MANUAL

ALPHA-TUBULIN HOUSEKEEPING KITS

Part # 64ATUBPEG & 64ATUBPEH

Test Size#: 500 tests (64ATUBPEG), 10,000 tests (64ATUBPEH) **Revision:** 06 of September 20233

Store at: ≤-60°C

For research use only. Not for use in diagnostic procedures.

ASSAY PRINCIPLE

This assay is intended for the simple, rapid and direct detection of endogenous levels of Alpha-Tubulin in cells. Alpha-Tubulin is one of the most commonly used housekeeping proteins. It is ubiquitously and constitutively expressed by every tissue, and its concentration is expected to be proportional to cell number and sample loading. This protein can therefore be used as an internal control for data normalization to correct for signal changes due to experimental variability (e.g. number of cells plated into the culture plate or volume of lysate transferred in the detection plate). After lysis of the cell membrane, Alpha-Tubulin can be detected using the kit reagents.

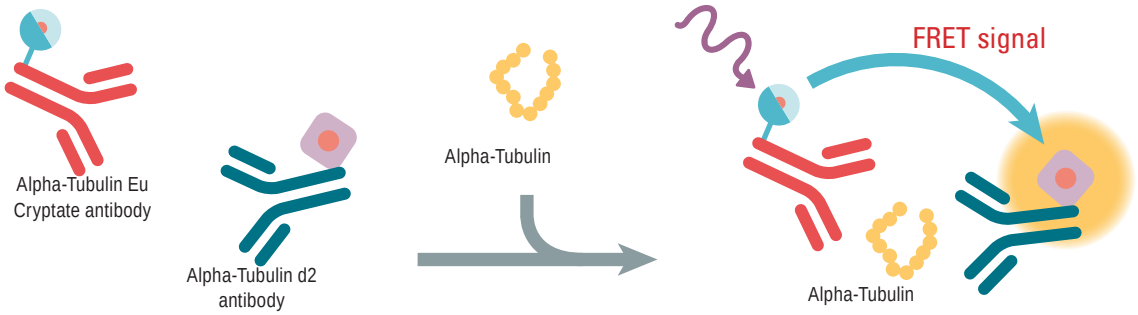


Figure 1: Principle of HTRF sandwich assay.

As shown here, Alpha-Tubulin is detected in a sandwich assay format using 2 different specific antibodies, one labelled with Eu^{3+}-Cryptate (donor) and the second with d2 (acceptor).

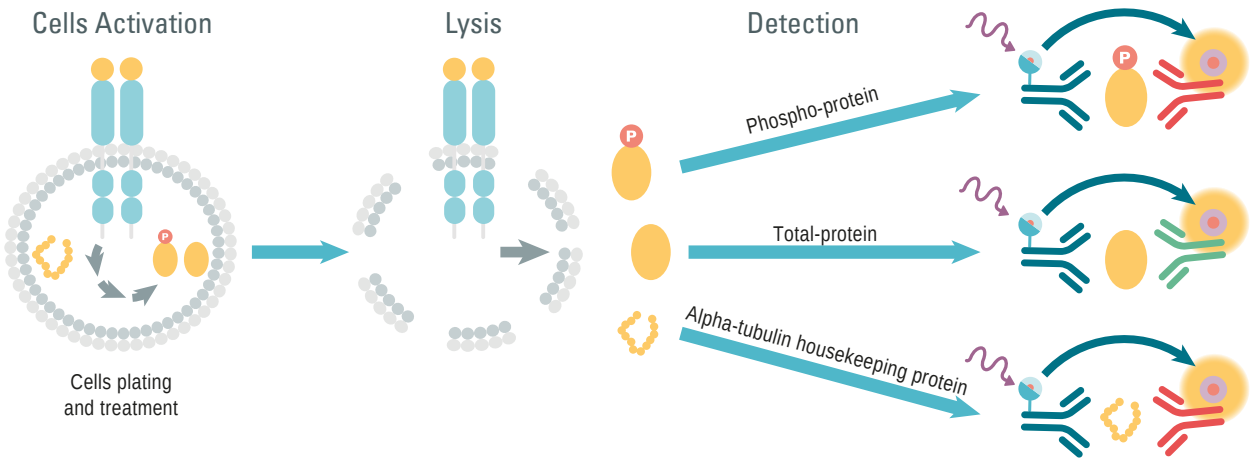
When the dyes are in close proximity, the excitation of the donor with a light source (laser or flash lamp) triggers a Fluorescence Resonance Energy Transfer (FRET) towards the acceptor, which in turn fluoresces at a specific wavelength (665 nm). The specific signal modulates positively in proportion to Alpha-Tubulin.

