Covalent Modifications of Signaling Proteins

This PDF file provides an alphabetical listing of proteins for which information on covalent modifications has been collected. The distinct types and sites of modification reported by AfCS Molecule Page authors are listed below each protein. This list may be searched for specific key words using the search feature in Adobe Acrobat or Acrobat Reader. If you wish to sort items we recommend downloading the Excel spreadsheet version of this list.

Members were asked to supply the following information about the AfCS molecules assigned to them.

1. Type(s) of covalent modification
2. Site(s) of covalent modification
3. Enzyme(s) catalyzing the modification
4. Enzyme(s) removing the modification
5. Whether the modification has been documented in intact cells
6. Receptor(s) that regulate the stoichiometry of the modification

Responses have been and will continue to be tabulated. You may search the AfCS Molecule Page database with possible synonyms to find the name of a protein and ID number used by the AfCS.

Last modified: April11, 2003

14-3-3 epsilon

Haian Fu

Cytosolic, misc.

A000140

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

14-3-3 sigma

Haian Fu

Cytosolic, misc.

A000041

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Ubiquitination	Unknown	Estrogen-responsive finger protein				Yes	No			

Comments:

5-Hydroxytryptamine receptor 3

Sarah CR Lummis

Receptor, ligand-gated channel

A000153

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser412	Protein kinase A catalytic subunit				Yes	Yes			

Comments:

AMPK gamma2

David Stapleton

Protein kinase, Ser/Thr (non-receptor)

A002820

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

AMPK gamma3

David Stapleton

Protein kinase, Ser/Thr (non-receptor)

A002821

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Abin1

Rudi Beyaert

Inhibitor protein

A000160

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown					Yes	Yes	Egf receptor	A000823	Stimulates

Comments:

Abin2

Rudi Beyaert

Inhibitor protein

A001598

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Abr

John H Groffen

GTPase activating protein, Rac/Rho

A000163

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Acetylcholine (muscarinic) receptor M1

Tatsuya Haga

Receptor, GPCR

A000167

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Carboxy terminus	Protein kinase C				Yes	No			
Phosphorylation	Unknown	Casein kinase I alpha	A000485			Yes	No			
Phosphorylation	Third intracellular loop	Grk2	A001094			Yes	Yes	Acetylcholine (muscarinic) receptor M1	A000167	Stimulates

Comments:

Acetylcholine (muscarinic) receptor M2

Tatsuya Haga

Receptor, GPCR

A000080

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn2,3, and/or 6					Yes	No			
Palmitoylation	Cys457					Yes	Yes	Acetylcholine (muscarinic) receptor M2	A000080	Stimulates
Phosphorylation	Third intracellular loop	Grk2	A001094			Yes	Yes	Acetylcholine (muscarinic) receptor M2	A000080	Stimulates

Comments:

Acetylcholine (muscarinic) receptor M3

Tatsuya Haga

Receptor, GPCR

A000081

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown	Casein kinase I alpha	A000485			Yes	No			
Phosphorylation	Third intracellular loop	Grk2	A001094			Yes	Yes	Acetylcholine (muscarinic) receptor M3	A000081	Stimulates
Phosphorylation	Third intracellular loop	Grk3	A001095			Yes	Yes	Acetylcholine (muscarinic) receptor M3	A000081	Stimulates
Phosphorylation	Third intracellular loop	Grk6	A001098			Yes	Yes	Acetylcholine (muscarinic) receptor M3	A000081	Stimulates

Comments:

Acetylcholine (muscarinic) receptor M4 — Tatsuya Haga

Receptor, GPCR

A000082

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments: Phosphorylation, palmitoylation, and glycosylation are expected based on homology with A000080.

Acetylcholine (muscarinic) receptor M5 — Tatsuya Haga

Receptor, GPCR

A000168

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments: Phosphorylation, palmitoylation, and glycosylation are expected based on homology with A000080.

Ack1 — Takaya Satoh

Protein kinase, tyrosine (non-receptor)

A000186

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr unknown	c-Src	A002227			No	No			
Phosphorylation	Tyr -unknown					Yes	Yes	Integrin beta 1	A001220	
Phosphorylation	Tyr-unknown	Fyn	A000969			Yes	Yes	Acetylcholine (muscarinic) receptor M3	A000081	

Comments:

Acyl protein thioesterase 2

Lipid modification, protein

Teresa LZ Jones

A000205

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Adenylyl cyclase type 1

Adenylyl cyclase

Wei-Jen Tang

A000212

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Adenylyl cyclase type 3

Adenylyl cyclase

Paul A Insel

A000213

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Adenylyl cyclase type 8

Dermot Cooper

Adenylyl cyclase

A000066

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn815 and/or Asn819					Yes	No			

Comments:

Adenylyl cyclase type 9

Ferenc Antoni

Adenylyl cyclase

A000131

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown					Yes				

Comments:

Adrenergic receptor alpha 1d

Kenneth P Minneman

Receptor, GPCR

A000051

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown	Protein kinase C				Yes	Yes	Probably homologous & heterologous		Stimulates

Comments:

Adrenergic receptor alpha 2a

David B Bylund

Receptor, GPCR

A000100

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn10					No	No			
Glycosylation	Asn14					No	No			
Palmitoylation	Cys442					No	No			
Phosphorylation	Ser296	Grk2	A001094			Yes	Yes	Adrenergic receptor alpha 2a	A000100	Stimulates
Phosphorylation	Ser297	Grk2	A001094			Yes	Yes	Adrenergic receptor alpha 2a	A000100	Stimulates
Phosphorylation	Ser298	Grk2	A001094			Yes	Yes	Adrenergic receptor alpha 2a	A000100	Stimulates
Phosphorylation	Ser299	Grk2	A001094			Yes	Yes	Adrenergic receptor alpha 2a	A000100	Stimulates
Phosphorylation	Ser296	Grk3	A001095			Yes	Yes	Adrenergic receptor alpha 2a	A000100	Stimulates
Phosphorylation	Ser297	Grk3	A001095			Yes	Yes	Adrenergic receptor alpha 2a	A000100	Stimulates
Phosphorylation	Ser298	Grk3	A001095			Yes	Yes	Adrenergic receptor alpha 2a	A000100	Stimulates
Phosphorylation	Ser299	Grk3	A001095			Yes	Yes	Adrenergic receptor alpha 2a	A000100	Stimulates

Comments:

Adrenergic receptor alpha 2b

David B Bylund

Receptor, GPCR

A000102

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Palmitoylation	Cys440					No	No			
Phosphorylation	Unknown	Grk2	A001094					Adrenergic receptor alpha 2b	A000102	Stimulates
Phosphorylation	Unknown	Grk3	A001095					Adrenergic receptor alpha 2b	A000102	Stimulates

Comments:

Adrenergic receptor beta 1

Peter H Fishman

Receptor, GPCR

A000219

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn15					Yes	No			
Phosphorylation	Unknown	Grk's				Yes	Yes	Adrenergic receptor beta 1	A000219	Stimulates
Phosphorylation	Ser464	Grk5	A001097			Yes	Yes	Adrenergic receptor beta 1	A000219	Stimulates
Phosphorylation	Ser301(a)	Protein kinase A catalytic subunit alpha	A001914			Yes(b)	No			
Phosphorylation	Ser301(a)	Protein kinase C alpha	A001919			Yes(b)	No			

Comments: (a) Demonstrated in human at Ser312
(b) Based on change in receptor activity

Arf-like protein 1

Richard A Kahn

G protein, monomeric (non-Rab)

A000317

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Myristoylation	Gly2	Protein N-myristoyltransferase 1	A000095			Yes	No			
Myristoylation	Gly2	Protein N-myristoyltransferase 2	A001935			Yes	No			

Comments:

Arf-like protein 2

Richard A Kahn

G protein, monomeric (non-Rab)

A000318

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Arf-like protein 3

Hans-Georg Joost

G protein, monomeric (non-Rab)

A000319

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Arf6

Richard A Kahn

G protein, monomeric (non-Rab)

A000316

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Myristoylation	Gly2	Protein N-myristoyltransferase 1	A000095			Yes	No			
Myristoylation	Gly2	Protein N-myristoyltransferase 2	A001935			Yes	No			

Comments:

Bam32

Edward Clark

Adaptor/scaffold

A000361

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr139	Lck	A001394			Yes	Yes	B cell receptor		Stimulates
Phosphorylation	Tyr139	Lck	A001394			Yes	Yes	Insulin receptor	A001190	Stimulates
Phosphorylation	Tyr139	Lck	A001394			Yes	Yes	Insulin-like growth factor-1 receptor	A001198	Stimulates
Phosphorylation	Tyr139	Lck	A001394			Yes	Yes	Platelet-derived growth factor receptor beta	A001846	Stimulates
Phosphorylation	Tyr139	Lyn	A001441			Yes	Yes	B cell receptor		Stimulates
Phosphorylation	Tyr139	Lyn	A001441			Yes	Yes	Insulin receptor	A001190	Stimulates
Phosphorylation	Tyr139	Lyn	A001441			Yes	Yes	Insulin-like growth factor-1 receptor	A001198	Stimulates
Phosphorylation	Tyr139	Lyn	A001441			Yes	Yes	Platelet-derived growth factor receptor beta	A001846	Stimulates

Bam32

Edward Clark

Adaptor/scaffold

A000361

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr139	c-Src	A002227			Yes	Yes	B cell receptor		Stimulates
Phosphorylation	Tyr139	c-Src	A002227			Yes	Yes	Insulin receptor	A001190	Stimulates
Phosphorylation	Tyr139	c-Src	A002227			Yes	Yes	Insulin-like growth factor-1 receptor	A001198	Stimulates
Phosphorylation	Tyr139	c-Src	A002227			Yes	Yes	Platelet-derived growth factor receptor beta	A001846	Stimulates

Comments:

Bcr

John H Groffen

GTPase activating protein, Rac/Rho

A002835

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr177	Abl	A000161			Yes	No			
Phosphorylation	Tyr283	Abl	A000161			Yes	No			
Phosphorylation	Tyr328	Abl	A000161			Yes	No			
Phosphorylation	Tyr360	Abl	A000161			Yes	No			
Phosphorylation	Tyr177	Fes	A000911			Yes	No			
Phosphorylation	Tyr246	Fes	A000911			Yes	No			
Phosphorylation	Tyr283	Fes	A000911			Yes	No			
Phosphorylation	Tyr177	Hck	A001111			Yes	No			
Phosphorylation	Ser354	Bcr	A002835			Yes	No			

Comments:

Bsap

John G Monroe

Transcription factor

A000403

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Btk

Xin-Yun Huang

Protein kinase, tyrosine (non-receptor)

A000038

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr223	Btk	A000038			Yes	Yes	B cell receptor		Stimulates
Phosphorylation	Tyr551	Btk	A000038			Yes	Yes	B cell receptor		Stimulates
Phosphorylation	Tyr551	c-Src	A002227			Yes	Yes	B cell receptor		Stimulates

Comments:

CD39

Simon C Robson

Hydrolase, non-esterase

A000055

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Multiple Asn					Yes	No			
Palmitoylation	Cys13					Yes	No			

Comments:

CD4

Rolf Konig

Cell surface, misc.

