

FGF Family Signaling Pathway

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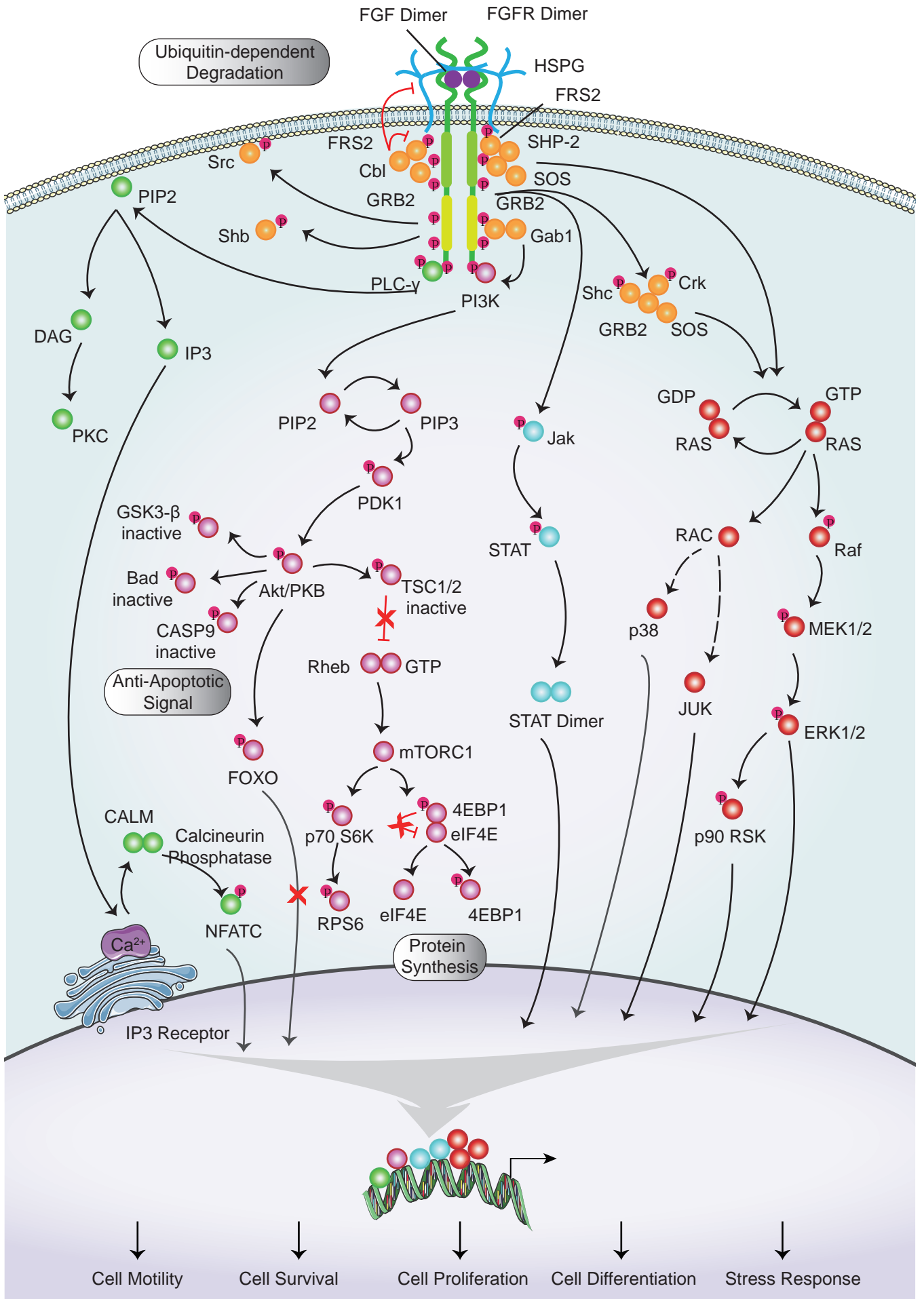
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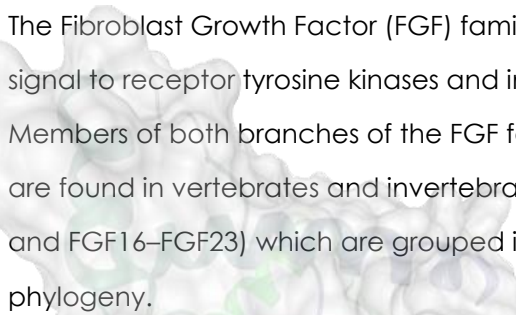
FGF Family Signaling Pathway



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The signaling component of the mammalian Fibroblast Growth Factor (FGF) family is comprised of eighteen secreted proteins that interact with four signaling tyrosine kinase FGF receptors (FGFRs). FGF signaling generally follows one of three transduction pathways: Ras/MAP kinase, PI3/AKT, or PLC γ . Each pathway likely regulates specific cellular behaviors. FGFs bind to their cognate receptors and activate c-Raf-1/ ERK1 (MAPK3)/ ERK2 (MAPK1) and Rac1/ p38 MAPK cascades, both of them are involved in the regulation of cell proliferation and differentiation. Activation of PI3K/AKT(PKB) promotes cell survival and epithelial-to-mesenchymal transition. PLC γ / PKCs cascade takes part in the regulation of development and stress response in different tissues. Inappropriate expression of FGF and improper activation of FGFRs are associated with various pathologic conditions, unregulated cell growth, and tumorigenesis.