The assay is run under a two-plate assay manual, where cells are plated, stimulated and lysed in the same culture plate. Lysates are then transferred to the assay plate for the detection of Alpha-Tubulin by HTRF® reagents. This manual gives the cells viability and confluence to be monitored.

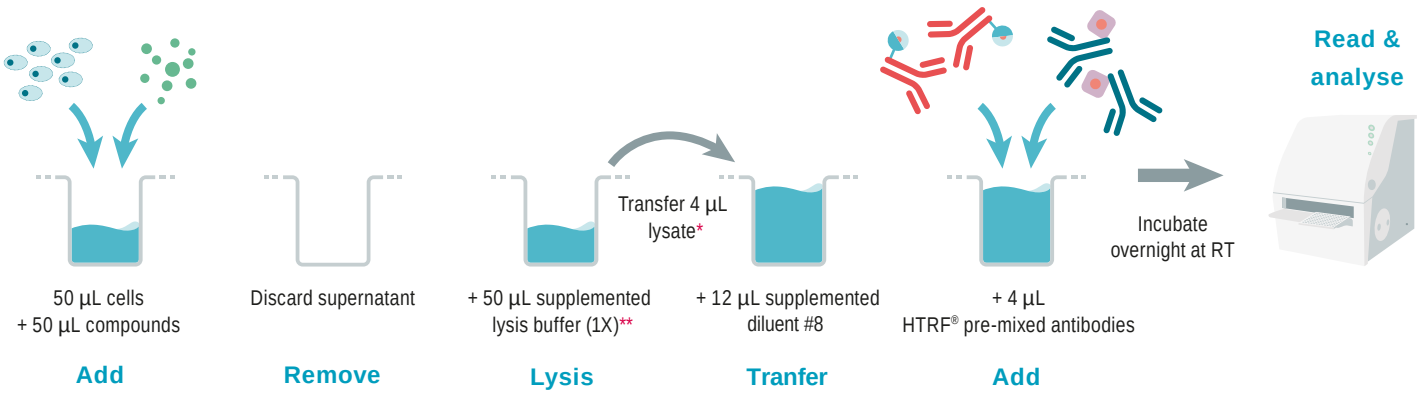
For tissue derived samples, please refer to the technical note: "Optimize your htrf® cell signaling assays on tissues" on www.revvity.com

Technical support team can help you to set-up this manual or another one. Please contact us at www.revvity.com.

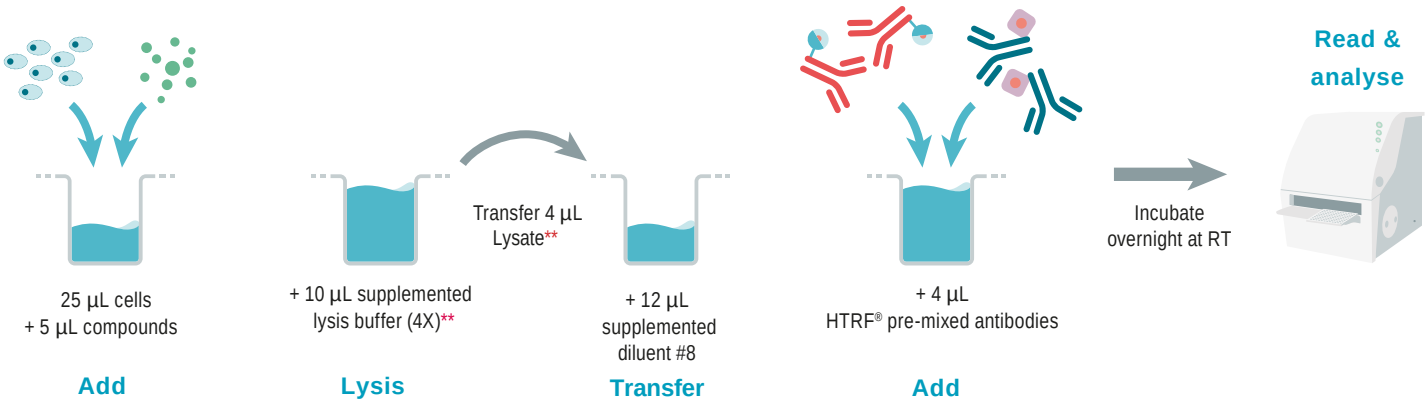
MANUAL AT A GLANCE



► TWO-PLATE ASSAY MANUAL FOR ADHERENT CELLS:



► TWO-PLATE ASSAY MANUAL FOR SUSPENSION CELLS:



* Depending on cell lines used, volume of lysis should be optimized.
**It can be necessary to dilute the cell lysate to ensure samples are within the assay linear range. The cell lysate must be prediluted with the supplemented lysis buffer 1X.

► FOR HTRF CERTIFIED READER

For more information about HTRF® compatible readers and for set-up recommendations, please visit our website at: www.revvity.com

MATERIALS PROVIDED:

KIT COMPONENTS	STORAGE	500 TESTS CAT# 64ATUBPEG		10,000 TESTS CAT# 64ATUBPEH	
Control lysate (ready-to-use)	≤-60°C	green cap	1 vial - 150 µL	green cap	2 vials - 150 µL
Alpha-Tubulin Eu Cryptate antibody	≤-16°C	red cap	1 vial - 50 µL	red cap	1 vial - 1 mL
Alpha-Tubulin d2 antibody	≤-16°C	blue cap	1 vial - 50 µL	blue cap	1 vial - 1 mL
Blocking reagent* (stock solution 100X)	≤-16°C	purple cap	1 vial - 2 mL	purple cap	4 vials - 2 mL
Lysis buffer # 4* (stock solution 4X)	≤-16°C	transparent cap	4 vials - 2 mL	white cap	1 vial - 130 mL
Detection buffer** (ready-to-use)	≤-16°C	orange cap	2 vials - 2 mL	red cap	1 vial - 50 mL
Diluent #8 (1X)	≤-16°C	white cap	1 vial - 10 mL	white cap	1 vial - 200 mL

* Amounts of reagents provided are sufficient for generating 50 µL of cell lysate per well.
** The Detection Buffer is used to prepare working solutions of acceptor and donor reagents.

► PURCHASE SEPARATELY (small volume (SV) detection plate):

96-well or 384-well small volume (SV) detection microplates - For more information about microplate recommendations, please visit our website at: www.revvity.com

STORAGE AND STABILITY

Antibodies, control lysate and buffers should be stored frozen until used.
Thawed lysis buffer, detection buffer, diluent and blocking reagent can be stored at 2-8°C in your premises. Thawed antibodies are stable 48 hours at 2-8°C; they can be refrozen (at ≤-16°C) and thawed at least one more time. Control lysate must be stored frozen at ≤-60°C. Thawed control lysate can be refrozen (at ≤-60°C) and thawed one more time.

Allow all reagents to thaw before use. We recommend centrifuging the vials gently after thawing, before pipeting the stock solutions.

Prepare the working solutions from stock solutions by following the instructions below.

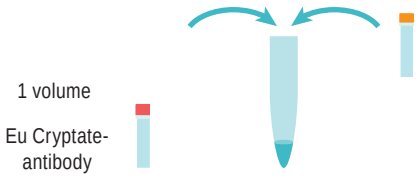
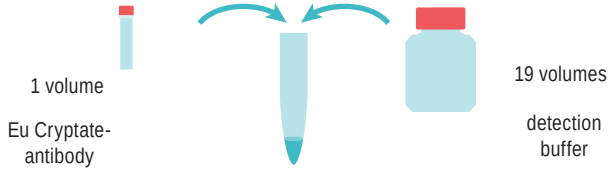
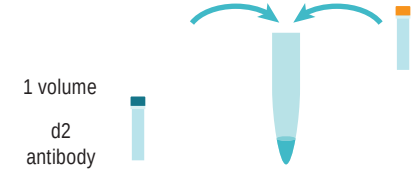
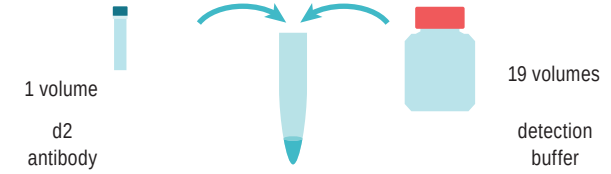
TO PREPARE WORKING CONTROL LYSATE SOLUTION

The control lysate is only provided as an internal assay control to check the quality of the results obtained. The window between control lysate and negative control should be greater than 2.
Thaw the control lysate. Mix gently, the control lysate is ready to use.

