

Product survey: Cell signalling assays

# Uncovering Cell Relay Runners

Cell signalling is so fundamental to many cellular processes that almost any cell biologist has to deal with signal transduction. Cell signalling assays may help to keep track of the numerous signalling proteins and pathways.

Trying to gain an overview of the key players and connections of most cell signalling pathways is like figuring out routes and stations from the route map of a large city's transport network. In signal transduction textbooks and reviews, one is continually bombarded with schematics showing diverse coloured lines, representing the confusing communication tracks between different signalling molecules. A lot of the so called signalling 'pathways' are more like spider webs: networks of interwoven signalling molecules and cascades, rather than simple pathways.

Though signal transduction networks may look confusing, the basic steps of cell signalling are always the same. The signalling cascade starts with the arrival of a signalling molecule, typically a hormone or a neurotransmitter, that binds to a receptor on the cell surface. The receptor then activates downstream proteins e.g. protein kinases that deliver the signal into the nucleus to stimulate transcription. Many signalling pathways are conserved throughout evolution and regulate fundamental cellular responses such as proliferation, differentiation, secretion and apoptosis. A whopping 40% of the human genome codes for proteins like signal molecules, receptors, kinases, regulators, proto-oncogenes and ion channels that are directly or indirectly involved in signal transduction. Needless to say, malfunction or defects in cell signalling proteins may trigger severe diseases ranging from metabolic disorders to cancer.

## Antibodies, kinases and reporters

Hence, it is no wonder that cell signalling assays may be found in almost every cell biology laboratory. There are countless assays on the market that may help to track

down proteins involved in signalling pathways. Due to the different nature and the position of their targets along the pathway, they can roughly be divided into three main categories: antibody-based assays, protein kinase assays and signalling assays utilising reporter genes or electrophoretic mobility shift assays (EMSA) to determine DNA binding activities of transcription factors devoted to cell signalling.

Antibodies against signalling proteins are indispensable cell signalling research tools. They are widely used to estimate expression levels of signalling proteins with western blots, follow the moves of signalling proteins within a cell by immunofluorescence or to check the phosphorylation status of signalling proteins. Finding the most suitable antibody, however, is not always

easy, since antibody makers offer myriads of antibodies raised against different kinds of signalling proteins. Some provide arrays containing hundreds of antibodies targeting known signalling proteins. Instead of probing a western blot with just one sig-

nalling protein-directed antibody, a multitude of interacting signalling proteins may be detected with one antibody array. Typical examples are phosphotyrosine profiling arrays for classification of primary tumours or arrays charged with antibodies recognising phosphorylated signalling proteins.

## Signalling arrays

After entering the cell via a receptor, e.g., a G-protein-linked-receptor or a tyrosin-kinase receptor, the signal is usually transmitted to a protein kinase cascade. The latter are at the heart of almost any signal transduction pathway. Protein kinase assays are, therefore, routine in most cell signalling labs. Cell signalling researchers often

use a phosphocellulose filter assay to quantify protein kinase activity. This relatively old assay model monitors the amount of radio-labelled phosphate that has been transferred to a peptide substrate, immobilised on a phosphocellulose paper. Though this method is reliable and can even be automated, many other non-radioactive kinase assays are currently available. Amongst them are immunoassay panels, allowing the multiplex quantification of total and phosphorylated levels of signalling proteins working in the ERK signalling pathway and IMAP-assays (Immobilised Metal Assay for Phosphochemicals). The latter are based on the interaction of a trivalent metal-nanoparticle-complex with phosphogroups. After peptide phosphorylation, the complex binds to the phosphogroup, leading to a measurable increase in fluorescence polarisation.

## Many different methods

In the third and last step of cell signalling, the signal molecule arrives in the nucleus and activates a transcription factor. Transcription factor binding and activation can be quantified with different methods. Assays based on Luciferase reporter vectors, for example, measure the increase in light emission when an activated transcription factor binds to the reporter gene. Usually reporter genes are available for different transcription factors involved in cell signalling. Colorimetric or chemiluminescence Enzyme-linked immunoabsorbent assays are another possibility. To this end, biotinylated oligos harbouring transcription factor binding sites are immobilised on streptavidin coated ELISA-plates. Bound transcription factors are then detected with antibodies.

However, one may also use classical electrophoretic mobility shift assays or modified chromatin immunoprecipitation assays to study transcription factor activation. You may find them, along with many other cell signalling assays, on the following pages.

HARALD ZÄHRINGER



Don't drop the baton.

