Which kinases are assayable in compound selectivity screens using Kinome 2.0^{plus}?

Compound profiling is a key part of the drug discovery process. The Kinome 2.0^{plus} Compound Profiling Kit from Sense Proteomic can be used to determine selectivity and potency for a wide range of kinases under identical experimental conditions. The Kinome 2.0^{plus} Compound Profiling Kit contains 10 identical kinome arrays of 336 human kinases and related proteins spotted on glass slides and sufficient Broad Specificity Ligands (BSL) to assay all 10 arrays, either for selectivity or potency experiments. The kinases are tethered to the slide using a proprietary tag which allows orientation of the kinases in a reproducible manner and which ensures that the proteins are folded and functional. One kit will allow up to nine compounds to be assayed for selectivity on individual arrays using one BSL reporter. Alternatively, for greater confidence, four compounds can be selectivity screened in parallel on pairs of arrays and the binding compared with that on two control arrays. We present here a highly reliable and simple method of data analysis for such selectivity studies using Sense Proteomic Kinome 2.0^{plus} Compound Profiling Kits. Using this methodology in conjunction with Sense Proteomic's latest selectivity analysis software semi-automates and greatly simplifies the process of kinase inhibitor selectivity screening.

Previously, the method used to specify all the assayable kinases was based on identifying those kinases which bound labeled-ligand above a defined cut-off* value. This value was calculated from the level at which the ligand bound to the control proteins present on the array. Although this method was adequate for kinases which bound considerably more ligand than the controls it was more problematic for kinases that bound ligand at levels close to the background binding to control proteins.

To address these issues Sense Proteomic has re-evaluated the way in which assayable kinases are defined on the arrays. A definitive method to determine whether a kinase is assayable is to demonstrate that a kinase inhibitor is able to specifically and reproducibly displace the ligand from that kinase. If it can be demonstrated that binding of the labeled-ligands (BSL3-Cy3 or BSL2-Cy3B) to the kinase ATP binding site is inhibited by a compound then that kinase is classified as an assayable kinase. Kinome 2.0 arrays were therefore assayed with BSL3-Cy3 and BSL2-Cy3B in the presence of a range of broad specificity inhibitors, including unlabeled BSL2 and BSL3. Assays were repeated on at least eight arrays

* Cut-off was defined as the mean of labeled ligand binding to the 4 control proteins + 3 x mean standard deviation of binding to the control proteins.

Sense Proteomic Limited | Unit 4 The Switchback Gardner Road Maidenhead Berkshire SL6 7RJ England

for each inhibitor to ensure confidence in the results and a list of "Assayed kinases" i.e. those that have been inhibited on the arrays has been compiled.

The kinases in the Kinome 2.0 panel have therefore been classified into:

- "Assayable" for which inhibition or binding of ligand well above the cut-off has been demonstrated.
- "Non-assayable kinases" which do not bind the labeled-ligands above the defined cut-off*.

The numbers of kinases which fall into these categories are shown in Table 1.

Inhibition of ligand binding has been demonstrated at Sense Proteomic for all of the kinases in the "Assayable kinase" category which is listed in Tables 1 and 2 below.

Due to the differing affinities of BSL3-Cy3 and BSL2-Cy3B for the kinases on the arrays the amount of ligand binding, which defines the assay window†, is different for each kinase. The level of ligand binding affects the ease of assay interpretation therefore those assayable kinases (Table 1) which have a large assay window are easily interpreted (coloured green) and those that have a small assay window require more careful interpretation (coloured yellow). For the group of kinases that have a small assay window, more care must be taken to inspect the data to ensure confidence in the reported results. When kinases in the yellow category are reported as not inhibited by the compound of interest, examine the data in more detail to check for any large standard deviations which might suggest high assay variability for that particular kinase and compare data for the same kinase on other arrays in the same experiment to check reproducibility. Finally check the images to ensure that all the spots are free from assay artifacts and remove any data points which are compromised.

† The assay window is defined as the difference between fluorescently labeled ligand binding to the control and the fully inhibited kinase.