TO PREPARE WORKING ANTIBODY SOLUTIONS:

HTRF® reagent concentrations have been set for optimal assay performances. Note that any dilution or improper use of the d2 and Eu Cryptate-antibodies will impair the assay's quality. Be careful, as working solution preparation for antibodies may differ between the 500 and 10,000 tests data point kit.

Determine the amount of detection antibody needed for the experiment. Each detection well requires 2 µL of d2 antibody and 2 µL of Eu Cryptate antibody
Antibody working solutions are stable for 2 days at 2-8°C. Dilute the antibodies with detection buffer. In practice:

500 TESTS KIT 64ATUBPEG	10,000 TESTS KIT 64ATUBPEH
Alpha-Tubulin Eu Cryptate antibody	
 Dilute 20-fold the frozen stock solution with detection buffer: e.g. add 0,95 mL of detection buffer to the 0,05 mL of Eu Cryptate antibody stock solution.	 Dilute 20-fold the frozen stock solution with detection buffer: e.g. add 19 mL of detection buffer to the 1 mL of Eu Cryptate antibody stock solution.
Alpha-Tubulin d2 antibody	
 Dilute 20-fold the frozen stock solution with detection buffer: e.g. add 0,95 mL of detection buffer to the 0,05 mL of d2 antibody stock solution.	 Dilute 20-fold the frozen stock solution with detection buffer: e.g. add 19 mL of detection buffer to the 1 mL of d2 antibody stock solution.
Antibody mix	
It is possible to pre-mix the two ready-to-use antibody solutions just prior to dispensing the reagents by adding 1 volume of d2-antibody solution to 1 volume of Cryptate-antibody solution.	

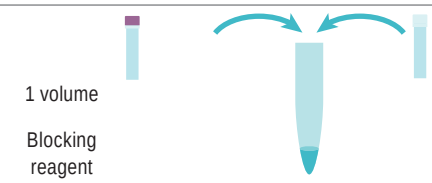
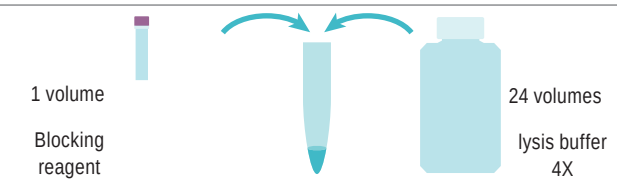
TO PREPARE SUPPLEMENTED LYSIS BUFFER:

Make sure that the lysate has been generated by using the kit reagents.
Supplemented lysis buffer differs between the manuals. Make sure to use the appropriate supplemented lysis buffer depending on the chosen manual's specification.

Prepare the required amount of supplement lysis buffer before running the assay, working solutions are stable for 2 days at 2-8°C.

► ***Supplemented Lysis buffer 4X for two-plate assay manual on suspension cells***

Determine the amount of supplemented lysis buffer needed for the experiment. Each well requires 10 µL for two-plate assay manual on suspension cells. Dilute the blocking reagent stock solution 25-fold with lysis buffer 4X. In practice:

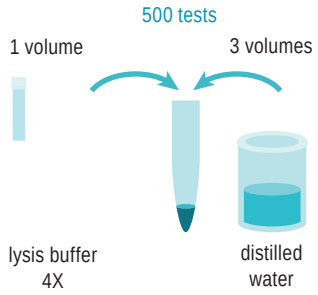
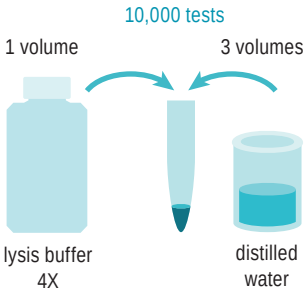
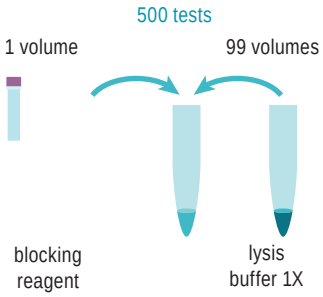
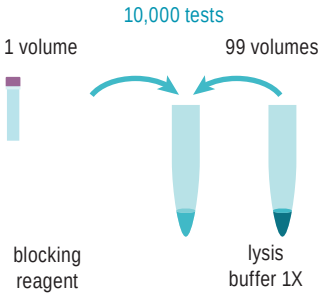
TWO-PLATE MANUAL ON SUSPENSION CELL	
500 TESTS KIT 64ATUBPEG	10,000 TESTS KIT 64ATUBPEH
Preparation of Supplemented Lysis buffer 4X	
	