## Cell signalling assays

Company /Distributor	Name of roduct	Signalling pathway	Assay theory	Application(s)	Miscellaneous, Specialities, Generally	Price [EUR]
<b>Active Motif</b> Rixensart, Belgium www.activemotif.com <b>Contact:</b> Phone: +32 2 653 0001 eurotech@activemotif.com	FACE Kits (Fast activated cell based ELISA)	JAK/STAT, ERK/JNK, NF-kB, AKT, and many others	<ul style="list-style-type: none"> <li>Stimulate and fix cells in 96 well format</li> <li>Perform ELISA procedure</li> <li>Detection by fluorescence or luminescence</li> </ul>	A sensitive method to detect phosphorylated proteins directly inside the cells.	<ul style="list-style-type: none"> <li>Eliminates the need to make cell extracts</li> <li>Compare phosphorylated and native protein</li> <li>Fixation preserves activation-specific protein modification</li> <li>Simple, non-radioactive method</li> <li>Easily quantified</li> </ul>	Please enquire
	TransAM Transcription factor ELISA)	NF-kB, AP-1, STAT, IRF, NRF2, SREBP1... more than 40 different targets	<ul style="list-style-type: none"> <li>Activated transcription factors are captured with oligonucleotides containing consensus-binding sites</li> <li>Detection and quantification by specific antibodies</li> </ul>	Quantitative ELISA to monitor Transcription factor activation.	<ul style="list-style-type: none"> <li>Up to 100 fold more sensitive than classical EMSA</li> <li>Colorimetric output is easily quantified</li> <li>Feasible with cell- or tissue extracts</li> <li>More than 800 product citations</li> </ul>	Please enquire
	TransAM Family Kits Kits	NF-kB, AP-1, STAT, GATA, MAPK, HNF	See above	Quantitative ELISA to profile DNA binding of transcription factor families.	<ul style="list-style-type: none"> <li>Up to 100 fold more sensitive than classical EMSA</li> <li>Colorimetric output is easily quantified</li> <li>Feasible with cell- or tissue extracts</li> <li>Results in less than 5 hours</li> </ul>	Please enquire
	ChIP-IT Kits	More than 70 ChIP validated antibodies are available: c-jun, E2F, p53, Rb, C/EBP	<ul style="list-style-type: none"> <li>Fix &amp; crosslink DNA &amp; proteins</li> <li>Shearing of the DNA-Immuno-precipitation</li> <li>Reverse crosslinking</li> <li>DNA purification</li> <li>PCR</li> </ul>	Powerful method to study transcription factor DNA interactions directly on the gene of interest.	<ul style="list-style-type: none"> <li>Flexibility by different shearing options</li> <li>No need to optimize reagents and protocol</li> <li>No phenol/chloroform extraction</li> <li>Controls available</li> </ul>	Please enquire
<b>BioCat</b> Heidelberg, Germany www.biocat.com <b>Contact:</b> Elke Gamer Phone: +49 6221-7141516 gamer@biocat.com	Transcription Factor EMSA Kits	> 400 Transcription factors	A transcription factor-specific biotin-labeled DNA probe is incubated with your protein(s) of interest. The mixture is separated on a non-denaturing polyacrylamide gel, and shifted bands are visualized.	Identification of proteins interacting with DNA.	<ul style="list-style-type: none"> <li>Easy identification of DNA-binding proteins</li> <li>High sensitivity</li> <li>No radioactivity required</li> <li>For the simultaneous profiling of multiple transcription factors, corresponding Protein/DNA arrays are available</li> </ul>	370,- (25 rxns)
	Luciferase Reporter Vectors for measuring transcription factor binding activity	AP1, AP3, AR, CRE, E2F, ELK1, ER, GAS, GAS/ISRE, GATA, GATA-1, GATA-1/2, GATA-2, ...Stat1, Stat3, Stat4, VDR, YY1	A cis-acting DNA binding element is recognized by a specific TF. Binding at this site results in the expression of firefly luciferase. Light emitted from the chemical reaction is dir. proportional to the binding activity of the targeted TF.	Quantification of transcription factor binding by measuring luciferase activity.	<ul style="list-style-type: none"> <li>Available for many transcription factors</li> <li>Flexible and fast in vivo assay</li> <li>Stable luciferase reporter cell lines also available (e.g. NFKB, CREB, NFAT, STAT1, STAT3, SRF, HIF)</li> </ul>	430,- (10 µg)