Table 1: Key to Table 2 shows the number of assayable and non-assayable kinases

	BSL3-Cy3	BSL2-Cy3B
Total assayable kinases using both ligands: The total number of assayable kinases is comprised of the categories shown below.	**196**	
Total assayable kinases with either ligand: Total number of kinases assayable with each individual ligand	**171**	**79**
Assayed kinases with large assay window: The number of kinases for each ligand which exhibit ligand binding with a large assay window and for which inhibition by kinase inhibitors has been demonstrated	97	41
Assayed kinases with small assay window: Number of kinases for each ligand which exhibit ligand binding with a smaller assay window and for which inhibition by kinase inhibitors has been demonstrated	74	38

A number of kinases on Kinome 2.0 arrays do not bind either BSL3-Cy3 or BSL2-Cy3B above the level of the defined cut-off and are therefore not assayable with these ligands. These proteins may however be assayable with alternative labeled ligands or assays.

To achieve highest coverage of the kinome it is recommended to use both BSL3-Cy3 and BSL2-Cy3B in selectivity and potency assays, but if only one ligand is used it is recommended to use BSL3-Cy3 in preference to BSL2-Cy3B as it gives a greater number of high quality assays. Although BSL2-Cy3B binds to a large number of kinases, in many cases the ligand binding is very close to background.

Sense Proteomic Limited | Unit 4 The Switchback Gardner Road Maidenhead Berkshire SL6 7RJ England

sense PROTEOMIC

Table 2: List of content and assayable kinases on Kinome 2.0 arrays

Symbol	Name	BSL2-Cy3B	BSL3-Cy3
AAK1	AP2 associated kinase 1		
ABL2	V-ABL Abelson murine leukemia viral oncogene homolog 2		
ACK1	Activated p21cdc42Hs kinase		
ACVR1	Activin A receptor, type I		
ACVR1C	Activin A receptor, type IC		
ACVR2	Activin A receptor, type II, mRNA (cDNA clone MGC:97294)		
ADCK1	AARF domain containing kinase 1, mRNA (cDNA clone MGC:64983)		
ADCK4	AARF domain containing kinase 4		
ADRBK2	Adrenergic, beta, receptor kinase 2		
AK1	Adenylate kinase 1		
AK2	Adenylate kinase 2, transcript variant AK2A		
AK3	Adenylate kinase 3		
AK3L1	Adenylate kinase 3-like 1, transcript variant 3		
AK7	Adenylate kinase 7		
AKT1	V-AKT, murine thymoma viral oncogene homolog 1		
AKT2	V-AKT, murine thymoma viral oncogene homolog 2		
AKT3	V-AKT, murine thymoma viral oncogene homolog 3		
ALPK1	Alpha-kinase 1, mRNA (cDNA clone MGC:71554)		
ALS2CR2	Amyotrophic lateral sclerosis 2 (juvenile) chromosome region, candidate 2		
APEG1	Aortic preferentially expressed protein 1		
ARAF1	V-RAFmurine sarcoma 3611 viral oncogene homolog 1		
AURKB	Serine/threonine kinase 12, clone MGC:8406		

Sense Proteomic Limited | Unit 4 The Switchback Gardner Road Maidenhead Berkshire SL6 7RJ England

AXL	AXL receptor tyrosine kinase, transcript variant 1		
BCKDK	Branched chain alpha-ketoacid dehydrogenase kinase		
BLK	B lymphoid tyrosine kinase		
BMPR1A	Bone morphogenetic protein receptor, type IA		
BMPR1B	Bone morphogenetic protein receptor, type IB, mRNA (cDNA clone MGC:54267)		
BMPR2	Bone morphogenetic protein receptor, type II (serine/threonine kinase), mRNA (cDNA clone MGC:60135)		
BMX	BMX non-receptor tyrosine kinase		
BRD2	Bromodomain containing 2, mRNA (cDNA clone MGC:74927)		
BRD3	Bromodomain containing 3		
BRSK1	BR serine/threonine kinase 1		
BUB1	BUB1 budding uninhibited by benzimidazoles 1 homolog (yeast), clone MGC:39991		
BUB1B	BUB1 budding uninhibited by benzimidazoles 1 homolog beta (yeast)		
C1orf57	Chromosome 1 open reading frame 57		
C20orf64 / PRPK	Chromosome 20 open reading frame 64		
C20orf97	Chromosome 20 open reading frame 97		
C6orf199	Chromosome 6 open reading frame 199		
C9orf96	Chromosome 9 open reading frame 96, mRNA (cDNA clone MGC:43306)		
CABC1	Chaperone, ABC1 activity of bc1 complex like (S. pombe)		
CAMK1	Calcium/calmodulin-dependent protein kinase I (CAMK1)		
CAMK1G	Calcium/calmodulin-dependent protein kinase IG		
CAMK2A	Calcium/calmodulin-dependent protein kinase (CaM kinase) II alpha, transcript variant 2, mRNA (cDNA clone MGC:26106)		
CAMK2B	Calcium/calmodulin-dependent protein kinase (CaM kinase) II beta, transcript		
CAMK2D	Calcium/calmodulin-dependent protein kinase (CaM kinase) II delta		
CAMK2G	Calcium/calmodulin-dependent protein kinase (CaM kinase) II gamma		
CAMK4	Calcium/calmodulin-dependent protein kinase IV		