FGF and FGFR Family



The Fibroblast Growth Factor (FGF) family is comprised of secreted signaling proteins (secreted FGFs) that signal to receptor tyrosine kinases and intracellular non-signaling proteins (intracellular FGFs (iFGFs)). Members of both branches of the FGF family are related by core sequence conservation and structure and are found in vertebrates and invertebrates. There are 18 mammalian fibroblast growth factors (FGF1–FGF10 and FGF16–FGF23) which are grouped into 6 subfamilies based on differences in sequence homology and phylogeny.

The mammalian fibroblast growth factor receptor family has 4 members, FGFR1, FGFR2, FGFR3, and FGFR4. The FGFRs consist of three extracellular immunoglobulin-type domains (D1–D3), a single-span transmembrane domain and an intracellular split tyrosine kinase domain. A hallmark of FGFRs is the presence of an acidic, serine-rich sequence in the linker between D1 and D2, termed the acid box. The D2–D3 fragment of the FGFR ectodomain is necessary and sufficient for ligand binding and specificity, whereas the D1 domain and the acid box are proposed to have a role in receptor autoinhibition.

The FGF ligands carry out their diverse functions by binding and activating the FGFR family of tyrosine kinase receptors in an HSGAG-dependent manner. FGF–FGFR binding specificity is regulated both by primary sequence differences between the 18 FGFs and the 7 main FGFRs (FGFR1b, FGFR1c, FGFR2b, FGFR2c, FGFR3b, FGFR3c, and FGFR4) and by temporal and spatial expression patterns of FGFs, FGFRs, and HSGAGs. The alternative splice isoforms of FGFRs are generally tissue-specific.

A functional FGF–FGFR unit consists of two 1:1:1 FGF–FGFR–HSGAG complexes juxtaposed in a symmetrical dimer. HSGAG facilitates FGF–FGFR dimerization by simultaneously binding both FGF and FGFR, thereby promoting and stabilizing protein–protein contacts between ligand and receptor both within the 1:1 FGF–FGFR complex and between the two complexes in the 2:2 FGF–FGFR dimer. In addition to facilitating FGF–FGFR binding, HSGAGs stabilize FGFs against degradation, act as a storage reservoir for ligand and

determine the radius of ligand diffusion.

Intracellular Signal Transduction

FGF binding activates the FGFR tyrosine kinase by inducing receptor dimerization and trans-autophosphorylation of the kinase domain. The activated FGFR phosphorylates adaptor proteins for four major intracellular signaling pathways, RAS-MAPK, PI3K-AKT, PLC γ , and signal transducer and activator of transcription (STAT).

Activation of the RAS-MAPK and PI3K-AKT pathway is initiated by phosphorylation of FRS2a. Activated (phosphorylated) FRS2a binds the membrane anchored adaptor protein, growth factor receptor-bound 2 (GRB2) and the tyrosine phosphatase SHP2. GRB2 further activates the RAS-MAPK pathway through recruitment of SOS, and the PI3K-AKT pathway through recruitment of GAB1 to the signaling complex. Phosphorylation of PLC γ by the activated FGFR tyrosine kinase leads to the hydrolysis of phosphatidylinositol 4,5-bisphosphate to produce inositol triphosphate (IP3) and diacylglycerol (DAG). The activated FGFR also phosphorylates and activates STAT1, STAT3, and STAT5, to regulate STAT pathway target gene expression.

FGF Family Signaling Pathway and Disease

The FGF signaling pathway plays many diverse and essential roles in orchestrating human embryonic development. Numerous studies have demonstrated that FGF signaling is a widely utilized regulatory system in early vertebrate development and has been conserved throughout chordate evolution. FGFs control cell migration during gastrulation, epithelio-mesenchymal interactions during limb morphogenesis, and neural induction and patterning in later stages of development. Besides, FGF signaling plays a critical role in the normal development and morphogenesis of the craniofacial skeleton during embryogenesis and postnatal growth.

Deregulated FGF signaling can contribute to pathological conditions either through gain- or loss-of-function mutations in the ligands themselves or through gain- or loss-of-function mutations in FGFRs, which contribute to many skeletal syndromes, Kallmann syndrome, LADD syndrome, and cancer.

Recently, significant research has focused on the therapeutic potential of FGF-FGFR signaling. To date, the therapeutic potential of FGFRs mostly relate to their role in tumorigenesis and cancer development. In particular, direct inhibition of FGFRs may improve outcomes of various cancers. The interference of the interaction of FGFR and its downstream signaling pathways has become a conceivable therapeutic strategy.