Dilute the "blocking reagent stock solution" 25-fold with "lysis buffer 4X" e.g take 0.1 ml of "Blocking reagent stock solution" and add it to 2.4 ml of lysis buffer 4X. Mix gently.	

► *Supplemented Lysis buffer 1X for two-plate assay manual on adherent cells*

Determine the amount of supplemented lysis buffer needed for the experiment. Each well generally requires 50 µL of supplemented lysis buffer. Prepare a lysis buffer solution 1X and then dilute the blocking reagent stock solution 100-fold with this lysis buffer 1X.
In practice:

TWO-PLATE ASSAY MANUAL ON ADHERENT CELLS

500 TESTS K IT 64ATUBPEG & 10,000 TESTS KIT 64ATUBPEH

Preparation of lysis buffer 1X		Preparation of supplemented Lysis buffer 1X	
500 tests	10,000 tests	500 tests	10,000 tests
			
Dilute the “lysis buffer 4X” 4-fold with distilled water to prepare lysis buffer 1X. e.g. take 1.25 mL of lysis buffer 4X and add it to 3.75 mL of distilled water. Mix gently.		Dilute the “blocking reagent” 100-fold with “Lysis buffer 1X”. e.g. take 0.05 mL of “Blocking reagent stock solution” and add it to 4.95 mL of lysis buffer 1X. Mix gently.	

PREDILUTION OF LYSATES

If your cells express a large amount of alpha-tubulin, or if you are working with high cell densities (> 50,000 cells plated in a 96-well plate the day before), cell lysates must be prediluted with the supplemented lysis buffer 1X before running the HTRF assay.

When performing the assay for the first time, it is therefore highly recommended to measure alpha-tubulin on neat and prediluted samples (e.g. 1/10) to ensure working in the linear range of the kit Alpha-Tubulin Housekeeping - 500 tests

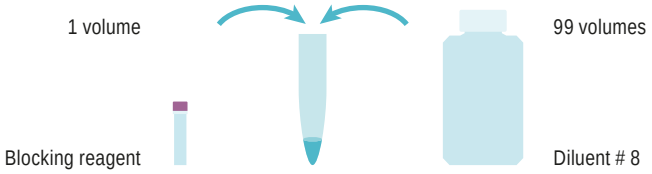
PREPARATION OF SUPPLEMENTED DILUENT

Determine the amount of supplemented Diluent #8 needed for the detection step. Each detection well requires 12 µL.

Before running the assay, supplement Diluent #8 with the blocking reagent: dilute the blocking reagent stock solution 100-fold with Diluent #8. Mix gently.

500 TESTS KIT 64NH3PEG / 10,000 TESTS KIT 64NH3PEH

Suplement diluent



Dilute the “blocking reagent stock solution” 100-fold with “Diluent # 8 1X”. e.g. take 0.05 mL of “Blocking reagent stock solution” and add it to 4.95 mL of Diluent # 8 1X. Mix gently.

GENERAL LAB WORK PRIOR USING REVVITY KIT: CELLS PREPARATION

	FOR ADHERENT CELLS	FOR SUSPENSION CELLS	
1	Plate 50 µL of cells in 96-well tissue-culture treated plate in appropriate growth medium and incubate overnight, at 37°C in CO2 atmosphere.	Plate 25 µL of cells in 96 half-well plate in your appropriate medium.	 96-well culture plate
	Cell seeding densities of 50 K cells/well are generally sufficient for most cell lines, but optimization of cell seeding densities is recommended. Depending on receptor a starving step with serum-free medium could be essential.		
2	Dispense 50 µL of compound (2X) diluted in cell culture serum-free medium	Dispense 5 µL of compound (6X), diluted in your appropriate medium.	 96-well culture plate
	For most compound, incubation time is between 10 and 30 minutes at 37°C. We recommend a time course study to determine the optimal stimulation time.		
3	Remove carefully cell supernatant either by aspirating supernatant or by flicking the plate.	Do not remove your appropriate medium.	Discard supernatant (for adherent cells)  96-well culture plate