Sense Proteomic Limited | Unit 4 The Switchback Gardner Road Maidenhead Berkshire SL6 7RJ England

CAMKK1	Calcium/calmodulin-dependent protein kinase kinase 1		
CAMKK2	Calcium/calmodulin-dependent protein kinase kinase 2, beta		
CAMKV	Hypothetical protein MGC8407		
CARKL	Carbohydrate kinase-like		
CCRK	Cell cycle related kinase		
CDC2	Cell division cycle 2, G1 to S and G2 to M, transcript variant 1		
CDC2L1	Cell division cycle 2-like 1 (PITSLRE proteins) (CDC2L1), transcript variant 6		
CDC2L6	Cell division cycle 2-like 6 (CDK8-like)		
CDK10	Cyclin-dependent kinase (CDC2-like) 10		
CDK2	Cyclin-dependent kinase 2, transcript variant 1		
CDK3	Cyclin-dependent kinase 3		
CDK4	Cyclin-dependent kinase 4, transcript variant 1		
CDK5	Cyclin-dependent kinase 5		
CDK5R1	Cyclin-dependent kinase 5, regulatory subunit 1 (p35)		
CDK7	Cyclin-dependent kinase 7		
CDK9	Cyclin-dependent kinase 9 (CDC2-related kinase)		
CDKN1A	Cyclin-dependent kinase inhibitor 1A (p21, Cip1), transcript variant 1		
CDKN2A	Cyclin-dependent kinase inhibitor 2A (melanoma, p16, inhibits CDK4)		
CDKN2B	Cyclin-dependent kinase inhibitor 2B (p15, inhibits CDK4)		
CDKN2C	Cyclin-dependent kinase inhibitor 2C (p18, inhibits CDK4)		
CDKN2D	Cyclin-dependent kinase inhibitor 2D (p19, inhibits CDK4)		
CHEK1	CHK1 checkpoint homolog (S. pombe)		
CHEK2	CHK2 checkpoint homolog (S. pombe), transcript variant 1		
CKB	Creatine kinase, brain		
CKM	Creatine kinase, muscle		

CKMT2	Creatine kinase, mitochondrial 2 (sarcomeric)		
CKS1B	CDC28 protein kinase regulatory subunit 1B		
CLK1	CDC-like kinase 1		
CLK2	CDC-like kinase 2, transcript variant phclk2		
CLK3	CDC-like kinase 3, transcript variant phclk3		
CLK4	CDC-like kinase 4 (CLK4)		
CMPK	Cytidylate kinase		
COL4A3BP	Similar to collagen, type IV, alpha 3 (Goodpasture antigen) binding protein, clone MGC:1410		
CSK	C-SRC tyrosine kinase (CSK)		
CSNK1D	Casein kinase 1, delta, transcript variant 1		
CSNK1G1	Casein kinase 1, gamma 1,		
CSNK1G2	Casein kinase 1, gamma 2		
CSNK2A1	Casein kinase 2, alpha 1 polypeptide, transcript variant 2		
CSNK2A2	Casein kinase 2, alpha prime polypeptide		
DAPK2	Death-associated protein kinase 2 (DAPK2)		
DDR1	Discoidin domain receptor family, member 1, transcript variant 2, mRNA (cDNA clone MGC:3909)		
DDR1_aa 19-416	Discoidin domain receptor family, member 1, extracellular domain: aa 19-416		
DDR1_aa 444-913	Discoidin domain receptor family, member 1, cytoplasmic domain aa 444-913		
DGUOK	Deoxyguanosine kinase, transcript variant 1		
DMPK	Dystrophia myotonica-protein kinase, mRNA (cDNA clone MGC:71319)		
DTYMK	Deoxythymidylate kinase (thymidylate kinase)		
DYRK2	Dual-specificity tyrosine-(Y)-phosphorylation regulated kinase 2		
DYRK2_1	Dual-specificity tyrosine-(Y)-phosphorylation regulated kinase 2		
DYRK4	Dual-specificity tyrosine-(Y)-phosphorylation regulated kinase 4		
EEF2K	Elongation factor-2 kinase		