Group Name	Cat.No.	Product Name	Species	Source	Tag
FGF1	FGF1-12861H	Recombinant Human FGF1, GST-tagged	Human	E.coli	GST
	FGF1-244H	Recombinant Human FGF1, StrepII-tagged	Human	Human Cell	Strep II
	FGF1-4094H	Recombinant Human FGF1 Protein, GST-tagged	Human	Wheat Germ	GST
	FGF1-619H	Recombinant Human FGF1, Met-tagged	Human	E.coli	Met
	FGF1-8498H	Recombinant Human FGF1, His-tagged	Human	Sf21 Insect Cell	His
FGF2	FGF2-198H	Recombinant Human FGF2 protein, His/S-tagged	Human	E.coli	His S
	FGF2-19H	Recombinant Human FGF2 protein, ERHV-His-tagged	Human	Barley Grain	ERHV His
	FGF2-22H	Recombinant Human FGF2 protein, GST-tagged	Human	Wheat Germ	GST
	FGF2-2784H	Recombinant Human FGF2 protein, His-tagged	Human	E.coli	His
	FGF2-293H	Recombinant Human FGF2, StrepII-tagged	Human	Human Cell	Strep II
	FGF2-41H	Recombinant Human FGF2 protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
FGF3	FGF3-560H	Recombinant Human FGF3	Human	E.coli	Met
	FGF3-8153H	Recombinant Human FGF3 protein, His-tagged	Human	E.coli	His
FGF4	FGF4-023E	Recombinant Human FGF4 (54 - 206aa)	Human	E.coli	N/A
	FGF4-681H	Recombinant Human Fibroblast Growth Factor 4	Human	HEK293	N/A
FGF5	FGF5-4114H	Recombinant Human FGF5 Protein, GST-tagged	Human	Wheat Germ	GST
	FGF5-501H	Recombinant Human FGF5 Protein, His/GST-tagged	Human	E.coli	His GST
FGF6	FGF6-12872H	Recombinant Human FGF6, GST-tagged	Human	E.coli	GST
	FGF6-644H	Recombinant Human FGF6 protein, His & GST-tagged	Human	E.coli	His GST
FGF7	FGF7-189H	Recombinant Human FGF7 protein, His/S-tagged	Human	E.coli	His S
	FGF7-218H	Recombinant Human FGF7, StrepII-tagged	Human	Human Cell	Strep II

Group Name	Cat.No.	Product Name	Species	Source	Tag
	FGF7-282H	Recombinant Human FGF7, His-tagged	Human	E.coli	His
	FGF7-4116H	Recombinant Human FGF7 Protein, GST-tagged	Human	Wheat Germ	GST
	FGF7-594H	Recombinant Human Fibroblast Growth Factor 7, His-tagged	Human	HEK293	His
FGF8	FGF8-374H	Recombinant Human Fibroblast Growth Factor 8 (Androgen-induced)	Human	HEK293	N/A
	FGF8-789H	Recombinant Human FGF8 Protein, His-tagged	Human	E.coli	His
FGF9	FGF9-186H	Recombinant Human FGF9 protein, His/S-tagged	Human	E.coli	His S
	FGF9-202H	Recombinant Human FGF9, Fc tagged	Human	Human Cell	Fc
	FGF9-4117H	Recombinant Human FGF9 Protein, GST-tagged	Human	Wheat Germ	GST
	FGF9-647H	Recombinant Human FGF9 protein, His-tagged	Human	E.coli	His
FGF10	FGF10-195H	Recombinant Human FGF10 protein, His/S-tagged	Human	E.coli	His S
	FGF10-4099H	Recombinant Human FGF10 Protein, GST-tagged	Human	Wheat Germ	GST
	FGF10-452H	Recombinant Human FGF10 protein, His-tagged	Human	HEK293F	His
FGF11	FGF11-4101H	Recombinant Human FGF11 Protein, GST-tagged	Human	Wheat Germ	GST
	FGF11-8154H	Recombinant Human FGF11 protein, His & T7-tagged	Human	E.coli	His T7
FGF12	FGF12-2020H	Recombinant Human FGF12 Protein, His-tagged	Human	E.coli	His
	FGF12-12862H	Recombinant Human FGF12, GST-tagged	Human	E.coli	GST
	FGF12-4102H	Recombinant Human FGF12 Protein, GST-tagged	Human	Wheat Germ	GST
FGF13	FGF13-4103H	Recombinant Human FGF13 Protein, GST-tagged	Human	Wheat Germ	GST
	FGF13-8155H	Recombinant Human FGF13 protein, His-tagged	Human	E.coli	His
FGF14	FGF14-4104H	Recombinant Human FGF14 Protein, GST-tagged	Human	Wheat Germ	GST
	FGF16-4105H	Recombinant Human FGF16 Protein, GST-tagged	Human	Wheat Germ	GST

