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	Please stroke out any approved Biohazards to be removed below	Write additional Biohazards for approval below. Give the full name - do not abbreviate.
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Approved Primary and Established Cells	Rodent (primary) brain. Human (established) Daoy, D283, HEK, U87, U343, U373, UW426, UW228, SY5Y. Rodent (established) 3T3, SN56, PC12, nnr5. Non-human primate (established) Cos7. Insect (established) Sf21.	
Approved Use of Human Source Material		
Approved Genetic Modifications (Plasmids/Vectors)	pCMX, EGFP, pCAAL5, Taptag, pAd Easy, SV 40 Large T Antigen, E1A oncogene, CA-Ras, v-src, BDNF-egfp	pIresPuro2-RhoBS185A pGST-Parallel-RhoA pGST-Parallel -RhoB pGST-Parallel -RhoC
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Date of Last Biohazardous Agents Registry Form: Jun 21, 2010

Date of Last Modification (if applicable): Aug 13, 2010

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The Rho constructs will be used to examine the mechanism(s) of how TrkA is inducing cell death in human neural tumors.

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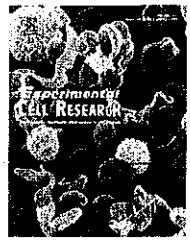

Research Article

Phosphorylation of RhoB by CK1 impedes actin stress fiber organization and epidermal growth factor receptor stabilization

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ABSTRACT

RhoB is a small GTPase implicated in cytoskeletal organization, EGF receptor trafficking and cell transformation. It is an immediate-early gene, regulated at many levels of its biosynthetic pathway. Herein we show that the serine/threonine protein kinase CK1 phosphorylates RhoB *in vitro* but not RhoA or RhoC. With the use of specific CK1 inhibitors, IC261 and D4476, we show that the kinase phosphorylates also RhoB in HeLa cells. Mass spectrometry analysis demonstrates that RhoB is monophosphorylated by CK1, in its C-terminal end, on serine 185. The substitution of Ser185 by Ala dramatically inhibited the phosphorylation of RhoB in cultured cells. Lastly we show that the inhibition of CK1 activates RhoB and promotes RhoB dependent actin fiber formation and EGF-R level. Our data provide the first demonstration of RhoB phosphorylation and indicate that this post-translational maturation would be a novel critical mechanism to control the RhoB functions.

Introduction

The phosphorylation–dephosphorylation cycle controls the activity of a large number of proteins, including several members of the Ras superfamily of low molecular weight GTP-binding proteins. Small GTPases act as molecular switches orchestrating a variety of signalling pathways by cycling between an inactive GDP-bound form to an GTP-bound active form [1]. Emerging reports suggest that phosphorylation of small GTPases contributes to their activity regulation, most often independently of GTP/GDP cycling and was proposed as a secondary switch in addition to GDP/GTP cycle. For instance, while the phosphorylation of Rac1 or Rab6 modifies their affinity for GTP [2,3], the phosphorylation of K-Ras by PKA or PKC leads to its activation but without impact on the GTP binding or GTPase activity [4]. Phosphorylation interferes with functions of several small G proteins by inducing their translocation from membrane to cytosolic compartments as in the case of Rap1A [5], RhoE [6] Cdc42 or RhoA [7–9].

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Phosphorylation of small GTPases has been also observed to affect binding affinity for the GDP/GTP cycle regulators notably GDP dissociation inhibitor (GDI) [10]. Indeed the EGF or cAMP-dependent phosphorylation of Cdc42 is associated with enhanced Cdc42–GDI interaction [8,11]. RhoA inhibition by PKA or cGK phosphorylation has been shown to occur also through enhanced RhoGDI interaction rather than direct perturbation of guanine nucleotide exchange factor (GEF) or GTPase activating protein (GAP) status [7,8,12]. Lastly, phosphorylation of the small GTPases could change the affinity for or discriminate their partners. For example phosphorylation of Rem and Gem, GTPases of the RGK family, is critical for their association with 14-3-3 proteins [13,14]. An alternative pathway was proposed for regulating RhoA signalling whereby GTP-bound RhoA, when phosphorylated by PKA or cGK, could be separated from its putative effector(s) independently of its GTP/GDP cycling [7]. That was illustrated nicely in the recent work of Nusser et al. which has shown that serine phosphorylation of RhoA differentially affects binding to its effectors, PKN/PRK, ROCK and rhotekin [15].

RhoB belongs to the highly related Rho GTPase family (including Cdc42, Rac, RhoA and RhoC) best characterized for their effects on the actin cytoskeleton [16]. While its close relatives, RhoA and RhoC, promote oncogenesis and invasion, RhoB rather plays a negative regulator role in oncogenesis [17–21]. Moreover we [20] and others [22,23] have shown that RhoB protein expression levels are inversely related to malignancy of various tumors. Furthermore RhoB is essential for UVB-induced cell survival [24] and inhibits radiation-induced mitotic cell death [25]. Additionally endosomal RhoB has been implicated in the regulation of the endocytic trafficking of different proteins such as EGF-R [26–28] as well as in the outward movement of Src to plasma membrane [29] or CXCR2 sorting decision [30].

Unlike most small GTPases, RhoB is short lived and is an immediate-early response gene induced by growth factors [24,31,32] and genotoxic stress [24,33,34]. RhoB is a highly controlled protein, regulated at many steps of its biosynthetic pathway including transcriptional and post-transcriptional activity [24,35–38] and RNA [24,39,40] or protein stability [41]. Moreover post-translational modifications are very important in RhoB activity such as prenylation [42] or palmitoylation [43].

Because protein phosphorylation is a major and dynamic type of protein modification, implicated in the regulation of many small GTPases as mentioned above, we investigated herein whether RhoB could also be regulated by this process.

Materials and methods

Materials

Anti-HA monoclonal antibody (clone 12CA5) and human recombinant EGF were purchased from Roche Molecular Biochemicals. RhoB polyclonal antibody (sc-180), RhoA monoclonal antibody (sc-418) and anti-HA monoclonal antibody (F7) conjugate agarose beads were from Santa Cruz Biotechnology, anti EGF-R monoclonal antibody from Cell Signaling Technology, anti pPRK1 was from Becton Dickinson. Tetramethylrhodamine isothiocyanate (TRITC) labeled phalloidin was from Molecular Probes. CK1 (C-terminal truncated δ rat isoform), cAMP-dependent protein kinase (PKA catalytic subunit) and CK2 were purchased from New England Biolabs. IC261 was from Calbiochem. RhoB siRNA (5′GGCAUUCUCUAAAGCUAUG dTdT3′) designed against the 3′UTR region of RhoB mRNA, RhoA siRNA (5′GAAGUCAAGCAUUUCUGUC-dTdT3′) [44] and control (siRNA negative control) were purchased as duplexes from Eurogentec.

Plasmids and site-directed mutagenesis of RhoB

The human cDNA encoding RhoA, RhoB or RhoC were obtained by standard PCR with primers containing restriction sites. The digested PCR products (NcoI–BamHI for RhoA and RhoC or BglII–EcoRI for RhoB) were inserted into the bacterial glutathione S-transferase (GST) expression vector pGST-Parallel2 [45]. cDNA encoding HA-RhoB were obtained by cloning digested RhoB PCR products (NdeI/BamH1) in pAS2 vector (Clontech) then subcloned in pIrespuro2 vector (Clontech) using EcoRI and BamH1 restriction sites. RhoB S185A mutation was created through PCR mutagenesis using the QuickChange mutagenesis kit (Stratagene) on pGST//2-RhoB or pAS2-HA-RhoB. All constructs were confirmed by DNA sequencing.

Cell culture and transfections

Human cervix adenocarcinoma HeLa cells (ATCC CCL-2) were maintained in Dulbecco's modified Eagle's medium (DMEM) supplemented with 10% Fetal Calf Serum (FCS) at 37 °C in a humidified incubator containing 5% CO_2. Cells were plated 24 h before transfection to reach 60–70% confluence the day of plasmid transfection or 50% confluence for siRNA transfection. Plasmid transfection experiments were performed using Jet PEI (QBiogen) following the instructions provided by the manufacturer. SiRNA transfections were carried out using 20 nM of pooled siRNA duplexes and Oligofectamine (Invitrogen) according to the manufacturer's protocol.

Purification of recombinant proteins

GST fusion proteins (GST-RhoA, GST-RhoB, GST-RhoC) were expressed in BL21(DE3)pLys E. coli cells (Invitrogen) by addition of 100 μM isopropyl-β-D-thiogalactopyranoside (IPTG) for 3 h at room temperature and purified by affinity chromatography on Glutathione Sepharose™ high performance beads (Amersham Biosciences) using standard procedure. When necessary, separation of RhoB protein from the GST moiety was achieved by cleavage with TEV Protease (Invitrogen, 50 U/ml) in manufacturer's buffer overnight at 4 °C. TEV protease was removed from the reaction via polyhistidine tag sequence by affinity chromatography on Ni-NTA Magnetic Agarose Beads (Qiagen). Protein concentration was determined by Bradford assay (Biorad). GST-RBD fusion protein was produced and purified as previously described [46].