EGFR_aa 25-645	Epidermal growth factor receptor (erythroblastic leukemia viral (v-erb-b) Extracellular domain: aa 25-645		
EGFR_aa 669-1210	Epidermal growth factor receptor (erythroblastic leukemia viral (v-erb-b) Intracellular domain: aa 669-1210		
EPHA10	EPH receptor A10		
EPHA3	EPH receptor A3, Extracellular domain: aa 21-541		
EPHB4	EPH receptor B4, mRNA (cDNA clone MGC:59690)		
ERBB3	V-ERB-B2 erythroblastic leukemia viral oncogene homolog 3 (avian), Extracellular domain: 20-643		
ETNK2	Ethanolamine kinase 2		
FASTK	FAST kinase, transcript variant 2		
FES	Feline sarcoma oncogene		
FGFR1_aa 22-376	Fibroblast growth factor receptor 1 Extracellular domain: aa 22-376		
FGFR1_aa 398-822	Fibroblast growth factor receptor 1, Intracellular domain: aa 398-822		
FGFR2	Fibroblast growth factor receptor 2 (bacteria-expressed kinase, keratinocyte		
FGFR2_aa 22-377	Fibroblast growth factor receptor 2, Extracellular domain: aa 22-377		
FGFR2_aa 399-821	Fibroblast growth factor receptor 2, Intracellular domain: aa 399-821		
FGFR4_aa 25-369	Fibroblast growth factor receptor 4, Extracellular domain: aa 25-369		
FGFR4_aa 391-802	Fibroblast growth factor receptor 4, Intracellular domain: aa 391-802		
FLJ14813	Hypothetical protein FLJ14813		
FLJ20574	Hypothetical protein FLJ20574		
FLJ23356	Hypothetical protein FLJ23356 (FLJ23356)		
FRK	FYN-related kinase		
FYN	FYN oncogene related to SRC, FGR, YES, transcript variant 3		
GALK1	Galactokinase 1		
GK	Glycerol kinase, transcript variant 2		
GK2	Glycerol kinase 2		
GPRK6	G protein-coupled receptor kinase 6		

GRK5	G protein-coupled receptor kinase 5, mRNA (cDNA clone MGC:71228)		
GSK3B	Glycogen synthase kinase 3 beta		
GUK1	Guanylate kinase 1		
H11	Protein kinase H11		
HIPK1	Homeodomain interacting protein kinase 1, transcript variant 4		
HK1	Hexokinase 1, transcript variant 1		
HK2	Hexokinase 2		
IHPK1	Inositol hexaphosphate kinase 1		
IHPK2	Inositol hexaphosphate kinase 2		
IKBKB	Inhibitor of kappa light polypeptide gene enhancer in B-cells, kinase beta		
IKBKE	Inhibitor of kappa light polypeptide gene enhancer in B-cells, kinase epsilon (IKBKE)		
ILK	Integrin-linked kinase		
IPMK	Inositol polyphosphate multikinase		
IRAK1	Interleukin-1 receptor-associated kinase 1		
IRAK4	Interleukin-1 receptor-associated kinase 4, mRNA (cDNA clone MGC:13330)		
ITK	IL2-inducible T-cell kinase (ITK)		
ITPK1	Inositol 1,3,4-triphosphate 5/6 kinase		
ITPKB	Inositol 1,4,5-trisphosphate 3-kinase B		
JAK3	Janus kinase 3 (a protein tyrosine kinase, leukocyte), mRNA (cDNA clone MGC:39993)		
JIK	STE20-like kinase		
KIS	Kinase interacting with leukemia-associated gene (stathmin)		
KIT	V-KIT Hardy-Zuckerman 4 feline sarcoma viral oncogene homolog, mRNA (cDNA clone MGC:87427)		
KIT_aa 23-520	V-KIT Hardy-Zuckerman, Extracellular domain: aa 23-520		
KIT_aa 544-976	V-KIT Hardy-Zuckerman, Intracellular domain: aa 544-976		
LATS1	LATS, large tumor suppressor		