A000561

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn187	Oligosaccharide-protein transferase				Yes	No			No
Glycosylation	Asn298	Oligosaccharide-protein transferase				Yes	No			No
Glycosylation	Asn392	Oligosaccharide-protein transferase				Yes	No			No
Phosphorylation	Ser432	Protein kinase C delta	A001922			Yes	Yes	CD2	A000539	Stimulates
Phosphorylation	Ser439	Protein kinase C delta	A001922			Yes	Yes	CD2	A000539	Stimulates
Phosphorylation	Ser432	Protein kinase C delta	A001922			Yes	Yes	CD3 zeta	A000553	Stimulates
Phosphorylation	Ser439	Protein kinase C delta	A001922			Yes	Yes	CD3 zeta	A000553	Stimulates

Comments:

CD40

Gail A Bishop

Receptor, cytokine

A000031

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Unknown					Yes	No			
Phosphorylation	Unknown					Yes	No			

Comments:

CD81

Shoshana Levy

Cell surface, misc.

A000591

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Palmitoylation	Unknown					Yes	No			

Comments:

CD9

Eisuke Mekada

Cell surface, misc.

A000596

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Palmitoylation	Unknown									

Comments:

Calca

Donald J DiPette

Secreted protein

A002904

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Calcium channel, voltage-dependent, T type, alpha 1G subunit

Francesco Belardetti

Channel, calcium

A000447

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Calmodulin I

Daniel Martin Watterson

Calcium-binding protein

A000452

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Acetylation	Ala2					Yes	No			
Lys N-methylation	Lys116	Lysine methyl transferase				Yes	No			
Phosphorylation	Tyr100					Yes	Yes	Insulin receptor	A001190	Stimulates
Phosphorylation	Tyr139					Yes	Yes	Insulin receptor	A001190	Stimulates

Comments:

Calmodulin II

Daniel Martin Watterson

Calcium-binding protein

A000453

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Acetylation	Ala2					Yes	No			
Lys N-methylation	Lys116	Lysine methyl transferase				Yes	No			
Phosphorylation	Tyr100					Yes	Yes	Insulin receptor	A001190	Stimulates
Phosphorylation	Tyr139					Yes	Yes	Insulin receptor	A001190	Stimulates

Comments:

Calmodulin III

Daniel Martin Watterson

Calcium-binding protein

A000454

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Acetylation	Ala2					Yes	No			
Lys N-methylation	Lys116	Lysine methyl transferase				Yes	No			
Phosphorylation	Tyr100					Yes	Yes	Insulin receptor	A001190	Stimulates
Phosphorylation	Tyr139					Yes	Yes	Insulin receptor	A001190	Stimulates

Comments:

Calpain 2

Joan EB Fox

Protease (non-proteasomal)

A000467

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser369	Protein kinase A catalytic subunit				No	Yes	Chemokine receptor CXCR3	A000635	
Phosphorylation	Thr370	Protein kinase A catalytic subunit				No	Yes	Chemokine receptor CXCR3	A000635	

Comments:

Cap

Jeffrey Field

Cytosolic, misc.

A000014

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Casein kinase II alpha 1

David Litchfield

Protein kinase, Ser/Thr (non-receptor)

A000109

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr182	Casein kinase II alpha 1	A000109			No	No			
Phosphorylation	Ser362	Cdc2 kinase	A000604			Yes	No (b)			
Phosphorylation	Ser370	Cdc2 kinase	A000604			Yes	No (b)			
Phosphorylation	Thr(a)	Cdc2 kinase	A000604			Yes	No (b)			
Phosphorylation	Thr344	Cdc2 kinase	A000604			Yes	No (b)			

Comments: (a) Human sequence. Mouse has Ser at position 360.
(b) Phosphorylation occurs in cells arrested in mitosis.

Casein kinase II alpha 2

David Litchfield

Protein kinase, Ser/Thr (non-receptor)

A000108

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr183	Casein kinase II alpha 2	A000108			No	No			

Comments:

Casein kinase II beta

David Litchfield

Protein kinase, Ser/Thr (non-receptor)

A000110

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser2	Casein kinase II alpha 2	A000108			Yes	No			
Phosphorylation	Ser3	Casein kinase II alpha 2	A000108			Yes	No			
Phosphorylation	Ser2	Casein kinase II alpha 1	A000109			Yes	No			
Phosphorylation	Ser3	Casein kinase II alpha 1	A000109			Yes	No			
Phosphorylation	Ser209	Cdc2 kinase	A000604			Yes	No (a)			

Comments: (a) Phosphorylation occurs in cells arrested in mitosis.

Caveolin 2

Rennolds S Ostrom

Adaptor/scaffold

A000521

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Cdp

Richard H Scheuermann

Transcription factor

A000612

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Acetylation	Lys1199	P/Caf	A001706			Yes	No			
Acetylation	Lys1199	p300	A001716			Yes	No			
Phosphorylation	Ser1234	Cdk1		Cdc25 phosphatase type A (a)	A000084	Yes	No			
Phosphorylation	Ser1267	Cdk1		Cdc25 phosphatase type A (a)	A000084	Yes	No			
Phosphorylation	Ser1157	Casein kinase II alpha 2	A000108			Yes	No			
Phosphorylation	Ser585	Casein kinase II alpha 2	A000108			Yes	No			
Phosphorylation	Ser974	Casein kinase II alpha 2	A000108			Yes	No			
Phosphorylation	Ser1157	Casein kinase II alpha 1	A000109			Yes	No			
Phosphorylation	Ser585	Casein kinase II alpha 1	A000109			Yes	No			
Phosphorylation	Ser974	Casein kinase II alpha 1	A000109			Yes	No			
Phosphorylation	Ser1157	Casein kinase II beta	A000110			Yes	No			
Phosphorylation	Ser585	Casein kinase II beta	A000110			Yes	No			
Phosphorylation	Ser974	Casein kinase II beta	A000110			Yes	No			
Phosphorylation	Ser1172	Protein kinase C alpha	A001919			Yes	No			
Phosphorylation	Thr600	Protein kinase C alpha	A001919			Yes	No			
Phosphorylation	Thr989	Protein kinase C alpha	A001919			Yes	No			
Phosphorylation	Ser1172	Protein kinase C beta1	A001920			Yes	No			
Phosphorylation	Thr600	Protein kinase C beta1	A001920			Yes	No			
Phosphorylation	Thr989	Protein kinase C beta1	A001920			Yes	No			
Phosphorylation	Ser1172	Protein kinase C beta2	A001921			Yes	No			
Phosphorylation	Thr600	Protein kinase C beta2	A001921			Yes	No			
Phosphorylation	Thr989	Protein kinase C beta2	A001921			Yes	No			
Phosphorylation	Ser1172	Protein kinase C gamma1	A001927			Yes	No			
Phosphorylation	Thr600	Protein kinase C gamma1	A001927			Yes	No			
Phosphorylation	Thr989	Protein kinase C gamma1	A001927			Yes	No			

Comments: (a) Probable

Chk1

Yolanda Sanchez

Protein kinase, Ser/Thr (non-receptor)

A000642

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser317	Atm	A000349			Yes	No			
Phosphorylation	Ser345	Atm	A000349			Yes	No			
Phosphorylation	Ser317	Atr	A000350			Yes	No			

Chk1

Yolanda Sanchez

Protein kinase, Ser/Thr (non-receptor)

A000642

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser345	Atr	A000350			Yes	No			

Comments:

Chk2

Yolanda Sanchez

Protein kinase, Ser/Thr (non-receptor)

A000643

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser28(a)					Yes	No			
Phosphorylation	Thr26(a)	Atr	A000350			Yes	No			

Comments: (a) Human only

Cpi17

David Brautigan

Inhibitor protein

A002849

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser12	Protein kinase C				No	No			
Phosphorylation	Ser12	Zip	A002398			No	No			
Phosphorylation	Thr38	Protein kinase N, A and G				Yes	Yes			
Phosphorylation	Thr38	Ilk	A001173			Yes	Yes			
Phosphorylation	Thr38	Protein kinase C alpha	A001919			Yes	Yes			
Phosphorylation	Thr38	Protein kinase C delta	A001922			Yes	Yes			
Phosphorylation	Thr38	Protein kinase C delta3	A001923			Yes	Yes			
Phosphorylation	Thr38	Protein kinase C delta2	A001924			Yes	Yes			
Phosphorylation	Thr38	Rock2	A002089			Yes	Yes			
Phosphorylation	Thr38	Zip	A002398			Yes	Yes			

Comments:

Csk

Kjetil Tasken

Protein kinase, tyrosine (non-receptor)

A000701

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser364	Protein kinase A catalytic subunit alpha	A001914			Yes	Yes	Prostanoid receptor Ep4	A001904	Stimulates
Phosphorylation	Ser364	Protein kinase A catalytic subunit beta	A001915			Yes	Yes	Prostanoid receptor Ep4	A001904	Stimulates

Comments:

Cyp1a1

James P Morgan

Oxidoreductase

A000741

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Dab2

Philip H Howe

Adaptor/scaffold

A000748

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser24	Protein kinase C				Yes	Yes	Colony-stimulating factor 1 receptor	A000674	Stimulates

Comments:

Dagk1

Isabel Merida

Kinase, lipid

A000764

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser/Thr Unknown	Protein kinase C				Yes	Yes	Egf receptor	A000823	
Phosphorylation	Ser/Thr Unknown	Protein kinase C				Yes	Yes	Hgfr	A001119	
Phosphorylation	Ser/Thr Unknown	Egf receptor	A000823			Yes	Yes	Egf receptor	A000823	
Phosphorylation	Ser/Thr Unknown	Egf receptor	A000823			Yes	Yes	Hgfr	A001119	
Phosphorylation	Ser/Thr Unknown	Src kinase	Src0001			Yes	Yes	Egf receptor	A000823	
Phosphorylation	Ser/Thr Unknown	Src kinase	Src0001			Yes	Yes	Hgfr	A001119	

Comments:

Dap kinase

Thomas Lukas

Apoptosis

A002502

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser308	Dap kinase	A002502			Yes	No			

Comments:

Daxx

Roya Khosravi-Far

Cytosolic, misc.