In vitro phosphorylation of Rho proteins

Phosphorylation in vitro was performed on purified GST-Rho proteins bound to glutathione-sepharose beads. Phosphorylation

by PKA (10 U), CK1 (50 U) or CK2 (50 U) was performed according to the manufacturer's protocols (New England Biolabs). Reactions were carried out in a 25 µl final volume of each kinase buffer supplemented with 80 µM ATP and 1 µCi [γ-^{32}P ATP] (4500 Ci/mmol; MP Biomedicals) on 10 µg of substrate for 30 min at 30 °C. Reactions were stopped by extensively washing with cold phosphorylation buffer. Proteins were then eluted in Laemmli buffer with dithiothreitol (DTT), separated on a 12.5% SDS-polyacrylamide gel and blotted onto Polyvinylidene difluoride (PVDF) membrane (Amersham Pharmacia Biotech). Membrane bound proteins were detected by phosphorimaging (STORM 840) then by amido-black staining (Sigma). For spectrometry analysis, the phosphorylation of RhoB by CK1 was carried out on 3 µg of purified RhoB in a 25 µl final volume of 50 mM Tris pH 7.5, 10 mM $MgCl_2$, 5 mM DTT, 250 µM ATP and 250 U CK1 for 2 h at 30 °C.

Mass spectrometric analysis of RhoB after SDS-PAGE separation and in-gel digestion

After *in vitro* phosphorylation by CK1, RhoB was denatured for 2 h at 30 °C in Laemmli sample buffer and reduced with 16.7 mM DTT for 10 min at room temperature. After cysteine alkylation with 90 mM idoacetamide for 30 min at room temperature in the dark, RhoB was separated by SDS-PAGE and detected using Coomassie blue staining. The band was excised from the gel, cut into small pieces, and in-gel digested as described previously [47] with minor modifications. Briefly, after several washing steps to eliminate staining, the gel pieces were dried under vacuum. The gel pieces were swollen in a sufficient covering volume of modified trypsin (Promega) solution (20 ng/µl in 25 mM NH_4HCO_3) for 15 min in an ice bath. Trypsin digestion was performed overnight at 37 °C under shaking. The supernatant was pooled with three peptide extracts performed at 37 °C for 30 min under shaking using once 25 mM NH_4HCO_3 and twice 5% formic acid in 50% acetonitrile. The peptide mixture was dried under vacuum and resuspended in 10 µl of 0.1% formic acid in 1% acetonitrile for nano-LC-MS/MS analysis.

Nano-LC-MS/MS analysis and database search

The tryptic digest was analyzed by on-line capillary HPLC (LC Packings) coupled to a nanospray QSTAR Pulsar mass spectrometer (Applied Biosystems, Foster City, USA). Peptides were separated on a 75 mm ID×15 cm C18 PepMap™ column after loading onto a 300 µm ID×5 mm PepMap C18 precolumn (LC Packings, Dionex). The flow rate was set at 150 nl/min. Peptides were eluted using a 0 to 50% linear gradient of solvent B in 50 min (solvent A was 0.2% formic acid in 5% acetonitrile and solvent B was 0.2% formic acid in 90% acetonitrile). The mass spectrometer was operated in positive ion mode at a 2 kV needle voltage. MS and MS/MS data were continuously acquired in an information-dependant acquisition mode consisting of a 7 s cycle time. Within each cycle, a MS spectrum was accumulated for 1 s over the range *m/z* 40–2000 followed by three MS/MS acquisitions of 2 s each on the three most abundant ions in the MS spectrum using a 30 s dynamic exclusion duration. MS/MS data were acquired using a 3 *m/z* units ion isolation window. Collision energies were automatically adjusted according to the charge state and mass value of the precursor ion and collision gas was N_2.

The MASCOT search engine was used for protein identification by searching against a non-redundant human database with MS/MS spectra. The identification of phosphorylation sites resulting from a MASCOT search was confirmed by manual interpretation of corresponding MS/MS data.

In vivo ^{32}P labelling

3×10^6 HeLa cells were plated in 140 mm Petri dishes and transfected with the plasmids as indicated in the legends of figures. 48 h later, cells were starved for 30 min in phosphate free-DMEM (Sigma) and labeled with 200 µCi/ml of [^{32}P] orthophosphoric acid (25 mCi/ml, MP Biomedicals) in 9 ml of phosphate free-DMEM supplemented with 10% dialyzed FCS for 4 h at 37 °C. For inhibition of CK1, the inhibitors IC261 or D4476 were added at the indicated concentration 5 min prior to ^{32}P labelling. D4476 is only sparingly soluble when diluted directly into the aqueous cell culture medium. In order to promote solubility, drug was added in Fugene 6 (Roche Molecular Biochemicals) as previously described [48].

Immunoprecipitation of HA-RhoB and western-blot analysis

Cells were washed twice with cold TBS and quickly lysed in ice-cold lysis buffer [50 mM Tris pH 8, 150 mM NaCl, 1% (v/v) Triton-X100, 5 mM EDTA] supplemented with protease inhibitor cocktail (Sigma), 2 mM sodium orthovanadate, 25 mM NaF and 6.4 mg/ml paranitrophenylphosphate. Lysates were clarified by centrifugation at 13,000 *g* for 10 min at 4 °C. Supernatants were incubated with 15 µg of anti-HA monoclonal antibody conjugate agarose beads for 2 h at 4 °C. The beads were washed twice with 1 ml of lysis buffer. Immunoprecipitates were eluted with Laemmli sample buffer. The proteins were separated on a SDS-PAGE and electrotransferred onto PVDF membranes and phosphorylated RhoB was detected by phosphorimaging (^{32}P) after overnight exposition. RhoB was detected by western-blot using RhoB polyclonal antibody, peroxidase-conjugated secondary antibody (Bio-Rad) and chemiluminescence detection kit (ECL plus, Amersham Pharmacia Biotech).

RhoB activation assay

The amount of activated, GTP-bound RhoB was determined using a technique similar to the method described previously [49]. Briefly, cells were harvested by scraping into 800 µl of ice-cold extraction buffer [50 mM Tris pH 7.2, 500 mM NaCl, 1% (v/v) Triton-X100, 10 mM $MgCl_2$, protease inhibitor cocktail, 2 mM sodium orthovanadate, 25 mM NaF and 6.4 mg/ml paranitrophenylphosphate]. Cell lysates were cleared by centrifugation at 13,000 *g* for 2 min at 4 °C. 700 µl of the lysate was incubated with 10 µg of GST-RBD beads (GST fusion protein containing the Rho-binding domain of Rhotekin (RBD)) and rotated for 45 min at 4 °C. Beads were then washed twice with 1 ml of ice-cold wash buffer [50 mM Tris (ph 7.2), 150 mM NaCl, 1% (v/v) Triton-X100, 10 mM $MgCl_2$]. Bound proteins were eluted with 40 µl of Laemmli sample buffer. Proteins were separated on a 12.5% SDS-polyacrylamide gel and RhoB was

detected by western-blotting. Determination of the total RhoB was done on 30 µl of the lysates by western-blotting.

Actin stress fiber analysis

Cells were seeded on glass coverslips into six-well plates (Nunc) at a density of 150,000 cells/well in DMEM 10% FCS. 24 h later cells were serum-starved for 48 h, and treated as indicated in the legends of figures. Cell were fixed in 3% paraformaldehyde and permeabilized into 0.1% Triton X-100 in phosphate-buffered saline. Actin fibers were detected by incubation with TRITC-phalloidin. Images were acquired on a DM 5000 microscope (Leica) using CCD Princeton camera and subsequently processed by the Metamorph software (Toulouse RIO imaging).

Results

RhoB is phosphorylated by CK1 in vitro and in HeLa cells

The *in silico* analysis of RhoB amino acid sequence showed that the protein possesses several serine and threonine residues, which could be potential phosphorylation sites. Some of them, underlined in blue, are not present in the highly homologous protein RhoA and RhoC (Fig. 1). Moreover putative phosphorylation sites in RhoB sequence were identified *in silico* using NetPhos2.0 software, including three CK1, three CK2 and two PKA sites (highlighted in red in Fig. 1). To investigate whether RhoB is actually and specifically phosphorylated by the above kinases, the recombinant GST-RhoB and its highly homologous isoforms RhoA and RhoC, were subjected to *in vitro* kinase reaction with catalytic kinase subunits in the presence of [γ-^{32}P] ATP. Consistent with previous reports [7], PKA phosphorylated efficiently GST-RhoA *in vitro* (Fig. 2). In contrast, the kinase did not produce

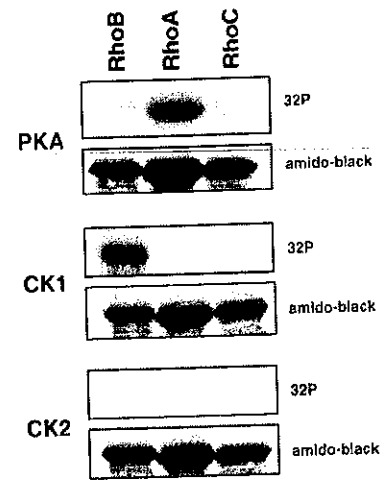

Fig. 2 – RhoB is phosphorylated by CK1 *in vitro*. GST-RhoB, RhoA or RhoC was produced and purified from *E. coli* as described in Materials and methods and 10 µg of each was subjected to *in vitro* phosphorylation reaction with 10 U of PKA, 50 U of CK1 or 50 U of CK2 in the presence of 1 µCi of [γ-^{32}P ATP] for 30 min at 30 °C, before SDS/PAGE separation and PVDF blotting. After overnight exposition, PVDF membranes were analysed by phosphorimaging (^{32}P) then by amido-black staining (amido-black).

any detectable *in vitro* phosphorylation of either RhoB or RhoC. Fig. 2 shows on the contrary that CK1 phosphorylated RhoB *in vitro*, but not RhoA nor RhoC, while CK2 phosphorylated neither RhoA, RhoB nor RhoC.

To investigate RhoB phosphorylation in cells, [^{32}P] orthophosphate metabolic labelling was performed on HeLa cells transiently transfected with plasmid encoding HA-RhoB under its wild-type form (RhoBWT). Then RhoB was

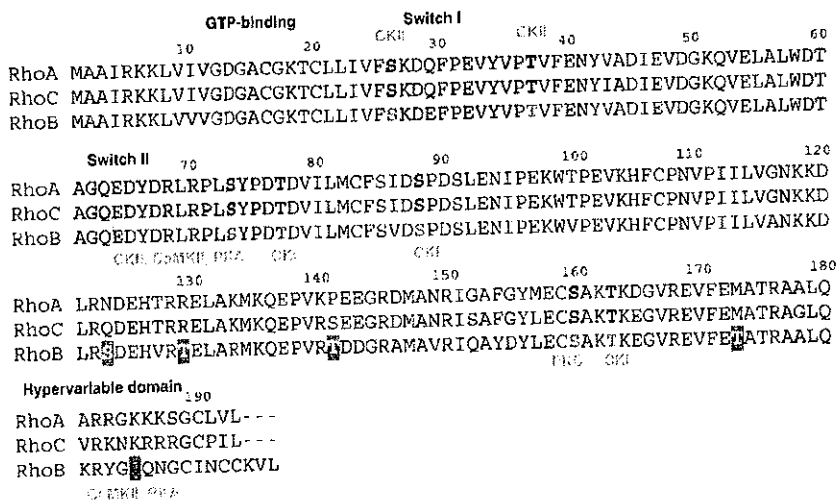

Fig. 1 – Phosphorylation site prediction for RhoB sequence. The amino acid sequences of human RhoA, RhoC and RhoB (accession # NP_001655, NP_756886 and NP_004031 respectively) were aligned and consensus GTPase domains are indicated. The RhoB putative phosphorylation sites are predicted *in silico* using NetPhos 2.0 software, and highlighted in red. RhoB specific sites (not present in RhoA or RhoC sequence) are highlighted in blue.

immunoprecipitated with antibody against the HA tag and phosphorylated proteins were detected by phosphorimaging. As shown in Fig. 3A, phosphorylated RhoB could be immunoprecipitated from RhoBWT transfected cells. Similar results were obtained when HeLa cells were transfected with the constitutively-activated form (RhoBV14).

To determine whether intracellular CK1 is able to phosphorylate RhoB, phosphorylation status of RhoB was analysed in cells treated or not with 3-[(2,3,6-trimethoxyphenyl)methylidenyl]-indolin-2-one (IC261), a membrane permeable ATP competitive inhibitor of CKI kinases [50]. Fig. 3B points up a significant reduction of the phosphorylated RhoB level in cells incubated with 100 μM of IC261 during the labelling period. To confirm an actual implication of CK1 in RhoB phosphorylation, another CK1 inhibitor, D4476, which was recently described as a more potent and specific inhibitor of CK1 family than IC261 [48,51], was tested. As shown in Fig. 3C, the phosphorylated RhoB level decreased dramatically in the presence of 50 μM D4476 and no additional effect was observed with higher concentration (150 μM) of D4476. Together these results

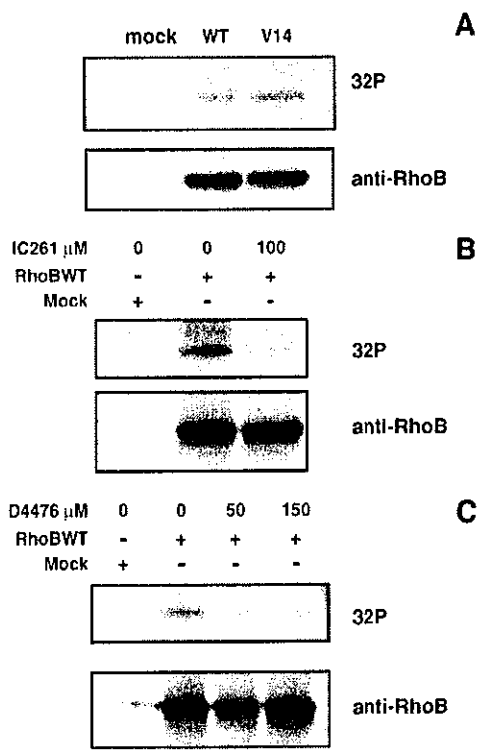

Fig. 3 – RhoB is phosphorylated by CK1 in cultured cells. (A) HeLa cells were transfected with empty pIrespuro2 (mock) or pIrespuro2 encoding HA-RhoBWT or HA-RhoBV14. 48 h later cells were labeled with [^{32}P] orthophosphoric acid. After immunoprecipitation with anti-HA antibody agarose beads, SDS-PAGE and blotting, phosphorylated RhoB was detected by phosphorimaging (^{32}P) and total immunoprecipitated RhoB by immunoblot with anti-RhoB polyclonal antibody (anti-RhoB). Similar experiments were performed in the presence of CK1 inhibitors, IC261 (B) or D4476 (C) added to the medium at the indicated concentration 5 min prior [^{32}P] orthophosphate labelling.

showed that RhoB is phosphorylated in cultured cells and suggested that RhoB is a substrate of CK1 family.

RhoB is phosphorylated at Serine 185 by CK1 in vitro and in cultured cells

The mass spectrometry analysis of RhoB phosphorylated *in vitro* by CK1 allowed the identification of a RhoB monophosphorylated isoform (data not shown). Identification of RhoB phosphorylation site by CK1 was further performed by nano-LC-MS/MS. RhoB was phosphorylated *in vitro*, separated on SDS-PAGE and the corresponding band was in-gel digested with trypsin as described in Materials and methods. Database searching from nano-LC-MS/MS data confirmed the identification of RhoB (data not shown) and proposed a monophosphorylated peptide sequence, 183-YGSQNGCINCCK-194, the MS/MS spectra of this monophosphorylated peptide is presented in Fig. 4A. The observed fragment ions confirm the peptide sequence and the presence of a phosphate group on Ser185 on the peptide (Fig. 4A). These results strongly suggested that RhoB is monophosphorylated by CK1 on serine 185. To conclude we generated the RhoBS185A mutant and subjected it to *in vitro* CK1 kinase reaction. As shown in Fig. 4B the phosphorylation of GST-RhoBS185A by CK1 was radically reduced in comparison to GST-RhoBWT protein.

To confirm the implication of Ser185 RhoB phosphorylation *in cellulo*, intracellular phosphorylation status of mutant RhoBS185A was analysed, after transfection as described above. As shown in Fig. 4C, substitution of Ser185 by Ala dramatically inhibited the ability of RhoB to be phosphorylated in cultured cells. Altogether, these observations strongly demonstrate that a member of the CK1 family phosphorylates RhoB protein on serine 185.

The inhibition of RhoB phosphorylation led to its activation and stimulated RhoB cell functions

Next to determine the consequence of phosphorylation by CK1 on RhoB biological functions, we first investigated the effects of CK1 inhibition on RhoB activity by a pull-down assay using the Rho Binding Domain (RBD) of Rhotekin, an effector of Rho proteins that selectively binds to their activated forms [46,49]. As shown in Fig. 5A, a 2 h exposure to CK1 inhibitors, either D4476 or IC261, achieved respectively a 2.2 to 3.4 fold increase of RhoB binding to the RBD. This observation suggested that RhoB phosphorylation impaired the activation of RhoB.

We then investigated the effect of CK1 inhibition on cellular functions known to be regulated by RhoB, such as stress fiber organization as we have previously shown [42]. While serum-starvation induced as expected a total fiber disorganization, the sole addition of IC261 for 30 min allowed the formation of thin actin fibers (data not shown) and after 2 h a total recovery of thick stress fibers in HeLa cells (Fig. 5B). Similar results were obtained after treatment with 50 μM of D4476 (data not shown).

It is well known that stress fiber formation is under the control of Rho proteins [52]. Actin stress fibers disassemble in response to *Clostridium botulinum* C3 toxin [53], for which the major cellular targets are RhoA, B and C. The vast majority of work has focused on RhoA which as this time appears a major

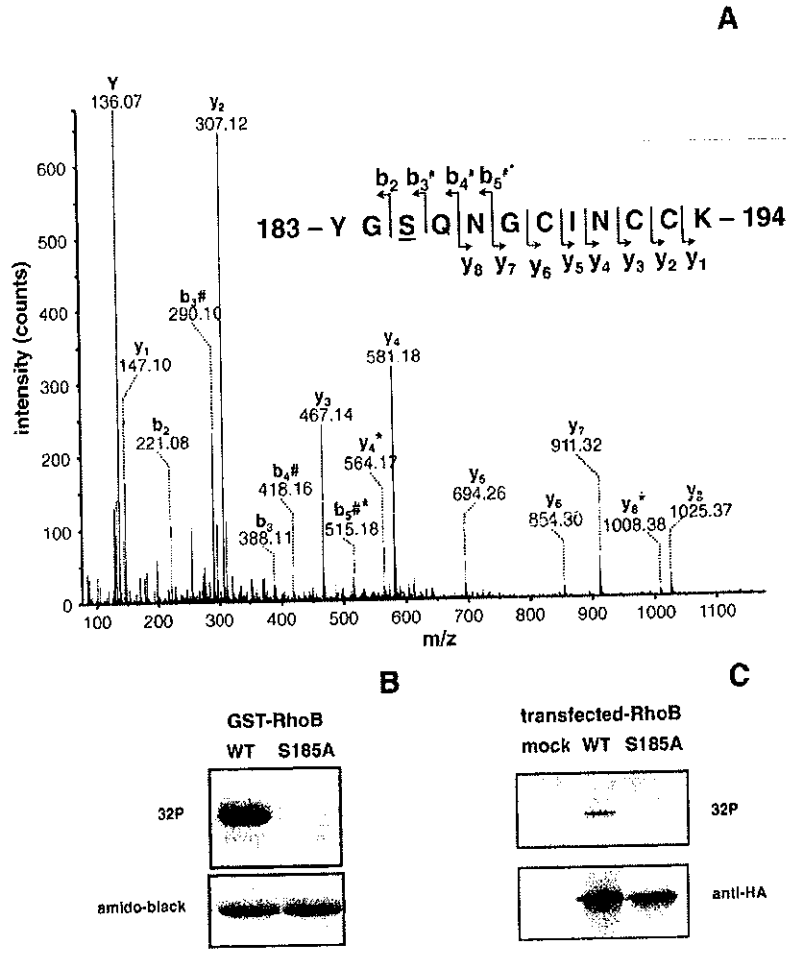

Fig. 4 – RhoB is phosphorylated by CK1 on Ser185. (A) Identification of CK1 phosphorylation site in RhoB by nano-LC-MS/MS. The MS/MS spectra of the RhoB monophosphorylated peptide 183–194 displays series of b- and y-ions (according to the Biemann's nomenclature [69]) indicating that the underlined serine residue 185 is phosphorylated (* and # correspond to the loss of NH_3 and H_3PO_4 from sequence ions, respectively). (B) 10 μg of GST-RhoBWT (WT) or RhoBS185A (S185A) was subjected to in vitro phosphorylation reaction with 50 U of CK1 in the presence of [γ-^{32}P] ATP. The upper panel (^{32}P) shows the PhosphorImager analysis and the lower panel (amido-black) the amido-black staining. Data are representative of 4 independent experiments. (C) HeLa cells transfected with pIrespuro2 (mock), pIrespuro2-HA-RhoBWT (WT) or pIrespuro2-HA-RhoBS185A (S185A) were labeled with [^{32}P] orthophosphate. Phosphorylated RhoB (^{32}P) and total immunoprecipitated RhoB (anti-RhoB) were detected as described above.

regulator of stress fiber formation [52]. Since CK1 phosphorylates RhoB, and not RhoA, leading to its inactivation as described above, this data might suggest that CK1 inhibition allows specifically the restoration of RhoB biological function.

Thus we assessed further the specific implication of RhoB in this process by specific downregulation of protein expression using specific RNA interference. As shown in Fig. 5B, inhibition of RhoB expression by RhoB siRNA impeded fully the reorganization of actin stress fibers induced by IC261 addition. In contrast the siRNA inhibition of RhoA expression did not modify the response to IC261 treatment (Fig. 5B). We ensured that the siRNA RhoB silencing was efficient and specific since the expression of its close relative RhoA was not altered; and in parallel the efficiency and specificity of the RhoA silencing in HeLa cells was also verified (Fig. 5C). These data showed that RhoB expression is critical for IC261 induced stress fibers, and suggested strongly that RhoB phosphorylation impaired the activation and functions of RhoB.

To confirm this, we analyzed the activation status of RhoBS185A mutant in comparison with RhoBWT. As shown in Fig. 6A, substitution of Ser185 by Ala increased the RhoB-GTP level, strongly suggesting that RhoB phosphorylation by CK1 negatively affects its activity. We then investigated whether RhoB phosphorylation could be implicated in another function described to be controlled by RhoB, the endocytic traffic of EGF-R [26–28,54]. Indeed RhoB was shown to delay the intracellular trafficking of EGF-R and limit its degradation in lysosomes [28]. Thus we examined effect of the RhoBS185A mutant expression on the EGF-R status by western-blot analysis as previously described [26,28]. Transfection of RhoBWT in HeLa cells led to a substantial increase of EGF-R level, as well before and after EGF treatment (Fig. 6B) in

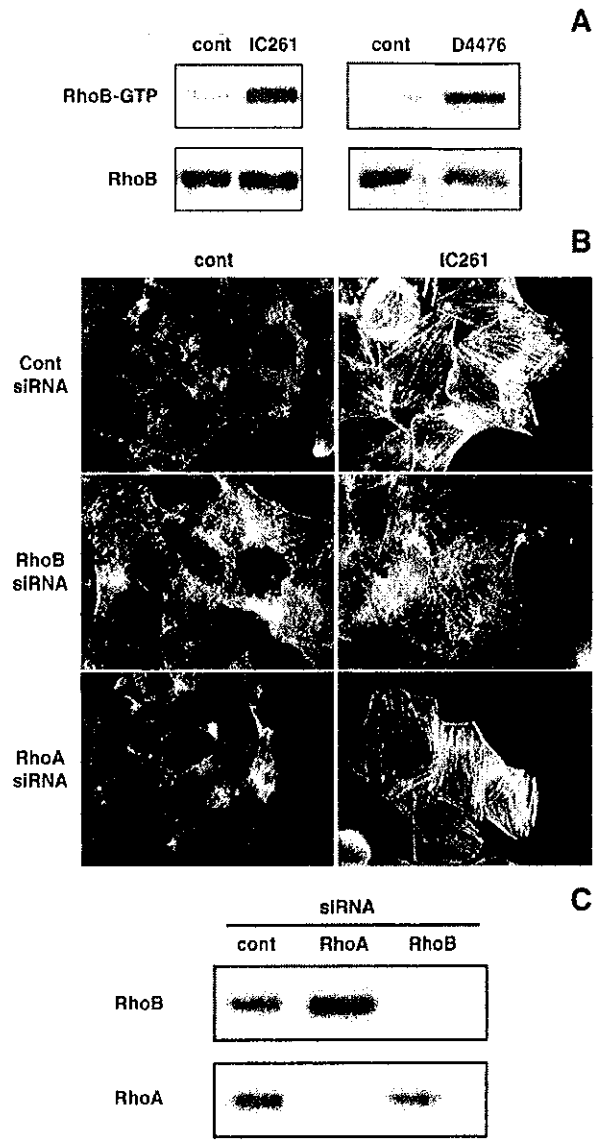

Fig. 5 – Inhibition of CK1 activates RhoB and promotes RhoB dependent actin stress fiber formation. (A) 3×10^5 HeLa cells were seeded in 100 mm culture dishes, then 48 h later treated 2 h with the CK1 inhibitors IC261 (100 μM) or D4476 (50 μM). Cells were lysed and incubated with GST-RBD beads. Active RhoB (RhoB-GTP), bound to GST-RBD beads, and the total RhoB (RhoB) were detected by SDS-PAGE and immunoblotting with anti-RhoB polyclonal antibody. (B) 1 day after being seeded on glass coverslips, HeLa cells were transfected with 20 nM of control, RhoB or RhoA siRNA. After a 24 h incubation cells were serum-starved for 48 h and then treated with vehicle, 100 μM of IC261 for 2 h. Actin fibers were then visualized with TRITC-phalloidin. Data are representative of 3 independent experiments. (C) HeLa cells were transfected with 20 nM of control, RhoB or RhoA siRNAs for 72 h then cells lysates were immunoblotted with anti-RhoB or anti-RhoA antibodies.

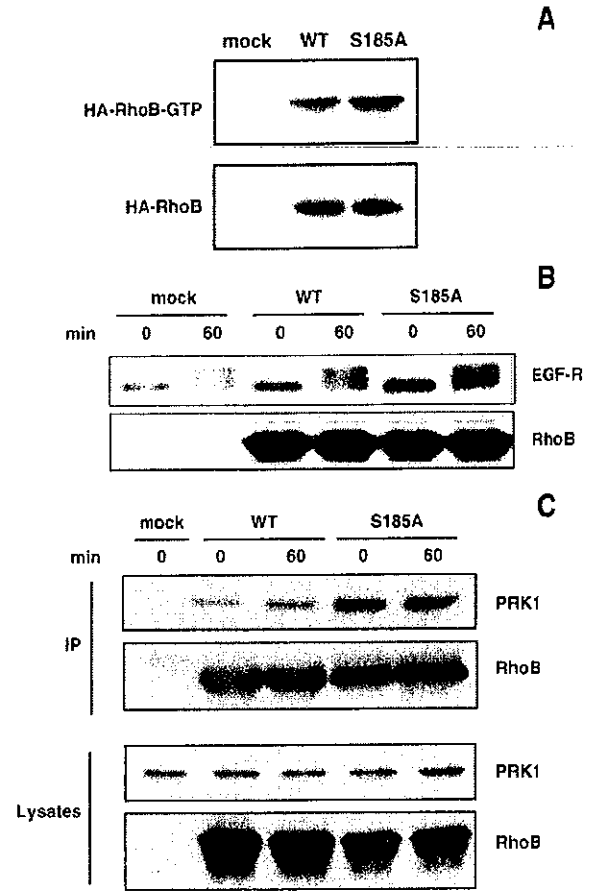

Fig. 6 – Inhibition of RhoB phosphorylation activates RhoB and promotes EGF-R stabilization and binding to the effector PRK1. HeLa cells were transfected with pIrespuro2 (mock), pIrespuro2-HA-RhoBWT (RhoBWT) or pIrespuro2-HA-RhoBS185A (RhoBS185A) for 48 h. (A) Then cells were lysed and incubated with GST-RBD beads. Active RhoB (RhoB-GTP), bound to GST-RBD beads, and total RhoB (RhoB) were detected by SDS-PAGE and immunoblotting with anti-HA monoclonal antibody. (B) After transfection cells were serum-starved for 24 h, then treated for 120 min with 100 ng/ml of EGF. EGF-R and exogenous RhoB expression were then analyzed by western-blot with anti EGF-R and anti-HA tag respectively. (C) 48 h after transfection HA-RhoB was immunoprecipitated with anti-HA antibody agarose beads, and immunoprecipitates and total lysates were separated by SDS-PAGE and blotted with anti-HA antibody (RhoB) or anti PRK1 (PRK1).

agreement with previous results that demonstrated that cells overexpressing active RhoB had delayed EGF-R degradation [28] or cells that displayed downregulation of RhoB had accelerated EGF-R degradation [55]. It is noteworthy that when the RhoBS185A mutant was expressed, the increase of EGF-R level appeared to be significantly greater in both conditions (Fig. 6B).

It was previously shown that RhoB acts through PRK1 to regulate the kinetics of epidermal growth factor receptor

traffic [27], thus we investigated whether phosphorylation of RhoB on Ser185 might alter its binding to PRK1, by a coimmunoprecipitation experiment. As shown in Fig. 6C, the phosphorylation mutant RhoBS185A was able to recruit a larger amount of PRK1 than RhoBWT as well as before EGF treatment, underlining that the phosphorylation of RhoB reduces its capacity to bind the effectors.

Discussion

We provide both *in vitro* and *in vivo* evidence for phosphorylation of the small GTPase RhoB on serine 185 by an isoform of CK1, and for a critical role of this post-translational modification in its cellular activities.

The *in silico* analysis by NetPhos2.0 software predicted that CK1 could phosphorylate RhoB but on Thr77, Ser88 or Thr163. Nevertheless the mass spectrometry and nano-LC-MS/MS analysis of RhoB phosphorylated *in vitro* by CK1 allowed the identification of a RhoB monophosphorylated isoform and indicated that RhoB is phosphorylated by CK1 on serine 185. The radical reduction of the phosphorylation by CK1 of GST-RhoBS185A strengthened this observation. Unexpectedly the sequence around Ser185 does not conform to the canonical consensus for CK1 substrates; which stipulates either phosphoamino-acids or acidic residues in position n-3 from the serine [56], as for the RhoB potential sites proposed by NetPhos2.0 (Fig. 1). The sequence downstream of Ser185 is also distinct to the sequence recognized by CK1 in NF-AT4 or β-catenin, including an SLS motif followed downstream by a cluster of acidic residues [57]. Thus the phosphorylation of a substrate by CK1 appears to be not strictly dependent on a consensus sequence, as it was shown that it may depend on the tertiary structure of the substrate [56].

In contrast NetPhos2.0 analysis predicted that Ser185 could be a substrate of the kinases CamKII and PKA. The *in vitro* kinase reactions with purified kinases showed that CamKII was able to phosphorylate GST-RhoB (data not shown) while on the contrary PKA did not produce any detectable phosphorylated GST-RhoB (Fig. 2). Thus whereas RhoA and RhoB are highly homologous proteins they appeared to be specific substrates of distinct kinases, such as CK1 and PKA. It is noteworthy that the phosphorylable amino acids are located in the hyper variable region of the Rho proteins that could explain this discrepancy. For instance the RhoA Ser188, target of PKA, follows the basic amino acids of the C-terminal region not present in RhoB, which instead possess palmitoylated cysteine.

CK1 comprises a family of serine/threonine protein kinases, that includes different CK1 isoforms namely α, β, δ, ε and γ their various splice variants [56]. It was reported that the pharmacological inhibitor IC261 shows an order of magnitude of higher selectivity for CK1δ or CK1ε isoforms (IC50 of 1 μM) over other CK1 isoforms (IC50 of 16 μM for CK1α) [50]. Hence the IC261 concentration required to inhibit RhoB phosphorylation suggests that RhoB would be the substrate of a CK1 isoform distinct from CK1δ or CK1ε.

The similarity of the ratio of phosphorylated RhoB/total RhoB in cells transfected with wild-type or constitutively-activated RhoB indicated that the nature of the nucleotide bound, GDP or GTP, to RhoB did not alter its rate of phosphorylation *in cellulo*, as reported previously for Cdc42 by Src [11]. Moreover the phosphorylation of RhoB was also observed in A549 and COS-7 (data not shown) indicating that it is not restricted to a single cell model and could be a broad-spectrum regulation process of RhoB.

Further work need to be performed to determine whether RhoB is constitutively phosphorylated by CK1 as it was shown for Parkinson disease associated αsynuclein [58] or whether its phosphorylation takes place during responses to extracellular stimuli such as for hnRNP in response to H_2O_2 [59] or Dvl in response to Wnt-5a [60]. Nevertheless since RhoB is highly regulated by diverse stimuli such as stress and growth factors, its phosphorylation might probably be a regulated process.

The pull-down assay using the Rho Binding Domain (RBD) of Rhotekin that selectively binds to the Rho activated form [46] showed that exposure to CK1 inhibitors, either D4476 or IC261, increased significantly RhoB binding to the RBD. The effects of the CK1 inhibitors in increasing RhoB activity could be due to indirect effects on phosphorylation of other proteins, such as GEFs/GAPs for RhoB, rather than directly via reduced phosphorylation of RhoB itself. Nevertheless the mutant RhoBS185A mutant appears to be more active than wild-type RhoB in this pull-down assay. These observations strongly suggest that RhoB phosphorylation by CK1 impaired the binding of RhoB to its effectors. This could be the result of the reduction of RhoB-GTP following the modulation of its GTPase activity such as for Rab24 [61] or of its interaction with the GDP/GTP cycle regulators e.g, GDI or GEFs such as for CdC42 [11]. But the CK1-mediated phosphorylation of RhoB on Ser185 might also merely alter the binding of RhoB to this effector, without any incidence of GTP loading, as recently described for PKA phosphorylation of RhoA [15]. Accordingly we observed that the unphosphorylated mutant RhoBS185A might recruit its effector PRK1, as well before as after EGF treatment, which is reported to stimulate GTP loading on RhoB [24,49]. Hence as described previously for RhoA [15], the phosphorylation of RhoB which inhibits its cell functions could serve as an alternative regulation mechanism in addition to GDP/GTP cycle. Our data show that inhibition of CK1 activity induced an important stress fiber formation which is known to be under the control of Rho proteins. The silencing experiments indicated that RhoB expression is critical for IC261 effect on actin cytoskeleton, suggesting that CK1 phosphorylation of RhoB down regulates its regulatory role on actin cytoskeleton organization. Our data also emphasized the role of RhoB in control of actin organization as we previously described [42]. Chardin et al., using *C. botulinum*, which affects the three Rho proteins, first proposed that they may be involved in stress fiber control [53]. That was subsequently argued by Rho protein overexpression or injection experiments that underlined the role of the three Rho proteins on actin stress fiber formation [62,63]. Nevertheless an incomplete effect of siRhoA on actin fiber regulation was also reported [64,65] due to RhoB activity. Herein we showed with RhoB siRNA treatment that RhoB plays a true role in stress fiber organization.

The substitution of serine 185 by an alanine led to an increase of EGF-R stabilization along with a better binding of PRK1, a RhoB effector described to be involved in EGF-R

intracellular traffic. Overall these data indicated that the phosphate group on serine 185 impaired its binding to the effector and consequently its functions. Moreover we observed that the inhibition of CK1 by IC261 prevented fully the decrease of the EGF-R cellular pool after addition of EGF (data not shown). The other CK1 inhibitor, D4476, displayed a similar effect, slowing down also strongly the EGF-R decrease after addition of EGF (data not shown). These results suggested that CK1 might play a key role in EGF-R stability in mammal cells and thus might regulate receptor trafficking. Besides it was shown that yeast casein kinase I controls a late step in the endocytic trafficking [66]. Some publications have also proposed that mammalian CK1 play a role in membrane trafficking, such as protein traffic through the early secretory pathway [67] and synaptic vesicle exocytosis [68].

The CK1 phosphorylation of RhoB might be also critical for its role in oncogenesis. It is noteworthy that several reports link elevated CK1 activity and/or expression to cancer [56], thus it could be hypothesized that this process contributes to the downregulation of RhoB activity during carcinogenesis in addition to the downregulation of its expression [20,22,23].

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Modification Form for Permit BIO-RRI-0011

Permit Holder: Susan Meakin

Approved Personnel
(Please stroke out any personnel to be removed)

Renee Phillips

Kayla Driver

Asghar Talebian

Alfonso Dietrich

Chunhui Li

James MacDonald

Additional Personnel
(Please list additional personnel here)

	Please stroke out any approved Biohazards to be removed below	**Write additional Biohazards for approval below. Give the full name - do not appreviate.**
Approved Microorganisms	Yeast (PJ694A), Bacteria (E.coli BL21, DH5a, MC1061/P3, XL10 Gold, Arctic Express), Adenovirus	
Approved Primary and Established Cells	Rodent (primary) brain. Human (established) Daoy, D283, HEK, U87, U343, U373, UW426, UW228, SY5Y. Rodent (established) 3T3, SN56, PC12, nnr5. Non-human primate (established) Cos7. Insect (established) Sf21.	
Approved Use of Human Source Material		
Approved Genetic Modifications (Plasmids/Vectors)	pCMX, EGFP, pCAAL5, Taptag, pAd Easy, SV 40 Large T Antigen, E1A oncogene, CA-Ras, v-src	BDNF-egfp
Approved Use of Animals		
Approved Biological Toxin(s)		

** PLEASE ATTACH A MATERIAL SAFETY DATA SHEET OR EQUIVALENT FOR NEW BIOHAZARDS.*
*** PLEASE ATTACH A BRIEF DESCRIPTION OF THE WORK THAT EXPLAINS THE BIOHAZARDS USED AND HOW THEY WILL BE STORED, USED AND DISPOSED OF..*

As the principal investigator, I have ensured that all of the personnel named on the form have been trained. I will ensure that this project will follow the Western Biosafety Guidelines and Procedures Manual for Containment Level 1 2 Laboratories (and the Level 3 Facilities Manual for Level 3 projects). I will ensure that UWO faculty, staff and students working in my laboratory have an up-to-date Hazard Communication Form, found at http://www.wph.uwo.ca.

Signature of Permit Holder: Susan Mead

Current Classification: 2 **Containment Level for Added Biohazards:** _____

Date of Last Biohazardous Agents Registry Form: Jun 21, 2010

Date of Last Modification (if applicable): _____

BioSafety Officer(s): J Stanley. Aug 13/10 Ronald Wasowicz 16/07/10

Chair, Biohazards Subcommittee: Susan Kovalik **Date:** August 13, 2010

Material Transfer Agreement

You are receiving from: Dr. Volkmar Lessmann, Otto-von-Guericke Universität Magdeburg, plasmid DNA coding for: rat **BDNF-EGFP**

You obtain the plasmid to examine the role of the signaling adapters Nesca and FRS3 in the transport of secretory vesicles in primary mouse hippocampal and cortical neurons, and to follow retrograde transport and whether the adapters facilitate cargo transport. You will use the plasmid solely for the above described purpose and will not extend these studies without prior written consent by Dr. Lessmann. You further agree that your projects employing the BDNF-GFP plasmid will run as collaboration between our labs including co-authorship.

Importantly, research on any aspects of synaptic plasticity in mammalian neurons is not covered by this MTA and would require renegotiation of the terms of use for the plasmid.

You herewith assure that you will not distribute the plasmids in any form to others working outside your own laboratory. You further assure that the plasmids will be used solely for non-commercial research purposes, and that the constructs won't be used for military-related research. Please acknowledge receipt of plasmids and cite our relevant papers in any publication.

THE UNIVERSITY OF WESTERN ONTARIO
BIOHAZARDOUS AGENTS REGISTRY FORM
Approved Biohazards Subcommittee: September 25, 2009
Biosafety Website: www.uwo.ca/humanresources/biosafety/

This form must be completed by each Principal Investigator holding a grant administered by the University of Western Ontario or in charge of a laboratory/facility where the use of Level 1, 2 or 3 biohazardous agents is described in the laboratory or animal work proposed. The form must also be completed if any work is proposed involving animals carrying zoonotic agents infectious to humans or involving plants, fungi, or insects that require Public Health Agency of Canada (PHAC) or Canadian Food Inspection Agency (CFIA) permits.

This form must be updated at least every 3 years or when there are changes to the biohazards being used.

Containment Levels will be established in accordance with Laboratory Biosafety Guidelines, 3rd edition, 2004, Public Health Agency of Canada (PHAC) or Containment Standards for Veterinary Facilities, 1st edition 1996, Canadian Food Inspection Agency (CFIA).

Completed forms are to be returned to Occupational Health and Safety, (OHS), (Support Services Building, Room 4190) for distribution to the Biohazard Subcommittee. For questions regarding this form, please contact the Biosafety Officer at extension 81135 or biosafety@uwo.ca. If there are changes to the information on this form (excluding grant title and funding agencies), contact Occupational Health and Safety for a modification form. See website: www.uwo.ca/humanresources/biosafety

PRINCIPAL INVESTIGATOR	Dr. Susan Meakin
SIGNATURE	Susan Meakin
DEPARTMENT	Molecular Brain Research, Robarts Res. Inst.
ADDRESS	100 Perth Drive., Rm 3228
PHONE NUMBER	519-663-5777 ext. 24304
EMERGENCY PHONE NUMBER(S)	519-858-0928
EMAIL	smeakin@robarts.ca

Location of experimental work to be carried out: Building(s) Robarts Res. Inst. Room(s) 3224, 3226

*For work being performed at Institutions affiliated with the University of Western Ontario, the Safety Officer for the Institution where experiments will take place must sign the form prior to its being sent to the University of Western Ontario Biosafety Officer (See Section 12.0, Approvals).

FUNDING AGENCY/AGENCIES: NSERC; CIHR
GRANT TITLE(S): TrkB, ShcC and RasGrf1 regulate NMDA receptor activity
Nesca, a Novel Signaling Adapter that Regulates Neuronal Growth and Function

PLEASE ATTACH A BRIEF DESCRIPTION OF YOUR WORK THAT EXPLAINS THE BIOHAZARDS USED AND HOW THEY WILL BE USED. PROJECTS SUBMITTED WITHOUT A SUMMARY WILL NOT BE REVIEWED. A GRANT SUMMARY PAGE MAYBE ADEQUATE IF IT PROVIDES SUFFICIENT DETAIL ABOUT EACH BIOHAZARD USED.

Names of all personnel working under Principal Investigators supervision in this location:

James MacDonald	Chunhui Li
Alfonso Dietrich	Asghar Talebian
Renee Phillips	Kayla Driver

*** DESCRIPTION MUST BE ATTACHED TO THIS FORM OR PROJECT WILL NOT BE REVIEWED***

1.0 Microorganisms

1.1 Does your work involve the use of biological agents? ⊗ YES O NO
(including but not limited to bacteria and other microorganisms, viruses, prions, parasites or pathogens of plant or animal origin)? If no, please proceed to Section 2.0

Do you use microorganisms that require a permit from the CFIA? O YES ⊗ NO
If YES, please give the name of the species. _____
What is the origin of the microorganism(s)? _____
Please describe the risk (if any) of escape and how this will be mitigated:

_____
_____
_____

Please attach the CFIA permit.
Please describe any CFIA permit conditions:

_____
_____
_____

1.2 Please complete the table below:

Name of Biological agent(s)*	Is it known to be a human pathogen? YES/NO	Is it known to be an animal pathogen? YES/NO	Is it known to be a zoonotic agent? YES/NO	Maximum quantity to be cultured at one time? (in Litres)	Source/ Supplier	PHAC or CFIA Containment Level
Yeast (PJ694A)	O Yes ⊗ No	O Yes ⊗ No	O Yes ⊗ No	500 ml	In house	~~⊗~~ 1 ~~⊗~~ 2 O 3
Bacteria (E.coli:	O Yes ⊗ No	O Yes ⊗ No	O Yes ⊗ No	1 Litre	In house	~~⊗~~ 1 ~~⊗~~ 2 O 3
BL21, DH5a, MC1061/P3,	O Yes O No	O Yes O No	O Yes O No			O 1 O 2 O 3
XL10 Gold, Arctic Express)	O Yes O No	O Yes O No	O Yes O No			O 1 O 2 O 3

*Please attach a Material Safety Data Sheet or equivalent from the supplier.

Adenovirus Yes Yes Yes see section 4.3 (viral vectors) Level 2

2.0 Cell Culture

2.1 Does your work involve the use of cell cultures? ⊗ YES O NO
If no, please proceed to Section 3.0

2.2 Please indicate the type of primary cells (i.e. derived from fresh tissue) that will be grown in culture:

Cell Type	Is this cell type used in your work?	Source of Primary Cell Culture Tissue	AUS Protocol Number
Human	O Yes ⊗ No		Not applicable
Rodent	⊗ Yes O No	Brain	2009-048
Non-human primate	O Yes ⊗ No		
Other (specify)	O Yes O No		

*** DESCRIPTION MUST BE ATTACHED TO THIS FORM OR PROJECT WILL NOT BE REVIEWED***

2.3 Please indicate the type of established cells that will be grown in culture in:

Cell Type	Is this cell type used in your work?	Specific cell line(s)*	Supplier / Source
Human	⊗ Yes O No	Daoy,D283,HEK,U87,U343,U373,UW426,UW228,SY5Y	
Rodent	⊗ Yes O No	3T3,SN56,PC12,nnr5	
Non-human primate	⊗ Yes O No	Cos7	
Other (specify)	⊗ Yes O No	Sf21 Insect cells	

*Please attach a Material Safety Data Sheet or equivalent from the supplier. (For more information, see www.atcc.org)

2.4 For above named cell types(s) indicate PHAC or CFIA containment level required O 1 ⊗ 2 O 3

3.0 Use of Human Source Materials

3.1 Does your work involve the use of human source materials? O YES ⊗ NO
If no, please proceed to Section 4.0

3.2 Indicate in the table below the Human Source Material to be used.

Human Source Material	**Source/Supplier /Company Name**	**Is Human Source Material Infected With An Infectious Agent? YES/NO**	**Name of Infectious Agent (If applicable)**	**PHAC or CFIA Containment Level (Select one)**
Human Blood (whole) or other Body Fluid		O Yes O No O Unknown		O 1 O 2 O 3
Human Blood (fraction) or other Body Fluid		O Yes O No O Unknown		O 1 O 2 O 3
Human Organs or Tissues (unpreserved)		O Yes O No O Unknown		O 1 O 2 O 3
Human Organs or Tissues (preserved)		Not Applicable		Not Applicable

4.0 Genetically Modified Organisms and Cell lines

4.1 Will genetic modifications be made to the microorganisms, biological agents, or cells described in Sections 1.0 and 2.0? ⊗ YES O NO If no, please proceed to Section 5.0

4.2 Will genetic modification(s) involving plasmids be done? ⊗ YES, complete table below O NO

Bacteria Used for Cloning *	Plasmid(s) *	Source of Plasmid	Gene Transfected	Describe the change that results
DH5alpha XL10,Arc.Exp.	pCMX,EGFP, pCAL5 Taptag	Literature or generated in the lab	Multiple genes List of lab plasmids attached	No effect to the E.coli

* Please attach a Material Data Sheet or equivalent if available.

4.3 Will genetic modification(s) involving viral vectors be made? ⊗ YES, complete table below O NO

Virus Used for Vector Construction	Vector(s) *	Source of Vector	Gene(s) Transduced	Describe the change that results
Adeno	pAd Easy	Literature Bert Vogelstein	Trk, FRS3, FRS2 Nesca	Changes in nerve growth/stability

* Please attach a Material Safety Data Sheet or equivalent.

4.4 Will genetic sequences from the following be involved?

- HIV O YES, please specify _____ ⊗ NO
- HTLV 1 or 2 or genes from any Level 1 or Level 2 pathogens O YES, specify _____ ⊗ NO
- SV 40 Large T antigen ⊗ YES O NO
- E1A oncogene ⊗ YES O NO
- Known oncogenes ⊗ YES, please specify CA-Ras, v-src O NO
- Other human or animal pathogen and or their toxins O YES, please specify _____ ⊗ NO

4.5 Will virus be replication defective? ⊗ YES O NO

4.6 Will virus be infectious to humans or animals? ⊗ YES O NO

4.7 Will this be expected to increase the containment level required? O YES ⊗ NO

5.0 Human Gene Therapy Trials

5.1 Will human clinical trials be conducted involving a biological agent? O YES ⊗ NO
(including but not limited to microorganisms, viruses, prions, parasites or pathogens of plant or animal origin)
If no, please proceed to Section 6.0

5.2 If YES, please specify which biological agent will be used: _____
Please attach a full description of the biological agent.

5.2 Will the biological agent be able to replicate in the host? O YES O NO

5.3 How will the biological agent be administered? _____

5.4 Please give the Health Care Facility where the clinical trial will be conducted:_____

5.5 Has human ethics approval been obtained? O YES, number: _____ O NO O PENDING

6.0 Animal Experiments

6.1 Will live animals be used? O YES ⊗ NO If no, please proceed to section 7.0

6.2 Name of animal species to be used_____

6.3 AUS protocol # _____

6.4 Will any of the agents listed in section 4.0 be used in live animals O YES, specify: _____ O NO

6.5 Will the agent(s) be shed by the animal: O YES O NO, please justify:

_____

_____

*** DESCRIPTION MUST BE ATTACHED TO THIS FORM OR PROJECT WILL NOT BE REVIEWED***

7.0 Use of Animal species with Zoonotic Hazards

7.1 Will any of the following animals or their organs, tissues, lavages or other body fluids including blood be used?

- Pound source dogs O YES ⊗ NO
- Pound source cats O YES ⊗ NO
- Cattle, sheep or goats O YES ⊗ NO
- Non-human primates O YES, please specify species _____ ⊗ NO
- Wild caught animals O YES, please specify species & colony # _____ ⊗ NO
- Birds O YES ⊗ NO
- Others (wild or domestic) O YES, please specify _____ ⊗ NO

8.0 Biological Toxins

8.1 Will toxins of biological origin be used? O YES ⊗ NO If no, please proceed to Section 9.0

8.2 If YES, please name the toxin(s)_____
Please attach information, such as a Material Safety Data Sheet, for the toxin(s) used.

8.3 What is the LD_{50} (specify species) of the toxin_____

8.4 How much of the toxin is handled at one time*? _____

8.5 How much of the toxin is stored*? _____

8.6 Will any biological toxins be used in live animals? O YES, Please provide detais:_____ O NO

*For information on biosecurity requirements, please see:
http://www.uwo.ca/humanresources/docandform/docs/healthandsafety/biosafety/Biosecurity_Requirements.pdf

9.0 Insects Requiring CFIA Permits

9.1 Do you use insects that require a permit from the CFIA? O YES ⊗ NO
If no, please proceed to Section 10.0

9.2 If YES, please give the name of the species. _____

9.3 What is the origin of the insect? _____

9.4 What is the life stage of the insect? _____

9.5 What is your intention? O Initiate and maintain colony, give location: _____
O "One-time" use, give location: _____

9.6 Please describe the risk (if any) of escape and how this will be mitigated:
_____
_____
_____

9.7 Please attach the CFIA permit.

9.8 Please describe any CFIA permit conditions:
_____
_____

*** DESCRIPTION MUST BE ATTACHED TO THIS FORM OR PROJECT WILL NOT BE REVIEWED***

10.0 Plants Requiring CFIA Permits

10.1 Do you use plants that require a permit from the CFIA? O YES ⊗ NO
If no, please proceed to Section 11.0

10.2 If YES, please give the name of the species. _____

10.3 What is the origin of the plant? _____

10.4 What is the form of the plant (seed, seedling, plant, tree…)? _____

10.5 What is your intention? O Grow and maintain a crop O "One-time" use

10.6 Do you do any modifications to the plant? O YES O NO
If yes, please describe: _____
_____

10.7 Please describe the risk (if any) of loss of the material from the lab and how this will be mitigated:
_____
_____
_____

10.8 Is the CFIA permit attached? O YES O NO
If NO, please forward the permit to he Biosafety Officer when available.

10.9 Please describe any CFIA permit conditions:
_____
_____
_____

11.0 Import Requirements

11.1 Will any of the above agents be imported? ⊗ YES, please give country of origin USA
If no, please proceed to Section 12.0 O NO

11.2 Has an Import Permit been obtained from HC for human pathogens? ⊗ YES O NO

11.3 Has an import permit been obtained from CFIA for animal or plant pathogens? ⊗ YES O NO

11.4 Has the import permit been sent to OHS? ⊗ YES, please provide permit # P-13851 O NO

12.0 Training Requirements for Personnel Named on Form

All personnel named on the above form who will be using any of the above named agents are required to attend the following training courses given by OHS:

- Biosafety
- Laboratory and Environmental/Waste Management Safety
- WHMIS (Western or equivalent)
- Employee Health and Safety Orientation

As the Principal Investigator, I have ensured that all of the personnel named on the form who will be using any of the biohazardous agents in Sections 1.0 to 9.0 have been trained.

SIGNATURE Susan Mark

*** DESCRIPTION MUST BE ATTACHED TO THIS FORM OR PROJECT WILL NOT BE REVIEWED***

13.0 Containment Levels

11.1 For the work described in sections 1.0 to 9.0, please indicate the highest HC or CFIA Containment Level required. O 1 ⊗ 2 O 3

13.2 Has the facility been certified by OHS for this level of containment?

⊗ YES, permit # if on-campus BIO-RRI-0011
O NO, please certify
O NOT REQUIRED for Level 1 containment

14.0 Procedures to be Followed

14.1 As the Principal Investigator, I will ensure that this project will follow the Western Biosafety Guidelines and Procedures Manual for Containment Level 1 & 2 Laboratories (and the Level 3 Facilities Manual for Level 3 projects). I will ensure that UWO faculty, staff and students working in my laboratory have an up-to-date Hazard Communication Form, found at http://www.wph.uwo.ca/

SIGNATURE Susan Mesh Date: April 8th, 2010

14.2 Please describe additional risk reduction measures will be taken beyond containment level 1, 2, or 3 measures, that are unique to this agent.

All virus work is done in a separate TC hood and the waste is autoclaved before leaving the tissue culture room. Workers use double gloves.

14.3 Please outline what will be done if there is an exposure to the biohazards listed, such as a needlestick injury:

Allow wound to bleed then wash with soap and water. Contact First-aid person and follow up with University Occupational Health and Safety.

15.0 Approvals

UWO Biohazard Subcommittee: SIGNATURE: [signature]
Date: 21 June 2010

Safety Officer for Institution where experiments will take place: SIGNATURE: [signature]
Date: April 14, 2010

Safety Officer for University of Western Ontario (if different from above): SIGNATURE: J Stanley
Date: June 11, 2010

Approval Number: BIO-RRI-0011 Expiry Date (3 years from Approval): June 20 2013

Special Conditions of Approval:

*** DESCRIPTION MUST BE ATTACHED TO THIS FORM OR PROJECT WILL NOT BE REVIEWED***

Meakin Laboratory Research
Biohazard Agents Registry
April 12th, 2010

Brief Description of our Research and how the 'Biohazards' are Used.