	Luminescent Transcription Factor Microplate Assays	Quantification of the DNA binding activity of transcription factors.	Nuclear extracts are incubated with a biotin-labeled DNA probe. Probes containing bound transcription factors are captured onto the surface of the microplate and bound probes are detected.	Studying the mechanisms of gene regulation and analyzing signalling pathways important in cellular functions.	<ul style="list-style-type: none"> <li>Superior sensitivity, broad dynamic range and excellent reproducibility</li> <li>No need for radioactivity</li> <li>Results are obtained in less than 4 hours</li> <li>Convenient stripwell format</li> <li>Chemiluminescent signal</li> <li>Luminex-based multiplex format available</li> </ul>	549,- (96 assays)
	Colorimetric Transcription Factor ELISA Kits	Quantification of the DNA binding activity of transcription factors.	Activated transcription factor binds to the corresponding consensus site on a biotinylated oligonucleotide. These are then immobilized on a streptavidin coated 96-well plate. The bound transcription factor is detected by an antibody.	Study of drug potency, inhibitor or activator proteins, and/or protein structure/function in the signalling pathway.	<ul style="list-style-type: none"> <li>High sensitivity - detect activation with as little as 0.5 µg of nuclear extract</li> <li>Complete assay in less than 3.5 h</li> <li>96-well plate format, with individual strips of 8 wells</li> <li>Luminex-based multiplex format (20- or 50-plex) also available</li> </ul>	617,- (96 assays; with nuclear extraction kit 678,-)
	Cell-based Phosphotyrosine ELISA Kits	Relative quantification of phosphotyrosine-EGFR, ERK1/2, JNK, P38 MAPK, Stat1, Stat3, or Stat5.	Cells are seeded into a 96 well tissue culture plate & fixed after the treatment by growth factor, cytokines or inhibitor. Anti-Phosphotyrosine-HRP is pipetted into the wells & incubated at RT. TMB substr. solut. is added t. the wells.	Analysis of protein tyrosine kinase (PTK) activity and screening inhibitors of tyrosine phosphorylation.	<ul style="list-style-type: none"> <li>High sensitivity and simple procedure, no radioactive materials</li> <li>Screen the effect of various treatments such as inhibitors or activators in one experiment</li> <li>No need for cell lysate preparation</li> <li>Works reliably with wide range of cell lines</li> </ul>	323,- to 573,- (depending on pack size)
	TranSignal Phosphotyrosine Profiling Arrays	Tyrosine kinase/phosphatase signalling cascades.	Phosphorylated proteins that interact with SH2 domains arrayed on the membrane are detected with biotinylated anti-phosphotyrosine antibodies.	Classification of primary tumors or tumor-derived cell lines as tyrosine phosphorylation patterns are specific to cancer cell types.	<ul style="list-style-type: none"> <li>High sensitivity and specificity</li> <li>Profile multiple interacting partners of tyrosine-phosphorylated proteins</li> <li>Monitor specific tyrosine kinase/phosphatase signalling cascades</li> <li>Identify SH2 domain-receptor interaction</li> </ul>	617,- (2 membranes & reagents)
	Signal Transduction Antibody Array	400 proteins involved in cell signalling.	Protein extracts containing phosphorylated proteins are incubated with the antibody array, containing 400 antibodies recognizing proteins well-known to be involved in cell signalling, and captured by the corresponding antibodies.	Profiling protein phosphorylation patterns of 400 proteins involved in cell signalling.	<ul style="list-style-type: none"> <li>Sensitive and reliable identification of protein phosphorylation</li> <li>Short time to result</li> <li>No extra equipment required</li> <li>Free Trial Antibody Array containing 60 high quality antibodies against signalling proteins included</li> </ul>	1095,-