Group Name	Cat.No.	Product Name	Species	Source	Tag
FGF17	FGF17-4106H	Recombinant Human FGF17 Protein, GST-tagged	Human	Wheat Germ	GST
	FGF17-577H	Recombinant Human fibroblast growth factor 17, His-tagged	Human	E.coli	His
FGF18	FGF18-12867H	Recombinant Human FGF18, GST-tagged	Human	E.coli	GST
	FGF18-183H	Recombinant Human FGF18 protein, His/S-tagged	Human	E.coli	His S
	FGF18-222H	Recombinant Human Fibroblast Growth Factor 18, HlgG1 Fc-tagged, mutant	Human	CHO	Fc
	FGF18-4108H	Recombinant Human FGF18 Protein, GST-tagged	Human	Wheat Germ	GST
	FGF18-504H	Recombinant Human FGF18 Protein, His-tagged	Human	HEK293	His
FGF19	FGF19-48H	Recombinant Human FGF19 Protein, His-tagged	Human	HEK293	His
	FGF19-251H	Recombinant Human FGF19, FLAG-tagged	Human	HEK293	Flag
	FGF19-252H	Recombinant Human FGF19, Fc-tagged	Human	HEK293	Fc
FGF20	FGF20-12869H	Recombinant Human FGF20, GST-tagged	Human	E.coli	GST
	FGF20-15H	Recombinant Human FGF20 protein, His-tagged	Human	E.coli	His
Fgf21	FGF21-192H	Recombinant Human FGF21 protein, His/S-tagged	Human	E.coli	His S
	FGF21-1966H	Recombinant Human FGF21 Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	FGF21-28827TH	Recombinant Human FGF21, His-tagged	Human	HEK293	His
	FGF21-28828TH	Recombinant Human FGF21, FLAG-tagged	Human	HEK293	Flag
	FGF21-28829TH	Recombinant Human FGF21, Fc-tagged	Human	HEK293	Fc
	FGF21-4111H	Recombinant Human FGF21 Protein, GST-tagged	Human	Wheat Germ	GST
Fgf22	FGF22-32H	Recombinant Human FGF22 protein, His-tagged	Human	E.coli	His
FGF23	FGF23-27708TH	Recombinant Human FGF23, Fc-tagged	Human	HEK293	Fc
	FGF23-28141TH	Recombinant Human FGF23, His-tagged	Human	HEK293	His

Group Name	Cat.No.	Product Name	Species	Source	Tag
	FGF23-4112H	Recombinant Human FGF23 Protein, GST-tagged	Human	Wheat Germ	GST
FGFR1	FGFR1-384H	Recombinant Human FGFR1 protein, Strep-tagged	Human	HEK293	Strep
	FGFR1-01H	Recombinant Human Fibroblast Growth Factor Receptor 1, Fc-tagged	Human	Insect Cell	Fc
	FGFR1-111H	Recombinant Human FGFR1 protein, T7/His-tagged	Human	E.coli	T7 His
	FGFR1-1133H	Recombinant Human FGFR1 Protein, His-tagged	Human	HEK293	His
	FGFR1-1405H	Recombinant Human FGFR1 (Active), GST-tagged	Human	Sf9 Insect Cell	GST
	FGFR1-2054H	Recombinant Human FGFR1 Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	FGFR1-208H	Recombinant Human FGFR1 protein, DDK/His-tagged	Human	HEK293	DDK His
	FGFR1-236H	Recombinant Human FGFR1 Protein, His & GST-tagged	Human	Insect Cell	His GST
	FGFR1-45H	Recombinant Human FGFR1 protein, Flag-tagged, Biotinylated	Human	Insect Cell	Flag
	FGFR1-605H	Recombinant Human FGFR1, His-tagged, Biotinylated	Human	Human Cell	His
	FGFR1-606H	Recombinant Human FGFR1, Fc-tagged, Biotinylated	Human	Human Cell	Fc
	FGFR2	FGFR2-02H	Recombinant Human Fibroblast Growth Factor Receptor 2, Fc-tagged	Human	Insect Cell
FGFR2-18H		Recombinant Human FGFR2 protein, GST-tagged	Human	Insect Cell	GST
FGFR2-2055H		Recombinant Human FGFR2 Protein, DDK-tagged	Human	Insect Cell	DDK
FGFR2-777H		Recombinant Human FGFR2 Protein, Fc-tagged	Human	HEK293	Fc
FGFR2-778H		Recombinant Human FGFR2 Protein, His-tagged	Human	HEK293	His
FGFR2-791H		Recombinant Human FGFR2 Protein, DDK/His-tagged	Human	HEK293	DDK His
FGFR2-821H		Recombinant Human FGFR2, GST-tagged	Human	Sf9 Insect Cell	GST
FGFR2-82H		Recombinant Human FGFR2, MYC/DDK-tagged	Human	HEK293	Myc DDK

Group Name	Cat.No.	Product Name	Species	Source	Tag
Fgfr3	FGFR3-119H	Recombinant Human FGFR3 Protein, DDK-tagged	Human	Insect Cell	DDK
	FGFR3-1811H	Recombinant Human FGFR3 protein, His & T7-tagged	Human	E.coli	His T7
	FGFR3-4135H	Recombinant Human FGFR3 Protein, Fc/His-tagged	Human	HEK293E	Fc His
	FGFR3-4136H	Recombinant Human FGFR3 Protein, GST-tagged	Human	Insect Cell	GST
	FGFR3-46H	Recombinant Human FGFR3 protein, Flag-tagged, Biotinylated	Human	Insect Cell	Flag
	FGFR3-751H	Recombinant Human FGFR3 Protein, Fc-tagged	Human	HEK293	Fc
	FGFR3-752H	Recombinant Human FGFR3 Protein, His-tagged	Human	HEK293	His
	FGFR3-78H	Recombinant Human FGFR3, MYC/DDK-tagged	Human	HEK293	Myc DDK
	FGFR3-79H	Recombinant Human FGFR3, DDK/His-tagged	Human	HEK293	DDK His
FGFR4	FGFR4-2062H	Recombinant Human FGFR4 Protein, Fc/His-tagged	Human	HEK293	Fc His
	FGFR4-04H	Recombinant Human Fibroblast Growth Factor Receptor 4, Fc-tagged	Human	Insect Cell	Fc
	FGFR4-12882H	Recombinant Human FGFR4, His-tagged	Human	E.coli	His
	FGFR4-32H	Recombinant Human FGFR4, MYC/DDK-tagged	Human	HEK293	Myc DDK
	FGFR4-47H	Recombinant Human FGFR4 protein, Flag-tagged, Biotinylated	Human	Insect Cell	Flag
	FGFR4-792H	Recombinant Human FGFR4 Protein, DDK/His-tagged	Human	HEK293	DDK His
	FGFR4-90H	Recombinant Human FGFR4, GST-tagged	Human	Sf9 Insect Cell	GST
HSPG2	HSPG2-5262H	Recombinant Human HSPG2 Protein, GST-tagged	Human	Wheat Germ	GST
	HSPG2-8046H	Recombinant Human HSPG2 protein, His-tagged	Human	E.coli	His
FRS2	FRS2-22H	Recombinant Human FRS2 protein, His-tagged	Human	E.coli	His
	FRS2-23H	Recombinant Human FRS2 protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	FRS2-4506H	Recombinant Human FRS2 Protein, GST-tagged	Human	Wheat Germ	GST

Group Name	Cat.No.	Product Name	Species	Source	Tag
CBL	CBL-0457H	Recombinant Human CBL Protein, GST-Tagged	Human	Wheat Germ	GST
	CBL-1390H	Recombinant Human CBL protein, His & GST-tagged	Human	E.coli	His GST
	CBL-2727H	Recombinant Human CBL Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
PTPN11	PTPN11-1518H	Recombinant Human PTPN11 (Active), GST-tagged	Human	Sf9 Insect Cell	GST
	PTPN11-31402TH	Recombinant Human PTPN11 protein, GST-tagged	Human	E.coli	GST
	PTPN11-519H	Recombinant Human PTPN11 Protein, His-tagged	Human	E.coli	His
GRB2	GRB2-127H	Recombinant Human GRB2 protein, T7/His-tagged	Human	E.coli	T7 His
	GRB2-435H	Recombinant Human GRB2 protein, His-tagged	Human	HEK293F	His
	GRB2-5038H	Recombinant Human GRB2 Protein, GST-tagged	Human	Wheat Germ	GST
	GRB2-5248H	Recombinant Human GRB2 Protein, GST/His-tagged	Human	E.coli	GST His
SRC	SRC-1100H	Recombinant Human SRC protein, GST-tagged	Human	E.coli	GST
	SRC-1358H	Recombinant Human SRC protein, His/GST-tagged	Human	Insect Cell	His GST
	SRC-192H	Recombinant Human SRC, SH3 Domain, GST-tagged	Human	E.coli	GST
	SRC-2747H	Recombinant Human SRC Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	SRC-381H	Recombinant Human SRC	Human	Mammalian Cell	His
	SRC-79H	Recombinant Human SRC protein, Flag-tagged, Biotinylated	Human	Insect Cell	Flag
SHB	SHB-1948H	Recombinant Human SHB protein, His & T7-tagged	Human	E.coli	His T7
	SHB-290H	Recombinant Human SHB Protein, His-tagged	Human	E.coli	His
GAB1	GAB1-22H	Recombinant Human GAB1 Protein, T7/His-tagged	Human	E. coli	T7 His
	GAB1-1450H	Recombinant Human GRB2-associated Binding Protein 1, His-tagged	Human	Sf9 Insect Cell	His
	GAB1-4618H	Recombinant Human GAB1 Protein, GST-tagged	Human	Wheat Germ	GST

Group Name	Cat.No.	Product Name	Species	Source	Tag
PLCG1	PLCG1-17H	Recombinant Human PLCG1, MYC/DDK-tagged	Human	HEK293	Myc DDK
	PLCG1-334H	Recombinant Human PLCG1 Protein, His-tagged	Human	E.coli	His
PLCG2	PLCG2-1018H	Recombinant Human PLCG2 protein, His & T7-tagged	Human	E.coli	His T7
DAG1	DAG1-2327H	Recombinant Human DAG1 Protein, GST-tagged	Human	Wheat Germ	GST
	DAG1-620H	Recombinant Human DAG1 Protein, His-tagged	Human	HEK293	His
PRRT2	PRRT2-5035H	Recombinant Human PRRT2, His-tagged	Human	E.coli	His
CALM1	CALM1-10668H	Recombinant Human CALM1, GST-tagged	Human	E.coli	GST
	CALM1-650H	Recombinant Human CALM1 protein, His-tagged	Human	E.coli	His
	CALM1-7969H	Recombinant Human CALM1 protein, His & GST-tagged	Human	E.coli	His GST
	CALM1-7970H	Recombinant Human CALM1 protein, His & MBP-tagged	Human	E.coli	His MBP
CALM2	CALM2-0304H	Recombinant Human CALM2 Protein, GST-Tagged	Human	Wheat Germ	GST
	CALM2-571H	Recombinant Human CALM2, His tagged	Human	E.coli	His
CALM3	CALM3-2291H	Recombinant Human CALM3 Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	CALM3-30H	Recombinant Human CALM3 protein, His-tagged	Human	E.coli	His
	CALM3-92H	Recombinant Human CALM3, GST-tagged	Human	Wheat Germ	GST
NFATC1	NFATC1-1273H	Recombinant Human NFATC1, His-tagged	Human	E.coli	His
	NFATC1-7051H	Recombinant Human NFATC1, GST-tagged	Human	Sf9 Insect Cell	GST
NFATC2	NFATC2-181H	Recombinant Human NFATC2 protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	NFATC2-29251TH	Recombinant Human NFATC2, His-tagged	Human	E.coli	His
NFATC3	NFATC3-236H	Recombinant Human NFATC3 Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	NFATC3-27538TH	Recombinant Human NFATC3	Human	Wheat Germ	N/A

Group Name	Cat.No.	Product Name	Species	Source	Tag
NFATC4	NFATC4-1275H	Recombinant Human NFATC4, GST-tagged	Human	E.coli	GST
	NFATC4-750H	Recombinant Human NFATC4 Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
PDK1	PDK1-124H	Recombinant Human PDK1 Protein, GST-tagged	Human	Insect cells	GST
	PDK1-824H	Recombinant Human PDK1 Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	PDK1-904H	Recombinant Human PDK1, His tagged	Human	Insect Cell	His
GSK3B	GSK3B-120H	Recombinant Human GSK3B Protein, DDK-tagged	Human	Insect Cell	DDK
	GSK3B-2350H	Recombinant Human GSK3B Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	GSK3B-2857H	Recombinant Human GSK3B (C-79aa), His-tagged	Human	E.coli	His
	GSK3B-2858H	Recombinant Human GSK3B (1-351 aa), His-tagged	Human	E.coli	His
	GSK3B-326H	Recombinant Human GSK3B protein, GST-tagged	Human	Insect Cell	GST
	GSK3B-376H	Recombinant Human GSK3B Protein, His-tagged	Human	Insect Cell	His
BAD	BAD-048H	Recombinant Human BAD protein, GST-tagged	Human	Wheat Germ	GST
	BAD-564H	Recombinant Human BAD Protein, His-tagged	Human	E.coli	His
CASP9	CASP9-0433H	Recombinant Human CASP9 Protein, GST-Tagged	Human	Wheat Germ	GST
	CASP9-148H	Recombinant Human CASP9 Protein, His-tagged	Human	E.coli	His
	CASP9-48H	Recombinant Human CASP9 protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
AKT1	AKT1-14H	Recombinant Human AKT1 Protein, His-tagged	Human	Insect Cell	His
	AKT1-336H	Recombinant Human AKT1 protein, His/Strep-tagged	Human	HEK293	His Strep
	AKT1-101H	Recombinant Human AKT1, GST-tagged	Human	Sf9 Insect Cell	GST
	AKT1-155H	Recombinant Human AKT1 protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	AKT1-30H	Recombinant Human AKT1 protein, Flag-tagged, Biotinylated	Human	Insect Cell	Flag

Group Name	Cat.No.	Product Name	Species	Source	Tag
AKT2	AKT2-166H	Recombinant Human AKT2, His-tagged	Human	Sf9 Insect Cell	His
	AKT2-1841H	Recombinant Human AKT2 protein, His & T7-tagged	Human	E.coli	His T7
	AKT2-31H	Recombinant Human AKT2 protein, Flag-tagged, Biotinylated	Human	Insect Cell	Flag
	AKT2-424H	Recombinant Human AKT2 Protein, GST-His tagged	Human	Insect Cell	GST His
	AKT2-802H	Recombinant Human AKT2, GST-tagged	Human	Sf9 Insect Cell	GST
AKT3	AKT3-104H	Recombinant Human AKT3, GST-tagged, Active	Human	Sf9 Insect Cell	GST
	AKT3-308H	Recombinant Human AKT3 protein, His/MBP-tagged	Human	E.coli	His MBP
	AKT3-550H	Recombinant Human AKT3 Protein, His-tagged	Human	E.coli	His
	AKT3-804H	Recombinant Human AKT3 protein, GST-His-tagged	Human	Insect Cell	GST His
FOXO1	FOXO1-146H	Recombinant Human FOXO1 protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	FOXO1-147H	Recombinant Human FOXO1 protein, His-tagged	Human	E.coli	His
	FOXO1-4469H	Recombinant Human FOXO1 Protein, GST-tagged	Human	Wheat Germ	GST
FOXO3	FOXO3-2811H	Recombinant Human FOXO3, MYC/DDK-tagged	Human	HEK293	Myc DDK
	FOXO3-4471H	Recombinant Human FOXO3 Protein, GST-tagged	Human	Wheat Germ	GST
	FOXO3-7633H	Recombinant Human FOXO3 protein, His & T7-tagged	Human	E.coli	His T7
FOXO4	FOXO4-099H	Recombinant Human FOXO4 Protein, HIS-tagged	Human	E.coli	HIS
TSC2	TSC2-31631TH	Recombinant Human TSC2, His-tagged	Human	E.coli	His
RHEB	RHEB-1144H	Recombinant Human Ras Homolog Enriched In Brain, GST-tagged	Human	E.coli	GST
	RHEB-1181H	Recombinant Human RHEB Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	RHEB-2289H	Recombinant Human RHEB, His-tagged	Human	E.coli	His
RPS6KB1	RPS6KB1-13H	Recombinant Human RPS6KB1 Protein, His-tagged	Human	E.coli	His

Group Name	Cat.No.	Product Name	Species	Source	Tag
	RPS6KB1-195H	Recombinant Human RPS6KB1, GST-tagged	Human	Sf9 Insect Cell	GST
RPS6KB2	RPS6KB2-1935H	Recombinant Human RPS6KB2 protein, His & GST-tagged	Human	E.coli	His GST
	RPS6KB2-2437H	Recombinant Human RPS6KB2, His-tagged	Human	E.coli	His
	RPS6KB2-360H	Recombinant Human RPS6KB2 protein, His/MBP-tagged	Human	E.coli	His MBP
	RPS6KB2-377H	Recombinant Human RPS6KB2, GST-tagged, Active	Human	Sf9 Insect Cell	GST
RPS6	RPS6-307H	Recombinant Human RPS6, GST-tagged	Human	Wheat Germ	GST
EIF4EBP1	EIF4EBP1-154H	Recombinant Human EIF4EBP1 protein, His-tagged	Human	E.coli	His
	EIF4EBP1-3203H	Recombinant Human EIF4EBP1 Protein, GST-tagged	Human	Wheat Germ	GST
EIF4E	EIF4E-26389TH	Recombinant Human EIF4E protein, His-tagged	Human	E.coli	His
	EIF4E-3198H	Recombinant Human EIF4E Protein, GST-tagged	Human	Wheat Germ	GST
JAK1	JAK1-1941H	Recombinant Human JAK1 Protein (850-1154 aa), His-tagged	Human	Yeast	His
	JAK1-159H	Recombinant Human JAK1 protein, His/MBP-tagged	Human	E.coli	His MBP
	JAK1-18H	Recombinant Human JAK1 protein, GST-tagged	Human	Insect Cell	GST
	JAK1-28H	Recombinant Human JAK1 protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	JAK1-56H	Recombinant Human JAK1 protein, Flag-tagged, Biotinylated	Human	Insect Cell	Flag
JAK2	JAK2-157H	Recombinant Human JAK2 protein, His/MBP-tagged	Human	E.coli	His MBP
	JAK2-254H	Recombinant Human JAK2 Protein, His-tagged	Human	E.coli	His
	JAK2-26H	Recombinant Human JAK2 protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	JAK2-336H	Recombinant Human JAK2 protein, GST-tagged	Human	Insect Cell	GST
	JAK2-532H	Recombinant Human Janus Kinase 2, His-tagged	Human	Sf9 Insect Cell	His
	JAK2-5441H	Recombinant Human Janus Kinase 2, GST-His-tagged	Human	Sf9 Insect Cell	GST His

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	JAK2-57H	Recombinant Human JAK2 protein, Flag-tagged, Biotinylated	Human	Insect Cell	Flag
JAK3	JAK3-467H	Recombinant Human JAK3 Protein, His-tagged	Human	Insect cells	His
	JAK3-1887H	Recombinant Human Janus Kinase 3, GST-tagged	Human	Insect Cell	GST
	JAK3-32H	Recombinant Human JAK3 protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
STAT1	STAT1-2783H	Recombinant Human STAT1, His-tagged	Human	E.coli	His
	STAT1-2901H	Recombinant Human STAT1 Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	STAT1-2996H	Recombinant Human STAT1, GST-tagged	Human	E.coli	GST
	STAT1-331H	Recombinant Human STAT1 protein, His/MBP-tagged	Human	E.coli	His MBP
	STAT1-7037H	Recombinant Human STAT1, His & GST tagged	Human	Insect Cell	His GST
STAT2	STAT2-334H	Recombinant Human STAT2 protein, His/MBP-tagged	Human	E.coli	His MBP
	STAT2-7056H	Recombinant Human STAT2, GST-tagged	Human	Sf9 Insect Cell	GST
	STAT2-8474H	Recombinant Human STAT2, His-tagged	Human	Sf21 Insect Cell	His
STAT3	STAT3-138H	Recombinant Human STAT3 Protein, His-tagged	Human	Insect Cell	His
	STAT3-1496H	Recombinant Human STAT3, GST-tagged	Human	Sf9 Insect Cell	GST
	STAT3-2175H	Recombinant Human STAT3, MYC/DDK-tagged	Human	HEK293	Myc DDK
	STAT3-316H	Recombinant Human STAT3 protein, His-tagged	Human	Yeast	His
	STAT3-335H	Recombinant Human STAT3 protein, His/MBP-tagged	Human	E.coli	His MBP
STAT4	STAT4-2898H	Recombinant Human STAT4 Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	STAT4-339H	Recombinant Human STAT4 protein, His/MBP-tagged	Human	E.coli	His MBP
	STAT4-8475H	Recombinant Human STAT4, His-tagged	Human	Sf21 Insect Cell	His
STAT5A	STAT5A-01H	Recombinant Human STAT5a, His-tagged	Human	E.coli	His

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	STAT5A-342H	Recombinant Human STAT5A protein, His/MBP-tagged	Human	E.coli	His MBP
STAT5B	STAT5B-1851H	Recombinant Human STAT5B protein, His & T7-tagged	Human	E.coli	His T7
	STAT5B-197H	Recombinant Human STAT5B, His-tagged	Human	E.coli	His
	STAT5B-2902H	Recombinant Human STAT5B Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	STAT5B-343H	Recombinant Human STAT5B protein, His/MBP-tagged	Human	E.coli	His MBP
	STAT5B-74H	Recombinant Human STAT5B, GST-tagged	Human	Sf9 Insect Cell	GST
	STAT6	STAT6-2897H	Recombinant Human STAT6 Protein, MYC/DDK-tagged	Human	HEK293
STAT6-30854TH		Recombinant Human STAT6, His-tagged	Human	E.coli	His
STAT6-344H		Recombinant Human STAT6 protein, His/MBP-tagged	Human	E.coli	His MBP
STAT6-4889H		Recombinant Human Signal Transducer And Activator Of Transcription 6, GST-tagged	Human	Sf9 Insect Cell	GST
SHC1	SHC1-2654H	Recombinant Human SHC1, GST-tagged	Human	E.coli	GST
	SHC1-30065TH	Recombinant Human SHC1, His-tagged	Human	E.coli	His
SHC3	SHC3-1277H	Recombinant Human SHC3 protein, His & GST-tagged	Human	E.coli	His GST
	SHC3-2655H	Recombinant Human SHC3, GST-tagged	Human	E.coli	GST
SHC4	SHC4-2656H	Recombinant Human SHC4, GST-tagged	Human	E.coli	GST
CRK	CRK-1886H	Recombinant Human CRK Protein, GST-tagged	Human	Wheat Germ	GST
	CRK-2854H	Recombinant Human CRK, His-tagged	Human	E.coli	His
KRAS	KRAS-358H	Recombinant Human KRAS Protein, His-tagged	Human	E. coli	His
	KRAS-163H	Recombinant Human KRAS protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	KRAS-4888H	Recombinant Human KRAS Protein, GST-tagged	Human	Wheat Germ	GST
ERAS	ERAS-1261H	Recombinant Human ERAS Protein (3-230 aa), His-tagged	Human	E.coli	His

Group Name	Cat.No.	Product Name	Species	Source	Tag
	ERAS-3440H	Recombinant Human ERAS Protein, GST-tagged	Human	Wheat Germ	GST
MRAS	MRAS-5533H	Recombinant Human MRAS Protein, GST-tagged	Human	Wheat Germ	GST
	MRAS-703H	Recombinant Human MRAS (Q71L) Protein, His-tagged	Human	E.coli	His
NRAS	NRAS-165H	Recombinant Human NRAS protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	NRAS-447H	Recombinant Human NRAS Protein, His-tagged	Human	E.coli	His
	NRAS-6106H	Recombinant Human NRAS Protein, GST-tagged	Human	Wheat Germ	GST
RAF1	RAF1-1123H	Recombinant Human RAF1 Protein, GST-tagged	Human	E.coli	GST
	RAF1-413H	Recombinant Human RAF1 Protein (Ser306-Phe648), His-GST-tagged	Human	Insect Cell	His GST
	RAF1-169H	Recombinant Human RAF1 protein, His-tagged	Human	Insect Cell	His
	RAF1-352H	Recombinant Human RAF1 protein, His/MBP-tagged	Human	E.coli	His MBP
	RAF1-552H	Recombinant Human RAF1, MYC/DDK-tagged	Human	HEK293	Myc DDK
RAC1	RAC1-190H	Recombinant Human RAC1, His-tagged	Human	E.coli	His
	RAC1-191H	Recombinant Human RAC1(Q61L), His-tagged	Human	E.coli	His
	RAC1-192H	Recombinant Human RAC1, GST-tagged	Human	E.coli	GST
	RAC1-445H	Recombinant Human RAC1 Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
RAC2	RAC2-2148H	Recombinant Human RAC2, GST-tagged	Human	E.coli	GST
	RAC2-2549H	Recombinant Human RAC2, His tagged	Human	E.coli	His
RAC3	RAC3-31284TH	Recombinant Human RAC3	Human	E.coli	N/A
MAPK1	MAPK1-2008H	Recombinant Human MAPK1 Protein, GST-tagged	Human	E.coli	GST
	MAPK1-28700TH	Recombinant Human MAPK1, His-tagged	Human	E.coli	His
	MAPK1-385H	Recombinant Human MAPK1 Protein, MYC/DDK-tagged	Human	HEK293	Myc DDK

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Map2k1	MAP2K1-1033H	Recombinant Human Mitogen-Activated Protein Kinase Kinase 1, GST-tagged	Human	Sf9 Insect Cell	GST
	MAP2K1-167H	Recombinant Human v protein, MYC/DDK-tagged	Human	HEK293	Myc DDK
	MAP2K1-299H	Recombinant Human MAP2K1 protein, His/MBP-tagged	Human	E.coli	His MBP
	MAP2K1-62H	Recombinant Human MAP2K1 protein, Flag-tagged, Biotinylated	Human	Insect Cell	Flag
	MAP2K1-639H	Recombinant Human MAP2K1 protein, His-tagged	Human	E.coli	His
ERK1	ERK1-12538H	Recombinant Human ERK1, His-tagged	Human	E.coli	His
RPS6KA1	RPS6KA1-1934H	Recombinant Human RPS6KA1 protein, His & T7-tagged	Human	E.coli	His T7
	RPS6KA1-555H	Recombinant Human RPS6KA1, GST-tagged	Human	Sf9 Insect Cell	GST