A000753

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Sumoylation	(a)	SUMO-1				Yes	No			

Comments: (a) Lys630 and 631 are required for sumoylation of human Daxx; there is as yet no information on the mouse protein

Dickkopf 1

Christof Niehrs

Cytosolic, misc.

A003196

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Dickkopf 2

Christof Niehrs

Cytosolic, misc.

A003197

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Dickkopf 3

Mikhail V Semenov

Cytosolic, misc.

A003215

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Unknown					Yes	No			

Comments:

Dickkopf 4

Mikhail V Semenov

Cytosolic, misc.

A003263

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Cleavage	Lys133	(a)				Yes	No			

Comments: (a) Presumaby by furin-like proteases

Dyrk1a

Walter Becker

Protein kinase, dual specificity

A000796

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr321	Dyrk1a	A000796			Yes	No			

Comments:

Dyrk1b

Walter Becker

Protein kinase, dual specificity

A000797

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	(a)	Dyrk1b	A000797			Yes	No			

Comments: (a) Homology with Dyrk1a suggests Tyr273 as site of autophosphorylation

Dyrk2

Walter Becker

Protein kinase, dual specificity

A000798

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Dyrk3

Walter Becker

Protein kinase, dual-specificity

A000799

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr334	Dyrk3	A000799			Yes	No			

Comments:

Dyrk4a

Walter Becker

Protein kinase, dual specificity

A002403

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Egr1

John Monroe

Transcription factor

A003269

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown					Yes	No (a)			

Comments: (a) Stimulated by serum

Endothelin 1

Don C Rockey

Secreted protein

A000062

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Erk3 alpha

Sylvain Meloche

Protein kinase, Ser/Thr (non-receptor)

A000876

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser189					Yes	No			

Comments:

Ese1

Sean E Egan

Adaptor/scaffold

A000086

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Ese2

Sean E Egan

Adaptor/scaffold

A000881

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Fhit

Charles Brenner

Cytosolic, misc.

A000914

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Flotillin 1

Rainer Prohaska

Adaptor/scaffold

A000101

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Palmitoylation	Cys34					Yes	No			

Comments:

Flotillin 2

Rainer Prohaska

Adaptor/scaffold

A002226

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Frizzled 1

Craig C Malbon

Receptor, misc.

A000958

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Frizzled 10

Mikhail V Semenov

Receptor, misc.

A003262

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Frizzled 2

Hsien-yu Wang

Receptor, misc.

A000960

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Frizzled 9

Mikhail V Semenov

Receptor, misc.

A003261

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

G protein alpha i3

Philip Wedegaertner

G protein, heterotrimeric

A000112

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Myristoylation	Gly2	Protein N-myristoyltransferase 1	A000095			Yes	No			
Myristoylation	Gly2	Protein N-myristoyltransferase 2	A001935			Yes	No			
Palmitoylation	Cys3					Yes	(a)			

Comments: (a) Some receptors (e.g., A000145) regulate palmitoylation of Cys3 of G protein alpha i, but the isoform of G alpha i affected was not determined.

G protein alpha olf

Roland Seifert

G protein, heterotrimeric

A000977

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

G protein alpha s-xl

G protein, heterotrimeric

Teresa LZ Jones

A000979

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Palmitoylation	CysUnknown					Yes	No			

Comments:

G protein alpha z

G protein, heterotrimeric

David Manning

A000011

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Myristoylation	Gly2	Protein N-myristoyltransferase				Yes	No			
Palmitoylation	Cys3					Yes	No			
Phosphorylation	Ser16	Protein kinase C				Yes	No			
Phosphorylation	Ser16	Pak1	A000070			Yes	No			
Phosphorylation	Ser27	Protein kinase C alpha				Yes	Yes	Protease-activated receptor 1	A000079	Stimulates
Phosphorylation	Ser27	Protein kinase C alpha				Yes	Yes	Prostanoid receptor Tp	A001907	Stimulates

Comments:

G protein beta 4

G protein, heterotrimeric

Christiane Kleuss

A000985

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

G protein beta 5

G protein, heterotrimeric

Vladlen Z Slepak

A000018

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

G protein gamma 2

G protein, heterotrimeric

Janet D Robishaw

A000991

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Acetylation	Ala2					Yes	No			
Carboxyl methylation	Cys68	Icmt	A001154			Yes	Yes	Formyl peptide receptor	A000137	Stimulates
Carboxyl methylation	Cys68	Icmt	A001154			Yes	Yes	Prostanoid receptor Ep1	A001901	Stimulates
Carboxyl methylation	Cys68	Icmt	A001154			Yes	Yes	Prostanoid receptor Ep3	A001903	Stimulates
Carboxyl methylation	Cys68	Icmt	A001154			Yes	Yes	Prostanoid receptor Ep4	A001904	Stimulates
Geranylgeranylation	Cys68	Protein geranylgeranyl transferase				Yes	No			
Proteolysis	Cys68(a)	Rce1 CaaX protease	A002039			Yes	No			

Comments: (a) Proteolysis occurs at the C terminus of Cys68.

G protein gamma 4

G protein, heterotrimeric

John D Hildebrandt

A000993

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Carboxyl methylation	Cys72	Icmt	A001154			Yes	No			
Geranylgeranylation	Cys72	Protein geranylgeranyltransferase				Yes	No			
Proteolysis	Cys72(a)	Rce1 CaaX protease	A002039			Yes	No			

Comments: (a) Proteolysis occurs at the C terminus of Cys72

G protein gamma 8

G protein, heterotrimeric

Christiane Kleuss

A000996

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Acetylation	Ser2(a)					Yes	No			
Carboxyl methylation	Cys67	Icmt	A001154			Yes	No			
Geranylgeranylation	Cys67	Protein geranylgeranyltransferase				Yes	No			
Proteolysis	Cys67(b)	Rce1 CaaX protease	A002039			Yes	No			

Comments: (a) By analogy with G protein gamma 2
(b) Proteolysis occurs at the C terminus of Cys67

Gab2

Adaptor/scaffold

Haihua Gu

A002238

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr441					No	Yes	T cell receptor		Stimulates
Phosphorylation	Tyr465					No	Yes	T cell receptor		Stimulates
Phosphorylation	Tyr574					No	Yes	T cell receptor		Stimulates
Phosphorylation	Tyr604					No	Yes	T cell receptor		Stimulates
Phosphorylation	Tyr633					No	Yes	T cell receptor		Stimulates
Phosphorylation	Tyr441					No	Yes	CD23	A000543	Stimulates
Phosphorylation	Tyr465					No	Yes	CD23	A000543	Stimulates
Phosphorylation	Tyr574					No	Yes	CD23	A000543	Stimulates
Phosphorylation	Tyr604					No	Yes	Colony-stimulating factor 1 receptor	A000674	Stimulates
Phosphorylation	Tyr633					No	Yes	Colony-stimulating factor 1 receptor	A000674	Stimulates
Phosphorylation	Tyr604					No	Yes	Egf receptor	A000823	Stimulates
Phosphorylation	Tyr633					No	Yes	Egf receptor	A000823	Stimulates
Phosphorylation	Tyr441					No	Yes	Interleukin 3 receptor, alpha	A001260	Stimulates
Phosphorylation	Tyr465					No	Yes	Interleukin 3 receptor, alpha	A001260	Stimulates
Phosphorylation	Tyr574					No	Yes	Interleukin 3 receptor, alpha	A001260	Stimulates
Phosphorylation	Tyr604					No	Yes	Interleukin 3 receptor, alpha	A001260	Stimulates
Phosphorylation	Tyr633					No	Yes	Interleukin 3 receptor, alpha	A001260	Stimulates
Phosphorylation	S160	Akt1	A000249			Yes	Yes	Erbb2	A000868	Stimulates

Comments:

Gads

Edward Clark

Adaptor/scaffold

A001021

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Cleavage	Asp235	Caspase 3	A000498			Yes	Yes	CD95	A000600	Stimulates

Comments:

Galanin receptor 1

Suke Wang

Receptor, GPCR

A001023

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Galanin receptor 2

Suke Wang

Receptor, GPCR

A001024

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Galanin receptor 3

Suke Wang

Receptor, GPCR

A001025

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Gbp

David Kimelman

Inhibitor protein

A000956

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown	(a)				No	No			

Comments: (a) Gsk3 (A001106) enhancing phosphorylation; not known if Gsk3 is actual catalyst of Gbp phosphorylation

Gfr

Lawrence A Quilliam

Guanine nucleotide exchange factor, misc.

A001038

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Glucagon-like peptide receptor 1 — Dieter Hoersch

Receptor, GPCR

A001042

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Unknown					Yes	No			
Phosphorylation	Ser441/442	Protein kinase C				Yes	Yes	Glucagon-like peptide receptor 1	A001042	Stimulates
Phosphorylation	Ser444/445	Protein kinase C				Yes	Yes	Glucagon-like peptide receptor 1	A001042	Stimulates

Comments:

Glutamate receptor, metabotropic, type 1 — Peter Koulen

Receptor, GPCR

A001061

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None (a)										

Comments: (a) N-linked glycosylation likely at consensus sites (Asn98, 223, 397,515)

Glutamate receptor, metabotropic, type 2 — Herve Schaffhauser

Receptor, GPCR

A001062

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser843	Protein kinase A catalytic subunit alpha	A001914			Yes	Yes			

Comments:

Glutamate receptor, metabotropic, type 5

Peter Koulen

Receptor, GPCR

A001065

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None (a)										

Comments: (a) N-linked glycosylation likely at consensus sites (Asn88, 210, 378, 382, 445, 734)

Glutamate receptor, metabotropic, type 8

Peter Koulen

Receptor, GPCR

A001068

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None (a)										

Comments: (a) N-linked glycosylation likely at consensus sites (Asn95, 298, 452, 480, 565)

Grb10

Andre Nantel

Adaptor/scaffold

A000064

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown	Erk1(a)	A000874			Yes	Yes	Insulin receptor	A001190	Stimulates
Phosphorylation	Unknown	Erk1(a)	A000874			Yes	Yes	Insulin-like growth factor-1 receptor	A001198	Stimulates
Phosphorylation	Unknown	Erk2(a)	A000875			Yes	Yes	Insulin receptor	A001190	Stimulates
Phosphorylation	Unknown	Erk2(a)	A000875			Yes	Yes	Insulin-like growth factor-1 receptor	A001198	Stimulates
Phosphorylation	Tyr67 (b)	c-Src	A002227			Yes	Yes	Insulin receptor	A001190	Stimulates
Phosphorylation	Tyr67(b)	Tec	A002264			Yes	Yes	Insulin receptor	A001190	Stimulates

Comments: (a) Phosphorylation by Erk1 and/or Erk2
(b) This site is absent in the mouse protein. Phosphorylation demonstrated with human protein.