LCK	Lymphocyte-specific protein tyrosine kinase		
LIMK2	LIM domain kinase 2		
LOC149420	PDLIM1 interacting kinase 1 like		
LOC91461	LOC91461		
LYK5	Protein kinase LYK5, mRNA (cDNA clone MGC:10181)		
LYN	V-YES Yamaguchi sarcoma viral related oncogene homolog, mRNA (cDNA clone MGC:104151)		
MAK	Male germ cell-associated kinase		
MAP2K1	Mitogen-activated protein kinase kinase 1 (MAP2K1)		
MAP2K1IP1	Mitogen-activated protein kinase kinase 1 interacting protein 1		
MAP2K3	Mitogen-activated protein kinase kinase 3, transcript variant B		
MAP2K5	Mitogen-activated protein kinase kinase 5, transcript variant A		
MAP2K6	Mitogen-activated protein kinase kinase 6, transcript variant 1		
MAP2K7	Mitogen-activated protein kinase kinase 7		
MAP3K14	Mitogen-activated protein kinase kinase kinase 14		
MAP3K2	Mitogen-activated protein kinase kinase kinase 2 (MAP3K2)		
MAP3K6	Mitogen-activated protein kinase kinase kinase 6		
MAP3K7	Mitogen-activated protein kinase kinase kinase 7, transcript variant A		
MAP4K3	Mitogen-activated protein kinase kinase kinase kinase 3, mRNA (cDNA clone MGC:87206)		
MAP4K5	Mitogen-activated protein kinase kinase kinase kinase 5		
MAPK1	Mitogen-activated protein kinase 1, transcript variant 2		
MAPK10	Mitogen-activated protein kinase 10, mRNA (cDNA clone MGC:70580)		
MAPK11	Mitogen-activated protein kinase 11		
MAPK12	Mitogen-activated protein kinase 12		
MAPK13	Mitogen-activated protein kinase 13		
MAPK14	Mitogen-activated protein kinase 14, transcript variant 2		

Sense Proteomic Limited | Unit 4 The Switchback Gardner Road Maidenhead Berkshire SL6 7RJ England

MAPK3	Mitogen-activated protein kinase 3		
MAPK6	Mitogen-activated protein kinase 6		
MAPK7	Mitogen-activated protein kinase 7, transcript variant 4		
MAPK8	Mitogen-activated protein kinase 8 (MAPK8), transcript variant 1		
MAPK8_2	Mitogen-activated protein kinase 8 (MAPK8), transcript variant 2		
MAPK9	Mitogen-activated protein kinase 9, transcript variant 1,		
MAPKAPK3	Mitogen-activated protein kinase-activated protein kinase 3		
MAPKAPK5	Mitogen-activated protein kinase-activated protein kinase 5, transcript variant 1, mRNA (cDNA clone MGC:54058)		
MARK2	MAP/microtubule affinity-regulating kinase 2, mRNA (cDNA clone MGC:99619)		
MARK3	MAP/microtubule affinity-regulating kinase 3		
MARK4	MAP/microtubule affinity-regulating kinase 4		
MATK	Megakaryocyte-associated tyrosine kinase, transcript variant 1		
MGC16169	Hypothetical protein MGC16169		
MGC42105	Hypothetical protein MGC42105		
MGC45428	Hypothetical protein MGC45428		
MKNK1	MAP kinase-interacting serine/threonine kinase 1		
MKNK2	MAP kinase interacting serine/threonine kinase 2, mRNA (cDNA clone MGC:90284)		
MPP1	Membrane protein, palmitoylated 1, 55kDa		
MPP3	Membrane protein, palmitoylated 3 (MAGUK p55 subfamily member 3)		
MST4	Mst3 and SOK1-related kinase (MASK)		
MUSK	Muscle, skeletal, receptor tyrosine kinase (MUSK)		
NEK11	NIMA (never in mitosis gene a)- related kinase 11		
NEK3	NIMA (never in mitosis gene a)-related kinase 3, transcript variant 1		
NEK7	NIMA (never in mitosis gene a)-related kinase 7 (NEK7)		
NLK	Nemo like kinase, mRNA (cDNA clone MGC:60309)		