## Cell signalling assays

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<b>BioCat</b> (continued) Contact see page	Small GTPase Activation Assays (Cdc42, Rac, Ras, and Rho)	Cdc42, Rac, Ras, and Rho small GTPases which function as regulators in signalling transduction pathways.	Visible agarose beads conjugated to proteins which selectively bind the active form of the small GTPase are added. The beads bind to the active GTPase. The precipitated GTPase is detected by Western Blot analysis.	Detection of active small GTPases.	<ul style="list-style-type: none"> <li>■ Visible agarose beads minimize potential loss</li> <li>■ No radioactivity required</li> <li>■ 1 hour plus electrophoresis and blotting</li> <li>■ Rac/Cdc42 and Rho/Rac/Cdc42 Activation Assay Combo Kits also available</li> </ul>	399,- (20 assays)	
	cAMP ELISA Kits	GPCR Signalling/ G-protein pathways.	Anti-Rabbit IgG polyclonal coating antibody is adsorbed onto a microtiter plate. Cyclic AMP competes with Peroxidase cAMP Tracer for plate binding, in the presence of Rabbit Anti-cAMP Polyclonal Antibody.	Quantification of cAMP in cell culture supernatants, plasma, serum, saliva, urine, and cell lysates.	<ul style="list-style-type: none"> <li>■ Detection of 1 pmol/ml</li> <li>■ Strip-well format with either colorimetric or chemiluminescent detection</li> <li>■ No cross reactivities to other nucleotides or cyclic nucleotides</li> <li>■ cGMP ELISA Kits also available</li> </ul>	379,- (96 assays)	
<b>Biomol</b> Hamburg, Germany www.biomol.de <b>Contact:</b> Edgar Lipsius Phone: +49 40/853260-37 e_lipsius@biomol.de	Signal Reporter Assay Kits	Available for 18 different pathways.	The activity of signalling pathway-relevant downstream transcription factors is measured by using the dual-luciferase system or MGFP reporter constructs.	Quantitative assessment of the impact of proteins, peptides, RNA interference or small molecule drug treatment on signalling pathway activation or inhibition.	<ul style="list-style-type: none"> <li>■ Delivered as transfection-ready DNA construct formulations including negative and positive controls</li> <li>■ Very high sensitivity and specificity due to optimization of transcriptional response regions of each reporter</li> <li>■ Also available as ready-to-transduce lentiviral particles</li> <li>■ Also available as 10-Pathway Reporter Array</li> </ul>	Starting at 440,- (per kit)	
<b>Biotrend Chemikalien</b> Cologne, Germany www.biotrend.com <b>Contact:</b> Herr Jaeger Phone: +49 221-9498320 jaeger@biotrend.com	8-Plex Panel MultiBead Kit	Multiplex	(IL-4, IL-6, IL-8, IL-1beta, IFN-gamma, and TNF-alpha).	-	<ul style="list-style-type: none"> <li>■ Sensitivity IFN-gamma = 4.6 pg/ml IL-1beta = 1.7 pg/ml IL-4 = 19.9 pg/ml IL-6 = 1.6 pg/ml IL-8 = 1.5 pg/ml PGE2 = 64.2 pg/ml TNF-alpha = 3.6 pg/ml TXB2 = 65.9 pg/ml</li> </ul>	1430,-	
	MultiBead analysis software	Software	Result calculation	-	<ul style="list-style-type: none"> <li>■ Free</li> </ul>	-	
	Caspase-3 DEVD-R110	Fluorometric & Colorimetric Assay	-	-	-	<ul style="list-style-type: none"> <li>■ 100 assays</li> </ul>	280,-
	Steady-Luc Firefly	HTS Assay Kit	-	-	-	<ul style="list-style-type: none"> <li>■ 1000 assays</li> </ul>	480,-
<b>In Vitro Systems &amp; Services</b> Göttingen, Germany www.ivss.de <b>Contact:</b> Katrin Esslinger Phone: +49 551500 97325 kesslinger@ivss.de	lumox slide flask and lumox x-well	-	Slide based cell culture vessel with a gas-permeable growth surface made of the lumox Film with a low autofluorescence.	Fluorescencebased cell assays.	<ul style="list-style-type: none"> <li>■ Slide and cell culture vessel in one</li> <li>■ Gas-permeable</li> <li>■ Low autofluorescence</li> <li>■ Removeable slide</li> <li>■ No residues on the slide</li> </ul>	758,- (96 flask or x-well)	
<b>Li-Cor Biosciences</b> Bad Homburg, Germany www.licor.com <b>Contact:</b> Carina Grauvogel Phone: +49 6172-1717740 carina.grauvogel@licor.com	In-Cell Western Assay Odyssey Infrared Imaging System Aerius Automated Infrared Imaging System	-	Cell-based immunocytochemical Assay. Target protein is detected directly in cells. Advantages of Near Infrared Technology: IRDye labeled secondary antibodies as well as direct detection of the fluorescence signal and normalization against a second target give specific and quantitative Data.	Direct protein detection; detection of 2 targets simultaneously; quantification in cells; quantitative analyses of cellular signal transduction pathways; drug screening; high throughput screening; cell-based IC50 determination; inhibitor/effector screening.	<ul style="list-style-type: none"> <li>■ Odyssey Infrared Imaging System: scan up to 6 microtiter plates simultaneously</li> <li>■ Aerius System: optional microplate stacker enables automated scanning of up to 30 plates in one run</li> <li>■ Barcode Scanner</li> <li>■ Can easily be integrated in fully automated workflows</li> <li>■ Provides automated analyses of In-Cell Western Assays</li> </ul>	Upon request	
<b>Merck Chemicals</b> Calbiochem, Novagen, Novabiochem www.merckbio.eu <b>Contact:</b> Technical Services techservice@merckbio.eu	K-LISA mTOR Activity Kit	mTOR	An ELISA-based activity assay for measuring the kinase activity of purified or mTOR immunoprecipitated from cell lysates.	Useful for in vitro mTOR inhibitor screening & for assessing the regulation of mTOR cell signalling.	<ul style="list-style-type: none"> <li>■ ELISA-based activity assay</li> </ul>	385,-	
	Wide Screen EpiTag ERK Pathway Panel I Complete Kit	B-Raf, MEK1/2, ERK1 Total ERK1, ERK2 Total ERK2.	EpiTag Assays for the bead-based xMAP platform.	Multiplex quantitation of total and phosphorylated proteins.	<ul style="list-style-type: none"> <li>■ New technology</li> <li>■ 100 Tests</li> <li>■ G-plex</li> <li>■ Complete kit</li> </ul>	1.795,-	
	Wide Screen EpiTag ERK Pathway Panel II Complete Kit	MEK1 Total MEK2 Total MEK1/2, Raf1 Total Raf1, STAT1 Total.	EpiTag Assays for the bead-based xMAP platform.	Multiplex quantitation of total and phosphorylated proteins.	See above	1.795,-	
	Wide Screen RTK Total Assay Complete Kit	Total EGFR, IGF-1R, HGFR, PDGFRβ, HER-2, VEGFR2, Tie-2.	Detect of total RTK levels from human samples using the Luminex xMAP Platform.	Multiplex quantitation of total RTK levels.	<ul style="list-style-type: none"> <li>■ Multiplex quantitation</li> <li>■ Luminex xMAP Platform</li> </ul>	1.945,-	

