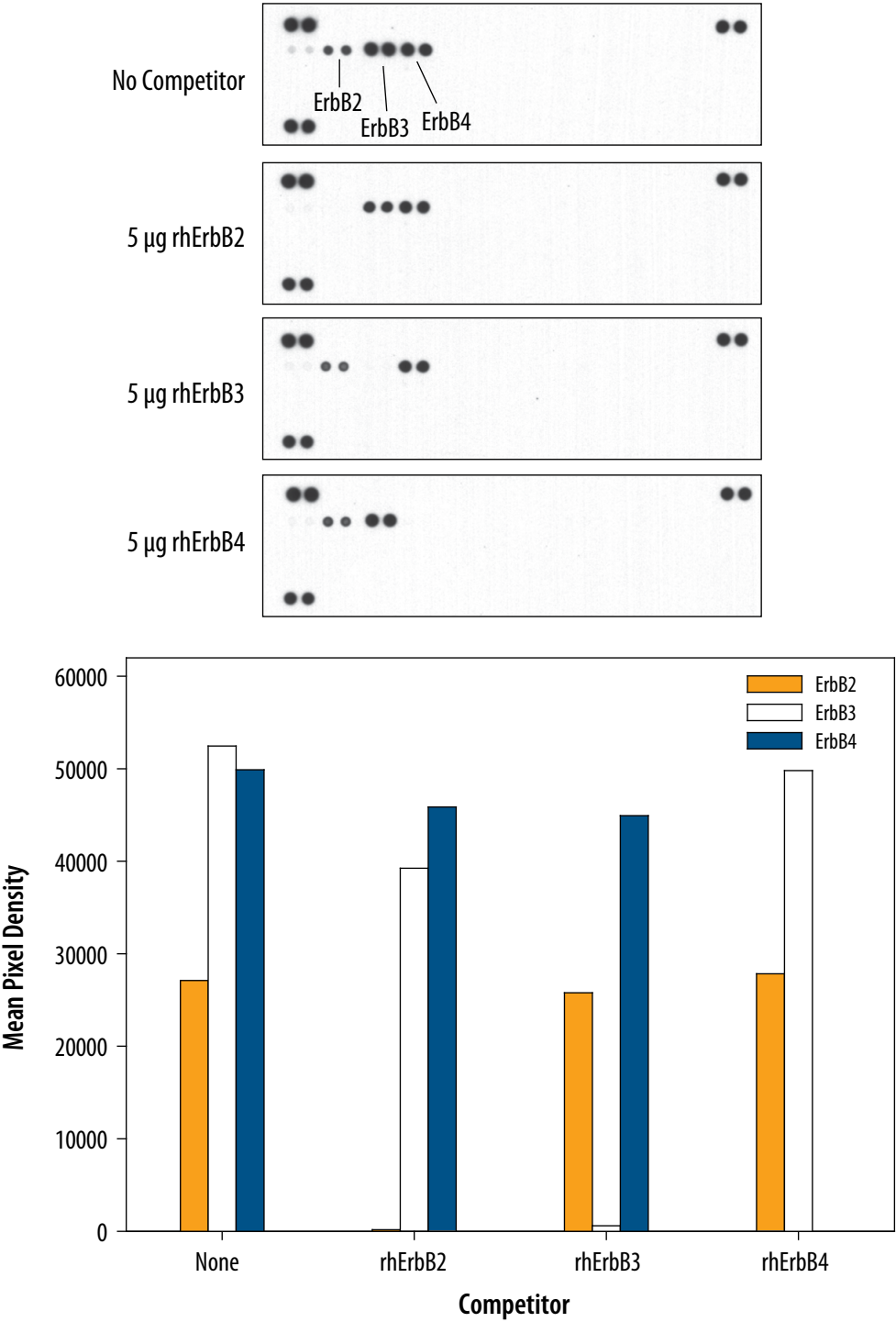


Figure 4: The Human Phospho-RTK Array is specific for ErbB2, ErbB3, and ErbB4 as shown by receptor competition. MDA-MB-453 human breast cancer cells were treated with 100 ng/mL of rhNRG1-β1/HRG1-β1 ([R&D Systems®, # 396-HB](#)) for 5 minutes. 5 µg of rhErbB2 ([R&D Systems, # 1129-ER](#)), rhErbB3 ([R&D Systems, # 348-RB](#)), or rhErbB4 ([R&D Systems, # 1131-ER](#)) extracellular domains were added to 50 µg of lysate and analyzed using the Human Phospho-RTK Array. Competition of a particular ErbB receptor was observed only with the corresponding recombinant soluble receptor.