Sense Proteomic Limited | Unit 4 The Switchback Gardner Road Maidenhead Berkshire SL6 7RJ England

NME4	Non-metastatic cells 4		
NME5	Non-metastatic cells 5, protein expressed in (nucleoside-diphosphate kinase)		
NME6	Non-metastatic cells 6, protein expressed in (nucleoside-diphosphate kinase)		
NME7	Non-metastatic cells 7, protein expressed in (nucleoside-diphosphate kinase), transcript variant 1		
NRBP2	Nuclear receptor binding protein 2 (NRBP2)		
NTRK2	Neurotrophic tyrosine kinase, receptor, type 2		
NTRK3	Neurotrophic tyrosine kinase		
OSR1	Oxidative-stress responsive 1		
PACE-1	Ezrin-binding partner PACE-1, transcript variant 1		
PAK2	p21 (CDKN1A)-activated kinase 2, mRNA (cDNA clone MGC:97077)		
PAK4	p21(CDKN1A)-activated kinase 4		
PAK7	P21(CDKN1A)-activated kinase 7, transcript variant 2, mRNA (cDNA clone MGC:26232)		
PANK3	Pantothenate kinase 3		
PAPSS2	3'-phosphoadenosine 5'-phosphosulfate synthase 2		
PCK2	Phosphoenolpyruvate carboxykinase 2 (mitochondrial)		
PCTK1	PCTAIRE protein kinase 1, transcript variant 2		
PCTK1_3	PCTAIRE protein kinase 1, transcript variant 3		
PCTK2	PCTAIRE protein kinase 2		
PCTK3	PCTAIRE protein kinase 3, transcript variant 3		
PDGFRA	Platelet-derived growth factor receptor, alpha polypeptide, mRNA (cDNA clone MGC:74795)		
PDGFRA_aa 24-524	Platelet-derived growth factor receptor, alpha polypeptide, Extracellular domain: aa 24-524		
PDGFRB_aa 33-531	Platelet-derived growth factor receptor, beta polypeptide, Extracellular domain: aa 33-531		
PDK1	Pyruvate dehydrogenase kinase, isoenzyme 1		
PDK2	Pyruvate dehydrogenase kinase, isoenzyme 2		
PDK3	Pyruvate dehydrogenase kinase, isoenzyme 3		

Sense Proteomic Limited | Unit 4 The Switchback Gardner Road Maidenhead Berkshire SL6 7RJ England