## Cell signalling assays

Company / Distributor	Name of product	Signalling pathway	Assay theory	Application(s)	Miscellaneous, Specialities, Generally	Price [EUR]
<b>Merck</b> (continued) Contact see page	Wide Screen RTK pTyr Assay Complete Kit	pTyr EGFR, IGF-1R, HGFR, PDGFR $\beta$ , HER-2, VEGFR2, Tie-2.	Detect phosphotyrosine-modified RTK levels from human samples using the Luminex xMAP Platform.	Multiplex detection of phosphotyrosine-modified RTK levels.	<ul style="list-style-type: none"> <li>■ Luminex xMAP Platform</li> </ul>	1.875,-
<b>Millipore</b> USA www.millipore.com Contact: Europe: stephanie_le_dall@millipore.com	Dual Detect CELISA Assay Kit (Fluorogenic Detection)	EGFR, Akt, Erk 1/2, ErbB2, p38a, various.	To measure both total and phosphorylated targets in whole cells in a 96 well microplate format using dual fluorescent detection.	Measurement of both total and phosphorylated proteins in a single well, Cell based ELISA.	<ul style="list-style-type: none"> <li>■ Simple and efficient</li> <li>■ Cell based ELISA</li> </ul>	460,-
	STAR (Signal Transduction Assay Reaction) ELISA kit	Various signalling pathways.	Solid phase sandwich enzyme linked immunosorbent assay provides a fast method to detect specific levels of signalling targets.	ELISA	<ul style="list-style-type: none"> <li>■ Takes less than 5 hours</li> <li>■ Sensitive method</li> <li>■ Whole cell extracts</li> <li>■ Minimal hands on</li> </ul>	499,-
<b>Molecular Devices</b> part of MDS Analytical Technologies Sunnyvale, CA www.moleculardevices.com Contact: Athena Panagiotakakos Phone +1 408.747.1700 Athena.panagiotakakos@moldev.com	FLIPR Calcium Assay Kits	Gq GPCR pathway.	Fluorescent Calcium indicator dye with patented masking dye measure changes in intracellular calcium via a homogeneous mix-and-read assay format.	Measures rapid cellular kinetics during assay development and HTS.	<ul style="list-style-type: none"> <li>■ Homogeneous</li> <li>■ Increased Z'-factor</li> <li>■ Compatible with a wide range of targets</li> <li>■ High signal intensity</li> <li>■ Adherent and non-adherent cells</li> </ul>	Please enquire
	FLIPR Membrane Potential Assay Kits	Ion channel pathways.	Proprietary fluorescent ion-sensitive indicator dye with patented masking dye measure changes in membrane potential via a homogeneous m.-a.-r. assay format.	Voltage gated and ligand gated ion channels / All types of ion channels (K, Na, Cl, etc) / Assay Development / HTS.	<ul style="list-style-type: none"> <li>■ Dual formulations (blue or red) for optimizing targets and cell lines</li> <li>■ Monitors rapid cellular kinetics</li> <li>■ Mix-and-read format is HTS compatible</li> </ul>	Please enquire
	FLIPR Membrane Potential Two Assay Kits	Sodium sensitive ion channel pathways.	Proprietary sodium sensitive fluorescent indicator dye and patented masking dye measure changes in membrane potential via a homog. m.-a.-r assay format.	Sodium sensitive ion channel targets / Voltage-gated and ligand gate ion channels / Assay Development / HTS.	<ul style="list-style-type: none"> <li>■ Optimized for ion channel targets which require low-sodium or sodium-free, cell-based environments</li> <li>■ Reduced sodium interference</li> </ul>	Please enquire
	IMAP Technology	Kinase, phosphatase and phosphodiesterase pathways.	Platform that utilizes high affinity binding of phosphate to immobilized trivalent metals for screening kinases, phosphatases and phosphodiesterases.	FP & TR-FRET formats Assay Development HTS.	<ul style="list-style-type: none"> <li>■ Antibody-free</li> <li>■ No radioactivity</li> <li>■ Optimized for high ATP concentrations and acid peptide substrates</li> <li>■ 5FAM- and TAMRA-labelled substrates</li> <li>■ IC50 correlates with literature values</li> </ul>	Please enquire
	Neurotransmitter Transporter Uptake Assay Kit	Membrane transporter pathways.	Fluorescence-based assay that detects uptake of serotonin, norepinephrine and dopamine transporter activity.	Monitors serotonin, dopamine and norepinephrine activity / Assay Development / HTS.	<ul style="list-style-type: none"> <li>■ Homogeneous fluorescence detection</li> <li>■ Non-radioactive assay format</li> <li>■ Real time kinetic mode</li> <li>■ IC50 values correlate to literature values</li> </ul>	Please enquire
	CatchPoint Cyclic AMP and cGMP Assay Kits	cAMP and cGMP pathways.	Increasing concentrations of cAMP competitively decrease the amount of bound conjugate, thus decreasing the measured HRP activity.	End point assay for low to medium throughput	<ul style="list-style-type: none"> <li>■ Sensitive detection limit</li> <li>■ Large dynamic range (4 log orders)</li> <li>■ Single wash step</li> <li>■ No termination step</li> </ul>	Please enquire
	Transfluor Technology	Gq, Gi, Go, Gs GPCR pathway.	Upon activation by ligand binding, GPCR rapidly undergoes desensitization. The desensitization process is monitored using GFP-tagged beta arrestin.	HCS / Assay Development.	<ul style="list-style-type: none"> <li>■ Single read-out for all GPCRs (Gq, Gi, Go, Gs)</li> <li>■ No GPCR labelling or tagging</li> <li>■ Validated in over 100 GPCRs</li> <li>■ De-orphanization studies</li> </ul>	Please enquire
	QBT Fatty Acid Uptake Kit	Membrane Transporter Pathways.	Employs BODIPY dodecanoic fluorescent fatty acid analog that is actively transported into the cell to measure fluorescent increase.	Assay Development / HTS / Real time kinetics for cellular processes.	<ul style="list-style-type: none"> <li>■ No radioactivity</li> <li>■ Homogeneous assay</li> <li>■ Real time kinetics</li> </ul>	Please enquire
<b>PerkinElmer LAS</b> Rodgau, Germany www.perkinelmer.com Contact: Michael Lässle Phone: 0800-181 0032 michael.laessle@perkinelmer.com	Alpha Screen Sure Fire cellular kinase assays	Akt signalling targets.	Lysate based detection of phospho-targets with AlphaScreen technology. No transfection needed. One lysate sample can be used f. detection of multiple phospho-targets.	pPDK1pBADp-S6RppP70S6K	<ul style="list-style-type: none"> <li>■ New kits added on regular basis</li> <li>■ pERK Assay can be used for GPCR targets</li> </ul>	0,50/well at 50000 dp; f. higher throughput please enquire
	See above	MAPK	See above	pErk ½pMEKpp38pJNK	See above	See above
	See above	Apoptosis	See above	pCaspase9pNFkappaB p65	See above	See above
	See above	Translational control.	See above	p4EBP1pGSK-3alpphapP70S6K	See above	See above
	See above	NFkappaB	See above	pNFkappaB p65	See above	See above
	See above	Cytokine	See above	pSTAT3pSTAT5	See above	See above
	See above	TGF beta	See above	pSMAD2	See above	See above