ALPHA-TUBULIN DETECTION USING REVVITY KIT

	FOR ADHERENT CELLS	FOR SUSPENSION CELLS	
4	Immediately add 50 µL of supplemented lysis buffer (1X) and incubate for at least 30 minutes at room temperature under shaking.	Immediately add 10 µL of supplemented lysis buffer (4X) and incubate for at least 30 minutes at room temperature under shaking.	 96-well culture plate
	Use the appropriate supplemented lysis buffer and incubate at room temperature with shaking. We recommend a time course study to determine the optimal lysis incubation time. Lysis incubation time may be optimized. Lysis volume can be decreased down to 25 µL.		
5	After homogenization by pipeting up and down, transfer 4 µL of cell lysate from the 96-well cell-culture plate to a small volume (SV) white detection plate. It can be necessary to dilute the cell lysate to ensure samples are within the assay linear range. The cell lysate must be prediluted with the supplemented lysis buffer 1X.		 96-well culture plate SV detection plate
6	Add 12 µL of supplemented Diluent #8 in the low volume detection white plate.		 SV detection plate
7	Add 4 µL of premixed antibody solutions (vol/vol) prepared in the detection buffer. Cover the plate with a plate sealer. Incubate overnight at room temperature. Set up your reader for Eu^{3+} Cryptate and read the fluorescence emission at two different wavelenghts (665nm and 620nm) on a compatible HTRF® reader.		 SV detection plate

► ***Standard manual for two-plate assay manual in 20 µL final volume (after lysis step)***

	NON TREATED CELL LYSATE	TREATED CELL LYSATE	CONTROL LYSATE	NEGATIVE CONTROL
Step 1	Dispense 4 µL of non treated cell lysate	Dispense 4 µL of treated cell lysate	Dispense 4 µL of control lysate	Dispense 4 µL of supplemented lysis buffer(1X)
Step 2	Add 12 µL Supplement Diluent #8 to all wells			
Step 3	Add 2 µL of Alpha-Tubulin d2 antibody working solution to all wells			
Step 4	Add 2 µL of Alpha-Tubulin Eu Cryptate antibody working solution to all wells			
Step 5	Cover the plate with a plate sealer. Incubate overnight at room temperature.			
Step 6	Remove the plate sealer and read on an HTRF compatible reader			

The Negative control is used to check the non-specific signal. The ratio between control lysate signal / non-specific signal should be greater than 2.

DATA REDUCTION & INTERPRETATION

1. Calculate the ratio of the acceptor and donor emission signals for each individual well.

$$\text{Ratio} = \frac{\text{Signal 665 nm}}{\text{Signal 620 nm}} \times 10^4$$

2. Calculate the % CVs. The mean and standard deviation can then be worked out from ratio replicates.

$$\text{CV (\%)} = \frac{\text{Standard deviation}}{\text{Mean Ratio}} \times 100$$

For more information about data reduction, please visit www.revvity.com

RESULTS

These data should be considered only as an example. Results may vary from one HTRF® compatible reader to another.
The curves are drawn up by plotting HTRF® Ratio versus the [compound] concentrations. Cell stimulation with IGF-1 induces a dose-dependent increase of AKT phosphorylation on Ser473. It also leads to a weak but significant decrease of the expression level of AKT, which is not caused by a global decrease of total protein level or due to experimental variability since the expression level of alpha-tubulin remains perfectly stable.

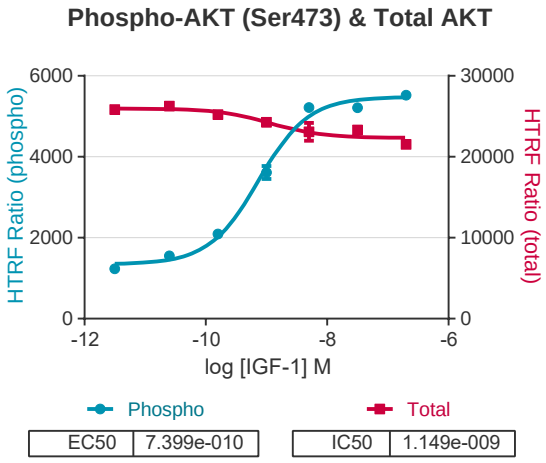
The signal linearity is dependent both on the cell line and the cell density used. A cell density experiment is highly recommended to ensure working in optimal conditions.