Growth hormone releasing hormone

Kelly C Mayo

Secreted protein

A002933

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Amidation (a)	C-Terminus					Yes	No			

Comments: (a) Amidation is linked to precursor processing. No amidation of rodent proteins.

Growth hormone releasing-factor receptor

Kelly C Mayo

Receptor, GPCR

A001101

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn49(a)					Yes	No			
Glycosylation	Asn50(a)					Yes	No			

Comments: (a) Location inferred from consensus sequence

Gsk3 alpha

Jim Woodgett

Protein kinase, Ser/Thr (non-receptor)

A001105

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser21	Akt1	A000249	Pp1 alpha	A001855	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Akt1	A000249	Pp2a alpha catalytic subunit	A001862	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Akt2	A000250	Pp1 alpha	A001855	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Akt2	A000250	Pp2a alpha catalytic subunit	A001862	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Akt3	A000251	Pp1 alpha	A001855	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Akt3	A000251	Pp2a alpha catalytic subunit	A001862	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	p70s6k	A000530	Pp1 alpha	A001855	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	p70s6k	A000530	Pp2a alpha catalytic subunit	A001862	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Protein kinase A catalytic subunit alpha	A001914	Pp1 alpha	A001855	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Protein kinase A catalytic subunit alpha	A001914	Pp2a alpha catalytic subunit	A001862	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Protein kinase A catalytic subunit beta	A001915	Pp1 alpha	A001855	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates

Gsk3 alpha

Jim Woodgett

Protein kinase, Ser/Thr (non-receptor)

A001105

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser21	Protein kinase A catalytic subunit beta	A001915	Pp2a alpha catalytic subunit	A001862	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Protein kinase A catalytic subunit gamma	A001916	Pp1 alpha	A001855	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Protein kinase A catalytic subunit gamma	A001916	Pp2a alpha catalytic subunit	A001862	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Rsk1	A002099	Pp1 alpha	A001855	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Rsk1	A002099	Pp2a alpha catalytic subunit	A001862	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Sgkl	A003047	Pp1 alpha	A001855	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates
Phosphorylation	Ser21	Sgkl	A003047	Pp2a alpha catalytic subunit	A001862	Yes	Yes	Receptor Tyrosine Kinases; GPCR's		Stimulates

Comments:

Gsk3 beta

Jim Woodgett

Protein kinase, Ser/Thr (non-receptor)

A001106

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser9	Akt1	A000249	Pp1 alpha	A001855	Yes	Yes			
Phosphorylation	Ser9	Akt1	A000249	Pp2a alpha catalytic subunit	A001862	Yes	Yes			
Phosphorylation	Ser9	Akt2	A000250	Pp1 alpha	A001855	Yes	Yes			
Phosphorylation	Ser9	Akt2	A000250	Pp2a alpha catalytic subunit	A001862	Yes	Yes			
Phosphorylation	Ser9	Akt3	A000251	Pp1 alpha	A001855	Yes	Yes			
Phosphorylation	Ser9	Akt3	A000251	Pp2a alpha catalytic subunit	A001862	Yes	Yes			
Phosphorylation	Ser9	p70S6k	A000530	Pp1 alpha	A001855	Yes	Yes			
Phosphorylation	Ser9	p70S6k	A000530	Pp2a alpha catalytic subunit	A001862	Yes	Yes			
Phosphorylation	Ser9	Protein kinase A catalytic subunit alpha	A001914	Pp1 alpha	A001855	Yes	Yes			
Phosphorylation	Ser9	Protein kinase A catalytic subunit alpha	A001914	Pp2a alpha catalytic subunit	A001862	Yes	Yes			
Phosphorylation	Ser9	Protein kinase A catalytic subunit beta	A001915	Pp1 alpha	A001855	Yes	Yes			
Phosphorylation	Ser9	Protein kinase A catalytic subunit beta	A001915	Pp2a alpha catalytic subunit	A001862	Yes	Yes			
Phosphorylation	Ser9	Protein kinase A catalytic subunit gamma	A001916	Pp1 alpha	A001855	Yes	Yes			

Gsk3 beta

Jim Woodgett

Protein kinase, Ser/Thr (non-receptor)

A001106

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser9	Protein kinase A catalytic subunit gamma	A001916	Pp2a alpha catalytic subunit	A001862	Yes	Yes			
Phosphorylation	Ser9	Rsk1	A002099	Pp1 alpha	A001855	Yes	Yes			
Phosphorylation	Ser9	Rsk1	A002099	Pp2a alpha catalytic subunit	A001862	Yes	Yes			
Phosphorylation	Ser9	Sgkl	A003047	Pp1 alpha	A001855	Yes	Yes			
Phosphorylation	Ser9	Sgkl	A003047	Pp2a alpha catalytic subunit	A001862	Yes	Yes			

Comments:

Gstp1

Kenneth Tew

Transferase

A002956

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Unknown/Asn					Yes	No			
Methylation	Unknown					Yes	No			
Phosphorylation	Unknown	Protein kinase C				No	No			

Comments:

Guanylyl cyclase cytosolic A1

Annie Beuve

Guanylyl cyclase

A000127

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Guanylyl cyclase cytosolic B1

Annie Beuve

Guanylyl cyclase

A000126

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Hdac4

Tso-Pang Yao

Hydrolase, esterase

A002996

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser246					Yes	No			
Phosphorylation	Ser467					Yes	No			
Phosphorylation	Ser632					Yes	No			
Sumoylation	Lys559	RanBP2				Yes	No			

Comments:

Hegfl

Eisuke Mekada

Cell surface, misc.

A002932

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
O-Glycosylation	Unknown					No	No			

Comments:

Hint

Charles Brenner

Inhibitor protein

A001120

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Hnrpd

Gary Brewer

RNA binding protein

A003244

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser87 (a)	Protein kinase A catalytic subunit				Yes	No			
Phosphorylation	Ser83 (a)	Gsk3 beta	A001106			Yes	No			
Ubiquitination	Unknown					Yes	No			

Comments: (a) Human sequence. Corresponding mouse residues are Ser52 and Thr56.

Homer 1a

Peter Koulen

Adaptor/scaffold

A001138

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Homer 1b

Peter Koulen

Adaptor/scaffold

A001139

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Homer 1c

Peter Koulen

Cytosolic, misc.

A002500

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Hpk1

Friedemann Kiefer

Protein kinase, Ser/Thr (non-receptor)

A001144

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser171	Hpk1	A001144			Yes	No			
Phosphorylation	Thr165	Hpk1	A001144			Yes	No			
Phosphorylation	Thr175	Hpk1	A001144			Yes	No			
Phosphorylation	Tyr379	Syk	A000040			Yes	Yes	B Cell and T Cell Receptors		Stimulates
Phosphorylation	Tyr379	Zap70	A002396			Yes	Yes	B Cell and T Cell Receptors		Stimulates

Comments:

Icmt

Ann M Winter-Vann

Lipid modification, protein

A001154

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

IkappaB-beta

Nickolai Dulin

Inhibitor protein

A001166

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser313 (a)	Casein kinase II				Yes	No			
Phosphorylation	Ser315 (a)	Casein kinase II				Yes	No			
Phosphorylation	Ser19	IKKalpha	A001170			Yes	Yes	TNF receptor superfamily (multiple)		Stimulates
Phosphorylation	Ser23	IKKalpha	A001170			Yes	Yes	TNF receptor superfamily (multiple)		Stimulates
Phosphorylation	Ser19	IKKalpha	A001170			Yes	Yes	Interleukin 1 receptor R2	A001242	Stimulates
Phosphorylation	Ser23	IKKalpha	A001170			Yes	Yes	Interleukin 1 receptor R2	A001242	Stimulates
Phosphorylation	Ser19	IKKalpha	A001170			Yes	Yes	Toll-like receptor 4	A002296	Stimulates
Phosphorylation	Ser23	IKKalpha	A001170			Yes	Yes	Toll-like receptor 4	A002296	Stimulates
Phosphorylation	Ser19	IKKbeta	A001172			Yes	Yes	TNF receptor superfamily (multiple)		Stimulates
Phosphorylation	Ser23	IKKbeta	A001172			Yes	Yes	TNF receptor superfamily (multiple)		Stimulates
Phosphorylation	Ser19	IKKbeta	A001172			Yes	Yes	Interleukin 1 receptor R2	A001242	Stimulates
Phosphorylation	Ser23	IKKbeta	A001172			Yes	Yes	Interleukin 1 receptor R2	A001242	Stimulates
Phosphorylation	Ser19	IKKbeta	A001172			Yes	Yes	Toll-like receptor 4	A002296	Stimulates
Phosphorylation	Ser23	IKKbeta	A001172			Yes	Yes	Toll-like receptor 4	A002296	Stimulates
Ubiquitination	Lys9	Smurf1	A002436			Yes	Yes	TNF receptor superfamily (multiple)		Stimulates
Ubiquitination	Lys9	Smurf1	A002436			Yes	Yes	Interleukin 1 receptor R2	A001242	Stimulates
Ubiquitination	Lys9	Smurf1	A002436			Yes	Yes	Toll-like receptor 4	A002296	Stimulates
Ubiquitination	Lys9	Smurf2	A002437			Yes	Yes	TNF receptor superfamily (multiple)		Stimulates
Ubiquitination	Lys9	Smurf2	A002437			Yes	Yes	Interleukin 1 receptor R2	A001242	Stimulates
Ubiquitination	Lys9	Smurf2	A002437			Yes	Yes	Toll-like receptor 4	A002296	Stimulates