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<b>Promega</b> Find your local branche on <a href="http://www.promega.com">www.promega.com</a> <b>Contact:</b> Jan Adam Technical Services (Germany) Phone: +49 621/8501-290 <a href="mailto:de_techserv@promega.com">de_techserv@promega.com</a>	cAMP-Glo Assay	GPCR	Indirect measurement of cAMP levels via coupling to luciferase reaction.	Regulation of GPCR.	<ul style="list-style-type: none"> <li>Best signal: background ratio of all cAMP assays (300, 3000, 30,000 assays)</li> <li>For 96-, 384- or 1536-well plates</li> </ul>	Please enquire
	PDE-Glo Phosphodiesterase Assay	Various	Indirect measurement of PDE activity from purified sources via coupling to luciferase reaction.	Regulation of PDE activity.	<ul style="list-style-type: none"> <li>Works with cAMP and cGMP PDEs</li> <li>1000, 10,000 Assays</li> </ul>	Please enquire
	Kinase-Glo Luminescent Kinase Assay	Various	Measurement of remaining ATP after reaction of purified kinase in luciferase reaction.	Regulation of kinase / Activity screening for kinase inhibitors.	<ul style="list-style-type: none"> <li>Wide range of kinases and substrates</li> <li>Linear to 10µM ATP (Kinase-Glo Plus 100µM ATP, Kinase-Glo Max 500 µM ATP)</li> <li>10 ml, 10x10 ml, 100 ml, 10x100 ml</li> </ul>	Please enquire
	ProFluor Phosphatase or PKA or Src-Kinase	Various	Reaction of purified phosphatase/kinase sets free fluorescent substrate.	Regulation of phosphatase/kinase activity.	<ul style="list-style-type: none"> <li>Homogenous assay with simple Add-mix-read format</li> <li>4 or 8 plates each</li> </ul>	Please enquire
	P450-Glo CYP3A4 Cell-Based Assay	Various	Measurement of cytochrome P450 activity with substrate for luciferase reaction.	Regulation of P450 / Activity screening for P450 activating/inhibiting substances.	<ul style="list-style-type: none"> <li>Homogenous assay with simple Add-mix-read format (10 ml, 50 ml)</li> <li>Luminescent substrate avoids background from fluorescent test compounds</li> </ul>	Please enquire
<b>PromoCell</b> Heidelberg, Germany <a href="http://www.promokine.info">www.promokine.info</a> <b>Contact:</b> Technical Support Phone: +49 6221 64934-0 <a href="mailto:info@promokine.info">info@promokine.info</a>	cAMP and cGMP Activity Assays	cAMP and cGMP signalling.	Competitive immunoassays utilizing 96-well plates coated with anti-cAMP or anti-cGMP antibodies and HRP-conjugated cAMP or cGMP.	<ul style="list-style-type: none"> <li>Quantitative determination of cAMP and cGMP levels, respectively</li> <li>Cell Signalling/cell growth studies</li> </ul>	<ul style="list-style-type: none"> <li>Fast and simple</li> <li>Highly sensitive</li> <li>Good linearity and reproducibility</li> <li>Suited for high-throughput and automation</li> </ul>	319,- (100 assays)
	Akt Activity Immunoassay Kit	Akt Signalling Pathway.	Utilizes Akt-specific antibody to immunoprecipitate Akt from cell lysate. Akt-specific activity is then detected in a kinase reaction.	<ul style="list-style-type: none"> <li>Akt kinase detection</li> <li>Screening for apoptotic cells</li> </ul>	<ul style="list-style-type: none"> <li>Easy, accurate and fast procedure</li> <li>Non-radioactive method</li> <li>Compatible with standard lab equipment</li> <li>Complete, ready-to-use kit</li> </ul>	499,- (40 assays)
	JNK Activity Screening Kit	JNK signalling pathway	JNK-specific activity is detected in a kinase reaction with c-Jun and ATP. Phosphorylated c-Jun is determined by Western blot analysis.	<ul style="list-style-type: none"> <li>JNK kinase detection</li> <li>Screening for apoptotic cells</li> </ul>	See above	399,- (40 assays)