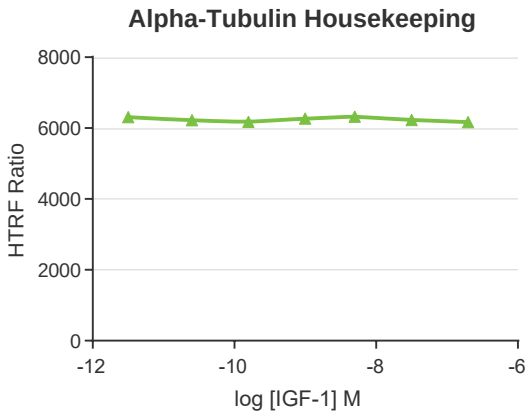
Results on HEK293 cells (100,000 cells/well), using the two-plate assay manual for adherent cells.

Cells were stimulated with human IGF-1 for 10 minutes and then lysed with 50 µL of supplemented lysis buffer #1 for 30 minutes at room temperature.

16 µL of lysate were transferred in a low volume white plate to detect phospho- AKT , an additional 16 µL of lysate were transferred in the same plate to detect total-using the HTRF phospho- and total- AKT assay.

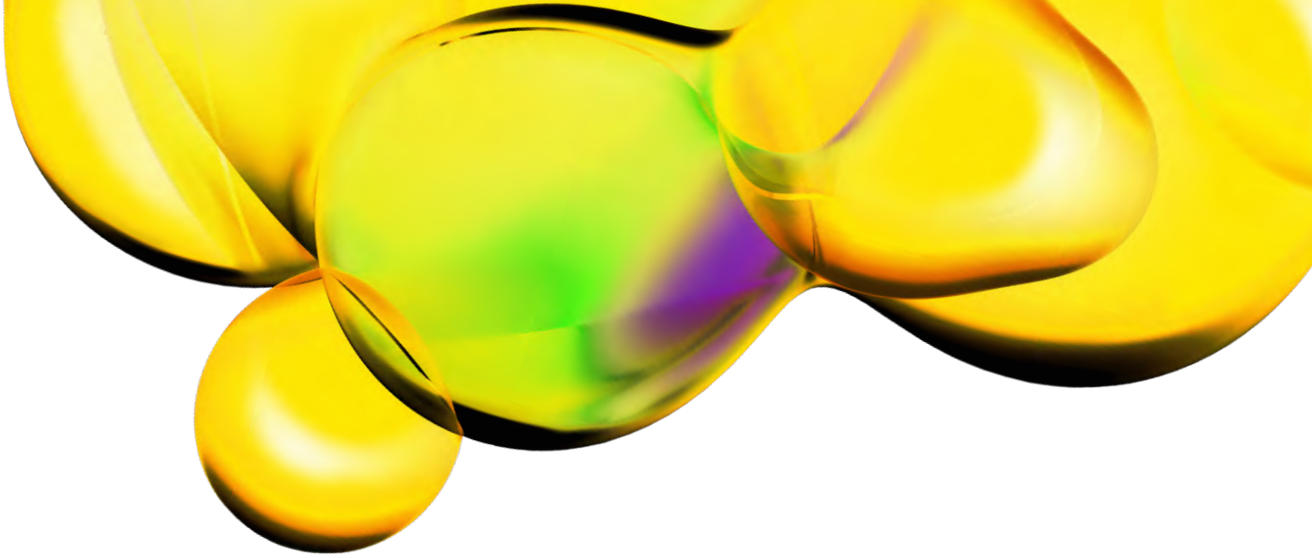
		Phospho-AKT (Ser473)		Total AKT		Alpha-Tubulin Housekeeping	
[IGF-1] (nM)	log [IGF-1) (M)	Mean HTRF Ratio	CV%	Mean HTRF Ratio	CV%	Mean HTRF Ratio	CV%
0	-11.5	1235	6%	25849	2%	6313	2%
0.026	-10.6	1551	3%	26265	2%	6225	2%
0.15	-9.8	2093	1%	25217	1%	6175	4%
0.93	-9	3610	6%	24255	0%	6269	1%
5.6	-8.3	5217	2%	23075	7%	6323	3%
33.3	-7.5	5211	2%	23316	2%	6232	3%
200	-6.7	5524	1%	21536	2%	6170	1%
Negative		501	3%	600	2%	634	3%
Control lysate		4100	4%	6460	2%	5289	4%