PDK4	Pyruvate dehydrogenase kinase, isoenzyme 4		
PDPK1	3-phosphoinositide dependent protein kinase-1		
PFKFB3	6-phosphofructo-2-kinase/fructose-2,6-biphosphatase 3		
PFKFB4	6-phosphofructo-2-kinase/fructose-2,6-biphosphatase 4		
PFTK1	PFTAIRE protein kinase 1 (PFTK1), OriGene unique variant 1		
PHKG1	Phosphorylase kinase, gamma 1 (muscle), mRNA (cDNA clone MGC:59809)		
PHKG2	Phosphorylase kinase, gamma 2 (testis)		
PIK3C3	Phosphoinositide-3-kinase, class 3		
PIK3R1	Phosphoinositide-3-kinase, regulatory subunit, polypeptide 1 (p85 alpha)		
PIM1	Pim-1 oncogene		
PIM2	Pim-2 oncogene		
PIP5K2B	Phosphatidylinositol-4-phosphate 5-kinase, type II, beta, transcript variant 2		
PIP5K2C	Phosphatidylinositol-4-phosphate 5-kinase, type II, gamma		
PKE	PKE protein kinase		
PKLR	Pyruvate kinase, liver and RBC, transcript variant 1		
PKM2	Pyruvate kinase, muscle, transcript variant 1		
PKMYT1	Protein kinase, membrane associated tyrosine/threonine 1 (PKMYT1), transcript variant 1		
PLK	Polo (Drosophia)-like kinase, clone MGC:8502		
PMVK	Phosphomevalonate kinase		
PRKAA1	Protein kinase, AMP-activated, alpha 1 catalytic subunit, mRNA (cDNA clone MGC:57364)		
PRKAA2	Protein kinase, AMP-activated, alpha 2 catalytic subunit, mRNA (cDNA clone MGC:97312)		
PRKACB	Protein kinase, cAMP-dependent, catalytic, beta		
PRKACG	Protein kinase, cAMP-dependent, catalytic, gamma		
PRKAG3	Protein kinase, AMP-activated, gamma 3 non-catalytic subunit (PRKAG3)		
PRKAR1A	Protein kinase, cAMP-dependent, regulatory, type I, alpha		

PRKCB1	Protein kinase C, beta 1		
PRKCH	Protein kinase C, eta		
PRKCI	Protein kinase C, iota		
PRKCN	Protein kinase D3		
PRKCZ	Protein kinase C, zeta,		
PRKD2	Protein kinase D2,		
PRKRA	Protein kinase, interferon-inducible double stranded RNA dependent activator		
PRKX	Protein kinase, X-linked, mRNA (cDNA clone MGC:52228)		
PRPS2	Phosphoribosyl pyrophosphate synthetase 2,		
PSKH1	Protein serine kinase H1, mRNA (cDNA clone MGC:70352)		
PTK2	PTK2 protein tyrosine kinase 2		
PTK2_1	PTK2 protein tyrosine kinase 2		
PTK6	PTK6 protein tyrosine kinase 6 (PTK6)		
PTK7_aa 31-704	PTK7 protein tyrosine kinase 7, transcript variant PTK7-1, Extracellular domain: aa 31-704		
PTK7_aa 726-1070	PTK7 protein tyrosine kinase 7, transcript variant PTK7-1, Intracellular domain: aa 726-1070		
PTK9	PTK9 protein tyrosine kinase 9		
PTK9L	PTK9L protein tyrosine kinase 9-like (A6-related protein)		
PXK	PX domain containing serine/threonine kinase		
RAF1	V-RAF1 murine leukemia viral oncogene homolog 1		
RAGE	Renal tumor antigen, mRNA (cDNA clone MGC:61453)		
RBKS	Ribokinase		
RET	RET proto-oncogene (multiple endocrine neoplasia		
RET_aa 29-635	RET proto-oncogene, Extracellular domain: aa 29-635		
RET_aa 658-1114	RETproto-oncogene, Intracellular domain: aa 658-1114		
RFK	Riboflavin kinase		

RIOK2	RIO kinase 2		
RIOK3	RIO kinase 3		
RIPK1	Receptor (TNFRSF)-interacting serine-threonine kinase 1 (RIPK1)		
RIPK2	Receptor-interacting serine-threonine kinase 2		
RIPK5	Receptor interacting protein kinase 5, transcript variant 2, mRNA (cDNA clone MGC:61657)		
RNASEL	Ribonuclease L (2',5'-oligoisoadenylate synthetase-dependent) (RNASEL)		
RPS6KA1	Ribosomal protein S6 kinase, 90kDa, polypeptide 1		
RPS6KA2	Ribosomal protein S6 kinase, 90kDa, polypeptide 2		
RPS6KA3	Ribosomal protein S6 kinase, 90kDa, polypeptide 3 (RPS6KA3), OriGene unique variant 1		
RPS6KA4	Ribosomal protein S6 kinase, 90kDa, polypeptide 4, mRNA (cDNA clone MGC:57704)		
RPS6KA5	Ribosomal protein S6 kinase, 90kDa, polypeptide 5, transcript variant 2		
RPS6KA6	Ribosomal protein S6 kinase, 90kDa, polypeptide 6 (RPS6KA6)		
RPS6KB1	Ribosomal protein S6 kinase, 70kDa, polypeptide 1, mRNA (cDNA clone MGC:61512)		
RPS6KB2	Ribosomal protein S6 kinase, 70kDa, polypeptide 2, transcript variant 1		
RPS6KL1	Ribosomal protein S6 kinase-like 1		
SGK	Serum/glucocorticoid regulated kinase		
SGK2	Serum/glucocorticoid regulated kinase 2, mRNA (cDNA clone MGC:74468)		
SGKL	Serum/glucocorticoid regulated kinase-like, transcript variant 1		
SNARK	Likely ortholog of rat SNF1/AMP-activated protein kinase		
SNK	Serum-inducible kinase		
SRC	V-SRC sarcoma (Schmidt-Ruppin A-2) viral oncogene homolog (avian)		
SRPK1	SFRS protein kinase 1		
SRPK2	SFRS protein kinase 2, transcript variant 2		
STK10	Serine/threonine kinase 10, mRNA (cDNA clone MGC:87394)		
STK11	Serine/threonine kinase 11 (Peutz-Jeghers syndrome)		