Comments: (a) Human sequence

Inosine-5'-monophosphate dehydrogenase II

James L Sherley

Oxidoreductase

A000130

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Inositol (1,4,5) P3 receptor 1

Richard JH Wojcikiewicz

Receptor, ligand-gated channel

A000077

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn2475					Yes	No			
Glycosylation	Asn2503					Yes	No			
Phosphorylation	Ser1588	Protein kinases A and G		Pp1 alpha	A001855	Yes	Yes	Several (b)		Stimulates
Phosphorylation	Ser1755	Protein kinases A and G		Pp1 alpha	A001855	Yes	Yes	Several (b)		Stimulates
Ubiquitination	Unknown					Yes	Yes	Several (a)		Stimulates

Comments: (a) Those that elevate IP3 concentrations persistently
(b) Those that elevate cyclic AMP concentrations

Inositol (1,4,5) P3 receptor 2

Richard JH Wojcikiewicz

Receptor, ligand-gated channel

A000116

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Unknown Asn					Yes	No			
Ubiquitination	Unknown					Yes	Yes	Several (a)		Stimulates

Comments: (a) Those that elevate IP3 concentrations persistently

Inositol (1,4,5) P3 receptor 3

Richard JH Wojcikiewicz

Receptor, ligand-gated channel

A000117

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	UnknownAsn					Yes	No			
Phosphorylation	Unknown	Protein kinase A catalytic subunit				Yes	Yes	Several (b)		Stimulates
Ubiquitination	Unknown					Yes	Yes	Several (a)		Stimulates

Comments: (a) Those that elevate IP3 concentrations persistently
(b) Those that elevate cyclic AMP concentrations

Integrin alpha 1

Kerstin Danker

Adhesin/agglutinin

A001199

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Unknown					Yes	No			

Comments:

Integrin alpha 11

Donald E Gullberg

Cell surface, misc.

A002838

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Integrin beta 7

Geoffrey W Krissansen

Adhesin/agglutinin

A001218

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Interleukin 12 alpha

Xiaojing Ma

Secreted protein

A002864

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn(human)					Yes	No			

Comments:

Interleukin 12 beta

Xiaojing Ma

Secreted protein

A002865

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn220					Yes	No			

Comments:

Interleukin 13 receptor, alpha 1

Raj K Puri

Receptor, cytokine

A001250

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Interleukin 13 receptor, alpha 2

Raj K Puri

Receptor, cytokine

A001251

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Interleukin 4 receptor, alpha

Raj K Puri

Receptor, cytokine

A001263

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Jik

John Manfredi

Protein kinase, Ser/Thr (non-receptor)

A000042

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser/Thr Unknown	Jik	A000042			No	No			

Comments:

Jnk1

John M Kyriakis

Protein kinase, Ser/Thr (non-receptor)

A001296

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Thr183, Tyr185 (a)	Mek4	A001508	(a)		Yes	Yes	(b)		
Phosphorylation	Thr183, Tyr185 (a)	Mek7	A001511	(a)		Yes	Yes	(b)		

Comments: (a) Phosphorylations of Thr183 and Tyr185 are listed as a single event because both phosphorylations are catalyzed concomitantly by dual specificity protein kinases. Enzymes responsible for dephosphorylation of these residues include Pp1 alpha (A001855); PP2a alpha subunit (A001860); Ptb1b (A000088); Skrp1 (A003155); Nttp1 (A001152); and Mkp's1 (A000025), 2 (A001544), 5 (A001546), and 7(A003068).
(b) Receptors that regulate phosphorylation of these sites include Interleukin 1 receptor R1 (A001241), Interleukin 1 receptor R2 (A001242), Rank (A002019), Toll-like receptors (A002293-A002301), and CD40 (A000031).

Jnk2

John M Kyriakis

Protein kinase, Ser/Thr (non-receptor)

A001297

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Thr183, Tyr185 (a)	Mek4	A001508	(a)		Yes	Yes	(b)		
Phosphorylation	Thr183, Tyr185 (a)	Mek7	A001511	(a)		Yes	Yes	(b)		

(a) Phosphorylations of Thr183 and Tyr185 are listed as a single event because both phosphorylations are catalyzed concomitantly by dual specificity protein kinases. Enzymes responsible for

Jnk2

John M Kyriakis

Protein kinase, Ser/Thr (non-receptor)

A001297

Comments: dephosphorylation of these residues include Pp1 alpha (A001855); PP2a alpha subunit (A001860); Ptb1b (A000088); Skrp1 (A003155); Nttp1 (A001152); and Mkp's1 (A000025), 2 (A001544), 5 (A001546), and 7(A003068).
(b) Receptors that regulate phosphorylation of these sites include Interleukin 1 receptor R1 (A001241), Interleukin 1 receptor R2 (A001242), Rank (A002019), Toll-like receptors (A002293-A002301), and CD40 (A000031).

Jnk3

John M Kyriakis

Protein kinase, Ser/Thr (non-receptor)

A001298

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Thr183, Tyr185 (a)	Mek4	A001508	(a)		Yes	Yes	(b)		
Phosphorylation	Thr183, Tyr185 (a)	Mek7	A001511	(a)		Yes	Yes	(b)		

Comments: (a) Phosphorylations of Thr183 and Tyr185 are listed as a single event because both phosphorylations are catalyzed concomitantly by dual specificity protein kinases. Enzymes responsible for dephosphorylation of these residues include Pp1 alpha (A001855); PP2a alpha subunit (A001860); Ptb1b (A000088); Skrp1 (A003155); Nttp1 (A001152); and Mkp's1 (A000025), 2 (A001544), 5 (A001546), and 7(A003068).
(b) Receptors that regulate phosphorylation of these sites include Interleukin 1 receptor R1 (A001241), Interleukin 1 receptor R2 (A001242), Rank (A002019), Toll-like receptors (A002293-A002301), and CD40 (A000031).

Khsrp

Gary Brewer

RNA binding protein

A003260

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Khsv-Gpcr

Marvin C. Gershengorn

Receptor, GPCR

A000035

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Kir3.3

Nathan Dascal

Channel, potassium

A000030

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Ksr1

Deborah K Morrison

Protein kinase, Ser/Thr (non-receptor)

A001349

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser297					Yes	No			
Phosphorylation	Ser518					Yes	No			
Phosphorylation	Ser443	Erk2	A000875			Yes	Yes	Receptor tyrosine kinases		Stimulates
Phosphorylation	Thr260	Erk2	A000875			Yes	Yes	Receptor tyrosine kinases		Stimulates
Phosphorylation	Thr274	Erk2	A000875			Yes	Yes	Receptor tyrosine kinases		Stimulates
Phosphorylation	Ser392	Mark3	A003012			Yes	Yes	Receptor tyrosine kinases		Inhibits

Comments:

Lck

Steven D Levin

Protein kinase, tyrosine (non-receptor)

A001394

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Myristoylation	Gly2					Yes	No			
Palmitoylation	Cys3					Yes	No			
Palmitoylation	Cys5					Yes	No			
Phosphorylation	Tyr505	Csk	A000701	CD45	A000567	Yes	Yes	CD45	A000567	Inhibits
Phosphorylation	Ser59	Erk1	A000874			Yes	Yes	TCR=?CD3zeta	A000553	Stimulates
Phosphorylation	Ser59	Erk2 (a)	A000875			Yes	Yes	TCR=?CD3zeta	A000553	Stimulates
Phosphorylation	Tyr394	Lck	A001394	Shp1	A002156	Yes	Yes	CD8		Stimulates
Phosphorylation	Tyr394	Lck	A001394	Shp1	A002156	Yes	Yes	T Cell antigen receptor CD2?	A000539	Stimulates
Phosphorylation	Tyr394	Lck	A001394	Shp1	A002156	Yes	Yes	CD28	A000548	Stimulates
Phosphorylation	Tyr394	Lck	A001394	Shp1	A002156	Yes	Yes	CD4	A000561	Stimulates

Comments: (a) Controversial

Lysophosphatidic acid acyltransferase, alpha

David W Leung

Transferase

A002990

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Lysophosphatidic acid acyltransferase, beta

David W Leung

Transferase

A002991

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Lysyl oxidase

Katalin Csiszar

Oxidoreductase

A002989

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Unknown			Endoglycosidase H		Yes	No			

Comments:

M-Ras

Lawrence A Quilliam

Guanine nucleotide exchange factor, ARF

A000348

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Carboxyl methylation	Cys205	Icmt	A001154			No	No			
Geranylgeranylation	Cys205	Protein geranylgeranyltransferase type I				No	No			

Comments:

MHC class II I-E beta

Gail A Bishop

Cell surface, misc.

A000087

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Unknown									

Comments:

Mapkap kinase 2

Matthias Gaestel

Protein kinase, Ser/Thr (non-receptor)

A000065

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Thr206	p38 alpha Map kinase	A001717			Yes	No			
Phosphorylation	Thr319	p38 alpha Map kinase	A001717			Yes	No			
Phosphorylation	Thr206	p38 beta Map kinase	A001718			Yes	No			
Phosphorylation	Thr319	p38 beta Map kinase	A001718			Yes	No			

Comments:

Mcip1

R Sanders Williams

Inhibitor protein

A001481

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser108	Erk1(a)	A000874	Calcineurin A alpha subunit	A000420	No	No			
Phosphorylation	Ser108	Erk2(a)	A000875	Calcineurin A alpha subunit	A000420	No	No			
Phosphorylation	Ser112	Gsk3 beta	A001106			No	No			

Comments: (a) Phosphorylation by Erk1 and/or Erk2

Mcip2

R Sanders Williams

Inhibitor protein

A001482

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Mcip3

R Sanders Williams

Inhibitor protein

A001483

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Mct3

Andrew P Halestrap

Transporter, facilitator

A003366

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Mef2a

Eric Olson

Transcription factor

A001499

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser444	p38 Map kinase				Yes	No			
Phosphorylation	Thr310	p38 Map kinase				Yes	No			
Phosphorylation	Thr317	p38 Map kinase				Yes	No			
Phosphorylation	N-terminal	Erk5	A000879			Yes	No			

Comments:

Mef2b

Eric Olson

Transcription factor

A001501

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Mef2c

Eric Olson

Transcription factor

A001503

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser378	p38 Map kinase				Yes	No			
Phosphorylation	Thr283	p38 Map kinase				Yes	No			
Phosphorylation	Thr290	p38 Map kinase				Yes	No			
Phosphorylation	N-terminal	Erk5	A000879			Yes	No			

Comments:

Mef2d

Eric Olson

Transcription factor

A001504

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Thr309	p38 Map kinase				Yes	No			
Phosphorylation	Thr316	p38 Map kinase				Yes	No			
Phosphorylation	N-terminal	Erk5	A000879			Yes	No			

Comments:

Mkp3

Stephen M Keyse

Protein phosphatase, dual-specificity

A000023

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Monocarboxylate transporter 1

Andrew P Halestrap

Transporter, facilitator

A001490

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Monocarboxylate transporter 2

Andrew P Halestrap

Transporter, facilitator

A001491

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Monocarboxylate transporter 4

Andrew P Halestrap

Transporter, facilitator

A001492

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Monocarboxylate transporter 5

Andrew P Halestrap

Transporter, facilitator

A001493

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Monocarboxylate transporter 6

Andrew P Halestrap

Transporter, facilitator

A001494

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Monocarboxylate transporter 7

Andrew P Halestrap

Transporter, facilitator

A001495

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Monocarboxylate transporter 8

Andrew P Halestrap

Transporter, facilitator

A001496

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Nedd4-1

Daniela Rotin

Ubiquitin conjugating system

A001622

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown Tyr					Yes	No			

Comments:

Nedd4-2

Daniela Rotin

Ubiquitin conjugating system

A001623

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser222	Sgkl	A003047			Yes	No			
Phosphorylation	Ser329	Sgkl	A003047			Yes	No			
Phosphorylation	Thr247	Sgkl	A003047			Yes	No			

Comments:

Nemo

Alain Israel

Adaptor/scaffold

A001628

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Nit1

Charles Brenner

Enzyme, misc.

A001657

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Nucleobindin

Marilyn G Farquhar

Cytosolic, misc.

A001675

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
O-Glycosylation	Unknown					Yes	No			
Sulfation	Unknown					Yes	No			

Comments: O-Glycosylation

Opioid receptor kappa 1

M Germana Paterlini

Receptor, GPCR

A000022

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Oxytocin receptor

Barbara M Sanborn

Receptor, GPCR

A001705

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

P2y11

Jean-Marie Boeynaems

Receptor, GPCR

A001689

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

P2y13

Jean-Marie Boeynaems

Receptor, GPCR

A000700

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

P2y4

Jean-Marie Boeynaems

Receptor, GPCR

A001691

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser329					Yes	Yes	Nucleotide receptor P2y4	A001691	Stimulates
Phosphorylation	Ser330					Yes	Yes	Nucleotide receptor P2y4	A001691	Stimulates

Comments:

P2y6

Jean-Marie Boeynaems

Receptor, GPCR

A001693

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Pdpk1

David Stokoe

Protein kinase, Ser/Thr (non-receptor)

A001740

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser244	Pdpk1	A001740			Yes	Yes	Insulin receptor	A001190	Stimulates

Comments:

Pdz-Gef1

Lawrence A Quilliam

Guanine nucleotide exchange factor, misc.

A000331

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Phosphodiesterase 4A, cAMP specific

Miles Douglas Houslay

Phosphodiesterase

A000104

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Phosphodiesterase 4B, cAMP specific

Miles Douglas Houslay

Phosphodiesterase

A000105

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Phosphodiesterase 4D, cAMP specific

Miles Douglas Houslay

Phosphodiesterase

A000106

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments: No answer so assume the answer is no covalent modifications, same as other three proteins

Phosphodiesterase 9A, cGMP specific

Joseph A Beavo

Phosphodiesterase

A001761

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Phosphofructokinase-M

Hiromu Nakajima

Kinase (non-protein)

A000096

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser775	Protein kinase C				Yes	No			

Comments: Author comment: "This modification does not vary the activity on the protein (enzyme)"

Phosphoinositide 3-kinase gamma catalytic subunit

Bernd Nuernberg

Kinase, lipid

A001771

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Acetylation	Unknown					No	No			
Phosphorylation	Ser1101	Phosphoinositide 3-kinase gamma catalytic subunit	A001771			No	Yes	Formyl peptide receptor	A000137	Stimulates

Comments:

Phosphoinositide 3-kinase p101 class Ib regulatory subunit

Bernd Nuernberg

Kinase, lipid

A001767

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Acetylation	Unknown					No	No			

Comments:

Phosphoinositide 3-kinase p110 delta, class Ia catalytic subunit

Bart Vanhaesebroeck

Kinase, lipid

A001770

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser1038	Phosphoinositide 3-kinase p110 delta, class Ia catalytic subunit	A001770			Yes	Yes	CD28	A000548	Stimulates

Comments:

Phosphoinositide 4-kinase type III alpha

Tamas Balla

Kinase, lipid

A001777

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Phosphoinositide 4-kinase type III beta

Tamas Balla

Kinase, lipid

A001778

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser258					No	No			
Phosphorylation	Ser266					No	No			
Phosphorylation	Ser277					No	No			
Phosphorylation	Ser294					No	No			
Phosphorylation	Ser496					No	No			
Phosphorylation	Thr263					No	No			
Phosphorylation	Thr423					No	No			
Phosphorylation	Thr504					No	No			

Comments:

Phosphoinositide 5-phosphate 4-kinase type II-alpha

Robin F Irvine

Kinase, lipid

A001783

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser304	Casein kinase II alpha 1	A000109			No	No			

Comments:

Phosphoinositide 5-phosphate 4-kinase type II-beta

Robin F Irvine

Kinase, lipid

A001784

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Phosphoinositide 5-phosphate 4-kinase type II-gamma

Robin F Irvine

Kinase, lipid

A001785

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Phospholamban

Evangelia Kranias

Inhibitor protein

A001786

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser16	Protein kinase A catalytic subunit		Pp1		Yes	Yes	Adrenergic receptor beta 1	A000219	

Comments:

Phospholipase A2, group IIa

David C Wilton

Phospholipase

A001789

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Phospholipase A2, group IVa

Edward Dennis

Phospholipase

A001795

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser437					Yes	No			
Phosphorylation	Ser454(a)					Yes	No			
Phosphorylation	Ser505					Yes	Yes	Unknown (b)		Stimulates
Phosphorylation	Ser515	Calmodulin-dependent protein kinase II				Yes	Yes	Unknown adrenergic receptor		Stimulates
Phosphorylation	Ser726					Yes	Yes	Unknown (c)		Stimulates

Comments: (a) Human only
(b) Exact receptor unknown. Ligands include ATP, PDGF, thrombin, interferon alpha, colony-stimulating factor-1, platelet activating factor, lysophosphatidylcholine, interleukin 1-beta, macrophage migratory inhibitory factor, and tumor necrosis factor alpha
(c) Exact receptor unknown. Ligands include ATP, PDGF, thrombin, interferon alpha, and interleukin-1

Phospholipase A2, group V

Edward Dennis

Phospholipase

A001798

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Phospholipase A2, group VIA

Edward Dennis

Phospholipase

A001801

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Phospholipase C beta2

Alan V Smrcka

Phospholipase

A001804

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown	cGMP-dependent protein kinase, type 2	A000044			No	No			
Phosphorylation	Unknown	Protein kinase A catalytic subunit beta	A001915			No	No			
Phosphorylation	Unknown	Protein kinase C alpha	A001919			No	No			
Phosphorylation	Unknown	Protein kinase C beta1	A001920			No	No			
Phosphorylation	Unknown	Protein kinase C gamma1	A001927			No	No			
Phosphorylation	Unknown	cGMP-dependent protein kinase, type 1	A000043			Yes	No			

Comments:

Phospholipase C beta3

Alan V Smrcka

Phospholipase

A001805

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser1105	cGMP-dependent protein kinase, type 1	A000043			Yes	No			
Phosphorylation	Ser26	cGMP-dependent protein kinase, type 1	A000043			Yes	No			
Phosphorylation	Ser1105	cGMP-dependent protein kinase, type 2	A000044			Yes	No			
Phosphorylation	Ser26	cGMP-dependent protein kinase, type 2	A000044			Yes	No			
Phosphorylation	Ser1105	Protein kinase A catalytic subunit beta	A001915			Yes	No			
Phosphorylation	Ser1105	Protein kinase C alpha	A001919			Yes	No			
Phosphorylation	Ser1105	Protein kinase C beta1	A001920			Yes	No			
Phosphorylation	Ser1105	Protein kinase C gamma1	A001927			Yes	No			

Comments:

Phospholipase C epsilon

Grant G Kelley

Phospholipase

A000046

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Pkd2l

Peter Koulen

Channel, cation

A001839

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None (a)										

Comments: (a) N-linked glycosylation likely at consensus sites (Asn177, 207, 241, 505).

Pkd2l2

Peter Koulen

Channel, cation

A001840

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None (a)										

Comments: (a) N-linked glycosylation likely at consensus sites (Asn115, 138).

Plasma membrane calcium transporting ATPase isoform 1 — Emanuel E Strehler

Transporter, ABC — A001841

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Asp475	Plasma membrane calcium transporting ATPase isoform 1 (a)	A001841	Plasma membrane calcium transporting ATPase isoform 1 (a)	A001841	Yes	(a)	(a)		
Phosphorylation	Ser1178	Protein kinase A catalytic subunit				Yes	No			

Comments: (a) Phosphorylation of Asp-475 of PMCA1 is an obligatory part of the calcium pumping reaction cycle. While the stoichiometry cannot be altered, the rate of phosphorylation (i.e., the pumping efficiency) can be regulated by receptors and other modulators of PMCA activity. For example, receptors that activate PKA or PKC signaling pathways will (indirectly) modulate PMCA activity.