SENSITIVITY

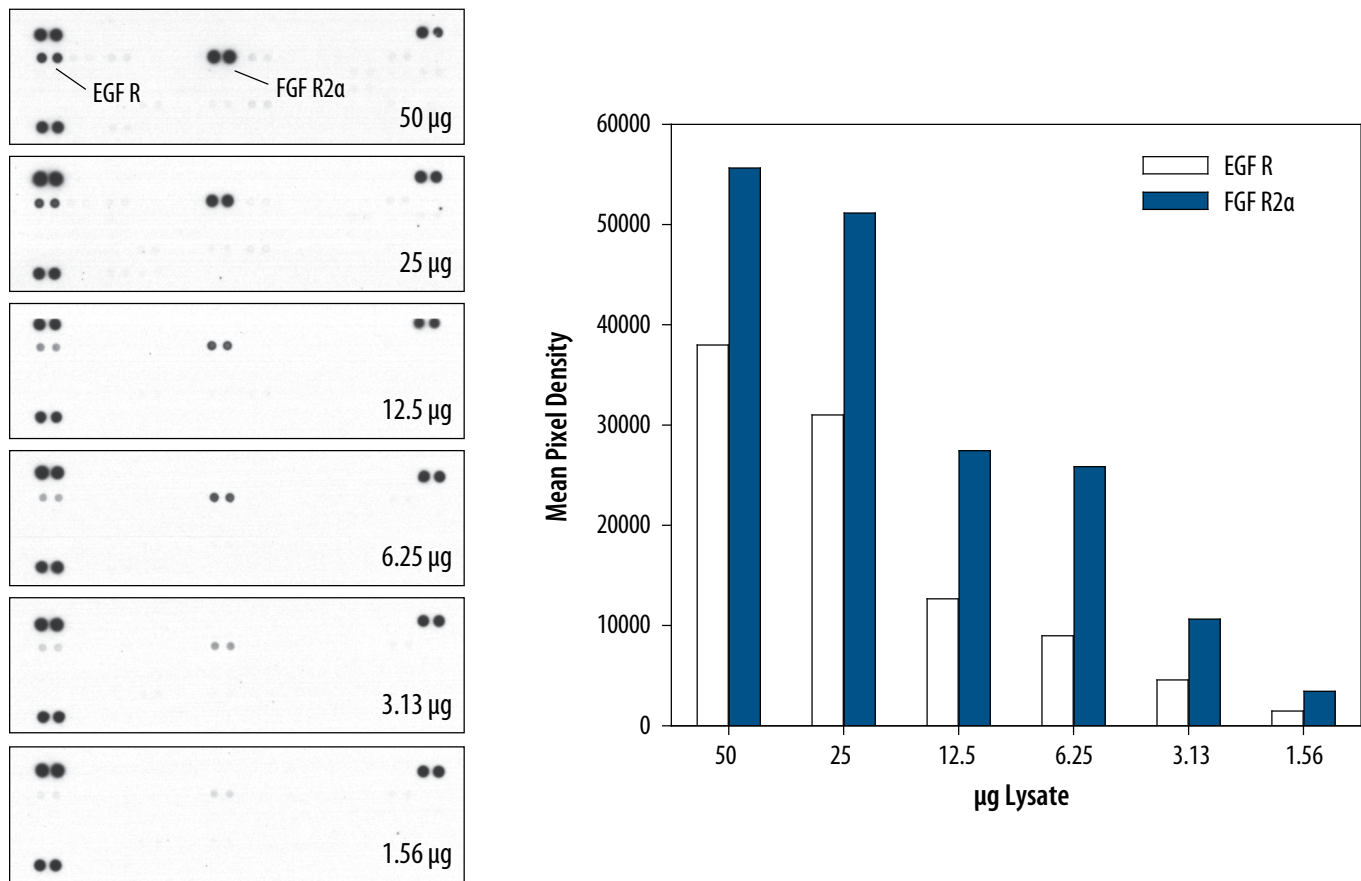


Figure 5: KATO-III human gastric carcinoma cells were treated with 100 ng/mL rhFGF acidic and 1 µg/mL heparin for 15 minutes. The indicated quantity of lysate was run on each array. Data shown are from a 10 minute exposure to film.

APPENDIX

Refer to the table below for the Human Phospho-RTK Array coordinates.

Coordinate	Receptor Family	RTK/Control	Coordinate	Receptor Family	RTK/Control
A1, A2	Reference Spots	—	D1, D2	Tie	Tie-2
A23, A24	Reference Spots	—	D3, D4	NGF R	TrkA
B1, B2	EGF R	EGF R	D5, D6	NGF R	TrkB
B3, B4	EGF R	ErbB2	D7, D8	NGF R	TrkC
B5, B6	EGF R	ErbB3	D9, D10	VEGF R	VEGF R1
B7, B8	EGF R	ErbB4	D11, D12	VEGF R	VEGF R2
B9, B10	FGF R	FGF R1	D13, D14	VEGF R	VEGF R3
B11, B12	FGF R	FGF R2 α	D15, D16	MuSK	MuSK
B13, B14	FGF R	FGF R3	D17, D18	Eph R	EphA1
B15, B16	FGF R	FGF R4	D19, D20	Eph R	EphA2
B17, B18	Insulin R	Insulin R	D21, D22	Eph R	EphA3
B19, B20	Insulin R	IGF-I R	D23, D24	Eph R	EphA4
B21, B22	Axl	Axl	E1, E2	Eph R	EphA6
B23, B24	Axl	Dtk	E3, E4	Eph R	EphA7
C1, C2	Axl	Mer	E5, E6	Eph R	EphB1
C3, C4	HGF R	HGF R	E7, E8	Eph R	EphB2
C5, C6	HGF R	MSP R	E9, E10	Eph R	EphB4
C7, C8	PDGF R	PDGF R α	E11, E12	Eph R	EphB6
C9, C10	PDGF R	PDGF R β	E13, E14	Insulin R	ALK
C11, C12	PDGF R	SCF R	E15, E16	—	DDR1
C13, C14	PDGF R	Flt-3	E17, E18	—	DDR2
C15, C16	PDGF R	M-CSF R	E19, E20	Eph R	EphA5
C17, C18	RET	c-Ret	E21, E22	Eph R	EphA10
C19, C20	ROR	ROR1	F1, F2	Reference Spots	—
C21, C22	ROR	ROR2	F5, F6	Eph R	EphB3
C23, C24	Tie	Tie-1	F7, F8	—	RYK
			F23, F24	Control (-)	PBS

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