STK16	Serine/threonine kinase 16		
STK17B	Serine/threonine kinase 17b (apoptosis-inducing)		
STK18	Serine/threonine kinase 18		
STK22B	Serine/threonine kinase 22B (spermiogenesis associated), mRNA (cDNA clone MGC:41904)		
STK22C	Serine/threonine kinase 22C (spermiogenesis associated)		
STK22D	Serine/threonine kinase 22D (spermiogenesis associated)		
STK24	Serine/threonine kinase 24 (STE20 homolog, yeast)		
STK25	Serine/threonine kinase 25 (STE20 homolog, yeast)		
STK29	BR serine/threonine kinase 2 (BRSK2)		
STK3	Serine/threonine kinase 3 (STE20 homolog, yeast)		
STK32A	Hypothetical protein MGC22688		
STK32B	Serine/threonine kinase 32B, mRNA (cDNA clone MGC:46065)		
STK33	Serine/threonine kinase 33		
STK38	Serine/threonine kinase 38		
STK38L	Serine/threonine kinase 38 like		
STK4	Serine/threonine kinase 4 (STK4)		
STK6	Serine/threonine kinase 6, transcript variant 1		
SYK	Spleen tyrosine kinase		
TAF9	TAF9 RNA polymerase II, TATA box binding protein (TBP)-associated factor, 32		
TBK1	TANK-binding kinase 1		
TEK	TEK tyrosine kinase		
TESK2	Testis-specific kinase 2, mRNA (cDNA clone MGC:45651)		
TGFBR2	Transforming growth factor, beta receptor II (70/80kDa), mRNA (cDNA clone MGC:33800)		
TIE1	Tyrosine kinase with immunoglobulin-like and EGF-like domains 1, Intracellular domain: aa 785-1138		
TK1	Thymidine kinase 1, soluble		

Sense Proteomic Limited | Unit 4 The Switchback Gardner Road Maidenhead Berkshire SL6 7RJ England

TLK1	Tousled-like kinase 1		
TLK2	Tousled-like kinase 2, mRNA (cDNA clone MGC:44450)		
TOPK	T-LAK cell-originated protein kinase		
TRB2	Tribbles homolog 2		
TTK	TTK protein kinase		
TXNDC3	Thioredoxin domain containing 3 (spermatozoa)		
TYRO3	TYRO3 protein tyrosine kinase, mRNA (cDNA clone MGC:51900)		
TYRO3_aa 451-890	TYRO3 protein tyrosine kinase, Intracellular domain: aa 451-890		
UCKL1	Uridine-cytidine kinase 1-like 1		
UMPK	Uridine monophosphate kinase		
VRK3	Vaccinia related kinase 3		
XYLB	Xylulokinase homolog (H. influenzae)		
ZAK	Sterile alpha motif and leucine zipper containing kinase AZK		
ZAP70	Zeta-chain (TCR) associated protein kinase 70kDa		

To find out more go to **www.sense proteomic.com**

mail us at **info@senseproteomic.com**

or call us +44 (0) 1628 513500