Polycystin 2 — Peter Koulen

Channel, cation — A001852

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None (a)										

Comments: (a) N-linked glycosylation likely at consensus sites (Asn297, 303, 326, 360, 373)

Pp2a A alpha subunit — Marc Mumby

Protein phosphatase, Ser/Thr (non-receptor) — A001860

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Pp2a A beta subunit

Marc Mumby

Protein phosphatase, Ser/Thr (non-receptor)

A001861

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Pp2a Pr72

Marc Mumby

Protein phosphatase, Ser/Thr (non-receptor)

A001872

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Pp2c alpha

Marc Mumby

Protein phosphatase, Ser/Thr (non-receptor)

A001874

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Pp2c beta

Marc Mumby

Protein phosphatase, Ser/Thr (non-receptor)

A001875

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Ppap2a

Alexander J Lazar

Phosphatase (non-protein)

A001416

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn142					Yes	No			

Comments:

Ppap2b

Alexander J Lazar

Phosphatase (non-protein)

A003071

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn171					Yes	No			

Comments:

Protein N-myristoyltransferase 1

Maurine E Linder

Lipid modification, protein

A000095

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Protein geranylgeranyltransferase type II, beta subunit

Miguel C Seabra

Lipid modification, protein

A000901

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Protein histidine phosphatase

Roland Kellner

Phosphatase

A003370

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Acetylation	Ala2					Yes	No			

Comments:

Protein kinase C mu2

Peter Storz

Protein kinase, Ser/Thr (non-receptor)

A001931

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser706 (a)	Protein kinase C alpha	A001919			Yes	Yes	Cholecystokinin type B receptor	A000654	Stimulates
Phosphorylation	Ser710 (a)	Protein kinase C alpha	A001919			Yes	Yes	Cholecystokinin type B receptor	A000654	Stimulates
Phosphorylation	Ser706 (a)	Protein kinase C epsilon	A001925			Yes	Yes	Cholecystokinin type B receptor	A000654	Stimulates
Phosphorylation	Ser710 (a)	Protein kinase C epsilon	A001925			Yes	Yes	Cholecystokinin type B receptor	A000654	Stimulates
Phosphorylation	Ser706 (a)	Protein kinase C eta	A001926			Yes	Yes	Cholecystokinin type B receptor	A000654	Stimulates
Phosphorylation	Ser710 (a)	Protein kinase C eta	A001926			Yes	Yes	Cholecystokinin type B receptor	A000654	Stimulates
Phosphorylation	Ser876 (a)	Protein kinase C mu2	A001931			Yes	Yes	Cholecystokinin type B receptor	A000654	Stimulates

Comments: (a) Human sequence

Protein kinase C nu

Peter Storz

Protein kinase, Ser/Thr (non-receptor)

A001932

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser731 (a)	Protein kinase C epsilon	A001925			Yes	Yes	B-cell antigen receptor		Stimulates
Phosphorylation	Ser735 (a)	Protein kinase C epsilon	A001925			Yes	Yes	B-cell antigen receptor		Stimulates
Phosphorylation	Ser731 (a)	Protein kinase C eta	A001926			Yes	Yes	B-cell antigen receptor		Stimulates
Phosphorylation	Ser735 (a)	Protein kinase C eta	A001926			Yes	Yes	B-cell antigen receptor		Stimulates
Phosphorylation	Ser731 (a)	Protein kinase C theta	A001933			Yes	Yes	B-cell antigen receptor		Stimulates
Phosphorylation	Ser735 (a)	Protein kinase C theta	A001933			Yes	Yes	B-cell antigen receptor		Stimulates

Comments: (a) Human sequence

Protein kinase C zeta

Jorge Moscat

Protein kinase, Ser/Thr (non-receptor)

A001934

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Thr410	Pdpk1	A001740			Yes	Yes	B-cell receptor		Stimulates
Phosphorylation	Thr410	Pdpk1	A001740			Yes	Yes	Egf receptor	A000823	Stimulates
Phosphorylation	Thr410	Pdpk1	A001740			Yes	Yes	Insulin receptor	A001190	Stimulates

Protein kinase C zeta

Jorge Moscat

Protein kinase, Ser/Thr (non-receptor)

A001934

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Proteolysis	Asp200(a)	Caspase 3	A000498			Yes	Yes	TNF receptor, type 1		Stimulates
Proteolysis	Asp210(a)	Caspase 3	A000498			Yes	Yes	TNF receptor, type 1		Stimulates
Proteolysis	Asp239(a)	Caspase 3	A000498			Yes	Yes	TNF receptor, type 1		Stimulates
Proteolysis	Asp200(a)	Caspase 3	A000498			Yes	Yes	CD95	A000600	Stimulates
Proteolysis	Asp210(a)	Caspase 3	A000498			Yes	Yes	CD95	A000600	Stimulates
Proteolysis	Asp239(a)	Caspase 3	A000498			Yes	Yes	CD95	A000600	Stimulates

Comments: (a) Cleavage occurs C terminal to the designated Asp residue

Protein palmitoyl thioesterase 1

Sandra L Hofmann

Lipid modification, protein

A000114

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn198					Yes	No			
Glycosylation	Asn213					Yes	No			
Glycosylation	Asn233					Yes	No			

Comments:

Protein palmitoyl thioesterase 2

Sandra L Hofmann

Lipid modification, protein

A001936

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn190					Yes	No			
Glycosylation	Asn206					Yes	No			
Glycosylation	Asn245					Yes	No			
Glycosylation	Asn289					Yes	No			
Glycosylation	Asn60					Yes	No			

Comments:

Pten

David Stokoe

Phosphatase, lipid

A001941

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Thr382					No	No			
Phosphorylation	Thr383					No	No			
Phosphorylation	Thr366					Yes	No			
Phosphorylation	Ser370	Casein kinase II alpha 2	A000108			Yes	No			
Phosphorylation	Ser385	Casein kinase II alpha 2	A000108			Yes	No			
Phosphorylation	Ser370	Casein kinase II alpha 1	A000109			Yes	No			
Phosphorylation	Ser385	Casein kinase II alpha 1	A000109			Yes	No			
Phosphorylation	Ser370	Casein kinase II beta	A000110			Yes	No			
Phosphorylation	Ser385	Casein kinase II beta	A000110			Yes	No			

Comments:

Ptp1b

Jonathan Chernoff

Phosphatase

A000088

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser352 (a)					Yes	No			
Phosphorylation	Ser50	Clk1	A000665			Yes	No			
Phosphorylation	Ser50	Clk2	A000666			Yes	No			
Phosphorylation	Ser378 (a)	Protein kinase C alpha	A001919			Yes	No			
Phosphorylation	Tyr 152,153	Egf receptor	A000823			Yes	Yes	Egf receptor	A000823	Stimulates
Phosphorylation	Tyr66	Insulin receptor	A001190			Yes	Yes	Insulin receptor	A001190	Stimulates

Comments: (a) Phosphorylated sites in human Ptp1b.

Ptpre

Ari Elson

Receptor, protein phosphatase, tyrosine

A003095

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn23 (a)					Yes	No			
Glycosylation	Asn31 (a)					Yes	No			
Phosphorylation	Tyr695					Yes	No			

Comments: (a) Presumed sites of glycosylation

Rab2

Ellen J Tisdale

G protein, Rab

A001957

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Geranylgeranylation	Cys211	Protein geranylgeranyltransferase type II	A000901			Yes	No			
Geranylgeranylation	Cys212	Protein geranylgeranyltransferase type II	A000901			Yes	No			
Phosphorylation	Unknown					Yes	No			

Comments:

RalGPS1A

Lawrence A Quilliam

Guanine nucleotide exchange factor, misc.

A000355

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Ramp1

Michel Bouvier

Receptor, misc.

A002014

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Rap1a

Jean de Gunzburg

G protein, monomeric (non-Rab)

A002021

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser180	Protein kinase A catalytic subunit				Yes	No			

Comments:

Rap1b

Jean de Gunzburg

G protein, monomeric (non-Rab)

A002022

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser179	Protein kinase A catalytic subunit				Yes	No			
Phosphorylation	Ser180	Protein kinase A catalytic subunit				Yes	No			

Comments:

Rap2a

Jean de Gunzburg

G protein, monomeric (non-Rab)

A002024

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Rap2b

Jean de Gunzburg

G protein, monomeric (non-Rab)

A002025

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Rgs1

Maurine E Linder

GTPase activating protein, RGS

A002040

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Rgs13

Kirk Druey

GTPase activating protein, RGS

A000020

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Rgs14

John R Hepler

GTPase activating protein, RGS

A002044

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser261	Protein kinase A catalytic subunit				Yes	No			
Phosphorylation	Thr497	Protein kinase A catalytic subunit				Yes	No			

Comments:

Rgs16

Thomas Martin Wilkie

GTPase activating protein, RGS

A000093

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Arginylation	Unknown					No	No			
Palmitoylation	Cys97					No	No			
Palmitoylation	Cys12					Yes	No			
Palmitoylation	Cys2					Yes	No			
Phosphorylation	Ser194					Yes	No			
Phosphorylation	Ser53					Yes	Yes	Adrenergic receptor alpha 2a	A000100	Stimulates
Phosphorylation	Tyr167	Egf receptor	A000823			Yes	Yes	Acetylcholine (muscarinic) receptor M2	A000080	Stimulates
Phosphorylation	Tyr176	Egf receptor	A000823			Yes	Yes	Acetylcholine (muscarinic) receptor M2	A000080	Stimulates
Phosphorylation	Tyr167	Egf receptor	A000823			Yes	Yes	Egf receptor	A000823	Stimulates
Phosphorylation	Tyr176	Egf receptor	A000823			Yes	Yes	Egf receptor	A000823	Stimulates

Rgs16

Thomas Martin Wilkie

GTPase activating protein, RGS

A000093

Comments:

Rgs17

Elliott M Ross

GTPase activating protein, RGS

A002045

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Palmitoylation	Unknown (a)			(b)		No	No			

Comments: (a) Palmitoylation probable on one or more sites in cysteine string residues 28-40
(b) Possibly acylprotein thioesterase 1 (A00010)

Rgs20

Elliott M Ross

GTPase activating protein, RGS

A002046

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Palmitoylation	Unknown (a)			(b)		No	No			

Comments: (a) Palmitoylation probable on one or more sites in cysteine string residues 59-71
(b) Possibly acylprotein thioesterase 1 (A00010)

Rin1

John Colicelli

Guanine nucleotide exchange factor, Rab

A002077

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser351	Protein kinase C mu1	A001930			Yes	No			

Comments:

Rin2

John Colicelli

Guanine nucleotide exchange factor, Rab

A003264

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Rin3

John Colicelli

Guanine nucleotide exchange factor, Rab

A003265

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Ryanodine receptor type III

Peter Koulen

Channel, calcium

A002110

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None (a)										

Comments: (a) N-linked glycosylation likely at consensus sites (Asn3276, 3760, 3801, 4000, 4007, 4697).

