Human gene name	Fly gene name	Fly genelD	Fly genotype
AAK1	Nak	CG10637	w[118]; PBac/w[+mC]=WH]Nak[f04720]
ABL ACVP1	ADI	CG1801	ADI(2) (MOD, 10[1]) v(1) w(1) exp(5)(v(2) D/w(arc)[-2vTh(1).DED)(v(2)
ACVR1 ACVR2B	out	CG7904	
ADCK1	CG3608	CG3608	v[1118]: PBac(w]+mC]=WH]CG3608[f03261] CG4741[f03261]/CyO, P{w[+mC]=2xTb[1]-RFP]CyO
ADCK5	CG7616	CG7616	y[1] w[ <sup>4</sup> ]; P{w[+mC]=EP}CG7616[G14668]
AKT1	Akt1	CG4006	y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2}Akt1[EY10012]/TM6B, Tb[1]
ALK	Alk	CG8250	w[1118]; Mi{ET1}Alk[MB06458]
ATM	tefu	CG6535	w[7]; P[ry]+47, 2]=neoFR1]82B tefu]atm-61 e[1]/TM6B, Tb[1]
	mei-4 i	CG3068	mer+4 (K + 1) (1) (1) FW/2, K + 10) = 2X + 0 (1) - K + F + F + W + C, SN + 1 surf8 2A = 37 MABE T-11
BMPR1A	tkv	CG14026	autoración involtante de la construction de
BMPR2	wit	CG10776	bwl1; wl1A12; stl1/TM6B, Tb[1]
BRAF	phl	CG2845	ph[7]/FM7c, P{w[+mC]=2xTb[1]-RFP}FM7c, sn[+]
BRD3	fs(1)h	CG2252	w[67c23] P{w[+mC]=lacW]fs(1)h[G0495]/FM7c, P{w[+mC]=2xTb[1]-RFP}FM7c, sn[+]
BRSK1	sff	CG6114	w[1118]; Mik[ET1]sff[MB06603]
BUB1	Bub1	CG14030	w[1118]; PBac/w[+mC]=PB/Bub1[c04512]
CAMK2D	Calviki	CG18060	(1) w(0/c23); P(w(+nC))(+nD)n(2)=P(9)(2)Gain(E)(1)/(19) (4) w(14)(5); P(w(+nC))(4)=Dn(2)(2)Gain(E)(4)(4)(7) (4) w(14)(5); P(w(+nC))(4)=Dn(2)(2)Gain(E)(4)(4)(7)(7)(7)(7)(7)(7)(7)(7)(7)(7)(7)(7)(7)
CASK	CASK	CG6703	yr) m(rno), r(mo) r) mar - t gr2 commerce (record) w(*) ch(askiX-313) (CASKX-313) (Th6B) th+1
CDC42BPA	gek	CG4012	P(ry[+t7.2]=PZ)gek[09373] cn[1]/CyO, P(w[+mC]=2xTb[1]-RFP)CyO
CDC7	CG5790	CG5790	w[1118]; PBac(w[+mC]=WH]CG5790[f04763]
CDC7	l(1)G0148	CG32742	w[67c23] P{w[+mC]=lacW}(1)G0148[G0148]/FM7c, P{w[+mC]=2xTb[1]-RFP}FM7c, sn[+]
CDK1	cdc2	CG5363	cdc2[E1-23] b[1] pr[1] cn[1]
CDK11B	Pitsire	CG4268	y[1] w[6/c23]; P[w]+mC] y[+mUInt2]=EPgy2[Ptstre]EY22469] (M08, 16]1
CDK12	Ein63E	CG10579	y () w(orces), eyymanuncz w jak.c. bkj-somor-ysuki z (koussi z) iyjoudy (wob, i bi () wff: Einesz Erst/TMBB Th(1)
CDK2	cdc2c	CG10498	
CDK4/6	Cdk4	CG5072	w[1118]; P{w[+mC]=lacW}Cdk4[s4639]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
CDK8	Cdk8	CG10572	y[1] w[1118]; PBac{w[+mC]=5HPw[+]}Cdk8[A162]/TM6B, Tb[1]
CDK9	Cdk9	CG5179	w[1118]; PBac{w[+mC]=WH}Cdk9[f05537]
CHEK1	grp	CG17161	P{ry[+#7,2]=PZ]grp[06034] cn[1]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
CHUK	Ird5	CG4201	P{[y]#1.2]=Dupt2.2-lac2.3, ird3[1] ca[1]/1Mbb, 10[1] v[4]: Dick = Dupt2[1]:Dick = Dupt2[1]:Dick = Dick[1]:Dick = Dick = Dic
CSK	su csk	CG42317	yri, ryminning work.c.brj-ouror-sainou rusijiyoug nwob, nijij wr-Epraya dedvinartiMar Thili
CSNK1A1	Cklalpha	CG2028	w[7+c2]Febusiesuntees_http://withoutilatees.com/file/file/file/file/file/file/file/file
CSNK1E	dco	CG2048	y[1] w["]; P{w[+mC]=lacW]dco[j3B9]/TM6B, Tb[1]
CSNK1G3	gish	CG6963	y[1]; ry[506] P{y[+mDint2] w[BR.E.BR]=SUPor-P}gish[KG03891]/TM6B, Tb[1]
CSNK2A1	Ckllalpha	CG17520	y[1] w["]: Ckillalpha[Tik]/TM6B, Tb[1]
DDR2	Ddr	CG33531	y(1) w(1); M(y)+mDin2]=M(C)Ddr(M04117)(CyO, P(w)+mC)=2xTb(1)=RFP)CyO
DGKE	Dgkepsilon	CG42667	cn[1] P(t)[+t/.2]=P2/ox[1] Dgkepsiion[ox-1]/CyO, P{w[+mC]=2x10[1]-REP}CyO redeAt/FSE01
DYRK1B	mnb	CG42007	ngy-nixxuvj v11 wl67c231 P{wl+mCl vl+mDint21=EPnv23mnblEY143201 CG12985[EY143201
DYRK4	smi35A	CG4551	y(1) w[']; M[y]+mDint2]=MIC}smi35A[MI04771]/CyO, P[w]+mC]=2xTb]1]-RFP]CyO
EGFR	Egfr	CG10079	cn[1] Egfr[[2] bw[1] sp[1]/CyO, P{w[+mC]=2xTb[1]-RFP]CyO
EIF2AK3	PEK	CG2087	y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2}PEK[EY09578]
EPHB1	Eph	CG1511	y[1]; Mi{y[+mDint2]=MIC}Eph[MI05205]
ERN1	Ire1	CG4583	w[1118]; PBac/w[+mC]=WHJre1[t021/0]/1M6B, 1b[1]
FER	Eas Ens85D	CG8874	W[110] edglade: I3] w[11] PublickmClalarWEnc85DIX42]/TM6R_Tb[1]
FGFR	htl	CG7223	
FGFR	btl	CG32134	y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2]btl[EY01638)/TM6B, Tb[1]
FLT1	Pvr	CG8222	w[1118]; PBac{w[+mC]=PB}Pvr[c02195]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
FRK	Src42A	CG44128	w[1118]; Src42A[myri]
FYN, SRC	Src64B	CG7524	w[1118]; PBac/w[+mC]=PB]Src64B[c04709]/TM6B, Tb[+]
GAK	aux Cork2	CG17008	W[]; 8UX[L///1005, 10[1] outfood Dictury 31-D21Cody2060261 CC11237060361/TM6D_Tb11
GSK3A	saa	CG2621	njevoj njera zaje zaplazivazaj od naslovazaj naka, na ji sali M11 wili 1886/EVENCE Pisi-mel Z2XTh11-REPERTA: sn(+)
GSK3B	askt	CG31003	signing with the second se
GUCY2D	CG34357	CG34357	y[1] w[67c23]; P{w[+mC] y[-mDint2]=EPgy2]CG34357[EY21024]/TM6B, Tb[1]
HIPK2	hipk	CG17090	w[1118]; P{w[+mGT]=GT1}hipk[BG00855]/TM6B, Tb[1]
ILK	llk	CG10504	mwh[1] III[1] ed[1] ed[4]/TM6B, TD[1]
INSR	InR	CG18402	y(b00) Y(y)+(7.2)=Y2)tnK(05545)/TM6B, Tb[1] → (1) = 1/(2) = -(1)
IKAK4	hop	CG159/4	e(i) jui(z) ca(i) box/2/EMT/c D/w/amC1=2vTbi(1LRED)EMT/c sola
JNK	bsk	CG5680	belti enti buti softi Voo. Pwi-melezabil-REPICvO

### Supplementary Table 1: Kinase-mutated flies.

Gene names, corresponding CG numbers, and fly genotypes are shown for each kinase. Human orthologs of fly genes were predicted by DIOPT (http://www.flyrnai.org/cgi-bin/DRSC\_orthologs.pl).

KRR         CollEGA         VITE         Fellow-Party-Restrict/Party-Restrit/Party-Restrict/Party-Restrict	Human gene name	Fly gene name	Fly genelD	Fly genotype
KSR         kar         C02389         yfl, light-r23, Proj-mol/2-Eng/20/act (17058) Hole (17058) Hole (1705757)           LDK1         LDK1         C0384         yfl, light-r23, Proj-mol/2-Eng/20/act (1705757)           LDK1         LDK1         C0384         yfl, light-r23, Proj-mol/2-Eng/20/act (1705757)           LDK1         C0374         wfl, light-r23, Proj-mol/2-Eng/20/act (1705757)           MP264         MA4         C05738         wfl, light-r23, Proj-mol/2-Eng/20/act (170577)           MP264         MA4         C05738         wfl, light-r23, Proj-mol/2-Eng/20/act (170577)           MP264         MA4         C05738         wfl, light-r23, Proj-mol/2-Eng/20/act (170577)           MP264         MA4         C0573         yfl light-r23, Proj-mol/2-Eng/20/act (17057)           MP264         MA4         C0573         yfl light-r23, Proj-r23, Proj-Ma4, Pro	KDR	Cad96Ca	CG10244	w[1118]; P{w[+mC]=XP}Cad96Ca[d07355]/TM6B, Tb[1]
LATS1 wis 0 C01202 wft webs10 Phytra 2-moorTR0287068. Tot1 1 LKH LKH C C0484 wft Phytra 2-moorTR0287068. Tot1 1 LKH LKH C C0484 wft Phytra 2-moorTR0287068. Tot1 1 LKH LKH C C0484 wft Phytra 2-moorTR0287068. Tot1 1 LKH C C0484 wft Phytra 2-moorTR028707068. Tot1 1 LKH C C0484 wft Phytra 2-moorTR02870706 LKH C C04707 wft Phytra 2-moorTR0287070 LKH C C04707 wft Phytra 2-moorTR0287070 LKH C C04708 wft Phytra 2-moorTR028707070 LKH C C04708 wft Phytra 2-moorTR0287	KSR	ksr	CG2899	y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2]ksr[EY01688] Hcs[EY01688]/TM6B, Tb[1]
LukY LikB LikB C6384 ([167:23]P(4)-c3]P(4)-c3]P(4)-c3[P(4)-c3]P(4)-c3[P(4)-c3]P(4)P(4)-c3]P(4)P(4)P(4)-c3]P(4)P(4)P(4)-c3]P(4)P(4)P(4)-c3]P(4)P(4)P(4)-c3]P(4)P(4)P(4)-c3]P(4)P(4)	LATS1	wts	CG12072	w[*]; wts[x1] P{ry[+t7.2]=neoFRT}82B/TM6B, Tb[1]
Lish         Lish         CG337         w11st [het_m0]=P[]ubliG235]           LISH         Lish         CG432         w11st [het_m0]=P[]ubliG235]           MAP2AK         Lish         CG433         w11st [het_m0]=P[]ubliG235]           MAP2AK         Lish         CG433         w11st [het_m0]=P[]ubliG235]         http: P[]ubliG235]           MAP2AK         Lish         CG4343         w11st [het_m0]=P[]ubliG235]         http: P[]ubliG235]           MAP2AK         Map3         CG4343         w11st [het_m0]=P[]ubliG235]         http: P[]ubliG235]           MAP3K         Map3         CG3424         w11st [het_m0]=P[]ubliG235]         http: P[]ubliG235]           MAP3K         Map3         CG3424         w11st [het_m0]=P[]ubliG235]         http: P[]ubliG235]           MAP3K         Tabit         CG3323         w11st [het_m0]=P[]ubliG235]         http: P[]ubliG235]           MAP3K         Tabit         CG333         w11st [het_m0]=P[]ubliG235]         http: P[]ubliG235]         http: P[]ubliG235]           MAP3K         mas         CG333         w11st [het_m0]=P[]ubliG235]         http: P[]ubliG235]         http: P[]ubliG235]           MAP3K         mas         CG333         w11st [het_m0]=P[]ubliG235]         http: P[]ubliG235]         http: P[]ubliG235]	LIMK1	LIMK1	CG1848	y[1] w[67c23] P{w[+mC] y[+mDint2]=EPgy2}LIMK1[EY08757]
LBRK1         Lnk         CG543         wf1:rufew1/Tu68. To11           MAP284         MA         CG7324         mf1:rufew1/Tu68. To11           MAP286         Le         CG1224         mf1:rufew1/Tu68. To11           MAP287         Le         CG1224         mf1:rufew1/Tu68. To11           MAP281         Ma         CG723         mf1:rufew1/Tu68. To11           MAP384         MAR1         CG772         mf1:rufew1/Tu69. PG44. To11           MAP384         MP4         CG4842         mf1:rufew1/Tu69. PG44. To11           MAP384         MP4         CG4843         mf1:rufew1/Tu69. PG44. To11           MAP384         MP4         CG4843         mf1:rufew1/Tu69. PG44. To11           MAP384         MP4         CG4843         mf1:rufew1/Tu69. PG44. To11           MAP484         CG7333         mf1:rufew1/rufew1	LKB1	Lkb1	CG9374	w[1118]; P{w[+mC]=EP}Lkb1[G5285]
MAP2K4         MA4         CG523         wtll111         Place/wtml21618/MA4/D01483/TM85. Tb[1]           MAP2K6         is         CG4533         wtll1146/TM1216/FM42-PM42-b1114/EPFPFMC.pl[1]           MAP2K1         is         CG4533         wtll1146/TM1216/FM42-PM42-b1114/EPFPFMC.pl[1]           MAP2K1         is         CG4523         wtll1146/TM1216/FM42-PM42-b1114/EPFPFMC.pl[1]           MAP2K1         is         CG4523         wtll1146/TM1216/FM22-b1114/EPFPFMC.pl[1]           MAP3K1         is         CG4523         wtll1181/FM22-m140/FM23-B1114/EPFPFMC.pl[1]           MAP3K1         Takl         CG4523         wtll1181/FM22-m140/FM23-B1114/EPFFMC2-b1111           MAP3K1         Takl         CG4523         wtll1181/FM22-m140/FM23-B1114/EPFFMC4-b121-M121/FM201/FM23-B1114/EPFFMC4-b111           MAP3K3         Takl         CG4523         wtll1181/FM22-m140/FM23-M201/FM23-B1114/EPFFMC4-b111           MAP4K4         rms         CG5323         vtll1141/FM2-m140/FM23-M201/FM23-B1114/EPFFMC4-b111           MAP4K4         rms         CG5323         vtll1141/FM2-m140/FM23-M201/FM23-B112         PM24-B123-B112           MAP4K4         rms         CG5323         vtll1141/FM24-m140/FM23-M201/FM23-B1412         PM24-B123-B112           MAP4K4         rms         CG5324         vtll1141/FM24-m140/FM24-B123/FM212	LRRK1	Lrrk	CG5483	w[*]; Lrrk[ex1]/TM6B, Tb[1]
MAP2K         is         C G1224         ytt bir/G23/PVL register           MAP2K1         wrg         G66789         ytt bir/G23/PVL register           MAP3K1         wrg         G66789         ytt bir/G23/PVL register           MAP3K1         wrg         G67879         ytt bir/G23/PVL register           MAP3K1         Wrg         G67879         ytt bir/G23/PVL register           MAP3K1         MAS1         CG4803         wtt bir/G23/PVL register           MAP3K1         Hak         CG4803         wtt bir/G23/PVL register           MAP3K1         Hak         CG4803         wtt bir/G21/PVL register           MAP3K3         Hak         CG4803         wtt bir/G21/PVL register           MAP3K3         Hak         CG4803         wtt bir/G21/PVL register           MAP4K4         Map3         CG4803         wtt bir/G21/PVL register           MAP4K4         Jbir         CG4803         wtt bir/G21/PVL register           MAP4K4         Jbir         CG4803         wtt bir/G21/PVL register           MAP4K4         Jbir         G6779         wtt bir/G21/PVL register           MAP4K4         Jbir         Jir         Jir <jir g21="" pvl="" register<="" td="">           MAP4K4         Jbir         Jir<jir g21="" pvl="" r<="" reg1="" td=""><td>MAP2K4</td><td>Mkk4</td><td>CG9738</td><td>w[1118]; PBac{w[+mC]=RB}Mkk4[e01485]/TM6B, Tb[1]</td></jir></jir>	MAP2K4	Mkk4	CG9738	w[1118]; PBac{w[+mC]=RB}Mkk4[e01485]/TM6B, Tb[1]
MAP2X1         Inp         CG4533         wfl pelf/3F/MC         FMpelf/3F/MC         FM	MAP2K6	lic	CG12244	y[1] w[67c23] P{y[+m8]=Mae-UAS.6.11}lic[GG01785]/FM7c, P{w[+mC]=2xTb[1]-RFP}FM7c, sn[+]
MAPRIS         wnd         CG6789         M(1)*1, M(F-T642, 2)-m(M)(M0646-64, M02/T)/SEB, Tb(1)           MAPRIS         FA2B         CG470         M(1)*1, M(F-T642, 2)-m(M)(M0264-64, M02/T)/SEB, Tb(1)           MAPRIX         Tail         CG1824         wt1Tail         FC182           MAPRIX         Tail         CG1827         wt1Tain         FC182           MAPRIX         Tail         CG1829         wt1Tain         FC182         M(2)           MAPRIX         Tail         CG1829         wt1Tain         FC142         FC182         MC2         Tail         FC142	MAP2K7	hep	CG4353	w[*] hep[r75]/FM7c, P{w[+mC]=2xTb[1]-RFP}FM7c, sn[+]
MAP3K1         PA2B         CG4720         Y(11)         Y(11) </td <td>MAP3K13</td> <td>wnd</td> <td>CG8789</td> <td>y[1] w(*); Mi{PT-BM.2}wnd[MI00494-BM.2]/TM6B, Tb[1]</td>	MAP3K13	wnd	CG8789	y[1] w(*); Mi{PT-BM.2}wnd[MI00494-BM.2]/TM6B, Tb[1]
MAPBAK         Mark         CG1717         yfill wfDr.223; Pelvin-Oly-in-Dinzig-Ergay/Makt/EV1161]           MAPBAK         Taki         CG1824         wfTist Pipelogi-m_Disploy00.4737 [auti/tploy17158]. Tol/1           MAPBAK         Taki         CG1827         wfTist Pipelogi-m_Disploy00.4737 [auti/tploy16154].           MAPBAK         thist Pipelogi-m_Disploy00.4737 [auti/tploy16154].         MapBAK           MAPBAK         thist Pipelogi-m_Disploy00.4737 [auti/tploy16154].         MapBAK           MAPBAK         thist Pipelogi-m_Disploy161543.         MapBAK           MAPBAK         thist Pipelogi-m_Disploy16153.         MapBAK           MAPBAK         thist Pipelogi-m_Disploy16153.         MapBAK           MAPBAK         thist Pipelogi-m_Disploy16123.         MapBAK           MAPBAK         thist Pipelogi-m_Disploy16123.         MapBAK           MAPBAK         thist Pipelogi-m_Disploy16123.         MapBAK           MAPBAK         thist Pipelogi-m_Disploy1623.         MapBAK           MAPAAK </td <td>MAP3K15</td> <td>Pk92B</td> <td>CG4720</td> <td>y[1] w[*]; Mi{y[+mDint2]=MIC}Pk92B[MI02915]/TM6B, Tb[1]</td>	MAP3K15	Pk92B	CG4720	y[1] w[*]; Mi{y[+mDint2]=MIC}Pk92B[MI02915]/TM6B, Tb[1]
MAPBX7         Tak1         CG16492         w(T1sk) [Proj+mac/pc1045]           MAPBX7         Tak2         CG4803         w(T1sk) [Proj+mac/pc1045]           MAPBX6         they         CG2707         w(T1sk) [Proj+mac/pc1045]           MAPBX6         they         CG2707         w(T1sk) [Proj+mac/pc1045]           MAPAX1         th         CG12553         w(T1sk) [Proj+mac/pc1045]           MAPAX4         the         CG12553         y(T1sk) [Proj+mac/pc1045]           MAPAX1         th         CG12553         y(T1sk) [Proj+Pc1045]           MAPX41         th2         CG12573         y(T1sk) [Proj+Pc1045]           MAPX41         th2         CG12573         y(T1sk) [Proj+Pc1045]           MAPX42         CG1418         W(T1sk) [Proj+Pc1047]         CG1418           MAPX44         CG4448         CG1418         W(T1sk	MAP3K4	Mekk1	CG7717	y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2}Mekk1[EY11461]
MAPBX7         Tak1         CG31421         uf118]: PBack/microlPBi/Syl0AX37 [attil(bAX37]TM68; Tb[1]           MAPBX8         sipr         CG3222         uf118] MET1/set/MB30555]           MAPAX4         map         CG16973         uf118] MET1/set/MB30555]           MAPAX4         map         CG16973         uf118] MET1/set/MB30551           MAPAX4         map         CG16973         uf118] MET1/set/MB30551           MAPAX4         map         CG16973         uf118] MENDERTV         HumbsFFT1/set/MB30531           MAPAX4         map         CG16973         uf118/ MU/mb12/set/MG1033U/O, PW/mC12-kEt/MG305341/TM88         HumbsFT1           MAPAX1         p386         CG3333         uf11s/mEn1/set/men2/set/MF4/m02/set/MB4X11         MAPAX4         MAPAX4         CG3058         uf11s/mEn1/set/MB4X11           MAPAX5         MAPAX2         CG3058         uf11s/mEn1/set/MB4X11         MAPAX4         GG3733         uf11s/mEn1/set/MB4X11         MAPAX4         GG3058         uf11s/mEn1/set/MB4X11           MAPAX4         CG3058         uf11s/mEn1/set/MB4X11         MB4X11         MAPAX4         GG3058         uf11s/mEn1/set/MB4X11           MAPAX4         GG3058         uf11s/mEn1/set/MB4X11         MB4X11         MB4X11         MB4X11           MAPAX4         GG30	MAP3K7	Tak1	CG18492	w[*] Tak1[179]
MAP3K7         Takl2         CG4603         w1118; Pt(+mC)=X7[back[d10454]           MAP3K6         tspy         CG2707         w1118; Pt(+mC)=X7[back[d101513 Ft(4+mC)=2x1b[1]-RFP[CyO           MAP4K4         mac         CG18259         v1[1] w1[1] w1[	MAP3K7	Takl1	CG31421	w[1118]; PBac{w[+mC]=PB}Syp[c04375] Takl1[c04375]/TM6B, Tb[1]
MAPAK3         sipr         CG222         witting Micri Maphe000555           MAPAK4         man         CG16977         witting Micri Maphe000505           MAPAK4         man         CG16977         witting Micri Maphe0005000           MAPAK4         man         CG16977         witting Micri Maphe00050000           MAPAK4         man         CG16977         witting Micri Maphe000000000000000000000000000000000000	MAP3K7	Takl2	CG4803	w[1118]; P{w[+mC]=XP}Takl2[d10454]
MAPAK4         tppy         CG7097         wft; Fwf(+mmC)=FRT(wft=B)[0]:51 P(w+mC)=cacW[hppC]R12611CyC), P(w+mC)=CacTb[1]:RFP]CyO           MAPK1         ri         CG12559         wft; Fwf(-mtC)=FRT[Wft=B][0]:CyD, P[w]+mC]=PacTb[1]:RFP]CyO           MAPK1         ri         CG12559         wft; Fwf(-mtC)=FRT[Wft=B][Wft=C]=Dec-FtT[VaE]UNCPC]           MAPK14         Mb2         CG3270         wft; Fwf(-mtC)=FMFT[VaE]UNCPC]         Wft=Fwf(-mtC)=FMFT[VaE]UNCPC]           MAPK44         Mb2         CG3270         wft; Fwf(-mtC)=FMVAEACCG2551         MtC)           MAPK45         Ex7         CG3270         wft; Fwf(-mtC)=FMVAEACCG2551         MtC)           MAPK45         Ex7         CG3270         wft; Fwf(-mtC)=FMVAEACCG2551         MtC)           MAPK45         Ex7         CG3270         wft; Fwf(-mtC)=FMVAEACCG2551         FWft=FWft=FWFtMC, sn(-mtC)=FWFtMEACCG2551           MARX3         par-1         CG3201         wft=FWft=FWFtMC=FWFMAEACCG2551         FWft=FWft=FWFtMC, sn(-mtC)=FWFtMC, sn(-mtC)=FWFtMG, sn(-mtC)=FWFtMG, sn(-mtC)=FWFtMG, sn(-mtC)=FWFtMG, sn(-mtC)=FWFtMC, sn(-mtC)=FWFtMC, sn(-mtC)=FWFtMC, sn(-mtC)=FWFtMG, sn(	MAP3K9	slpr	CG2272	w[1118] Mi{ET1}slpr[MB03655]
MAPAK         msn         CG16973         wft         msn(10)2 [Pr(yH12]=mceFR130B21M6B           MAPK1         H         CG3333         yft         msn(10)2 [Pr(yH12]=mceFR130B21M673B]C/C, Pkt+mc1]=2:Tb[1]=FFP[CyO           MAPK1         Mplc         CG3333         yft         msn(10)2 [Pr(yH12]=mceFR130B21M6713B]C/C, Pkt+mc1]=2:Tb[1]=FFP[CyO           MAPK1         P385         CG3333         yft         wft         msn(10)2 [Pr(yH12]=mceFR130B21M321           MAPK1         P386         CG3333         yft         wft         wft         msn(10)2 [Pr(yH12]=mceFR130B21           MAPK1         P474         CG3388         wft         msn(10)2 [Pr(yH12]=mceFR130B21]         wft         msn(10)2 [Pr(yH12]=mcFR130A20]           MAR31         MaPL         CG3888         wft         msn(10)2 [Pr(yH12]=mcFR130A20]         psn(11)2 [Pr(yH12]=mcFR130A20]         msn(11)2 [Pr(yH12]=mcFR130A20]         msn(11)2 [Pr(yH12]=mcFR130A20]         psn(11)2 [Pr(yH12]=mcFR130A20]         msn(11)2 [Pr(yH12]=mcFR130A20]         msn(11)2 [Pr(yH12]=mcFR130A20]         psn(11)2 [Pr(yH12]=mcFR130A20]         msn(11)2 [Pr(yH	MAP4K3	hppy	CG7097	w[*]; P{w[+mW.hs]=FRT(w[hs])}G13 P{w[+mC]=lacW}hppy[SH1261]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
MAPR1         rd         CG12559         Y[1] w[1]         MUT_MOLESTATURE         Y[1] w[1]         MUT_MOLESTATURE         Y[1]	MAP4K4	msn	CG16973	w(*); msn[102] P{ry[+t7.2]=neoFRT}80B/TM6B
MAPRI1         p38c         CG3338         Y[1] WE723; Py000 PY(-WDIRZ] WBR: EBR]=SUP-C-Pj032bg(C08534/TM6B, Tb[1]           MAPRI4         p38b         CG373         Y[1] WE723; Py0(-PI2]EBy2/B38 bg/21]           MAPRI4         p38b         CG373         Y[1] WE723; Py0(-PI2]EBy2/B38b[EY11174]           MAPRI4         p38b         CG373         Y[1] W[1723] Py0(-PI2]EBy2/B38b[EY11174]           MAPRIA         MAPRIA         CG3086         Y[1] W[1723] Py0(-PI2]EPy02[Pi23b[EY11174]           MARK3         MAPRIA         CG3086         Y[1] W[1723] Py0(-PI2]EPy02[Pi23b[EY1174]           MARK4         D801         CG4988         Y[1] W[1723] Py0(-PI2]EPy02[Pi23b[FS1]TMB. Tb[1]           MKK1         L66         CG1732         Y[11W[1723] Pp0(-PI2]EPy02[Ps1/MB. Tb[1]           MKK4         L66         CG1732         Y[11W[172]Pa0(-PI2]PP0(P12]ParmE17(Mb0(P)(PV0(-P)2XTb[1]AFPP)Cy0           MKK4         CG4007         Y[1] W[17012B=P1P(PV1/2]PaneR17(Mb0(P)(PV(-P)2XTb[1]AFP)Cy0           MULX2         Sm-Mack         CG4012         Y[11W[1P] Pa0(-PI2)EPM0[FS1/MB. SD1]           MULX2         Sm-Mack         CG4012         Y[1] W[1: MY(-PI0)EPM0[CY2]Pa0(-PX1Tb[1]AFP1Cy0           MULX3         spa         CG4212         Y[1] W[1: MY(-PI0)EPM0[CY2]Pa0(-PX1Tb[1]AFP1Cy0           NULX         Sm-Mack         CG31	MAPK1	rl	CG12559	y[1] w[*]; Mi{y[+mDint2]=MIC}rl[MI07033]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
MAPRIAL         Mp2         CG4375         W[1] P(q+r2]=modRF1[32B Mp2[1]           MAPRIAL         P38b         CG32703         V[1] W[1] M(y+mol2]=BV(g2)g3b[EY11714]           MAPRIAR         CG32703         V[1] W[7C33] P(q)(-m2)[P(g32)g3b[EY11714]           MAPRIAR         CG32703         V[1] W[7C33] P(q)(-m2)[P(g32)g3b[EY11714]           MAPRIAR         CG32003         V[1] W[7C33] P(q)(-m2)[P(g32)g3b[EY11714]           MARTIA         CG4498         V[118] P(q)(-m2)=EPM(g4005843]           MASTI         gwi         CG7719         V[118] P(q)(-m2)=EPM(g4005842]           MASTI         gwi         CG7739         V[118] P(q)(-m2)=EPM(g4005842]           MKK         L66         CG7732         V[118] P(q)(-m2)=PM(g20)G3011EP05076]           MKK         L66         CG7732         V[1187723] P(q)(-m2)[PS10]G3011EP05076]           MKK         L66         CG7732         V[1187723] P(q)(-m2)[PS10]G3021G706]           MKK         L66         CG4742         V[1187723] P(q)(-m2)[PS10]G3021G706]           MKK         L66         CG4742         V[1187723] P(q)(-m2)[PS10]G3021G706]           MKK         L66         CG44126         V[1187723] P(q)(-m2)[PS10]G70]           MKK         L66         CG44126         V[11876723] P(q)(-m2)[PS10072]           MKK	MAPK11	p38c	CG33338	y[1] w[67c23]; ry[506] P{y[+mDint2] w[BR.E.BR]=SUPor-P}p38c[KG05834]/TM6B, Tb[1]
MAPK14         p38b         CG7333         Y[1] w[27:23, P[w[-mC]=EP]x2[38b[EY1174]           MAPK15         Ext7         CG3235         Y[1] w[1]-mC]=EP]xABFxA2[2256]           MAPKARS         MAFAA2         CG3305         Y[1] w[1]-mC]=EP]xABFxA2[2256]           MARK3         MAFAA2         CG3305         Y[1] w[1]-CG448[Me0A82]           MASTL         GG448         CG448         Y[1] w[1]-CG448[Me0A82]           MASTL         GW         CG1733         Y[1] w[1]-CG448[Me0A82]           MASTL         GW         CG1734         Y[1] w[1]-CG448[Me0A82]           MKK4         L66         CG1734         Y[1] w[1]-CG448[Me1A832]           MKK4         L66         CG1734         Y[1] w[1]-CG448[Me1A9][P1]           MKK4         L66         CG1734         Y[1] w[1]-C10e187]           MKK4         L66         CG1474         Y[1] w[1]-C10e187]           MKK4         CG44162         Y[1] w[1]-C10e187]           MKK3         Saa         CG4417         Y[1] w[1]-C10e187]           MK1x         Saa         CG44123         Y[1] w[1]-C10e187]           MK1x         Saa         CG4247         Y[1] m[1]-C10e187]           MK1x         Naa         CG4425         Y[1] w[1]-P1P[2P]P3[NAB4(23262769] <td>MAPK14</td> <td>Mpk2</td> <td>CG5475</td> <td>w[*]; P{ry[+t7.2]=neoFRT}82B Mpk2[1]</td>	MAPK14	Mpk2	CG5475	w[*]; P{ry[+t7.2]=neoFRT}82B Mpk2[1]
MAPKIS         Er/r         CG3270         y[1] w[1] Mg[-mDm2]=MG[Ex7M06843]           MAPKARS         par1         CG366         w[1] w[67:23], P[w[-mC]=EP]MKA2[2G5]           MARKA         par1         CG366         w[1] w[67:23], P[w[-mC]=EP]MKR[M06863]           MASTI         CG468         w[118], P[w[-mC]=EP]MK[M06863]           MASTI         GG468         w[118], P[w[-mC]=EP]MK[M06863]           MAST         CG479         w[118], P[w[-mC]=EP]MK[M0710]           MKK         L6         CG1793         w[118], P[ag]V[mM6], Tu[1]           MKK         L6         CG1793         w[118], P[ag]V[mM6], Tu[1]           MKK         L6         CG1793         w[118], P[ag]V[mM6], Tu[1]           MKK         L6         CG1793         w[118], P[ag]V[w[C]=PE]VG[VK]W[C276]           MKK         L6         CG1793         w[118], P[ag]V[w[C]=PE]VG[VK]W[C276]           MUX         Sam Add         CG4103         w[118], P[ag]V[w[C]=PE]VG[VK]W[wC]=2x10[1], PEP[CyO           MUX         sam         CG4129         w[118], P[ag]V[w[mC]=P[W]W[mC]=2x10[1], PEP[CyO           MVX3         sam         CG4129         w[118], P[ag]V[w[mC]=2x10[1], PEP[CyO           NVX4         dock         CG3727         w[119] M[1], M[w[w[mC]=2x10[V], PM[w]W[mC]=2x10[V], PM[w]W[mC]=2x10[V], PM[w]W[mC]=	MAPK14	p38b	CG7393	y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2}p38b[EY11174]
MAPRA/RS         MAPA, AL2         CG308         wi[] Piqt=mc]=P[MAPA, AL2[265]           MARK3         par-1         CG3021         yi[] Piqt=mc]=P[MAPA, AL2[265]           MAST1         CG488         CG488         wi[118], Piqt=mc]=P[MAPA, AL2[265]           MAST1         CG488         CG488         wi[118], Piqt=mc]=P[MAPA, AL2[265]           MAST         Gwi         CG1799         yi[118], Piqt=mc]=P[MAPA, AL2[265]           MKK4         Deci         CG1799         yi[118], Piqt=mc]=P[MAPA, AL3[276]           MKK4         CG179         yi[118], Piqt=mc]=P[MAPA, AL3[276]         Piqt=mc]=2xTb[1], PEP]CyO           MKK4         CG1492         yi[118], Piqt=mc]=P[Piyk[2773]         CG1404(Piqt=2anesP[FMAIC)/P, Piqt=mc]=2xTb[1], PEP]CyO           MUXA         Sam-Malak         CG44162         wi[118], PBack[wimc]=PeB]Sim-Maks[c02860]/O, Piqt=mc]=2xTb[1], PEP]CyO           MUXA         saga         CG14247         yi[118], PBack[wimc]=PigNAIC/2739]         CG44162         wi[118], PBack[wimc]=PigNAIC/2739]         CG44162         wi[1148], PBack[wimc]=PigNAIC/2739]         CG44162         wi[1148], PBack[wimc]=PigNAIC/2739]         CG44162         wi[1147], Piqt=PigNAIC/2739]         CG44162         yi[1147], Piqt=PigNAIC/2739]         CG44162         yi[1147], Piqt=PigNAIC/2739]         CG44162         yi[1147], PiqPigNAIC/26549         PiqNAIC/26549	MAPK15	Erk7	CG32703	y[1] w[*] Mi{y[+mDint2]=MIC}Erk7[MI05843]
MARK3         par.1         CG8201         Y[1] w[17-23]; P[w]=mC]:lacWpar:P[06323]()-O; P[w]=mC]=2xTb[1]-RFP]CyO           MAST1         gwl         CG749         w[118]; P[w]=mC]=EP[swl[EP51](TM6B, Tb[1]           MAST4         CG6498         w[118]; P[w]=mC]=EP[swl[EP51](TM6B, Tb[1]           MKK4         L&         CG7493         y[1] w[17] To[2B1](P[w]=mW,Th]=FFT(W[h])[101/FMC, P[w]=mC]=2xTb[1]-RFP]CyO           MK44         CG4103         y[1] w[17] To[2B1]P[P[v]=2]-macRTTJAAL(YO, P[w]=mC]=2xTb[1]-RFP]CyO           MUX         Sun-Mack         CG44612         w[118]; PBacy[w=mC]=2B3[ShamMaki(2280])CyO, P[w]=mC]=2xTb[1]-RFP]CyO           MUX3         spa         CG44212         w[118]; PBacy[w=mC]=PB[ShamMaki(2280])CyO, P[w]=mC]=2xTb[1]-RFP]CyO           MUX4         Sun-Mack         CG3727         w[118]; PBacy[w=mC]=PB[ShamMaki(2280])CyO, P[w]=mC]=2xTb[1]-RFP]CyO           MUX2         Sun-Mack         CG3727         w[118]; PBacy[w=mC]=2xTb[1]-RFP]CyO           MUX4         docd         CG3727         w[118]; PBacy[w=mC]=2xTb[1]-RFP]CyO           NUX4         docd         CG3727         w[1147]: M[147]; MP[w]=DM[P]CyG422[MB20565]           NUK4         nna         CG3728         w[1140]; M[147]: M[147]: MP[w]=MD[RB20]           NUK4         nd         CG37183         v[1147]; M[147]: M[147]: M[140]           NUK4	MAPKAPK3	MAPk-Ak2	CG3086	w[*] P{w[+mC]=EP}MAPk-Ak2[G265]
MASTI         CG6489         CG4489         (millis), [Millis], [M	MARK3	par-1	CG8201	y[1] w[67c23]; P{w[+mC]=lacW}par-1[k06323]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
MASTL         gwl         CG7719         withing: hydrocle Figs/gwlEP151/1M68. Tb(1)           MEK         Daort         CG1533         (i) iii () Cost(11-10)         (iii) Cost(11-10)           MKNK1         L&G         CG1533         (i) iii () Cost(11-10)         (iii) Cost(11-10)           MKT4         CG1533         (i) iii () CG1533         (i) iii () CG1533         (ii) iii () CG1533           MKT4         CG4119         (iii) GF223; Pig/ii-rapeRT1040/COy. Pig/ii-rC]=2xTb(1):RFPICyO           MUK         Nok         CG4007         (iii) iii () Pig/iii () Pig/iiii () Pig/iii () Pig/iii () Pig/iiii () Pig/iiiii () Pig/iiii () Pig/iiiii () Pig/iiiiiiiiiiii () Pig/iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	MAST1	CG6498	CG6498	w[1118]; Mi{ET1}CG6498[MB04862]
MEK         Deor         CG15739         y[1] w[1] Deor[LH10] P[w[+mX]hs]=RT{(w[hs])}]00FM7c, P[w[+mC]=zhtb[1];RFP]FM7c, sn[+]           MKKkt         L66         GG17342         y[1] w[1] zG233] P[w[+mC] y=mD]nt2]=EPgy2]GGMI[[EY05076]           MGR         Tor         CG5992         y[1] w[1] zG233] P[w[+mC] y=mD]nt2]=EPgy2]GGMI[[EY05076]           MUKK         NK         CG4007         y[1] w[1] zG1281         P[w[+mC] y=mD]nt2]=EPgy2]GGMI[[EY05076]           MUKK         NK         CG40162         w[118]; PBac(w[+mC]=PFMAG20276]         CG41762           MUKX         sqa         CG42347         w[118]; PBac(w[+mC]=PHB]Sm-Mad(d22860]/CO, P[w[+mC]=2xTb[1];RFP]CyO           MUXA         sqa         CG42347         w[118]; PBac(w[+mC]=PKB[SMD2680]/CO, P[w[+mC]=2xTb[1];RFP]CyO           NCK1         dock         CG3727         P[w[+r0]=Z]=ZGdod[0723] on[1]/CyO, P[w[+mC]=2xTb[1];RFP]CyO           NKK1         pg         CG11240         y[1] pmg1[0839] w[7]/FM7c. P[w]+mC]=2xTb[1];RFP]CyO           NKK1         pg         CG14120         y[1] pmg1[0830] w[7]/FM7c. P[w]+mC]=2xTb[1];RFP]CyO           NKK1         pg         CG1120         y[1] mm[1] m[1], P[Bac(m]=Dm2]=PMC]CyB(MD253]           NKK1         pg         CG12140         y[1] mm[1] m[1], P[Bac(m]=Dm2]=PMC]CyB(MD254]           NKK1         pg         CG3216         w	MASTL	gwl	CG7719	w[1118]; P{w[+mC]=EP}gwl[EP515]/TM6B, Tb[1]
MKNK1         L6         CG1712         wi118; L62[7/M8B, Tb[1]           MST4         Gokili         Gokilii         G	MEK	Dsor1	CG15793	y[1] w[*] Dsor1[LH110] P{w[+mW.hs]=FRT(w[hs])}101/FM7c, P{w[+mC]=2xTb[1]-RFP}FM7c, sn[+]
MS14         Gokili         CC319         yi i wit Zig3; Priviend yi multic/EP3y2/35kille/109/076           MTOR         Tor         CC3692         yi i ''''''''''''''''''''''''''''''''''	MKNK1	Lk6	CG17342	w[1118]; Lk6[2]/TM6B, Tb[1]
MIOR         Tor         CG4007         V[1] w[1]: tor[belleP] P(y[+t7]:PleoFHR](G2759]           MUSK         Nrk         CG4017         V[1] w[1]: P[eq:(m-C]=PP]Nk(G2759]         CG4117           MYLK3         spa         CG4237         w[1]18]: PBack[wfmC]-PP]S(G3439](G2759]           MYLK3         spa         CG42347         w[1]18]: PBack[wfmC]-PP]S(G3439](G2759]           MYCA3         ninaC         CG5125         w[1]: ninaC[5]           NX1         dock         CG3727         P[r(y[+7:2]=P2/dock[vf72]) or[1]/CO, P(w[+mC]=2xTb[1]=RFP]CyO           NK1         prof         G4239         w[1]: mg[1]/B [W1]/W[V=7]         SpaceTh[W, spaceTh]           NK1         cG4269         CG4293         w[1]: mg[1]/B [W1]/W[V=7]         SpaceTh]         SpaceTh]           NK1         mmo         CG4263         v[1]: w[1]/B [W1]/B [W1]/D [W1]/B [W1]/D [	MS14	GckIII	CG5169	y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2}GckIII[EY05076]
MUSK         Nik         CG4007         y(1) w(1) P(M)=P(M)=M(2)CG34343[G2759]           MULK2         Stm-Malck         CG44152         w(1118) PBac(w(m-C)=P(M)=M(2)CQ), P(w(+mC)=2xTb(1)=RFP)CyO           MYGAA         ninaC         CG5125         w(1118) PBac(w(m-C)=P(M)=M(2)CQ), P(w(+mC)=2xTb(1)=RFP)CyO           MYGAA         ninaC         CG5125         w(1118) PBac(w(m-C)=P(M)=M(2)=XTb(1)=RFP)CyO           NK1         dock         CG32727         P(n(+r.7.2)=P2/dock(04723) cn(1)/CyO, P(w(+mC)=2xTb(1)=RFP)CyO           NK1         dock         CG32727         P(n(+r.7.2)=P2/dock(04723) cn(1)=RFP)CyO           NK1         dock         CG32727         P(n(+mC)=PM(-mC)=PM(m)=RD)=PM(-M)=P	MTOR	lor	CG5092	y[1] w[*]; Tor[DeltaP] P{ry[+t7.2]=neoFR1}40A/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	MUSK	Nrk	CG4007	y(1) w("); P{w[+mC]=EP}Nrk[G2759] CG34439[G2759]
MTCA3         sqa         CG4247         W[T18] FBac(w[+mC]=WT]sqa[0157]/v/0, P[w[+mC]=2x1b][];RFP]CyO           MYO3A         ninaC         CG5125         W[T], ninaC[G]           MYO3A         ninaC         CG5125         W[T], ninaC[G]           NCK1         dock         CG3727         P[v[+r12]; P2[dock[04723] on[1]/CyO, P[w[+mC]=2x1b][]; PEPP[VAC, sn[+]           NEK11         png         CG1420         y[1] mp[1068] w[T]/FM7c, P[w[+mC]=2x1b[1]; PEPP[VAC, sn[+]           NEK1         nmo         CG7822         w[T], ninD[D8] P[v[+r2]=necR13[0677M58], TM08, Tb[1]           NPR1         CG3216         CG31183         y[1] w[T]; M[y[+mDin12]=MC[CC6429[M02265]           NPR1         CG3216         CG31183         y[1] w[T]; M[y[+mDin12]=MC[CC64377]           NPR2         CG31183         Y[1] w[T]; M[y[+mDin12]=MC[C64318]M02001]           NPR2         CG31183         CG18383         y[1] w[T]; M[y[+mDin12]=MC[C64313]M00201]           NRP1         Madm         CG198         w[1118]; P[w[-mDin12]=MC[C64314]M00137]TM68, Tb[1]           NUAK1         CG43143         CG43145         y[1] w[T]; W[y[+mDin12]=MC[C64314]M00137]TM68, Tb[1]           PAK7         mbk         CG14895         y[1] w[T]; M[y[+mDin12]=MC[C64314]M0012]           PAK7         mbk         CG3155         y[1] w[T]; M[y[+mDin12]=MC	MYLK2	Stm-Mick	CG44162	w[1113]; PBac(w[+mC]=PB]Stm-Mick[02860]/CyO, P(w[+mC]=2x16[1]-RFP]CyO
MYOJAK         InitaC         CG3125         WI J: InitaCl3           NCK1         dock         CG3727         Pr[yHz72]Pc2]dock[04723] cn[1]/CyO, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           NIM1         CG4629         CG4629         Y[1] mg1[058] w[7]FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           NIM1         CG4629         CG4629         Y[1] mg1[058] w[7]FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           NIM1         CG4629         V[1] mg1[058] w[7]FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           NRP1         CG3216         CG3216         w[11] mg1[w[1] w[1] w[1] w[1] w[1] w[1] w[1] w[1	MYLK3	sqa	CG42347	w[1113]; PBac(w[+mC]=WH]sqa[t01512]/CyO, P{w[+mC]=2x1b[1]-R+P}CyO
NCK1         dook         CG3/27         P(ry(+r,2)=P2(docR(u/r,2)=0)(U/CV), P(w)+mC)=2x10(1)+PF(P)(V)           NEK11         png         CG1420         Y[1] ng(1)G8[0] W[1/Kn7, P(w)+mC)=2x10[1/V,2], P(P)FN7c, sn[+]           NIM1         CG429         CG429         Y[1] ng(1)S8[0] W[1/Kn7, P(w)+mC)=2x10[1/V,2], P(P)FN7c, sn[+]           NIK1         nmo         CG3792         W[1; nmo(DB] P(ry(+1,2)=neCr(3)G08/008/M6B, Tb(1)           NPR1         CG3216         CG31183         Y[1] w[110]: PBac(w]+mC]=5FIP(w]-1)(Syc76(CA377)           NPR2         CG31183         CG31183         Y[1] w[110]: PBac(w]+mC]=5EIP(w]-1)(Syc76(CA377)           NRP2         CG31183         CG31183         Y[1] w[110]: PBac(w]+mC]=FEIP(w]-1)(Syc76(CA377)           NRP2         CG31183         CG31183         Y[1] w[1118]: P(w]+mC]=TEPMadm[EP3137/TM6B, Tb[1]           NRP4         Mdm         CG1098         w(1118]: P(w]+mC]=TEPMadm[EP3137/TM6B, Tb[1]           NLX1         CG43143         Y[1] w[17] w[	MYOJA	ninaC	CG5125	
NEK11         prig         CG11420         Y[1] mg[103] w[1]*m/2, P(w]+mD[2]=k(0](-1]+KP}*m/c, sn[+]           NIM1         CG4629         Q[1] w[1], mg[103] w[1]*m/2, P(w]+mD[2]=k(0](-26452]m(0)(2585]           NLK         nmo         CG7892         w[1]: mno[DB] P(y[+tr/2, 2]=neoFR1]808/TM6B, Tb[1]           NPR1         CG3216         CG3216         w[1118]; Mg[ET1]CG3216[MB07455]           NPR2         CG31183         CG11420         y[1] w[1]*M[y[+mD12]=M(C]CG4318]M02001]           NPR2         CG31183         CG31183         y[1] w[1]*M[y[+mD12]=M(C]CG4314]M002001]           NRP1         Madm         CG1098         w[1118]; P(w[-mC]=EP]Madm[EP3137]TM6B, Tb[1]           NUK1         CG43143         CG11420         y[1] w[1]*M[y[+mD12]=M(C]CG43143[M00137]TM6B, Tb[1]           NUK1         CG43143         CG11485         y[1] w[1]*M[y[+mD12]=EPgy2]Pdx[EV01831]           PAK1         Pak3         CG18562         y[1] w[1]*M[y[+mD112]=EPgy2]Pdx[EV01831]           PAK3         Pak3         CG18562         y[1] w[1]*M[y[+mD112]=EPgy2]Pdx[EV01879]/CyO, P(w[+mC]=2xTb[1]=FFP)CyO           PDK1         Pdk1         CG1210         w[1118]; P(w[+mD12]=EPgy2]Pdx[EX1636]           PIK3C2A         P3K92E         CG1114         y[11] w[1]*M[x[H1]P17]           PIK3         Pdk         CG3210         w[1118	NCK1	dock	CG3/2/	P(ry +r/.2]=P2/dock[U4/23] cn[1]/CyO, P(w +mC]=2x1b[1]-RFP[CyO
NIMI         CG402.9         CG402.9         V[1] w[1]; W[1]; W[1]; W[1]; P[0]; CG4316]           NLK         nmo         CG3216         CG3216         V[1]; w[1]; W[1]; P[0]; CG4316]         V[1] w[1]; W[2]; P[0]; CG4316]           NPR1         CG3216         CG3216         V[1] w[1]; W[1]; P[0]; CG3216]         V[1] w[1]; V[1]; V	NEK11	png	CG11420	y[1] png[1038] w[]/FM/6, FW[]+mC]=2x10[1]-RFP}FM/6, sn[+]
NLK         Initio         CG3052         wij, Initiolopi r(vjrtv.z)=hork (s)obs (mob, folj)           NPR1         CG3216         CG3216         wij 118; Mig(HET)/GS26[MB0745]           NPR2         CG31183         CG1183         y[1] wij, Mig(HET)/GS26[MB0745]           NPR2         CG31183         CG13112         y[1] wij, Mig(HET)/GS26[MB0745]           NPR2         CG31183         CG1212         Wij 118; P(wij-mC)=EP)/Madm[EP3137]/TM6B, Tb[1]           NRBP1         Madm         CG1098         wij118; P(wij-mC)=EP)/Madm[EP3137]/TM6B, Tb[1]           NUAK1         CG43143         CG43143         y[1] wij', Mig/+mDin2]=MIC)CG3143[MI004137]/TM6B, Tb[1]           PAK1         Pak         CG10985         y[1] wij', P(wij-mC)=EP)/Q3/P314[MI00452]           PAK1         Pak         CG1252         y[1] wij'', Mig/+mDin2]=MIC)CG3143[MI00452]           PAK3         Pak3         CG14895         y[1] wij'': Mig/+mDin2]=MC)P2/P2/P3[EV01879]/CyO, P(wi+mC]=2xTb[1]-RFP]CyO           PAK4         Pak4         CG1200         y[1] wij'': Mig(H=T)[CG130252]           PAS         CG31162         y[1] wij'': Mig(H=T)[CG1302575]           PIK3CA         P3K68D         CG11621         wij118; P(wij-mC)=T=G1]P0A1[B602759]           PIK3CA         P3K68D         CG11201         wij118; P(Wij-MC)=ZTb[1],RFP]FM7c, sn[	NIMI	CG4029	CG4029	[1] w[]: wik[y[+mDint2]=wit[-]c34623[wit[2505]]
NPR1         CG3216         CG3216         w(1110), w(110), w(110)	NLK NDD1	nmo	CG7892	W[]; hmo[DB] P{y[+(1,2]=neork1]s0B/1M6B, 10[1]
NPR1         Op/CoL         CG42030         Y[1] w[1116], Paddw[HnC]=3nFW[4][SQ870207]           NPR2         CG31183         CG43143         Y[1] w[116], Paddw[I=MC]CG3138]         Y[1] w[116], Paddw[I=MC]CG3138]           NRB2         Gyc32E         CG3114         Y[1] w[176], Paddw[I=MC]CG3133[M02001]           NRB1         Madm         CG1098         w[118]; Plw[+mC]=EP]Madm[IEP3137]/TM6B, Tb[1]           PAK1         Cak         CG41434         Y[1] w[1]; M[y[+mD]II2]=MC]CG43143[M004137]/TM6B, Tb[1]           PAK1         Pak         CG10295         Pak[6]/TM6B, Tb[1]           PAK3         Pak3         CG14895         y[1] w[1]; M[y[+mD]II2]=MC]C43143[M004137]/TM6B, Tb[1]           PAK7         mbt         CG8308         y[1] w[1]; M[y[+mD]II2]=MC]C434[M04252]           PDK3         Pdk         CG3105         y[1] w[1]; M[y[+mD]II2]=EPgy2]Pdk[EY01879]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PDK1         Pdk1         CG1162         w[1118]; Mk[ET1]Pi3K69D[M080286] CG14131[MB08286]           PIK3CA         Pi3K92E         CG4114         w[118]; Mk[ET1]Pi3K69D[M080286] CG14131[MB08286]           PIK3CA         Pi3K92E         CG4114         w[118]; Mk[ET1]Pi3K69D[M080286] CG312625[EY20869]/FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PIKA2         Pi3K92E         CG11201         w[118]; Mk[ET1]Pi3K69D[M08032]/TM6B, Tb[1] </td <td>NPR I</td> <td>003210</td> <td>003210</td> <td>W[1110], W[E11]0-05210[WB07453]</td>	NPR I	003210	003210	W[1110], W[E11]0-05210[WB07453]
NPR2         Cost nos         Cost nos <thcost nos<="" th="">         Cost nos         <thc< td=""><td>NPRI</td><td>GyC/00</td><td>CC21102</td><td>y[1] w[110]; Pbac(w[+mc]=5mFw[+])g(y(2)0[A377] v[1] w[1] M[4] model[2]=M(2)0(2)112[2](2)112[2](2)112[2](2)[2)[2](2)[2)[2](2)[2)[2](2)[2)[2](2)[2)[2](2)[2)[2](2)[2)[2](2)[2)[2)[2](2)[2)[2](2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2](2)[2)[2](2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2](2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2)[2)[2](2)[2)[2)[2)[2)[2)[2](2)[2)[2)[2)[2)[2](2)[2)[2)[2)[2)[2](2)[2)[2)[2)[2)[2)[2)[2)[2)[2)[2)[2)[2)[2</td></thc<></thcost>	NPRI	GyC/00	CC21102	y[1] w[110]; Pbac(w[+mc]=5mFw[+])g(y(2)0[A377] v[1] w[1] M[4] model[2]=M(2)0(2)112[2](2)112[2](2)112[2](2)[2)[2](2)[2)[2](2)[2)[2](2)[2)[2](2)[2)[2](2)[2)[2](2)[2)[2](2)[2)[2)[2](2)[2)[2](2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2](2)[2)[2](2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2](2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2)[2](2)[2)[2)[2)[2)[2](2)[2)[2)[2)[2)[2)[2](2)[2)[2)[2)[2)[2](2)[2)[2)[2)[2)[2](2)[2)[2)[2)[2)[2)[2)[2)[2)[2)[2)[2)[2)[2
NH2         Oyco2L         Cossin F         (1) f(0)(23), (1) (f(0)(23), (1) (f(0)(23)), (1)		Cuo32E	CG331103	Y[1] w[], w[y]+inbinz]-wircy-051160[wirz/00] v[1] w[7-231: Du(_wircy-051160]wirz/00] Dec DD-20[cus22E]KC060141
Intol in waalin         Cortog         W(110), TW(HIC)=TW(AUC), TO(S), TO	NDDD1	Madm	CG1008	y[1] w[07223], ry[=minimiz] w[07.2.5],-07-07-05/022[[1300014]]
Norkit         Code (145)         Code (145)         Code (145)         Code (145)         Code (145)         Code (145)         Pak(6)[TM6B, Tb(1]           PAK1         Pak3         CG10255         Pak(6)[TM6B, Tb(1]         Pak3(1)         Pak3         CG10255         Pak(6)[TM6B, Tb(1]           PAK3         Pak3         CG10255         Pak(6)[TM6B, Tb(1]         Pak1(1)         Pak3         Pak3         CG10255         Pak(6)[TM6B, Tb(1]           PAK1         mbt         CG10255         Pak(6)[TM6B, Tb(1]         Pak1         CG10255         Pak(1)         Pak1         CG10255         Pak(1)         Pak1         Pak1         CG10255         Pak(1)         Pak1         Pak1<		CG43143	CG1030	W[1110], F(W[*110])モビア(Wood)[E-C-013] F(WOOD, 10[1]) いけい(ボン Work)エンドンドローン(1)(2)(2)(2)(2)(2)(2)(2)(2)(2)(2)(2)(2)(2)
PAK3         Cold 289         y[1] w[7:2] Habpinuo, hu[1]           PAK3         Cold 289         y[1] w[7:2] Habpinuo, hu[1]           PAK7         mbt         Cold 289         y[1] w[7:2] Habpinuo, hu[1]           PAK7         mbt         Cold 289         y[1] w[7:2] P[y[+mb]=Habe-UAS.6.11]Pak3[LA00012]           PAK7         mbt         Cold 289         y[1] w[7:2] P[y[+mb]=Habe-UAS.6.11]Pak3[LA00012]           PAK3         Pak         Cold 289         y[1] w[7:2] P[y[+mb]=Habe-UAS.6.11]Pak3[LA00012]           PAK3         Pak4         Cold 289         y[1] w[7:2] P[y[+mb]=Habe-UAS.6.11]Pak3[La0012]           PDK1         Pak4         Cold 289         y[1] w[7:2] P[y[+mC] y[+mDin2]=EPgy2]Pak[EY01879]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PDK1         Pdk1         Cold 210         w[1118], P[w[=T1]Pi3K880[MB00226] Cold 131[MB08286]           PIK3CA         Pi3K92E         Cold 111         w[1118], M[ET1]Pi3K92E[MB06212]/TM6B, Tb[1]           PIK3R4         id1         Cog+26         y[1] w[7: M[y[+mDin2]=MC]/v1[M05805]/TM6B, Tb[1]           PIK3R4         id1         Cog+26         y[1] w[7: M[y[+mDin2]=MC]/v1[M050, FD[1]           PIK4         S4         Cold 29         P[y[+t7.2]=P2]Pkn[06736] cn[1]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PIK1         plo         Cold 230         w[1] w[7: Alg[/+mE	DAK1	Dak	CG10205	
PAK7         mbt         CG1852         y[1] w[67c3] P[w[+mC]]=EPgy2[mb[EV08341]           PAK7         mbt         CG1852         y[1] w[67c3] P[w[+mC]]=EPgy2[mb[EV08341]           PASK         Pask         CG3105         y[1] w[67c3] P[w[+mC]]=EPgy2[mb[EV08341]           PASK         Pask         CG3105         y[1] w[67c3] P[w[+mC]]=EPgy2[mb[EV0831]           PDK3         Pdk         CG8808         y[1] w[67c3] P[w[+mC]]=EPgy2[mb[EV0879]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PDFK1         Pdk1         CG11621         w[1118]; P[w[+mC]=G11]Pdk1[B002769]           PIK3C2A         Pi3K68D         CG11621         w[1118]; M[ET1]Pi3K68D[MB08286] CG14131[MB08286]           PIK3CA         Pi3K92E         CG4141         w[1118]; M[ET1]Pi3K92E[MB06212]/TM6B, Tb[1]           PIK3CA         Pi3K92E         CG4141         w[1118]; M[eT1]Pi3K92E[MB06212]/TM6B, Tb[1]           PIK3CA         Pi3K92E         CG4141         w[1118]; M[eT1]Pi3K92E[MB06212]/TM6B, Tb[1]           PIKN1         Pink1         CG4523         w[0] +mc]=2xTb[1]-RFP]FM7c, sn[+]           PITNM/2         rdgB         CG1111         y[1] w[67c3] P[w[+mC]]=2xTb[1]-RFP]FM7c, sn[+]           PKN2         Pkn         CG2049         P[v[+tr.2]=PZ]Pkn[06736] cn[1]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PLK1         polo         CG12050 <td>PAK3</td> <td>Pak3</td> <td>CG14895</td> <td>v(1) v(*) P(v(+m))=Mae, IAS 6 11}Pak3II A000121</td>	PAK3	Pak3	CG14895	v(1) v(*) P(v(+m))=Mae, IAS 6 11}Pak3II A000121
PASK         Pask         CG3105         y[1] w[1]; M[y[+mDint2]=M[c]+Bask[M04252]           PDK3         Pdk         CG3808         y[1] w[1]; M[y[+mDint2]=M[c]+Bask[M04252]           PDK3         Pdk         CG3808         y[1] w[1]; M[y[+mDint2]=M[c]+Bask[M04252]           PDK1         Pdk1         CG1210         w[1118]; P[w]+mCin2[=T]+Pdx1[BG02759]           PIK3CA         Pi3K8D         CG11621         w[1118]; M[ET1]Pi3K82E[MB06212]TM6B, Tb[1]           PIK3CA         Pi3K82E         CG4141         w[1118]; M[ET1]Pi3K82E[MB06212]TM6B, Tb[1]           PIK3R4         ird1         CG9746         y[1] w[1]; M[y[+mDint2]=M[C]+adyB06212]TM6B, Tb[1]           PIKN2         rdgB         CG1111         y[1] w[1]; M[y[+mDint2]=EPgy2/pdgB[EY02869]CG32625[EY20869]/FM7c, P{w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PIKN2         Pkn         CG2049         P[y[+rt7_2]=PE7]Pkn[06736] cn[1]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PLK1         polo         CG1206         w[1]*In[1]PiFM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]	PAK7	mht	CG18582	(1) w(7-7)31 P(w(+mC) v(+mDint2)=EPuv2mht[EV08341]
PDK3         Pdk         CG8808         y[1] w[67c23]; P[w[+mC] y[+mDint2]=EPgy2]Pdk[EY01879]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PDK1         Pdk1         CG1210         w[1118]; P[w[+mC] y[+mDint2]=EPgy2]Pdk[EY01879]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PDK3         Pdk1         CG1210         w[1118]; P[w[+mC] y[+mDint2]=EPgy2]Pdk[EY01879]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PIK3CA         Pi3K68D         CG11621         w[1118]; M[ET1]Pi3K68D[MB06226] CG14141 31[MB08286]           PIK3CA         Pi3K92E         CG4141         w[118]; M[ET1]Pi3K68D[MB0622]/TM6B, Tb[1]           PIK3R4         ird1         CG9746         y[1] w[7]: M[y[+mDint2]=MC]/chrd1[MI05805]/TM6B, Tb[1]           PIKX1         Pink1         CG4523         w[7] Pink1[B9]/FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PKN2         Pkn         CG2049         P[ry[+t7_2]=P2P[M06736] cn[1]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PLK1         polo         CG1206         w[7] P[w[+mC]=PTT-GC]polo(C01328]/TM6B, Tb[1]           PLK4         SAK         CG7186         w[1118]: PBac(w[+mC]=PB]SAK[c06612]/TM6B, Tb[1]           PLK4         SAK         CG7186         w[1118]: PBac(w[+mC]=PB]SAK[c06612]/TM6B, Tb[1]           PRKAA2         SNF1A         CG3051         SNF1A[1]/FT7C, P[w[+mC]=2xTb[1]-RFP]CyO           PRKACG         CG12069         CG12069         w[	PASK	Pask	CG3105	v[1] w[i']: M[v]+mDint2]=M[C]Pask[M]04252]
PDFk1         Pdk1         CG1210         w(1118); P(w(+mGT)=GT1)Pdk1[B502759]           PIK3C2A         Pi3K58D         CG11621         w(1118); M(ET1)Pi3K68D(M808286)           PIK3CA         Pi3K92E         CG4141         w(1118); M(ET1)Pi3K68D(M808286)           PIK3CA         Pi3K92E         CG4141         w(1118); M(ET1)Pi3K68D(M808286)           PIK3CA         Pi3K92E         CG4141         w(1118); M(ET1)Pi3K68D(M808286)           PIK3R4         ird1         CG9746         y(1) w(1); M(y(+mDint2)=M(C)/w(1M05805)/TM68, Tb[1]           PIKN1         Pink1         CG4523         w(1"Pink1[B9)/FM7c, P(w(+mC)=2xTb[1]-RFP)FM7c, sn[+]           PIKN2         Pkn         CG2049         P(ry(+r.2)=P2)Pkn(06736) cn[1/(COV, O, P(w(+mC)=2xTb[1)-RFP)FM7c, sn[+]           PKN2         Pkn         CG2049         P(ry(+r.2)=P2)Pkn(06736) cn[1/(CVO, P(w(+mC)=2xTb[1)-RFP)CyO           PLK1         polo         CG12030         w(1"118); Pasc(w(+mC)=PTT-GC)polo(CC01328)/TM68, Tb[1]           PLK4         SAK         CG7166         w(1118); Pasc(w(+mC)=PTT-GC)polo(CC01328)/TM68, Tb[1]           PLK4         SAK         CG3051         SNF14(1)FM7c, P(w(+mC)=ZxTb[1)-RFP)CyO           PKA2A         SNF1A         CG3051         SNF14(1)FM7c, P(w(+mC)=ZxTb[1)-RFP)CyO           PKA2G         CG12069         v(1118	PDK3	Pdk	CG8808	v11 w(67c23): P(w)+mCl v(+mDint2)=EPav2)Pdk/EY01879)/CvO. P(w(+mCl=2xTb(1)-REP)/CvO
PIK3C2A         PI3K68D         CG11621         wi[118]; Mi[ET1]Pi3K68D[MB08286] CG14131[MB08286]           PIK3CA         Pi3K92E         CG4141         wi[118]; Mi[ET1]Pi3K68D[MB08286] CG14131[MB08286]           PIK3CA         Pi3K92E         CG4141         wi[118]; Mi[ET1]Pi3K68D[MB08212]/TM6B, Tb[1]           PIK3CA         Pi3K92E         CG4141         wi[118]; Mi[ET1]Pi3K92E[MB06212]/TM6B, Tb[1]           PIK3CA         Pi3K92E         CG4141         wi[17]Pi3K92E[MB06212]/TM6B, Tb[1]           PIK1         Pink1         CG4523         wi[7]Pink1[B9]/FM7c, P(wi+mC]=2xTb[1]-RFP]FM7c, sn[+]           PITPNM2         rdgB         CG11111         yi[1]wi[5/c33]Piwi+mC] y+mDint2]=EPgy2lrdgB[EY20869] CG32625[EY20869]/FM7c, P(wi+mC]=2xTb[1]-RFP]FM7c, sn[+]           PKN2         Pkn         CG2049         P(yi+t7.2]=P2]Pkn[06736] cn[1]/CyO, P(wi+mC]=2xTb[1]-RFP]CyO           PLK1         polo         CG12006         wi[7]Pink1(B9]PBSAK[06636]         Fb[1]           PLK4         SAK         CG7186         wi[118]; PBac(wi+mC]=2xTb[1]-RFP]FM7c, sn[+]         Pk           PRKAAC         NF1A         CG3051         SNF1A[1]/FM7c, P(wi+mC]=2xTb[1]-RFP]FM7c, sn[+]         Pk           PRKACG         CG12069         Wi[118]; Mi[ET1]CG12069[MB10013]/TM6B, Tb[1]         Pk         Pk           PRKACA         Pka-C1	PDPK1	Pdk1	CG1210	with the P(wi+mGTT)=CT1)=Ct1BG02759
PIK3CA         Pi3K92E         CG4141         w(1118); M(ET1)Fi3K92E[MB06212]/TM6B, Tb[1]           PIK3R4         ird1         CG9746         y(1) w(1); M(Y=M(y)=MDiR2)=MUC)ird1[MI05805]/M6B, Tb[1]           PIK3R4         ird1         CG9746         y(1) w(1); M(Y=M(y)=MDiR2)=MUC)ird1[MI05805]/M6B, Tb[1]           PIKN1         Pink1         CG4523         w(1) Pink1B9J/FM7c, P(w(+mC)=2xTb[1)-RFP)FM7c, sn[+]           PITPNM2         rdgB         CG11111         y(1) w(67c33) P(w(+mC))=Epgy2)rdgB[EY20869](CG32625[EY20869]/FM7c, P(w(+mC)=2xTb[1)-RFP)FM7c, sn[+]           PKN2         Pkn         CG2049         P(r(+rt.2)=P2)Pkn(06736) cn(1)(CyO, P(w(+mC)=2xTb[1)-RFP)CyO           PLK1         polo         CG12306         w(1); P(w(+mC)=PTT-GC)polo(CC01326)/TM6B, Tb[1]           PLK4         SAK         CG7186         w(1118]; PBac(w(+mC)=PTT-GC)polo(CC01326)/TM6B, Tb[1]           PRKAA2         SNF1A         CG3051         SNF14(1)/FM7c, P(w(+mC)=2xTb[1)-RFP)FM7c, sn[+]           PRKAA2         SNF1A         CG3051         SNF14(1)/FM7c, P(w(+mC)=2xTb[1)-RFP)FM7c, sn[+]           PRKACG         CG12069         CG12069 w(11118); M(ET1)CG12069(MB10013)/TM6B, Tb[1]           PRKACA         Pka-C1         CG4379         Pka-C1[H2)/CyO, P(w(+mC)=2xTb[1)-RFP]CyO           PRKACA         CG12069         v(1) w(1); M(y(+mD)in2)=M(C)Pka-R2[M00032]/CyO, P(w(+mC)=2x	PIK3C2A	Pi3K68D	CG11621	w111181. Mi/ET1)Pi3K68DI/MB08286I CG14131I/MB08286I
PIK3R4         ird1         CG9746         y[1] w[1]: M[y[+mDint2]=MIC]rd1[MI05805]/TM6B, Tb[1]           PIKN1         Pink1         CG4523         w[1] Pink1[B9]/FM7c, P(w[+mC]=2xTb[1]-RFP]/FM7c, sn[+]           PITPNM2         rdgB         CG11111         y[1] w[1]: M[y[+mDint2]=EJ9y]/270gB[E'20069]/CG32625[E'220869]/FM7c, P{w[+mC]=2xTb[1]-RFP]/FM7c, sn[+]           PITPNM2         rdgB         CG11111         y[1] w[1]: w[1]: w[1]: w[1]: w[0f7c23] P{w[+mC]} = P[Y]/270gB[E'20069]/CG32625[E'220869]/FM7c, P{w[+mC]=2xTb[1]-RFP]/FM7c, sn[+]           PKN2         Pkn         CG2049         P{y[y[+72]=P2P}/FN06736] cn[1](V]/CyO, P{w[+mC]=2xTb[1]-RFP]/CyO           PLK1         polo         CG12060         w[1]*PBac/w[+mC]=PB]SAK[c06612]/TM6B, Tb[1]           PLK4         SAK         CG7186         w[1118]; PBac/w[+mC]=PB]SAK[c06612]/TM6B, Tb[1]           PRKAA2         SNF1A         CG3051         SNF1A[1]/FM7c, P{w[+mC]=2xTb[1]-RFP]/FM7c, sn[+]           PRKAA2         SNF1A         CG3051         SNF1A[1]/FM7c, P{w[+mC]=2xTb[1]-RFP]/FM7c, sn[+]           PRKAC3         CG12069         CG12069         w[1118]; PBac/w[+mC]=PTI-GC]2069[MB10013]/TM6B, Tb[1]           PRKAC4         rka-C1         CG4379         Pka-C1[1/2]/CyO, P(w[+mC]=2TIb[1]-RFP]/CyO           PRKAC3         CG12069         cG12069         w[1118]; M[ET1]/CG12069[MB10013]/TM6B, Tb[1]           PRKCA	PIK3CA	Pi3K92E	CG4141	w(1118): MIET1)PI3K92E[MB06212]/TM6B. Tb[1]
PINK1         Pink1         CG4523         w("] Pink1[B9]/FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PITPNM2         rdgB         CG11111         y(1] w(5r23) P(w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PKN2         Pkn         CG2049         P(ry[+t7.2]=P2]/Pkn[06736] cn[1/CyO, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PKN2         Pkn         CG2049         P(ry[+t7.2]=P2]/Pkn[06736] cn[1/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PLK1         polo         CG1206         w["118]; PBac(w[+mC]=PTT-GC]polo(CC01326)/TM6B, Tb[1]           PLK4         SAK         CG7186         w[1118]; PBac(w[+mC]=PTT-GC]polo(CC01326)/TM6B, Tb[1]           PRKAA2         SNF1A         CG3051         SNF1A([1/FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PRKAA2         SNF1A         CG3051         SNF1A([1/FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PRKAA2         CG12069         CG12059         V(118); M[cT1]CG12069[MB10013]/TM6B, Tb[1]           PRKAR2A         Pka-R2         CG15862         y[1] w([1/FM0]C]=MIC]Pka-R2[M100092]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PRKCA         inaC         CG51882         y[1] w([1/FM0]C]=MIC]Pka-R2[M100092]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PRKCA         inaC         CG15862         y[1] w([1/FM0]C]=MIC]Pka-R2[M100092]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PRKCA         inaC         CG5518         w	PIK3R4	ird1	CG9746	v[1] w[*]: M[{v]-mDint2]=M[C]ird1[M[05805]/TM6B, Tb[1]
PITPNM2         rdgB         CG11111         y[1] w[67c23] P[w[+mC] y[+mDint2]=EPgy2]rdgB[EY20869] CG32625[EY20869]/FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PKN2         Pkn         CG2049         P[v][+r7_2]=P2]Pkn[06736] cn[1]/0y0, P[w[+mC]=2xTb[1]-RFP]CyO           PLK1         polo         CG13006         w[1]; P[w[+mC]=PTT-GC]polo[CC01329[/TM8b, Tb[1]           PLK4         SAK         CG7160         w[118]; PBac(w[+mC]=PB]SAK[c06612]/TM6b, Tb[1]           PRKAA2         SNF1A         CG3051         SNF1A[1]/FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PRKAA2         SNF1A         CG3051         SNF1A[1]/FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PRKAA2         SNF1A         CG3051         SNF1A[1]/FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PRKACA         Pka-C1         CG4379         Pka-C1[12]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PRKACG         CG12069         w[1118]; ME[ET1]CG12069[MB10013]/TM6B, Tb[1]           PRKAR2A         Pka-R2         CG15862         y[1] w[1]/S [w[y[+mD]n2]=EPgy2]Pkc53E[EY1400392]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PRKCA         inaC         CG6518         w[1]; imaC[2]           PRKCD         Pkc38E         CG6622         y[1] w[67c23]; P[w[+mC]]=EPgy2]Pkc53E[EY14093]           PRKCD         Pkcdeta         CG42349         w[1118] PBac(w[+mC]=RB]Pkcdeta[e04408] <td>PINK1</td> <td>Pink1</td> <td>CG4523</td> <td>win Pink 1[B9]/FM7c. P(wi+mC)=2xTb(1)-RFP)FM7c. sn(+)</td>	PINK1	Pink1	CG4523	win Pink 1[B9]/FM7c. P(wi+mC)=2xTb(1)-RFP)FM7c. sn(+)
PKN2         Pkn         CG2049         P(r/j+i7.2]=P2J)Pkn[06736] cn[1]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PLK1         polo         CG12306         w[1]; P(w[+mC]=PTT-GC]polo]CC01326]/TM6B, Tb[1]           PLK4         SAK         CG7186         w[1]: P[w[+mC]=PTT-GC]polo]CC01326]/TM6B, Tb[1]           PRKA2         SNF1A         CG3051         SNF1A[1]/FM7c, P[w[+mC]=PBSAK[c06612]/TM6B, Tb[1]           PRKA2         SNF1A         CG3051         SNF1A[1]/JFM7c, P[w[+mC]=2xTb[1]-RFP]CyO           PRKA2G         CG12069         CG12069         w[1118]; ME[ET1]CG12069[MB10013]/TM6B, Tb[1]           PRKA2G         CG12069         CG12069         w[1118]; M[ET1]CG12069[MB10013]/TM6B, Tb[1]           PRKA2G         CG12069         v[1118]; M[[V]+mDint2]=M[C]Pka-R2[MI00092]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PRKCA         inaC         CG6518         w[1]; w[0](-23); P[w[+mC]=2xTb[1]=RFP]CyO           PRKCA         inaC         CG6562         y[1] w[0] <sup>2</sup> /C3]; P[w[+mC]=2xTb[1]=RFP]CyO           PRKCA         kc53E         CG6622         y[1] w[0] <sup>2</sup> /C3]; P[w[+mC]=2RB]Pkcdelta[e04408]           PRKCD         Pkcdelta         CG42349         w[1118] PBac[w[+mC]=RB]Pkcdelta[e04408]	PITPNM2	rdgB	CG11111	y[1] w[67c23] P[w[+mC] y[+mDint2]=EPay2]rdgB[EY20869] CG32625[EY20869]/FM7c, P[w[+mC]=2xTb[1]-RFP]FM7c, sn[+]
PLK1         polo         CG12306         w( <sup>+</sup> ) <sup>*</sup> P{w(+mC]=PTT-GC)polo(CC01328)/TM6B, Tb[1]           PLK4         SAK         CG7186         w(1118); PBac/w(+mC]=PB]SAK[c06612/TM6B, Tb[1]           PRKAA2         SNF1A         CG3051         SNF1A[1]/FM7c, P{w(+mC]=2xTb[1]-RFP]FM7c, sn[+]           PRKAA2         Pka-C1         CG4379         Pka-C1[1/2]/CV_0 P(w(+mC]=2xTb[1]-RFP]CyO           PRKAC3         CG12069         CG12069         w[1118]; M[ET1)CG12069[MB10013]/TM6B, Tb[1]           PRKAC4         Pka-R2         CG15862         y[1] w[']: m[y[+mDin2]=MIC]Pka-R2[MI00092]/CVO, P{w(+mC]=2xTb[1]-RFP]CyO           PRKCA         inaC         CG6582         y[1] w[7]: aaC[2]           PRKCA         Pkc53E         CG6622         y[1] w[7: c33]; P[w[+mC] y[+mDin12]=EPgy2]Pkc53E[EY14093]           PRKCD         Pkcdelta         CG42349         w(1118] PBac/w[+mC]=RB]Pkcdelta[e04408]	PKN2	Pkn	CG2049	P{ry[+t7.2]=PZ}PKn[06736] cn[1]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
PLK4         SAK         CG7186         w[1118]; PBac(w[+mC]=PB)SAK[c06612]/TM6B, Tb[1]           PRKAA2         SNF1A         CG3051         SNF1A[1]/FM7c, P(w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PRKACA         Pka-C1         CG4379         Pka-C1[H2]/CyO, P(w[+mC]=2xTb[1]-RFP]CyO           PRKACG         CG12069         CG12069         w[1118]; Mi[ET1]/CG12069[MB10013]/TM6B, Tb[1]           PRKAR2A         Pka-R2         CG15862         y[1] w[1]; Mi[Y]+mDit2]=MIC)Pka-R2[M00092]/CyO, P(w[+mC]=2xTb[1]-RFP]CyO           PRKAR2A         Pka-R2         CG15862         y[1] w[1]; Mi[Y]+MDit2]=MIC)Pka-R2[M00092]/CyO, P(w[+mC]=2xTb[1]-RFP]CyO           PRKCA         inaC         CG618         w[1]; inaC[2]           PRKCA         Pkc53E         CG6622         y[1] w[67:c23]; P(w[+mC]=FB]Pkcdelta[e04408]           PRKCD         Pkcdelta         CG42349         w[1118] PBac(w[+mC]=RB]Pkcdelta[e04408]	PLK1	polo	CG12306	w[1]: P{w[+mC]=PTT-GC}polo[CC01326]/TM6B, Tb[1]
PRKAA2         SNF1A         CG3051         SNF1A[1]/FM7c, P{w[+mC]=2xTb[1]-RFP]FM7c, sn[+]           PRKACA         Pka-C1         CG4379         Pka-C1[H2]/CyO, P{w[+mC]=2xTb[1]-RFP]CyO           PRKACG         CG12069         CG12069         w[1118]; M[ET1]CG12069[MB10013]/TM6B, Tb[1]           PRKAR2A         Pka-R2         CG15862         y[1] w[*]; Mi(y[+mDint2]=MIC)Pka-R2[M00092]/CyO, P{w[+mC]=2xTb[1]-RFP]CyO           PRKCA         inaC         CG6518         w[*]; inaC[2]           PRKCA         Pkc53E         CG6622         y[1] w[67c23]; P{w[+mC]=EPgy2]Pkc53E[EY14093]           PRKCD         Pkcdelta         CG42349         w[1118] PBac{w[+mC]=RB]Pkcdelta[e04408]	PLK4	SAK	CG7186	w[1118]; PBac{w[+mC]=PB}SAK[c06612]/TM6B, Tb[1]
PRKACA         Pka-C1         CG4379         Pka-C1[I+2]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO           PRKACG         CG12069         CG12069         w[1118]; M[ET1]CG12069[MB10013]/TM6B, Tb[1]           PRKAR2A         Pka-R2         CG15862         y[1] w[7]: M{[y]+mC]=2xTb[1]-RFP}CyO           PRKCA         inaC         CG6518         w[7]: inaC[2]           PRKCA         Pkc53E         CG6622         y[1] w[67c23]; P{w[+mC]=EPgy2}Pkc53E[EY14093]           PRKCD         Pkcdelta         CG42349         w[1118] PBac{w[+mC]=RB}Pkcdelta[e04408]	PRKAA2	SNF1A	CG3051	SNF1A[1]/FM7c, P{w[+mC]=2xTb[1]-RFP}FM7c, sn[+]
PRKACG         CG12069         CG12069         w[1118]; M[ET1]CG12069[MB10013]/TM6B, Tb[1]           PRKAR2A         Pka-R2         CG15862         y[1] w[7]: M[y[+mDint2]=MIC]Pka-R2[MI00092]/CyO, P[w[+mC]=2xTb[1]-RFP]CyO           PRKCA         inaC         CG6518         w[7]; inaC[2]           PRKCA         Pkc53E         CG6622         y[1] w[67:23]; P[w[+mC]]=EPgy2]Pkc53E[EY14093]           PRKCD         Pkcdelta         CG42349         w[1118] PBac{w[+mC]=RB]Pkcdelta[e04408]	PRKACA	Pka-C1	CG4379	Pka-C1[H2]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
PRKAR2A         Pka-R2         CG15862         y[1] w[1]; M[y[+mDint2]=MIC]Pka-R2[MI00092]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO           PRKCA         inaC         CG6518         w[1]; inaC[2]           PRKCA         Pkc53E         CG6622         y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2}Pkc53E[EY14093]           PRKCD         Pkcdelta         CG42349         w[1118] PBac{w[+mC]=RB}Pkcdelta[e04408]	PRKACG	CG12069	CG12069	w[1118]; Mi{ET1}CG12069[MB10013]/TM6B, Tb[1]
PRKCA         inaC         CG6518         w(*); inaC[2]           PRKCA         Pkc53E         CG6622         y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2}Pkc53E[EY14093]           PRKCD         Pkcdelta         CG42349         w[1118] PBac{w[+mC]=RB}Pkcdelta[e04408]	PRKAR2A	Pka-R2	CG15862	y[1] w[*]; Mi{y[+mDint2]=MIC}Pka-R2[MI00092]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
PRKCA         Pkc53E         CG6622         y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2}Pkc53E[EY14093]           PRKCD         Pkcdelta         CG42349         w[1118] PBac{w[+mC]=RB}Pkcdelta[e04408]	PRKCA	inaC	CG6518	w[*]; inaC[2]
PRKCD Pkcdelta CG42349 w[1118] PBac{w[+mC]=RB}Pkcdelta[e04408]	PRKCA	Pkc53E	CG6622	y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2}Pkc53E[EY14093]
	PRKCD	Pkcdelta	CG42349	w[1118] PBac(w[+mC]=RB}Pkcdelta[e04408]

### Supplementary Table 1, continued.

Human gene name	Fly gene name	Fly geneID	Fly genotype
PRKCE	Pkc98E	CG1954	w[1118]; PBac{w[+mC]=WH}Pkc98E[f06221]/TM6B, Tb[1]
PRKCI	aPKC	CG42783	y[1] w[67c23]; P{w[+mC]=lacW}aPKC[k06403]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
PRKD1	PKD	CG7125	v[1] w[67c23]; Mi{ET1}PKD[MB00674]
PRKG1	CG4839	CG4839	v11 wf1: M/v1+mDiv12=MIC\CC4830IMI08552//Cv0_P/w[+mCl=2vTb[1]-REP\Cv0
DBKC1	for	CC10022	(i) w(i) indirac]=wird(correct)intercorrect(wird(correct)) (i) (i) (i) (i) (i) (i) (i) (i) (i) (
PRKO	IUI DiO1D	000003	y[i] w[], {w[Tito]=0x3p+irr:Rabx2.32 IN}io[02]/CyO, P(w[Tito]=2x10[1]-RFP3CyO
PRKGZ	PKgZTD	CG3324	w[1118]; wi[E11]FKg21D[wiB04805]
PRKX	Pka-C3	CG6117	y[1] w[*]; Mi{y[+mDint2]=MIC}Pka-C3[MI04599]/TM6B, Tb[1]
PRPF4B	CG7028	CG7028	y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2}CG7028[EY11156]
PTK2	Fak	CG10023	y[1] w[67c23]; P{y[+mDint2] w[BR.E.BR]=SUPor-P}Fak[KG00304]
PTK7	otk	CG8967	w[1118]; P{w[+mC]=EP}otk[EP2017]/CvO. P{w[+mC]=2xTb[1]-RFP}CvO
PXK	CG8726	CG8726	v[1] w[67-23]: P[w]+mC] v[+mDint2]=EPav2)CG8726[EY21837]
DYK	Slob	CG43756	(1) Resc(CALAD EVED)(ShollDL0)2841(D10)2841(D10)2611-pt(1)-bu(1)-DB22(CALAD EVED)DL00361 D(w(±m)(Lb2)-EPT(w(b2))20 D(x(±m2)-20-EPT)828
	SIUD	00443750	
REI	Ret	CG14396	y[1] w[']; m[y]+mDintz]=m[C];Ret[m]07200]/CyO, P{w[+mC]=2x1b[1]-RFP}CyO
RIOK3	CG3008	CG3008	y[1] w[1118]; P{w[+mC]=EP}CG3008[G18059]
ROCK1	rok	CG9774	y[1] w[1118] rok[2] P{ry[+t7.2]=neoFRT}19A/FM7c, P{w[+mC]=2xTb[1]-RFP}FM7c, sn[+]
ROS1	sev	CG18085	w[1118] sev[14]; P{w[+mW.hs]=sev2}ch21
RPS6KA3	S6kII	CG17596	w[*] P{w[+mC]=EP}S6kII[G1845] CG17600[G1845]
RPS6KA5	.111 -1	CG6297	v11: P/v1+mDint21wIBR F BRI=SUPpr-PUIL-1[KG02848] v/506)/TM6B Tb(1)
RPS6KB1	S6k	CG10539	$p_{in}$ (i) many formation of the set of $p_{in}$ (constrained in the set of $p_{in}$ (constrained in the set of $p_{in}$ ) (constrained in the set of p_{in}) (constrained in the set of $p_{in}$ ) (constrained in the set of p_{in}) (con
DVK	JUK	0017550	r (v) (r / z)=r z / sok(v) (v) (r / v) (v) (v) (v) (v) (r / v) (v) (r / v) (v) (v) (v) (v) (v) (v) (v) (v) (v)
RIK	ant	CG17559	y[1] w[or023]; P(y]+(1.7) w[+mc]=wmy/ant[DG04004]/CyO, P(w[+mc]=2x10[1]-rcP)/CyO
RYK	drl	CG17348	w[1118]; drl[exc21]/CyO, P{w[+mC]=2x1b[1]-RFP}CyO
RYK	Drl-2	CG3915	w[1118]; P{w[+mGT]=GT1}Drl-2[BG02105]
SBK1	CG11221	CG11221	y[1] w(*); Mi{y[+mDint2]=MIC}CG11221[MI03008]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
SBK2	CG4945	CG4945	w[1118]; PBac{w[+mC]=WH}CG4945[f02115]
SCYL1	vata	CG1973	v[1] w[67c23]: P{v[+t7.7] w[+mC]=wHv]vata[DG08312]/TM6B_Tb[1]
SCVL2	CG1951	CG1051	11 w(67-2)3: D(u(+))(u(+
SOVI 2	001331	001331	y[1] w[0122], F(w[HID]) w[0] CO24SE(MURCH) TH(1)
SUTLZ	CG34356	CG34356	y[1] w[1]; w[k]+mDint2]=w[c]>C534330[w106049] / 100B; 10[1]
SCYL3	CG1344	CG1344	w[1118]; P{w[+mC]=EP}CG1344[EP2646]/CyO, P{w[+mC]=2x10[1]-R+P}CyO
SGK494	Pk17E	CG7001	y[1] w[67c23] P{w[+mC] y[+mDint2]=EPgy2}Pk17E[EY06723]
SIK2	Sik2	CG4290	P{w[+mC]=EP}Sik2[G366] w[*]
SIK3	Sik3	CG42856	y[1] w[67c23]; P{w[+mC] y[+mDint2]=EPgy2}Sik3[EY14354]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
SMG1	nonC	CG32743	w[*] P{w(+mCl=EP)nonC(G1076)
SPEG	Unc-89	CG33519	v[1] w(67c23): P/w(+mC] v(+mDint2)=EPav2)[ loc-89(EY15484]
CDUK1	CH2	0000010	All w[6725]: Du(Hino) Dirth w[DE E DE] = 02100 O(E) (V/C/600/4) = (6.01)
OPPKO	ORZ	000474	y(1) w(0/c2), P(y(1)), D(1), CD(1)) CD(1) (2000) (1) (1) (2000) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1
SRPK2	SRPK	CG8174	y[1] w[orcz3]; P{w[+mC] y[+mDintz]=EPgyz}SRPK[EY03876]
SRPK3	srpk79D	CG11489	w[1118]; PBac{w[+mC]=PB}srpk79D[c00270]
STK10	slik	CG4527	y[1]; P{y[+mDint2] w[BR.E.BR]=SUPor-P}slik[KG04837]
STK17A	Drak	CG32666	y[1] P{y[+mDint2] w[BR.E.BR]=SUPor-P}Drak[KG03058]/FM7c, P{w[+mC]=2xTb[1]-RFP}FM7c, sn[+]
STK3	hpo	CG11228	v[d2] w[1118] P{rv[+t7,2]=ev-FLP.N]2; P{rv[+t7,2]=neoFRT]42D hoo[KC202]/CvO, P{w[+mC]=GAL4-Kr,C}DC3, P{w[+mC]=UAS-GFP.S65T}DC7
STK32B	CG32944	CG32944	w(*): P{w(+mW hs]=FRT/w(hs]))2A PBac(GAI 4D EYFP)CG32944[P] (00206) P{rv[+t7,2]=neoFRT)82B
STK36	fu	CG6551	fundsignation of the funds of t
OTKO	iu t	000001	
511,30	trc	CG8037	
STK39	tray	CG7693	y[1] w[']; Mi{y[+mDintz]=MiC}fray[Mi03454] CG7694[Mi03454]/TM6B, TD[1]
STYK1	CG3277	CG3277	y[1] w[*]; Mi{y[+mDint2]=MIC}CG3277[MI06697]
SYK	shark	CG18247	P{ry[+t7.2]=neoFRT}43D shark[1]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
TAF1	Taf1	CG17603	w[1118]; P{w[+mC]=EP}Taf1[EP421]/TM6B, Tb[1]
TAOK1	Тао	CG14217	w[1118] P{w[+mC]=EP}Tao[EP1455]
TBK1	ik2	CG2615	v(1) w(*); ik/251 do[ov1] bw(1)/CvO_P/w(+mCl=2xTb(1)-REP)CvO
TEC	Btk29A	CG8040	/11/wi52/31/P/wi4mClaa/Wi54/20/06//CV/D P/wi4mCla2/2Th/11/REP/CV/D
TECKO	odi	000043	
TESKZ	cal	CG6027	
TGFBR1	babo	CG8224	w[']; babo[32]/CyO, P{w[+mC]=2x1b[1]-RFP}CyO
TIE1	Tie	CG7525	y(1) w(*); Mi{y(+mDint2]=MIC}Tie[MI02904]/TM6B, Tb[1]
TIE1	tor	CG1389	vas[1] tor[1] cn[1] bw[1] sp[1]/CyO, P{w[+mC]=2xTb[1]-RFP}CyO
TLK2	tlk	CG34412	y[1] w[67c23] P{w[+mC] y[+mDint2]=EPgy2}Tlk[EY14954]/FM7c, P{w[+mC]=2xTb[1]-RFP}FM7c, sn[+]
TNK1	Ack-like	CG43741	w[1118]: Mi/ET1)Ack-like[MB05119]
TNK2	Ack	CG1/002	v[1] w[67-c3]: P[u]+mC] v[+mDint2]=EPav2]Ack[EV00374]
TDIP2	trbl	CC5408	(1) P((Appl)) (Appl) (A
TODAD	Nime of A	00000554	y[1], Fy[HiDini2] w[Br.c. br]=30F0H=fublice2300[Jy[300] Hilds, To[1]
TRRAP	Nippea-A	0633554	
TSSK1B	CG14305	CG14305	w[1118]; P{w[+mC]=EPg]CG14305[HP30350] CG14304[HP30350]
TTBK1	Asator	CG11533	y[1] w[67c23]; ry[506]; P{y[+mDint2] w[BR.E.BR]=SUPor-P]Asator[KG05051]
TTK	ald	CG7643	w[*]; P{w[+mGS]=GSV1}ald[EP-M50.2]/TM6B, Tb[1]
TTN	bt	CG32019	w[1118]; bt[l-b/ln(4)ci[D], ci[D] pan[ciD]
ULK1	Ata1	CG10967	w[1118]: P(rv[+tZ]2)=PZ)Atr1[00305] rv[506]/TM6B_Tb[1]
LILK3	CG8866	CG8866	v[1] u[3/23] - Dju[4] - Dju[5]
	000000	000000	J() η (στο εσ), τη τητο J() η (στο ματρίας)=CP σ() C (CO070[C 1102 ] ) (πίσα, το (τ)]
VRNJ	0600/0	0000/8	y(1) w(o/cs2), r/w(Tinc) y(TinDin(Z)=CP(y(2))C660/6[cT10/70] Hen1[cT10/70]
VVEE1	wee	CG4488	w[1]; wee[ES1] cn[1]/CyO, P{w[+mC]=2x1b[1]-R+P}CyO
WNK1	Wnk	CG7177	y(1) w[6/c23]; P{w[+mC] y[+mDint2]=EPgy2}Wnk[EY10165]/TM6B, Tb[1]

### Supplementary Table 1, continued.

Chron	nosome	Х								
	Drugs		Gene sym	lod	ptc>Ret <sup>^</sup>	<sup>19557</sup> viabi	lity (%)		s.e.	
_	soraf	L15	Human	Fly	_	soraf	L15	_	soraf	L15
				control	3	18	20	1	1	4
Pro-ta	rget for	sorafe	nib							
*	М		SGK494	Pk17E	19	67	43	4	5	18
Pro-ta	rgets fo	r LS1-	15							
*		М	GSK3	sgg	13	29	69	2	14	13
*		М	NEK11	png	26	35	63	8	4	7
*		М	TLK2	tlk	35	42	59	2	6	9
*		М	ROS1	sev	17	30	54	4	8	8
*		W	BRD3	fs(1)h	31	38	47	6	10	7
*		W	CSNK1A1 (CK1a)	Cklalpha	37	14	43	3	10	1
*		W	PINK1	Pink1	33	19	42	5	4	7
		W	DYRK1A	mnb	2	29	36	1	5	1
Pro-ta	rgets fo	r both	sorafenib and LS1-1	15						
*	S	S	BRAF	phl	100	90	96	0	7	4
*	S	S	STK36 (FU)	fu	76	93	88	9	7	13
*	S	S	PRKAA2 (AMPK)	SNF1A	29	86	81	3	9	10
*	М	М	MEK	Dsor1	78	55	80	6	3	20
*	М	М	JAK	hop	45	63	78	9	11	9
*	W	М	TAOK1	Тао	24	46	75	12	17	3
*	М	М	MAP2K6 (MKK6)	lic	36	54	75	10	8	13
*	W	М	ROCK1	rok	32	42	67	15	2	7
	М	М	STK17A (DRAK1)	Drak	14	64	65	9	9	6
*	М	М	MAP2K7 (MKK7)	hep	20	55	58	6	2	5
*	М	W	ATR	mei-41	10	61	39	3	6	1
	W	W	CDC7	l(1)G0148	0	24	21	0	4	1

#### Supplementary Table 2: Pro-targets of sorafenib [1] and LS1-15 [4].

A list of genes of which heterozygosity led to statistically significant increase in the survival of  $ptc>dRet^{M955T}$  flies in the presence of **1** or **4**.  $ptc>dRet^{M955T}$  flies were crossed to kinase-mutant flies, and the number of  $ptc>dRet^{M955T}$ , mutant<sup>-/+</sup> adults was divided by that of total pupae to calculate percent viability. Viabilities of kinase-proficient controls differ between data sets for different chromosomes due to swapped genders of parent flies in the crosses (Supplementary Figs. 3b-h). W, M, and S indicate statistically significantly weak, modest, and strong effects, respectively: for genes on the X chromosome, weak (21-50% viability), moderate (51-80% viability), and strong effects (81-100% viability), respectively, and for genes on 2nd, 3rd, and 4th chromosomes, weak (51-70% viability), moderate (71-90% viability), and strong effects (91-100% viability), respectively. s.e., standard error for three experimental replicates. Asterisks: statistically significant change in % viability in the absence of drug treatment. –, soraf, and L15 indicate vehicle-, sorafenib [**1**]-, and LS1-15 [**4**]-treated flies, respectively.

Chron	nosome	s 2, 3 a	and 4								
	Drugs		Gene symb	ol	ptc>Ret	<sup>M9557</sup> viabi	lity (%)		s.e.		
-	soraf	L15	Human	Fly	-	soraf	L15		soraf	L15	
				control	28	48	52	3	5	9	
Pro-ta	rgets fo	or soraf	enib								
	М		KSR2	ksr	51	78	69	8	2	13	
	М		STK24 (MST3)	GckIII	61	73	67	12	7	10	
*	М		IKBKB	ird5	47	89	57	5	2	9	
*	М		STK39 (PASK)	fray	54	71	52	3	8	6	
	М		ABL1, ABL2	Abl	18	79	42	6	3	6	
	М		MAP3K4 (MTK1)	Mekk1	12	72	38	4	5	5	
Pro-ta	rgets fo	or LS1-	15								
*		S	LATS1 (WARTS)	wts	70	58	96	10	4	4	
		М	KDR	Cad96Ca	44	46	89	13	5	1	
		М	PRKCA	Pkc53E	55	51	87	11	5	2	
		М	TNK1	Ack-like	42	55	87	6	4	2	
*		М	ADCK5	CG7616	84	63	86	3	7	3	
*		М	CDK2	cdc2c	78	54	85	4	3	7	
		М	CSNK1G3	aish	58	51	83	12	10	1	
*		M	CAMK1D	CaMKI	56	43	83	4	3	3	
*		M	RYK	Drl-2	53	58	83	13	5	2	
*		M	RPS6KA5 (MSK1)		75	32	83	5	11	5	
*		M	CDK1	cdc2	58	56	82	7	16	1	
*		M	PAK1	Pak	65	30	81	3	5	2	
*		M	FFR	Fns85D	72	50	81	2	13	7	
		M		CG3216	37	30	80	2	10	1	
*		M	SVK	shark	63	18	80	13	7	10	
		M	DTK7	silain	11	40	80	15	2	0	
*		IVI M	CDKA/6	Cdka	41 50	52	70	0	12	2	
*		IVI NA		CUK4	20	55	79	6	12	3	
*		IVI N4		dat	30 22	44 60	75	0 2	0	י ר	
*		IVI N4			33	00	70	ు	0	2	
ale		IVI N4	LNDI MASTI (CM/L)	LKDI	01	10	74	0 7	1	2	
**		IVI NA	MASTL (GWL)	gwi	61	38	74	1	5	ð	
*		IVI N4	AUVKI	Sax	35	52	13	1	2	2	
т Ф		IVI	VKKJ		43	46	13	2	2	1	
т 4		IVI		SU	58	43	12	9	8	4	
*		M	PLK4	SAK	64	39	72	(	5	6	
*		M	CDK12	Cdk12	66	47	72	2	2	6	
*		M	NLK	nmo –	69	45	71	3	0	7	
		W	MTOR	lor	43	46	70	9	9	5	
*		W	CASK	CASK	48	53	68	3	9	3	
10		W	PLK1	polo	39	24	68	9	12	5	
*		W	RPS6KB1 (p70S6K)	S6k	61	39	66	9	7	1	
		W	MINK1	msn	42	34	66	6	4	1	
*		W	DDR2	Ddr	49	37	65	6	12	4	
		W	ATM	tefu	29	61	62	4	2	1	

Supplementary Table 2, continued.

	Drugs		Gene symbol		ptc>Ret	<sup>M9557</sup> viabi	lity (%)	s.e.			
-	soraf	L15	Human	Fly	_	soraf	L15	_	soraf	L15	
				control	28	48	52	3	5	9	
Pro-ta	argets fo	or both	sorafenib and LS1-15	i							
*	S	S	TGFBR1 (ALK5)	babo	98	96	100	2	2	0	
*	М	S.	LRRK1	Lrrk	94	87	98	2	3	1	
*	М	S	MAP4K3 (GLK)	hppy	95	89	97	1	5	1	
*	М	S	MUSK	Nrk	77	79	95	5	5	3	
*	W	S	DYRK4	smi35A	64	70	95	10	8	3	
*	S	S	PKN	Pkn	88	93	94	2	2	3	
*	М	S	SRPK	SRPK	77	89	94	7	11	4	
*	М	S	PRKD1	PKD	83	84	94	4	3	1	
	М	S	PRKG1	CG4839	60	74	93	14	2	2	
*	М	S	TNK2	Ack	70	71	93	1	6	4	
*	М	S	ILK	llk	85	78	93	1	5	6	
	М	S	CDC42BPA	gek	47	81	92	8	2	1	
*	W	S	CHEK1	grp	78	67	92	5	4	3	
	М	S	MAP3K13 (LZK)	wnd	33	82	92	5	5	4	
*	М	S	SRPK	srpk79D	88	87	92	6	4	4	
*	М	S	FRK	Src42A	88	80	91	6	9	5	
*	М	S	JNK	bsk	76	88	91	6	3	5	
*	М	S	EPH	Eph	72	64	91	2	4	3	
*	W	S	AKT1	Akt1	51	69	91	7	3	2	
*	М	М	PRKACA (PKA)	Pka-C1	56	71	90	4	4	7	
*	М	М	TTN	bt	78	82	90	6	4	4	
*	M	M	BUB1	Bub1	45	80	90	4	13	2	
*	W	М	SPHK2 (SK2)	Sk2	67	68	89	1	8	7	
*	M	M	CSNK1E	dco	90	72	89	8	8	6	
*	M	M	CDK9	Cdk9	48	81	89	4	8	2	
*	W	M	RFT	Ret	73	69	88	3	4	6	
*	M	M	FLT1	Pvr	69	71	88	4	9	2	
*	M	M	FGFR	Fafr	86	76	88	1	4	1	
*	M	M	NPR2	Gvc32F	61	76	87	8	4	4	
*	W	M	SIK3	Sik3	43	67	86	3	4	4	
*	M	M	STK3 (MST2)	hno	66	76	86	3	8	6	
	M	M	SCVI 2	CG1051	31	70	86	8	14	1	
*	M	M	SCVL3	CG1344	67	73	86	7	9	2	
*		M	PRPF4R	CG7028	57	65	88	Δ	5	2	
*	N/	M	STK32B (VANK2)	CG32011	60	80	88	+ /	6	2	
*		M	NIIAK1	CG431/3	62	60	8/	ч Л	7	6	
*		N/	TESKO	odi	02 Q0	60	04 Q2	+ 6	10	10	
10.00	VV	IVI	ILONZ	Gui	02	00	05	0	12	12	

#### Chromosomes 2, 3 and 4 (continued)

Supplementary Table 2, continued.

	Drugs		Gene symbol		ptc>Ret <sup>/</sup>	<sup>M955T</sup> viabi	lity (%)	s.e.			
-	soraf	L15	Human	Fly		soraf	L15		soraf	L15	
				control	28	48	52	3	5	9	
*	М	М	CDK8	Cdk8	84	78	83	4	5	4	
	W	М	RIOK3	CG3008	49	69	83	9	2	3	
*	М	М	MYLK	Strn-Mlck	61	85	83	2	4	2	
	М	Μ	PDK3	Pdk	16	71	83	4	16	6	
*	М	М	PRKG1	for	55	73	82	4	14	2	
	М	М	PRKG2	Pkg21D	41	73	82	7	3	4	
*	S	М	CSNK2A1	Ckllalpha	69	93	82	4	7	7	
*	S	М	MAPK11 (p38b)	p38c	63	93	81	6	7	3	
*	М	М	SPEG	Unc-89	68	78	81	1	9	10	
*	Μ	М	STK10 (LOK)	slik	68	83	81	3	4	1	
*	Μ	М	CAMK2D	CaMKII	72	78	81	6	9	8	
*	М	М	BMPR2	wit	78	74	81	1	2	1	
*	М	М	PTK2 (FAK)	Fak	58	81	80	2	3	7	
*	М	М	CDK14	Eip63E	72	73	80	6	6	6	
*	W	М	MARK3	par-1	67	70	79	6	7	10	
	М	М	WEE1	wee	18	78	78	5	9	4	
*	М	М	PIK3CA	Pi3K92E	59	72	78	5	7	3	
*	W	М	PIK3C2A	Pi3K68D	49	63	78	8	10	6	
*	М	М	TRRAP	Nipped-A	66	82	78	12	2	4	
*	М	М	MAP2K4 (MKK4)	Mkk4	56	75	78	4	6	12	
*	W	М	ULK1 (ATG1)	Atg1	79	61	78	8	1	1	
*	W	М	MAPK14 (p38a)	Mpk2	82	51	78	1	1	2	
	W	М	MAPK11 (p38b)	p38b	39	69	77	4	3	6	
*	W	М	SCYL1	yata	91	70	77	7	13	4	
	W	М	CDC7	CG5790	31	61	76	9	13	3	
*	W	М	GRK5	Gprk2	64	70	73	5	2	5	
*	W	М	TTBK1 (BDTK)	Asator	60	67	72	9	7	4	
*	М	М	MYLK2	sqa	47	77	72	5	6	4	
	W	М	NPR1	CG10738	45	64	71	5	6	2	
*	М	W	MAPK1 (ERK)	rl	53	71	69	4	5	10	
	М	W	PRKCI	aPKC	35	78	68	7	2	1	
	Μ	W	NIM1	CG4629	29	79	68	2	2	10	
*	М	W	SRC, LCK, HCK	Src64B	70	74	67	2	3	2	
	М	W	SBK2	CG4945	25	76	67	9	1	0	
*	М	W	GAK	aux	56	71	67	3	5	7	
	М	W	AAK1	Nak	42	77	66	5	7	5	
*	W	W	PRKX	Pka-C3	49	70	66	5	3	4	
*	М	W	BTK	Btk29A	60	81	63	2	4	4	
	М	W	SBK1	CG11221	31	86	56	5	7	6	

Chromosomes 2, 3 and 4 (continued)

Supplementary Table 2, continued.

Chroi	mosom	ie X								
	Drugs		Gene symbo	l .	ptc>Ret <sup>^</sup>	<sup>⁄/9557</sup> viabi	lity (%)		s.e.	
-	soraf	L15	Human	Fly	-	soraf	L15	-	soraf	L15
				control	3	18	20	1	1	4
Anti-t	argets	for LS	1-15							
		S	SMG1	nonC	3	31	2	3	10	2
		М	LIMK1	LIMK1	1	22	8	1	9	4
Anti-t	argets	for bo	th sorafenib and LS1-1	5						
*	S	S	MAPK15 (ERK7)	Erk7	0	0	0	0	0	0
	М	S	MAP3K7 (TAK1)	Tak1	3	8	2	3	4	2
*	М	S	RPS6KA3 (p90RSK)	S6kII	0	8	4	0	7	4
Chroi	mosom	es 2, 3	3 and 4							
				control	28	48	52	3	5	9
Anti-t	arget fo	or sora	afenib							
	М		CSK	csk	43	22	58	11	5	6
Anti-t	argets	for LS	1-15							
*		М	STK38	trc	3	34	14	1	12	2
*		М	МҮОЗА	ninaC	14	48	25	2	3	4
*		W	MAP3K15 (ASK3)	Pk92B	16	40	36	4	8	1
Anti-t	argets	for bo	th sorafenib and LS1-1	5						
*	S	S	PDPK1	Pdk1	0	0	0	0	0	0
*	S	S	HIPK2	hipk	0	0	0	0	0	0
*	S	S	TTK	Mps1	1	0	0	1	0	0
*	S	S	MKNK1	Lk6	0	0	0	0	0	0
	S	М	PAK3	Pak3	14	6	20	8	4	2

#### Supplementary Table 3: Anti-targets of sorafenib [1] and LS1-15 [4].

A list of genes whose heterozygosity caused statistically significant decrease in % viability of  $ptc>dRet^{M955T}$  flies in the presence of drugs. Same legend as Supplementary Table 2 except for W, M, and S for genes on the X chromosome (weak [11-17% viability], moderate [6-10% viability], and strong [0-5% viability] effects, respectively} or 2nd, 3rd, and 4th chromosomes (weak [30-47% viability], moderate [10-29% viability], and strong effects [0-9% viability], respectively).

kinase	sorafenib [1]	LS1-15 [4]	APS5-16-2 [9]	APS-6-45 [10]	APS3-69-1 [5]	LS1-37 [6]	kinase	sorafenib [1]	LS1-15 [4]	APS5-16-2 [9	APS-6-45 [10	] APS3-69-1 [5]	LS1-37 [6]
ABL2 (Arg)	9	27	21	55	31	6	MAPK14 (p38 alpha)	11	21	29	19	38	11
ACVR1B (ALK4)	-2	4	1	-4	1	7	MAPK14 (p38 alpha) Direct	46	41	44	26	52	1
AKT1 (PKB alpha)	5	4	2	0	2	3	MAPK8 (JNK1)	-30	2	6	8	-9	6
AMPK A1/B1/G1	5	-4	-4	0	-6	1	MAPK9 (JNK2)	-15	32	7	10	7	-3
AMPK A2/B1/G1	12	4	5	9	1	7	MUSK	78	96	76	45	91	8
AURKA (Aurora A)	6	8	2	8	11	2	NTRK1 (TRKA)	29	71	52	47	64	6
BMPR2	3	0	2	-4	-4	7	NUAK1 (ARK5)	-11	-1	2	-4	5	6
BRAF	53	45	3	3	30	10	PAK3	8	7	2	6	17	28
CAMK1D (CaMKI delta)	-1	3	2	3	1	0	PDGFRA (PDGFR alpha)	94	89	82	63	81	15
CAMK2A (CaMKII alpha)	6	-5	-3	3	-2	2	PDK1 Direct	-9	19	-4	0	2	0
CDC42 BPA (MRCKA)	-6	-3	-10	-3	-12	-3	PKN1 (PRK1)	-7	12	16	4	-4	3
CDK1/cyclin B	0	-2	-1	2	2	0	PRKACA (PKA)	-4	2	4	4	-3	2
CSK	-2	13	4	21	20	0	PRKCA (PKC alpha)	26	1	-6	1	3	1
CSNK1A1 (CK1 alpha 1)	7	5	-2	2	4	2	PRKCB1 (PKC beta I)	-4	10	3	6	8	12
CSNK1E (CK1 epsilon)	-1	3	4	11	1	0	PRKG1	0	6	3	1	1	0
DDR2	42	97	91	96	95	7	PRKG2 (PKG2)	10	4	-2	1	-3	-1
DYRK1A	0	-7	2	3	3	0	PTK2 (FAK)	10	8	6	8	4	7
DYRK1B	-2	-3	-1	0	-2	-2	PTK2B (FAK2)	-2	-3	-2	7	-7	1
EGFR (ErbB1)	6	0	-7	3	-2	1	PTK6 (Brk)	-4	25	20	14	44	6
EPHA2	21	93	53	13	89	10	RET	94			52	102	3
FER	15	-2	-2	8	0	-4	RET M918T	101	99	92	84	100	3
FGFR1	14	8	15	9	15	4	ROCK1	-10	2	4	-5	5	3
FLT1 (VEGFR1)	62	62	45	24	74	-12	ROS1	-1	15	2	7	10	-5
FRAP1 (mTOR)	-3	-7	-10	3	-4	-1	RPS6KA3 (RSK2)	11	-3	0	0	-3	1
FRK (PTK5)	19	79	72	55	84	8	RPS6KA5 (MSK1)	0	5	5	6	4	-1
FYN	-4	12	6	7	17	8	RPS6KB1 (p70S6K)	-9	1	11	6	5	-4
HCK	-1	24	20	24	35	2	SGK (SGK1)	9	-1	4	4	5	3
HIPK2	8	6	8	5	6	2	SRC	3	14	12	13	23	3
IKBKB (IKK beta)	1	-1	-3	3	-7	-3	SRPK1	1	2	-1	-1	2	2
INSR	3	5	0	4	2	-2	SRPK2	-6	9	2	-3	2	3
JAK2	2	24	5	3	25	2	SYK	2	7	1	-9	0	3
KIT	49	32	2	1	21	16	TAOK2 (TAO1)	22	8	15	18	2	-10
LCK	18	33	22	39	58	14	TGFBR1 (ALK5)	2	1	6	-2	3	-3
LIMK1	45	6	0	3	11	-2	TNK2 (ACK)	1	-4	-3	3	-2	-2
LRRK2	9	25	22	24	21	18	WEE1	-3	-4	-2	-3	-4	-5
MAP2K1 (MEK1)	0	-7	-1	9	-5	-6	YES1	4	16	15	14	25	0
MAP2K6 (MKK6)	1/	32	52	30	21								% inhibition
MAP3K//MAP3K/IP1 (TAK1-TAB1)	35	31	58	/9	44	-11							81-100
MAP3K8 (COT)	6	12	10	12		13							41-80
MAP4K4 (HGK)	1/	4	-2	49	3	12							0-40

#### Supplementary Table 4: *In vitro* inhibition data for kinases.

Percent *in vitro* inhibition of human kinase activities by TCIs. Red, greater than 80% inhibition. White, 41-80% inhibition. Blue, less than 40% inhibition.

Category	Parameter	Description				
Assay	Type of assay	Whole organism				
	Target	Kinases				
	Primary measurement	Fly viability				
	Key reagents	Semi-defined fly medium (BDSC), DMSO (SIGMA- Aldrich)				
	Assay protocol	See "Fly assays" in Methods				
	Additional comments					
Library	Library size	31 FDA drugs and 30 in-house chemicals				
	Library composition	FDA-approved drugs and drug candidates				
	Source	Selleck, LC laboratories, Tocris Bioscience, and in- house				
	Additional comments					
Screen	Format	Fly culture vials				
	Concentration(s) tested	1 to up to 800 µM in 0.1% DMSO				
	Plate controls	not applicable				
	Reagent/ compound dispensing system	not applicable				
	Detection instrument and software	not applicable				
	Assay validation/QC	not applicable				
	Correction factors	not applicable				
	Normalization	not applicable				
	Additional comments					
Post-HTS analysis	Hit criteria	Rescue of lethality compared with DMSO control or sorafenib				
	Hit rate	not applicable				
	Additional assay(s)	Validation using cultured human MTC cells				
	Confirmation of hit purity and structure	Validated by LC-MS and <sup>1</sup> H NMR (See "Synthetic Methods and Compound Characterization")				
	Additional comments					

Supplementary Table 5: Small molecule screening data.



Supplementary Fig. 1: Determining the effects of inhibitors in *Drosophila* MTC model.

**a**, Scheme showing quantitative 'rescue-from-lethality' *Drosophila* platform used for drug and compound screening. In  $ptc>dRet^{M955T}$  flies, the *patched* (*ptc*) promoter drives an oncogenic mutant isoform of *Drosophila Ret* ( $dRet^{M955T}$ ) in several tissues, directing lethality prior to emergence as adults. Larvae consume candidate drugs; drug efficacy is quantified by dividing the number of rescued adults (*A*) by the number of total pupae (*P*).

#### **b**, Scheme showing preparation of *ptc>dRet*<sup>M955T</sup> flies. In

*ptc-gal4,UAS-GFP;UAS-dRet*<sup>M955T</sup>/*SM5*<sub>*tub-gal80</sub>-<i>TM6B* flies, *tubulin* promoter-driven GAL80 suppressed GAL4 activity to suppress  $dRet^{M955T}$  expression. For drug screening, these flies were crossed with  $w^{-}$  flies to create non-*Tb*, oncogenic *ptc-gal4,UAS-GFP;UAS-dRet*<sup>M955T</sup> (*ptc>dRet*<sup>M955T</sup>) flies that were morphologically distinguishable from *Tb* control flies at the pupal stage. Fly progenies were treated with or without drugs, and raised at 25°C.</sub>

**c**, The conformations of **1** when bound to various kinases in the DFG-out (*i.e.* inactive) conformation (gray); PDB ID of the shown structures is listed in parentheses. For example, when bound to BRAF, **1** (yellow version) interacts with the hinge region of the ATP-binding pocket and a conserved glutamate residue from the C-helix (E885) using hinge binder and linker regions, respectively. The cap group of **1** occupies the DFG-out pocket, which is created by movement of the phenylalanine (F1047) from the DFG-in (*i.e.* active) conformation.

**d**, Rescue of *ptc>dRet*<sup>M955T</sup> flies by TCIs. The chemical structures for tested compounds within the matrix is denoted based on linker (L1-L3), spacer (S1-S3), and caps (C1-C4) as shown in Fig. 2a. Lower case letters correspond to viability data as shown in Supplementary Figs. 2a and 2b. LS1-15 [**4**] (**j**) rescued viability significantly better than sorafenib [**1**] (**a**) and regorafenib [**2**] (**b**).



Supplementary Fig. 2: Extended description of the terminal cap group SAR.

**a**, Rescue of *ptc>dRet*<sup>M9557</sup> flies by TCIs. Additional, specific compound designations correspond to the synthetic procedures in the Methods section, and those highlighted in magenta posses spacer S2; see also Fig. 4a. APS5-16-2 carrying the  $-C_2F_5$  group within the cap showed significant rescue (**k**), whereas APS6-45, with the  $-isoC_3F_7$  substitution, shows the strongest efficacy (**o**) exceeding AD80. The lowercase letters (**a-o**) correspond to the dosing plots shown in **b**.

b, Dose response to TCIs. T, toxic dose for flies. Error bars, standard errors in triplicate.



# Supplementary Fig. 3: Determining the effects of heterozygosity of kinase genes in *Drosophila* MTC model.

**a**, Scheme showing screening approach to identify genetic modifiers of **4** efficacy in *ptc>dRet*<sup>M955T</sup> flies. Fly kinome genes were identified as "pro-targets" or "anti-targets" if—as whole animal heterozygotes (*ptc>dRet*<sup>M955T</sup>,*gene*<sup>-/+</sup>)—they increased or decreased, respectively, the efficacy of **4**.

**b-h**, Generating experimental flies.  $ptc > dRet^{M955T}$  flies are crossed with flies mutant for a kinase gene on either X (**b**, **c**), 2nd (**d**, **e**), 3rd (**f**, **g**), or 4th (**h**) chromosomes, and their progenies were raised on fly food with or without drugs at 23°C. Mutant alleles in parent flies are either balanced with *Tb* allele (**b**, **d**, **f**), or homozygous (**c**, **e**, **g**, **h**).



#### Supplementary Fig. 4: Shared and specific pro-targets and anti-targets.

**a**, *Lk6* heterozygosity had no effect on viability of control flies. Control ( $w^-$ ) or *Lk6* heterozygous ( $w^-$ ;*Lk6*<sup>-/+</sup>) larvae were treated with or without drugs, and cultured at 23°C. Percent viability was determined using numbers of pupae and adults. Error bars, standard errors in triplicate.

**b**, Venn diagrams showing pro-targets and anti-targets for **1** and/or **4**. Shown are strong pro-targets and strong anti-targets in which heterozygosity gave rise to > 91% and < 9% viability to  $ptc>dRet^{M955T}$  flies, respectively, in the presence of compounds at 23°C.





#### Supplementary Fig. 5: Pro-targets and anti-targets of sorafenib [1] and LS1-15 [4].

Pro-targets and anti-targets of **1** and **4** were grouped into receptor kinase/phosphoinositide 3-kinase (PI3K)/MAPK (**A**), stress (**B**), cytoskeleton (**C**), genome integrity/gene expression (**D**), cell cycle (**E**), or other signaling pathways (**F**) according to their functions. Pale green and dark green circles indicate pro-targets of **1** and **4**, respectively, whereas pink and red circles indicate anti-targets of **1** and **4**, respectively. Small and large circles indicate weak/medium and strong modifiers of compound efficacy in *ptc>dRet*<sup>M955T</sup> flies, respectively. Percent inhibition of each kinase by TCIs and Kd value by **1** (ref. <sup>10</sup>) are also shown. Soraf, sorafenib [**1**]; L15, LS1-15 [**4**]; A5, APS5-16-2 [**9**]; A6, APS6-45 [**10**].



#### Supplementary Fig. 6: Derivatives of sorafenib [1].

**a**, *Lk6* knockdown specifically in  $dRet^{M9557}$  cells increases the viability of  $ptc>dRet^{M9557}$  flies. Two different sequences (#1 and #2) were driven by the *ptc* promoter to knock down *Lk6* expression. Error bars, standard errors in triplicate. Asterisks, *p* < 0.05 in Student's *t*-test as compared with no-shRNA control.

b, A model of MKNK inhibition of RAS/MAPK pathway signaling.

**c**, The TCIs **9** and **10** possess extended perfluoroalkyl group substitutions relative to **1** and **4** (red).

**d**, Comparing efficacy and logP values (parentheses) for **1** and several of the TCIs, demonstrating poor correlation between the two parameters.



# Supplementary Fig. 7: Effects of APS6-45 [10] on Ras/MAPK signaling in human cancer cells.

**a**, Human cancer cell lines HCT-116 and LOVO were treated with the indicated doses of **1** and **10**, and the effects on Ras/MAPK signaling were measured by western blot using pMEK(S217/S221) and pERK(T202/Y204) antibodies. Peak transactivation of BRAF by **1** (ref. <sup>38</sup>) and **10** are indicated by arrows. Uncropped images are in Supplementary Fig. 8a.

**b**, **10** inhibited Ras pathway activity in human MTC cells. TT and MZ-CRC-1 were treated with vehicle (–), 1  $\mu$ M of sorafenib [**1**] (S), or 1  $\mu$ M of APS6-45 [**10**] (A) for 1 h, and cell lysates were analyzed for activity of the Ras/MAPK pathway effectors MEK, ERK, and S6. Uncropped images are in Supplementary Fig. 8b.

**c**, Maximum tolerated dose (MTD) and pharmacokinetics (PK) of **10** in mice. For PK test, mice were dosed with 20 mg/kg of **10** orally.



#### Supplementary Fig. 8: Uncropped western images.

a and b, Original images for Supplementary Figs. 7a and 7b, respectively.



#### Supplementary Fig. 9: Optimizing polypharmacology.

**a**, Scheme showing stepwise derivatization of TCIs. The first set of TCIs includes combinations between spacers/linkers/caps generated by medicinal chemistry. Drug screening experiments with  $ptc>dRet^{M955T}$  flies identified **4** as the best derivative; subsequent genetic screening revealed pro-targets and anti-targets for **1** and **4**. Computation compared physicochemical features between compounds such as intramolecular steric hindrance and modifications of the cap to prevent its binding to anti-targets, pointing to novel chemical spaces **9** and **10**.

**b**, Models for mechanism of action of each TCI.

(Left) **1** inhibits pro-targets such as RET (green). At low dose, however, such inhibition is not sufficiently potent to overcome anti-targets such as BRAF (yellow). Such unwanted effects are reduced but not abolished at higher concentration; in addition, inhibition of anti-targets (blue) further limits the therapeutic window (pink).

(Middle) **4** inhibits additional pro-targets EPH and FRK, generating a larger therapeutic window than **1**. **4** at low dose is still limited by toxicity because it activates BRAF as **1** does.

(Right) **9** and **10** displayed reduced binding potency to BRAF, thus preventing activation of these anti-targets even at low dose. Other anti-targets such as MKNK are also kept uninhibited, leading to a wider therapeutic window than **1**.



# Supplementary Fig. 10: Increased activity of APS6-45 [10] against pro-targets of sorafenib [1].

**a**, Distinct inhibition of pro-target kinases by TCIs. Percent inhibition of kinase activities were determined by *in vitro* assays. Percent rescue of  $ptc > dRet^{M955T}$  flies by each compound is shown (parentheses). Note that LRRK1 is a strong pro-target, whereas ABL2, DDR2, HCK, and LCK are weak to moderate pro-targets (Supplementary Table 2).

b, Kd values determined by multi-point assays for 1 and 10 against pro-target kinases of 1.



#### Supplementary Fig. 11. Computing physicochemical features for TCIs.

Torsional energy of the linker/cap and linker/spacer is converted into relative conformational population of the compounds, represented in a heatmap. Since most TCIs do not have a substituent on the spacer region, linker/spacer is symmetric at 180°. **1**, APS5-16-1, and AD57 have two predominant conformational populations, the *cis*- and the *trans*- conformers, likely due to the rotation of the linker/cap. Conversely, **4**, **9**, and AD80 strongly favor the *cis*- over the *trans*- conformation, likely due to the multipolar interaction between the urea amide hydrogen and fluorine (green broken line), and strong electrostatic repulsion between the fluorine and the urea carbonyl oxygen in the *trans*- conformation (magenta arcs).

#### Supplementary Dataset 1: *In vitro* inhibition of kinases by APS6-45 [10].

Percent *in vitro* activity remaining for human kinases was determined in the presence of 10  $\mu$ M of **10**.

Supplementary Dataset 2: Numbers of samples.