	Beta-Secretase Fluorometric Assay Kit	BACE-mediated signalling.	The assay utilizes a secretase-specific peptide substrate conjugated to a reporter molecule. Cleavage of the peptide by beta-Secretase removes quenching.	<ul style="list-style-type: none"> <li>beta-secretase activity detection</li> </ul>	<ul style="list-style-type: none"> <li>Fast and simple assay</li> <li>Highly sensitive detection</li> <li>Complete, ready-to-use kit</li> <li>Positive and negative controls included</li> <li>Suited for high-throughput and automation</li> </ul>	399,- (100 assays)
	Calcium indicators	Intracellular Calcium signalling.	Fluorescent calcium indicators that change their fluorescence properties when binding to calcium ions.	<ul style="list-style-type: none"> <li>Intracellular calcium signalling studies</li> <li>Neuroscience research</li> <li>Investigation of signal transduction and apoptotic cascades</li> </ul>	<ul style="list-style-type: none"> <li>High sensitivity</li> <li>Derivatives for special applications available</li> <li>Compatible with standard fluorescence equipment</li> </ul>	85,- to 165,- (per mg)
	Cytokine and Chemokine ELISAs	Cytokine/Chemokine signalling.	Conventional sandwich ELISA.	Quantification of cytokines/chemokines involved in cellular signalling.	<ul style="list-style-type: none"> <li>High sensitivity</li> <li>Convenient protocol</li> <li>Reliable and reproducible results</li> <li>Wide range of assays available</li> </ul>	399,- to 540,-
<b>Roche Diagnostics</b> Find your local contact names and phone number at <a href="http://www.roche-applied-science.com">www.roche-applied-science.com</a>	xCELLigence RTCA (Real Time Cell Analyzer), system and software	System utilizes an electronic readout called impedance to non-invasively quantify adherent cell proliferation and viability in real-time.	Real-time and dynamic monitoring of cells by impedance technology: Interaction of adherent culture cells with electronic sensors generates a cell-electrode impedance response (96 Well MTP Format; 1 x 96 or 6 x 96 wells).	Dynamically monitor the rate and onset of cell proliferation, cell death, cytotoxicity, apoptosis, receptor signalling etc.	<ul style="list-style-type: none"> <li>Results, not possible with end-point analysis</li> <li>More meaningful information from a single experiment</li> <li>No labeling of cells with expensive reagents</li> <li>Noninvasive</li> <li>Provides constant quality control for the cells allowing the user to make informed decisions about the timing of certain manipulations</li> </ul>	Please contact your local dealer
	Cell Death Detection ELISA <sup>PLUS</sup>	Cell death pathways.	Photometric enzyme immunoassay for quantitative in vitro determination of cytoplasmic histone-associated DNA fragments (mono- and oligonucleosome) after induction of apoptosis.	Detection of apoptosis and necrosis in cell culture supernatants, serum and plasma.	<ul style="list-style-type: none"> <li>Fast and easy One-step ELISA for the detection of apoptosis and necrosis</li> <li>High sensitivity and specificity</li> <li>Suitable to analyze cell culture supernatants, serum and plasma</li> <li>Non-radioactive, no pre-labelling</li> <li>Positive control included</li> </ul>	Please contact your local dealer
	Cytotoxicity Detection Kit <sup>PLUS</sup> (LDH)	Cell and compound mediated cytotoxicity/cytolysis.	Fast, sensitive, and simple method to quantitate cytotoxicity/cytolysis based on the measurement of LDH activity released from damaged cells.	Colorimetric quantification of cell & compound-mediated cytolysis in 96- or 384-well plates.	<ul style="list-style-type: none"> <li>Fast and easy One-Step ELISA</li> <li>High sensitivity and specificity</li> <li>Non-radioactive, no pre-labelling necessary</li> <li>Low background</li> </ul>	Please contact your local dealer