SGK085

Gerard Manning

None

A003358

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

SLC5A3

Jean-Yves Lapointe

Transporter, facilitator

A002755

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Sfrp5

Jeffrey S Rubin

Secreted protein

A003195

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Ship

Mark Coggeshall

Phosphatase, lipid

A002154

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr1021	Src family kinase				Yes	Yes	CD32	A000556	Stimulates
Phosphorylation	Tyr918	Src family kinase				Yes	Yes	CD32	A000556	Stimulates

Comments:

Slc16a10

Andrew P Halestrap

Transporter, facilitator

A003365

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Slc22a1

Edgar Schoemig

Transporter, facilitator

A002680

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Slc22a3

Edgar Schoemig

Transporter, facilitator

A002682

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Slc2a8

Hans-Georg Joost

Transporter, facilitator

A001050

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Slc2a9

Hans-Georg Joost

Transporter, facilitator

A001051

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Slc5a7

Randy D Blakely

Transporter, facilitator

A002902

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Unknown					Yes	No			
Phosphorylation	Unknown					Yes	No			

Comments:

Slc7a1

Ellen Closs

Transporter, facilitator

A002772

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn229			N-glycosidaseF		Yes	No			

Comments:

Slc7a2

Ellen Closs

Transporter, facilitator

A002773

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn239			N-glycosidaseF		Yes	No			

Comments:

Slc7a3

Ellen Closs

Transporter, facilitator

A002774

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn232			N-glycosidaseF		Yes	No			

Comments:

Slc7a4

Ellen Closs

Transporter, facilitator

A002775

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn501			N-glycosidaseF		Yes	No			

Comments:

Smit2

Jean-Yves LaPointe

Transporter, facilitator

A003341

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Sphingosine kinase 1

Sarah Spiegel

Kinase, lipid

A002219

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown	Protein kinase C				Yes	Yes	Flk1	A000946	Stimulates

Comments:

Sphingosine kinase 2

Sarah Spiegel

Kinase, lipid

A002220

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Srpk1

Henrik Daub

Protein kinase, Ser/Thr

A003232

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demonstrated in Intact Cells	Receptor Regulation Demonstrated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown					Yes	No			

Comments:

Srpk2

Henrik Daub

Protein kinase, Ser/Thr

A003233

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown					Yes	No			

Comments:

Stk4

Jonathan Chernoff

Protein kinase, Ser/Thr (non-receptor)

A001348

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Thr177	Stk4	A001348			Yes	No			
Phosphorylation	Thr183	Stk4	A001348			Yes	No			
Phosphorylation	Thr329	Stk4	A001348			Yes	No			

Comments:

Stomatin

Rainer Prohaska

Adaptor/scaffold

A000943

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Palmitoylation	Cys30	Protein palmitoyl transferase		Protein palmitoyl thioesterase		Yes	No			
Palmitoylation	Cys87	Protein palmitoyl transferase		Protein palmitoyl thioesterase		Yes	No			

Comments:

Stoml1

Rainer Prohaska

Adaptor/scaffold

A002840

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Syk

Robert L Geahlen

Protein kinase, tyrosine (non-receptor)

A000040

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr290	Syk	A000040			No	No			
Phosphorylation	Tyr357	Syk	A000040			No	No			
Phosphorylation	Tyr623	Syk	A000040			No	No			
Phosphorylation	Tyr624	Syk	A000040			No	No			
Phosphorylation	Tyr130	Syk	A000040			Yes	No			
Phosphorylation	Tyr317	Syk	A000040			Yes	Yes	B Cell antigen receptor		Stimulates
Phosphorylation	Tyr341	Syk	A000040			Yes	Yes	B cell antigen receptor		Stimulates
Phosphorylation	Tyr345	Syk	A000040			Yes	Yes	B Cell antigen receptor		Stimulates
Phosphorylation	Tyr518	Syk	A000040			Yes	Yes	B cell antigen receptor		Stimulates
Phosphorylation	Tyr519	Syk	A000040			Yes	Yes	B cell antigen receptor		Stimulates
Phosphorylation	Tyr317	Lyn	A001441			Yes	Yes	B Cell antigen receptor		Stimulates
Phosphorylation	Tyr341	Lyn	A001441			Yes	Yes	B cell antigen receptor		Stimulates
Phosphorylation	Tyr345	Lyn	A001441			Yes	Yes	B Cell antigen receptor		Stimulates
Phosphorylation	Tyr518	Lyn	A001441			Yes	Yes	B cell antigen receptor		Stimulates
Phosphorylation	Tyr519	Lyn	A001441			Yes	Yes	B cell antigen receptor		Stimulates
Ubiquitination	Unknown	Ubiquitin ligase recruited by c-Cbl				Yes	Yes	B cell antigen receptor		Stimulates

Comments:

Tead1

Norman L Eberhardt

Transcription factor

A002266

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	(a)	Protein kinase C				Yes	No			

Comments: (a) Multiple serine, threonine residues. Serines in the hinge region between the TEA/ATTS DNA-binding and the STY domains are extensively phosphorylated.

Tead2

Norman L Eberhardt

Transcription factor

A000763

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Tead3

Norman L Eberhardt

Transcription factor

A001153

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Tead4

Norman L Eberhardt

Transcription factor

A001165

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Toll-like receptor 1

Shizuo Akira

Receptor, cytokine

A002293

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Toll-like receptor 10

Shizuo Akira

Receptor, cytokine

A003371

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Toll-like receptor 2

Shizuo Akira

Receptor, cytokine

A002294

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Toll-like receptor 3

Shizuo Akira

Receptor, cytokine

A002295

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Toll-like receptor 4

Shizuo Akira

Receptor, cytokine

A002296

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Toll-like receptor 5

Shizuo Akira

Receptor, cytokine

A002297

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Toll-like receptor 6

Shizuo Akira

Receptor, cytokine

A002298

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Toll-like receptor 7

Shizuo Akira

Receptor, cytokine

A002299

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Toll-like receptor 8

Shizuo Akira

Receptor, cytokine

A002300

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Toll-like receptor 9

Shizuo Akira

Receptor, cytokine

A002301

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Tpl2

Christos Tsatsanis

Protein kinase, Ser/Thr (non-receptor)

A000092

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser400	Akt				Yes	Yes	T cell antigen receptor		Stimulates

Comments:

Tumor protein D52

Jennifer Anne Byrne

Cytosolic, misc.

A000072

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Tumor protein D52l1

Jennifer Anne Byrne

Cytosolic, misc.

A000073

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Tumor protein D52l2

Jennifer Anne Byrne

Channel, misc.

A000074

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Urea transporter UT-A

Jeff M Sands

Transporter, facilitator

A002589

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Unknown			PNGaseF		Yes	No			
Phosphorylation	Unknown	Protein kinase A catalytic subunit				Yes	Yes	Vasopressin 2 receptor	A002358	Stimulates

Comments:

Urea transporter UT-B

Jeff M Sands

Transporter, facilitator

A002588

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Unknown			PNGaseF		Yes	No			

Comments:

Vasopressin 2 receptor

Mariel Birnbaumer

Receptor, GPCR

A002358

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Glycosylation	Asn22					Yes	No			
Glycosylation	Unknown Ser/Thr					Yes	No			
Palmitoylation	Cys341					Yes	No			
Palmitoylation	Cys342					Yes	No			

Comments:

Wasp

Peter Burbelo

Adaptor/scaffold

A000118

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Wasp-N

Peter Burbelo

Adaptor/scaffold

A000091

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
None										

Comments:

Wnk1

Melanie Cobb

Protein kinase, Ser/Thr (non-receptor)

A002372

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser378	Wnk1	A002372			No	No			
Phosphorylation	Ser382	Wnk1	A002372			No	No			

Comments:

Zap70

Cosima T Baldari

Protein kinase, tyrosine (non-receptor)

A002396

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr126	Lck	A001394	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr290	Lck	A001394	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr314	Lck	A001394	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr318	Lck	A001394	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr473	Lck	A001394	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr491	Lck	A001394	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr492	Lck	A001394	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr596	Lck	A001394	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr597	Lck	A001394	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr126	Lck	A001394	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr290	Lck	A001394	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr314	Lck	A001394	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr318	Lck	A001394	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr473	Lck	A001394	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr491	Lck	A001394	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr492	Lck	A001394	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr596	Lck	A001394	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr597	Lck	A001394	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr126	Zap70	A002396	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr290	Zap70	A002396	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr314	Zap70	A002396	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr318	Zap70	A002396	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr473	Zap70	A002396	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr491	Zap70	A002396	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr492	Zap70	A002396	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates

Zap70

Cosima T Baldari

Protein kinase, tyrosine (non-receptor)

A002396

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Tyr596	Zap70	A002396	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr597	Zap70	A002396	Low molecular weight protein tyrosine phosphatase		Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr126	Zap70	A002396	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr290	Zap70	A002396	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr314	Zap70	A002396	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr318	Zap70	A002396	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr473	Zap70	A002396	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr491	Zap70	A002396	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr492	Zap70	A002396	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr596	Zap70	A002396	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates
Phosphorylation	Tyr597	Zap70	A002396	Shp1	A002156	Yes	Yes	T cell receptor/CD3 complex		Stimulates

Comments:

c Fos

Thomas Kerppola

Transcription factor

A000404

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Unknown (a)	(a)				Yes	Yes	Many		Stimulates
Ubiquitination	Unknown					No				

Comments: (a) C-Fos is phosphorylated by p34cdc2, protein kinase A, and protein kinase C at multiple sites.

mTOR

Michael N Hall

Protein kinase, Ser/Thr (non-receptor)

A000094

Modification	Modification Site	Enzyme Catalyzing Modification	AfCS ID, Catalyzing Enzyme	Enzyme Removing Modification	AfCS ID, Enzyme Removing Modification	Demon-strated in Intact Cells	Receptor Regulation Demon-strated	Receptor Regulating Modification	AfCS ID, Receptor	Stimulates or Inhibits
Phosphorylation	Ser2481	mTOR	A000094			Yes	No			
Phosphorylation	Ser2448	Akt				Yes	Yes	Insulin receptor	A001190	Stimulates
Phosphorylation	Thr2446	Akt				Yes	Yes	Insulin receptor	A001190	Stimulates

Comments: