

AC MO000000001

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DT 1999-06-18 18:04:57(created); frs

DT 2011-06-30 08:43:14(updated); shs

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NA PKAc

SY protein kinase A; cAMP-dependent protein kinase; PKA catalytic subunit; cAPK; protein kinase A catalytic subunit.

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CL enzymes; transferases EC 2; transferases EC 2.7; phosphotransferases EC 2.7.1; protein kinases; protein serine/threonine kinases; AGC kinases.

TY orthofamily.

HP <MO000019596>; AGC kinases.

HC <MO000020657>; PKAc(h).

HC <MO000021790>; PKAc(m).

HC <MO000021807>; PKAc(rb).

HC <MO000033328>; PKAc(b).

HC <MO000033604>; PKAc(v.s.).

HC <MO000034581>; PKAc(r).

HC <MO000035255>; PKAc-beta.

HC <MO000035257>; PKACA.

HC <MO000056798>; PKAc(m.s.).

HC <MO000186276>; PKAc(pg).

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CC experimental activator: 8-Bromo-cAMP; [7].

CC experimental inhibitor: H89; [59].

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CX <MO000016815>; R2C2.

CX <MO000016822>; PKAc:PKI.

CX <MO000108408>; R2C.

CX <MO000121716>; PKAc:(NR1)2:NR2B:NR2C.

CX <MO000121725>; PKAc:(NR1)2:NR2B:NR2C{pS}.

CX <MO000129345>; (Glu)2:(glycine)2:(NR1)2:NR2B:NR2C:PKAc.

CX <MO000131498>; (Glu)2:(glycine)2:(NR1)2:NR2A:NR2B:PKAc.

MF <MO000117327>; PKAc{pT}.

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XA <XN000000509>; PKAc + PKI <==> PKAc:PKI (binding) [42].

XA <XN000000728>; PKAc --> Rap1 (activation; phosphorylation) [43].

XA <XN000000968>; PKAc --/ GPCR (inhibition; phosphorylation) [44] [45].

XA <XN000001405>; PKAc --> Rad (unknown; phosphorylation) [46].

XA <XN000001552>; PKAc --> bad (phosphorylation) [60] [47] [15] [18] [20] [21].

XA <XN000001715>; PKAc --/ Ci (inhibition; phosphorylation) [48] [49].

XA <XN000003642>; PKAc --/ Raf-1 (inhibition; phosphorylation) [61] [62] [43].

XA <XN000004354>; PKAc --> CREB1 (activation; phosphorylation) [50] [18] [26] [38].

XA <XN000005173>; PKAc --/ AC5 (inhibition; phosphorylation) [52] [55].

XA <XN000005174>; 2 PKAc + 2 PKAr <==> R2C2 (binding) [53].

XA <XN000005176>; PKAc --/ AC6 (inhibition; phosphorylation) [52] [55] [56].

XA <XN000005182>; PKAc --> RelA-p65 (activation; binding; phosphorylation) [25] [51] [27] [34] [25].

XA <XN000005616>; PKAc --/ resistin (inhibition; expression) [57].

XA <XN000006622>; PKAc --/ PLCbeta3 (inhibition; phosphorylation) [58].

XA <XN000015246>; PKAc --> HNF-6 (activation; phosphorylation) [63].

XA <XN000015281>; PKAc --/ HNF-4 (inhibition; phosphorylation) [1] [64].

XA <XN000015486>; fatty acids & PKAc --> PPARalpha (NR1C1) (activation; phosphorylation) [2].

XA <XN000015628>; PKAc --/ stathmin (inhibition; phosphorylation) [3].

XA <XN000016709>; PKAc --> PFK2 (activation; phosphorylation) [4].

XA <XN000016728>; PKAc --/ GSK3 (inhibition; binding; phosphorylation) [5].

XA <XN000017434>; PKAc --/ PP1 (inhibition; phosphorylation; dissociation) [6].

XA <XN000017692>; PKAc --> SRY{p} (activation; phosphorylation) [10].

XA <XN000017695>; PKAc --> deltaCREB (activation; phosphorylation) [11].

XA <XN000017964>; PKAc --/ IP3R1 (inhibition; phosphorylation) [13] [14].

XA <XN000021885>; PKAc --/ PTP-PEST (inhibition; phosphorylation) [16].

XA <XN000022739>; PKAc --> vasp (unknown; phosphorylation) [17].

XA <XN000026992>; PKAc --/ GEF (inhibition; phosphorylation) [42].

XA <XN000026996>; PKAc --/ PDE (inhibition; phosphorylation) [42].

XA <XN000026999>; PKAc --> I1 (activation; phosphorylation) [42].

XA <XN000027342>; PKAc --/ cyclosome (inhibition; phosphorylation) [19].

XA <XN000033827>; PKAc --> plk1 (activation; phosphorylation) [22].

XA <XN000143311>; PKAc + ATP --PDK1{pS241}--> PKAc{pT} + ADP (phosphorylation) [54].  
XA <XN000144094>; PKAc --> LKB1 (phosphorylation) [18] [32].  
XA <XN000148374>; PKAc + (NR1)2:NR2B:NR2C <==> PKAc:(NR1)2:NR2B:NR2C (binding) [29] [35].  
XA <XN000150425>; PKAc --> NR2B (binding) [35].  
XA <XN000150450>; PKAc --> NR2C (phosphorylation) [30].  
XA <XN000151597>; PKAc --> T3R-alpha (NR1A1) (phosphorylation) [8] [26].  
XA <XN000151598>; PKAc --> Pit-1 (phosphorylation) [9] [12] [28].  
XA <XN000151658>; PKAc --> RasGRF1 (phosphorylation) [23].  
XA <XN000151945>; PKAc --> tyrosine 3-monooxygenase (phosphorylation) [24] [33].  
XA <XN000152012>; PKAc --> ACC (phosphorylation) [31].  
XA <XN000160787>; (Glu)2:(glycine)2:(NR1)2:NR2B:NR2C + PKAc <==> (Glu)2:(glycine)2:(NR1)2:NR2B:NR2C:PKAc (binding) [29] [35].  
XA <XN000164559>; (Glu)2:(glycine)2:(NR1)2:NR2A:NR2B + PKAc <==> (Glu)2:(glycine)2:(NR1)2:NR2A:NR2B:PKAc (binding) [29] [35].  
XA <XN000166231>; PKAc --> NR1 (phosphorylation) [36].  
XA <XN000236512>; PKAc --> IL-5Rbeta-isoform1 (phosphorylation) [40].  
XB <XN000000516>; R2C:(cAMP)4 <==> PKAc + R2:(cAMP)4 (dissociation) [42].  
XB <XN000000539>; R2C2:(cAMP)4 <==> PKAc + R2C:(cAMP)4 (dissociation) [42].  
XB <XN000001626>; PDK1 --> PKAc (activation; phosphorylation) [47].  
XB <XN000015487>; cAMP --> PKAc (activation; binding) [2].  
XB <XN000164761>; NR1 --> PKAc (binding) [35].  
XC <XN000000309>; GEF + NTP --PKAc--> inactiveGEF{p} + NDP (phosphorylation) [42].  
XC <XN000000386>; PDE + NTP --PKAc--> PDE{p} + NDP (phosphorylation) [42].  
XC <XN000000390>; I1 + NTP --PKAc--> I1{p} + NDP (phosphorylation) [42].  
XC <XN000023917>; vasp:SLAP-130{p}:SLP-76{p} + 3 ATP --PKAc--> vasp{pS156}{pS238}{pT277}:SLAP-130{p}:SLP-76{p} + 3 ADP (phosphorylation) [17].  
XC <XN000024089>; PPARalpha (NR1C1) + ATP --PKAc--> PPARalpha (NR1C1){pS} + ADP (phosphorylation) [2].  
XC <XN000027341>; cyclosome + ATP --PKAc--> cyclosome{p} + ADP (phosphorylation) [19].  
XC <XN000033826>; plk1 + ATP --PKAc--> plk1{p} + ADP (phosphorylation) [22].  
XC <XN000148397>; NR2C + ATP --PKAc--> NR2C{pS} + ADP (phosphorylation) [30].  
XC <XN000150679>; T3R-alpha (NR1A1) + ATP --PKAc--> T3R-alpha (NR1A1){p} + ADP (phosphorylation) [8] [26].  
XC <XN000150680>; Pit-1 + ATP --PKAc--> Pit-1{pT} + ADP (phosphorylation) [9] [12] [28].  
XC <XN000150700>; bad + ATP --PKAc--> bad{pS} + ADP (phosphorylation) [60] [15] [18] [20] [21].  
XC <XN000150703>; CREB1 + ATP --PKAc--> CREB1{pS} + ADP (phosphorylation) [18] [26] [38].  
XC <XN000150780>; RasGRF1 + ATP --PKAc--> RasGRF1{pS} + ADP (phosphorylation) [23].  
XC <XN000151055>; RelA-p65 + ATP --PKAc--> RelA-p65{pS} + ADP (phosphorylation) [51] [27] [34].

XC <XN000151234>; tyrosine 3-monooxygenase + ATP --PKAc--> tyrosine 3-monooxygenase{pS} + ADP (phosphorylation) [24] [33].  
XC <XN000151488>; ACC + ATP --PKAc--> ACC{pS} + ADP (phosphorylation) [31].  
XC <XN000164580>; NR1 + ATP --PKAc--> NR1{pS} + ADP (phosphorylation) [36].  
XC <XN000231944>; p50:RelA-p65{pS536} + ATP --PKAc--> p50:RelA-p65{pS276}{pS536} + ADP (phosphorylation) [27] [37] [39].  
XC <XN000241515>; bad{pS75}{pS99}:Bcl-xL:(14-3-3tau)2 + ATP --PKAc--> bad{pS75}{pS99}{pS118}:Bcl-xL:(14-3-3tau)2 + ADP (phosphorylation) [60] [20] [41].  
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PW <CH000000013>; cAMP ---> PPAR-alpha (chain).  
PW <CH000000666>; alpha IIb beta3 ---> Rac1 (chain).  
PW <CH000000678>; AC ---> PPAR-alpha (chain).  
PW <CH000000714>; PRIC complex ---> PPAR-alpha (chain).  
PW <CH000001001>; Plk1 activation and substrates (chain).  
PW <CH000004164>; EGF ---> HMGCR (chain).  
PW <CH000004180>; PKAc ---> NR2C (chain).  
PW <CH000004196>; NR2B:NR2C ---CaMKII---> c-Fos (chain).  
PW <CH000004255>; NR2A:NR2B ---PKAc---> Ca (chain).  
PW <CH000004467>; p50:RelA-p65 ---> IL8 (chain).  
PW <CH000004482>; Bad ---> 14-3-3 (chain).  
PW <CH000000748>; alpha IIb beta3 pathway (pathway).  
PW <CH000000712>; PPAR pathway (pathway).  
PW <CH000001002>; Plk1 cell cycle regulation (pathway).  
PW <CH000004254>; HMGCR regulation (pathway).  
PW <CH000003940>; NMDA receptor signaling (pathway).  
PW <CH000000772>; TNF-alpha pathway (pathway).  
PW <CH000004191>; ErbB3 ---> survival (pathway).  
PW <CH000004475>; IL-3 signaling (pathway).  
XX  
RN [1].  
RX <pubmed:18178962>.  
RA Gao, N., Asamitsu, K., Hibi, Y., Ueno, T., Okamoto, T.  
RT AKIP1 augments NF-kappa B-dependent gene expression by promoting the nuclear retention and phosphorylation of p65.  
RL J. Biol. Chem. 283:7834-7843 (2008).  
XX  
RN [2].

RX <pubmed:18362169>.

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AC MO000000009

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DT 1999-06-20 11:58:47(created); frs

DT 2008-08-11 12:08:33(updated); mkl

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NA Raf

XX

CL enzymes; transferases EC 2; transferases EC 2.7; phosphotransferases EC 2.7.1; protein kinases; protein serine/threonine kinases; MAPKKs.

TY orthofamily.

HP <MO000000075>; MAPKKs.

HP <MO000044005>; TKL family.

HC <MO000000015>; Raf-1.

HC <MO000000016>; A-Raf.

HC <MO000000017>; B-Raf.

HC <MO000008245>; v-Raf.

HC <MO000032057>; Raf(h).

HC <MO000088907>; Raf(m.s.).

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CC function: Raf integrates upstream signals from Ras and PKC; [4].

CC mechanism: Raf needs 3 steps to be activated: membrane recruitment by Ras, phosphorylation in part by PAK3 and oligomerization; [20].

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CX <MO000000073>; Ras:GTP:Raf.

CX <MO000016807>; Ras:GTP:Raf{p}.

MF <MO000016805>; Raf{p}.

MF <MO000016806>; Raf{p}2.

XX

XA <XN000000005>; Raf + Ras:GTP <=> Ras:GTP:Raf (binding) [5] [6].

XA <XN000000006>; Raf --> MEK (activation; phosphorylation; binding) [4] [18] [12] [14] [8] [9] [10].

XA <XN000000487>; Raf + NTP --PKC--> Raf{p} + NDP (phosphorylation) [7].  
XA <XN000000705>; Raf --> MEK1 (activation; phosphorylation) [20] [17] [11].  
XA <XN000000706>; Raf --> MEK2 (activation; phosphorylation) [20] [11].  
XA <XN000001123>; Raf --> p70S6K (activation; phosphorylation) [13].  
XB <XN000000004>; Ras --> Raf (activation; binding) [4] [18] [12] [14] [15] [17] [8] [9] [11].  
XB <XN000000058>; PKCalpha --> Raf (activation; phosphorylation) [4].  
XB <XN000000490>; Raf{p} --PP2A--> Raf + p (dephosphorylation) [7].  
XB <XN000001120>; IFNgamma --> Raf (activation) [13].  
XB <XN000001615>; AKT --/ Raf (inhibition; phosphorylation; binding) [22] [16].  
XB <XN000002747>; PKC --> Raf (activation; phosphorylation) [23] [19].  
XB <XN000004341>; PAK3 --> Raf (activation; phosphorylation) [20] [21].  
XB <XN000004376>; Src --> Raf (unknown; phosphorylation) [20].  
XB <XN000027003>; MAPK --> Raf (unknown; phosphorylation) [7].

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PW <CH000000038>; insulin ---> ERK (chain).  
PW <CH000000798>; PKC ---> ERK1, ERK2 (chain).  
PW <CH000000932>; PRL ---> Raf-1 (chain).  
PW <CH000000926>; PRL pathway (pathway).

XX

RN [1].

RX <pubmed:16904320>.

RA Singh, P. K., Hollingsworth, M. A.

RT Cell surface-associated mucins in signal transduction.

RL Trends Cell Biol. 16:467-476 (2006).

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RN [2].

RX <pubmed:11274345>.

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AC MO000000018

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DT 1999-06-22 15:23:27(created); frs

DT 2011-09-08 12:21:33(updated); shs

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NA MEK

SY mitogen-activated protein kinase/extracellular signal-regulated kinase family; MAP kinase kinase; ERK-kinase.

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CL enzymes; transferases EC 2; transferases EC 2.7; phosphotransferases EC 2.7.1; protein kinases; protein tyrosine kinases; MAPKs.

TY orthofamily.

HP <MO000000076>; MAPKs.

HC <MO000000078>; MEK1.

HC <MO000009393>; MEK2.

HC <MO000009411>; MKK5.

HC <MO000057373>; MEK(m).

HC <MO000058166>; MEK(h).

HC <MO000060282>; MEK(m.s.).

HC <MO000092286>; MEK(r).

HC <MO000100675>; MEK(pg).

HC <MO000134751>; MEK(b).

HC <MO000193504>; MEK(x).

XX

MF <MO000038305>; MEK{p}.

XX

XA <XN000000007>; MEK --> ERK (activation; phosphorylation; binding) [3] [9] [11] [6].

XA <XN000023295>; MEK + NTP --Ras:GTP:Raf{p}--> MEK{p} + NDP (phosphorylation) [8].

XA <XN000023296>; MEK + NTP --Raf{p}--> MEK{p} + NDP (phosphorylation).

XA <XN000023858>; MEK + ATP --PKCdelta:DAG:Raf-1--> MEK{p} + ADP (phosphorylation) [1].

XB <XN000000006>; Raf --> MEK (activation; phosphorylation; binding) [3] [13] [9] [10] [4] [5] [6].

XB <XN000001671>; PKCzeta --> MEK (activation) [12].

XB <XN000004953>; estradiol --> MEK (activation) [14].

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PW <CH000000038>; insulin ---> ERK (chain).

PW <CH000000567>; OSM ---> ERK (chain).

PW <CH000000586>; ZAP-70 ---> Elk-1 (chain).

PW <CH000000607>; BCR ---> ERK (chain).  
PW <CH000000639>; PDGF A ---> ERK (chain).  
PW <CH000000640>; PDGF B ---> ERK (chain).  
PW <CH000000656>; insulin ---Shc---> MAPK cascade (chain).  
PW <CH000000659>; VEGF-A ---> PLA2 (chain).  
PW <CH000000802>; G-alpha-q ---> arachidonic acid, ERK (chain).  
PW <CH000000937>; PRL ---Src,FAK1---> ERK (chain).  
PW <CH000000756>; OSM pathway (pathway).  
PW <CH000000751>; T-cell antigen receptor pathway (pathway).  
PW <CH000000753>; B-cell antigen receptor pathway (pathway).  
PW <CH000000736>; PDGF pathway (pathway).  
PW <CH000000750>; insulin pathway (pathway).  
PW <CH000000723>; VEGF-A pathway (pathway).  
PW <CH000000794>; neurotensin pathway (pathway).  
PW <CH000000926>; PRL pathway (pathway).

XX

RN [1].

RX <pubmed:16904320>.

RA Singh, P. K., Hollingsworth, M. A.

RT Cell surface-associated mucins in signal transduction.

RL Trends Cell Biol. 16:467-476 (2006).

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RN [2].

RX <pubmed:11171046>.

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