## Cell signalling assays

Company / Distributor	Name of product	Signalling pathway	Assay theory	Application(s)	Miscellaneous, Specialities, Generally	Price [EUR]
<b>Roche</b> (continued) Contact see page	Cell Proliferation Reagent WST-1	Cell proliferation, cell viability, cytotoxicity.	Designed for the nonradioactive, spectrophotometric quantification of cell proliferation and viability in cell populations using 96-well plate format.	Colorimetric quantification of cell proliferation and viability.	<ul style="list-style-type: none"> <li>■ High sensitivity and specificity</li> <li>■ Higher stability than MTT or XTT</li> <li>■ High linear range</li> <li>■ Non-radioactive One-step Assay</li> <li>■ Easy and fast, water-soluble</li> </ul>	Please contact your local dealer
<b>Takara Bio Europe/ Clontech</b> www.clontech.com Toll Free Phone: Germany 0800 1825 178; UK 0808 234 8063; Switzerland 0800 563 629; Austria 0800 296 141; Europe +33-1 3904 6880 tech@clontech-europe.com	ApoAlert pDsRed2-Bid Vector	Apoptosis Bcl-2	Translocation of Bid to the mitochondria following apoptosis can be monitored by fluorescence microscopy.	Cell-based assay; Monitor apoptotic events on a single cell level.	<ul style="list-style-type: none"> <li>■ Monitoring in living cells</li> </ul>	Please enquire
	ApoAlert Annexin V Apoptosis Kit	Apoptosis Phosphatidylserine.	A fluorescent annexin V conjugate to detect apoptosis by fluorescence microscopy or flow cytometry.	Early apoptosis detection.	<ul style="list-style-type: none"> <li>■ One-step procedure, just 10min,</li> <li>■ Suitable for both adherent and suspension cells</li> <li>■ Available separately or in a complete kit</li> </ul>	Please enquire
	ApoAlert Caspase Assay Kits	Apoptosis Caspases 3, 8, 9/6.	Caspase protease activity	Monitor apoptotic events in a cell population.	<ul style="list-style-type: none"> <li>■ Simple and convenient</li> <li>■ Fluorometric or colorimetric methods</li> </ul>	Please enquire
	ApoAlert Glutathione Detection Kit	Apoptosis glutathione.	Monochlorobimane dye that fluoresces blue when bound to glutathione.	Monitor early stages of apoptosis by detection of the decrease in glutathione levels.	<ul style="list-style-type: none"> <li>■ Simple, quantitative in vitro assay</li> </ul>	Please enquire
	ApoAlert DNA Fragmentation Assay Kit	Apoptosis	Based on TUNEL method. The fluorescein-labeled DNA can be quantified using either fluorescence microscopy or flow cytometry.	Monitor apoptotic events at a cell population level.	<ul style="list-style-type: none"> <li>■ Use with adherent cells, suspension cells, or fixed tissue sections</li> </ul>	Please enquire
	LDH Cytotoxicity Detection Kit	Apoptosis	Measure release of LDH (Lactate dehydrogenase) as a readout for cell viability.	Monitor apoptotic events at a cell population level / Determine the cytotoxic potential of compounds.	<ul style="list-style-type: none"> <li>■ Sensitive determination of cell death from supernatant sample in less than 1h</li> </ul>	Please enquire
	Premixed WST-1 Cell Proliferation Reagent	Cell proliferation.	Measure cleavage of WST-1 as a readout for metabolically active cells.	Quantify cell proliferation and viability.	<ul style="list-style-type: none"> <li>■ Ready-to-use, sterile format</li> <li>■ No washing steps or additional reagents required</li> </ul>	Please enquire
	Pathway Profiling Systems	Broad stress; Nuclear hormone receptors; PKC/ calcium signalling; Cell growth etc.	Each vector contains a distinct cis-acting enhancer element upstream of a reporter gene. To study effects by a given stimulus.	Measure transcription factor activation / Quantify differences in activation.	<ul style="list-style-type: none"> <li>■ Different Chemiluminescent or luciferase detection kits available targeting different pathways</li> <li>■ Easy to use &amp; reliable</li> </ul>	Please enquire
	Kinase expression vector set	MAPK pathway, NK/SAPK pathway PKA pathway.	Constitutive expression of MEK1, MEKK1, PKA to study the effects of a given stimulus on the corresponding pathways.	Measure transcription factor activation / Quantify differences in activation.	<ul style="list-style-type: none"> <li>■ Vector set consisting of three vectors, each constitutively expressing a kinase</li> </ul>	Please enquire
	Dominant-Negative Vector Sets	p53; I kappa B alpha; CREB; Ras and Raf.	Each vector set includes one vector that expresses a strong wild-type protein and one that provides a dominant negative, non-functional version.	Measure and quantify signal transduction pathway activity / Activation and knockdown studies.	<ul style="list-style-type: none"> <li>■ Dissect the network of signal transduction pathways</li> <li>■ Combine with cis reporter vectors to create a complete assay system</li> </ul>	Please enquire
TransFactor kits	NFkB p50; Inflammation; NFkB p65; Oncogenesis; HIF 1 alpha beta; NFkB; NFkB p52; STAT3; NFATc1.	TransFactor Kits provide a flexible Elisa-based assay format for studying transcription factor-DNA interaction.	Monitor signal transduction in various pathways / Study DNA-protein interaction.	<ul style="list-style-type: none"> <li>■ Different Chemiluminescent or colorimetric detection kits targeting different pathways</li> <li>■ Highly specific Faster and more sensitive than gel-shift assays</li> </ul>	Please enquire	
Proteasome Sensor Proteasome Sensor Cell Line	Proteasome	A reporter vector expressing a proteasome-sensitive fluorescent protein, ZsProSensor-1.	Monitor proteasome activity / Identify proteasome inhibitors with multi-well screening assays	<ul style="list-style-type: none"> <li>■ Easy, non-invasive detection</li> <li>■ Available as a vector or as a stable cell line</li> </ul>	Please enquire	
<b>Zeptosens</b> a Division of Bayer (Switzerland) www.zeptosens.com Contact: Markus Tobler Phone: +41 61 726 8181 markus.tobler@zeptosens.com	ZeptoMARK Reverse Arrays	> 200 Assays for the following pathways: Akt, MAPK, Jak/Stat, Wnt, Hedgehog, Cell cycle control, Lipid, Insulin, Chromatin regulation, Cytokine, Stress, Apoptosis.	Under denaturing conditions lysed cells, tissue or body fluids are deposited on ZeptoMARKmicroarray slides. An almost unlimited number of replicas for measurement of different signalling proteins can be applied. The highest sensitivity immunofluorescence detection allows for detection of even lowest concentrations of protein expression and posttranslational modification.	Biomarker / Target discovery Biomarker / Target validation Cell-based screening Mode of action profiling Selectivity profiling Toxicology investigation Systems biology model validation	<ul style="list-style-type: none"> <li>■ Totally flexible assay combination from study to study</li> <li>■ The reverse array principle allows fast and easy addition of new assays</li> <li>■ Highest sensitivity and reproducibility of results (even for fastest signalling events)</li> </ul>	Study size specific