GENERAL LAB WORK PRIOR USING REVVITY KIT: CELLS AND LYSATE PREPARATION FREQUENTLY ASKED QUESTIONS / TROUBLESHOOTING PARAMETERS

Using adherent cells, allow time for your cells to recover after plating	Allow cells to regain full signaling capacity by plating them at least 6 hours before starting the pharmacological treatment.
Depending on the pathway, a serum starving step could be essential to reduce the basal level activity. This step should be optimized case-by-case.	Advice on cell culture conditions prior using Revvity kit: - For adherent cells Before treating the cells with compounds, remove culture media from the plate and replace it with serum-free media before incubating from 2 hours up to overnight at 37°C. - For suspension cells Starvation step should be carried out in the flask. Harvest cells by centrifugation and re-suspend cells at a suitable cell density in serum-free media, incubate from 2 hours up to overnight at 37°C.
Generation of lysates	Ensure that the lysates used for the assay have been generated by using the HTRF® lysis buffer supplemented with the HTRF® blocking reagent, provided in the kit. Lysates generated with HTRF® buffers can be used in other technologies, like Western-blot. The blocking reagent contains only phosphatase inhibitors that prevent dephosphorylation of phosphorylated proteins from active serine/threonine and tyrosine phosphatases The lysis buffer is effective for creating cell extract under non denaturing conditions from both plated cells and cells pelleted from suspension cultures.
Using the two-plate assay manual, a low signal can often be improved by adjusting lysis volumes.	In most cases, a typical adherent cell line grown in 96-well plates is readily detected in a lysis volume of 50µL. However, the lysis volume can be adjusted from 25 µL to 200 µL.
Using an improper cell density can induce poor sensitivity and low signal	Check that the cell density is correct. Too high or low cell numbers can affect assay performances
Parameters such as cell density, stimulation time and lysis incubation time should be optimized for each cell line used.	The assay can be used for many adherent and non-adherent cell types, including transfected cell lines and primary cells. However, the expression and phosphorylation of the readout of interesrcan vary from one cell line to another. Depending on the type of treatment, and the temperature, the stimulation time can vary widely. Because of this, we recommend a time course study to determine the optimal compound incubation time. Depending of the nature of your cells, lysis time may vary from 30' to 1h. Because of this, we also recommend determination of the optimal time.
Fluorescence reading	Using an inappropriate set-up may seriously impair the results. For information about HTRF® compatible readers and for set-up recommendations, please visit our website at: www.revvity.com
Assaying for multiple targets from a single lysate.	The two-plate assay manual indicates the use of 4 µL of lysate per well, whereas the 96-well cell culture microplate would generate 50µL (or more) of lysate. Therefore, a typical cell lysate can be assayed for many targets, given that temporal and expression level constraints can vary from one target to another.
Batch production of cell lysates example of T175 flask	General lab work - prior using Revvity kit: Day1: Dispense 8 million cells in T175cm2, add 25 mL of cell culture complete medium and incubate 2 days at 37°C, 5% CO2. Day3: cell stimulation Remove cell culture medium by aspiration, wash once (do not detach the cells), add 5 mL of agonist (1x) diluted in FCS free medium and incubate at 37 ° C, 5% CO2, for the optimized time. Alpha-Tubulin detection using Revvity kit: Day3: cell lysis Remove stimulation medium, wash once (do not detach the cells), add 3 ml of 1X HTRF® lysis buffer supplemented with the HTRF® blocking reagent for 30 min at Room Temperature under orbital shaking. Transfer the cell lysate to a 15 mL vial, centrifuge 10 min, 2400 rcf at RT, recover cell lysate supernatant and store aliquots at -60°C or below. For long term conservation, aliquots should be stored in liquid nitrogen.



Manufactured by Cisbio Bioassays - Parc Marcel Boiteux - 30200 Codolet – FRANCE

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