The research in my lab examines intracellular signalling mechanisms regulated by a family of receptor tyrosine kinases, termed Trks, and how they function in the developing and mature nervous systems as well as how they can be used to cause the death of brain tumors. As such, we use a combination of biochemistry, cell biology, microscopy, cell culture and primary culture model systems to examine changes in the interaction and/or activation of individual proteins as well as their effects on cell survival, proliferation, differentiation and cell death.

The biohazards that my lab utilizes include a variety of primary and established cell lines, plasmids that will support the expression of individual receptors and signalling molecules as well as bacteria and yeast to facilitate their production in the lab and finally, in some cases, adenoviral vectors and their subsequent viral stocks, to deliver particular genes into cells which are otherwise resistant to gene delivery by traditional methods. To this end, genes encoding both wild type and mutated forms of specific signalling molecules are introduced into cell lines and then the cellular effects of these genes are assayed with respect to changes in cell proliferation, differentiation and/or death. These are standard approaches that are utilized to investigate how signalling networks function and their effects on cellular properties. None of the plasmids that we use express classical viral oncogenes. All encode normal cellular proteins, proto-oncogenes or mutants in which one or more biochemical properties have been modified.

* Info added
June 1, 2010

Meakin
Adenovirus list.

pAd- TRKA

- TRKB
- TrK C - see description ⁋
- Sh Pincher

~~[illegible]~~

- DN Pincher
- WT Pincher
- DN cdc 42
- CA cdc 42
- WT cdc 42
- PKC alpha
- PKC zeta
- JNK 1
- JNK 2
- DN JNK1
- DN JNK2
- GFP NESCA
- GFP
- Mono RED

The research in my lab addresses the mechanisms activated by the receptor tyrosine kinases termed Trk in the developing and mature nervous systems. The Trk family includes 3 members, TrkA (activated by nerve growth factor), TrkB (activated by brain-derived neurotrophic factor) and TrkC (activated by neurotrophin 3). My research addresses (1) mechanisms of how TrkA can activate cell death in tumors of the nervous system such as medulloblastomas and glioblastomas, (2) mechanisms where by TrkB facilitates long-term potentiation and memory, via ShcC, RasGrf1 and the NMDA receptors, (3) mechanisms of neuronal survival and neuronal process formation, via Nesca, RasGrf1 and FRS3 and (4) mechanisms of how FRS3 facilitates cortical neuron development and migration during cortical neurogenesis. We address these questions using a variety of molecular and cell biology approaches including transgenic mice, primary neuron cultures, knock down studies using knock-out mice or loss of expression via siRNA or shRNA approaches as well as transfection and over-expression approaches using plasmids or adenoviral expression in both established and primary neuronal cell culture.

2.0 Cells grown in culture

Human cells: Hek 293 and 293T cells, Human **Neuroblastoma** Cell Lines: SY5Y, IMR32, SK-N-AS, CHP-212, BE(2)-C, SK-N-DZ, SK-N-MC and SK-N-F1;
Medulloblastoma cells: Daoy, Daoy-TrkA/TrkB/TrkC (wt and mutants), D283, UW228, UW426
Gliomas and Astrocytomas: U87MG, U373, U343, T98G, A172, and SF767

Rodent: Established lines: nnr5 cells (and their derivatives), PC12 cells, NIH 3T3 cells, SN-56 cells
Primary culture: mouse cortical neurons, mouse brain-derived stem cells, hippocampal neurons, Cerebellar neurons.

Non-human primate: Cos7 cells

4.0 Recombinant plasmids, phage or viral vectors

Mammalian Expression Vectors: pCMX, pCDNA3.1, pEGFP vectors expressing Trk, FRS2, FRS3, ShcB, ShcC, AKT, Fyn, NR2B, STEP isoforms, Arf6, Rac, Cdc42, Ras, Rab5, Rab7, Rab34, CtBP/BARS, HDAC6, SNX5, RasGrf1, Nesca, Axin, β-catenin, FGFRs and their corresponding mutants
Bacterial Expression Vectors: GST fusion vectors encoding various subdomains of proteins encoded by the genes listed above.
Yeast: pAS, pACT, pGad → yeast two-hybrid vectors.
Viral Vectors: pAd-Easy (non-lytic virus) → expressing Trk (plus mutants), FRS2 and FRS3 (plus mutants), Shp2 (plus mutants), FRS3 (shRNA), Nesca (shRNA), RasGrf1 (shRNA)

VECTOR BIOLABS
THE ADENOVIRUS COMPANY

MATERIAL SAFETY DATA SHEET

EMERGENCY TELEPHONES: 1- 877-Biolabs 1-215-966-6045
http://www.vectorbiolabs.com

MATERIAL SAFETY DATA SHEET - INFECTIOUS SUBSTANCES

SECTION I - INFECTIOUS AGENT

PRODUCT IDENTIFICATION:
All pre-made adenovirus made by Vector BioLabs.

BIOLOGICAL NAME: Adenovirus - Type 5
CHARACTERISTICS: Adenoviridae; non-enveloped, icosahedral virions, 75-80 nm diameter, doubledstranded, linear DNA genome. The recombinant viruses are based on human adenoviral backbone which is deleted in the essential E1 gene as well as the E3 gene. The viruses produced are thus non-replicative.

SECTION II - HEALTH HAZARD

PATHOGENICITY: Varies in clinical manifestation and severity; symptoms include fever, rhinitis, pharyngitis, cough and conjunctivitis. The risk from infection by defective recombinant adenoviral vectors depends both on the dose of virus and on the nature of the transgene. Adenovirus does not integrate into the host cell genome but can produce a strong immune response.
HOST RANGE: Humans and animals
INCUBATION PERIOD: from 1-10 days
MODE OF TRANSMISSION: In the laboratory, care must be taken to avoid spread of infectious material by aerosol, direct contact or accidental injection
CHEMICAL LISTED AS CARCINOGEN OR POTENTIAL CARCINOGEN: None

SECTION III - VIABILITY

DRUG SUSCEPTIBILITY: No specific antiviral available
SUSCEPTIBILITY TO DISINFECTANTS: Susceptible to 1% sodium hypochlorite, 2% glutaraldehyde. Recommend use of 1/3 volume of bleach for 30 minutes.
PHYSICAL INACTIVATION: Sensitive to heat; 1 hour at 56°C is used to inactivate virus.
SURVIVAL OUTSIDE HOST: Adenovirus type 5 survived from 3-8 weeks on environmental surfaces at room temperature.

SECTION IV - MEDICAL

SURVEILLANCE: Monitor for symptoms; confirm by serological analysis
FIRST AID/TREATMENT:
Contact: Immediately flush eyes and skin with plenty of water for at least 15 minutes. Call a physician.
Inhalation: N/A
Ingestion: Wash out mouth with water. Call a physician
Accidental injection: wash area with soap and water. Call a physician.

SECTION V – ACCIDENTAL RELEASE PROCEDURES

Pour 1 volume of Javel water over the leak(s) and wait for 15 minutes.
Wipe up carefully.
Hold for autoclave waste disposal and decontaminate work surfaces with 70% alcohol.

SECTION VI - RECOMMENDED PRECAUTIONS

CONTAINMENT REQUIREMENTS: Biosafety level 2 practices and containment facilities for all activities involving the virus and potentially infectious body fluids or tissues. This level consists of etiological agents considered to be of ordinary potential harm.
PROTECTIVE CLOTHING: Recombinants Adenovirus: Laboratory coat; gloves.

OTHER PRECAUTIONS:
Access to the laboratory is limited.
Work surfaces are decontaminated before and after each procedure
Mechanical pipetting devices are used for all procedures; mouth pipetting is prohibited.
Eating, drinking, and smoking are not permitted in the laboratory; food is not stored in laboratory areas.
Laboratory coats are worn in and are removed before leaving the laboratory.
Hands are washed before and after handling virus.

SECTION VII - HANDLING INFORMATION

DISPOSAL: Decontaminate all wastes before disposal; steam sterilization
STORAGE: In sealed containers that are appropriately labeled

SECTION VIII - MISCELLANEOUS INFORMATION

The above information and recommendations are believed to be accurate and represent the most complete information currently available to us. All materials and components may present unknown hazards and should be used with caution. Vector BioLabs, Inc assumes no liability resulting from use of the above products.

Date of revision: May 24, 2004

3701 Market Street, Suite 340, Philadelphia, PA 19104 Tel: 877-biolabs Fax: 215-966-6001 info@vectorbiolabs.com

invitrogen™

Material Safety Data Sheet

Revision Date: 06-Jun-2008

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING

Product code 500274
Product name MC1061/P3 competent cells

Company/Undertaking Identification

INVITROGEN CORPORATON
5791 VAN ALLEN WAY
PO BOX 6482
CARLSBAD, CA 92008
760-603-7200

INVITROGEN CORPORATION
5250 MAINWAY DRIVE
BURLINGTON, ONT
CANADA L7L 6A4
800-263-6236

GIBCO PRODUCTS
INVITROGEN CORPORATION
3175 STALEY ROAD P.O. BOX 68
GRAND ISLAND, NY 14072
716-774-6700

2. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous/Non-hazardous Components
The product contains no substances which at their given concentration, are considered to be hazardous to health

3. HAZARDS IDENTIFICATION

Emergency Overview
The product contains no substances which at their given concentration, are considered to be hazardous to health

Form
Liquid

Principle Routes of Exposure/ Potential Health effects

Eyes No information available
Skin No information available

3. HAZARDS IDENTIFICATION

Inhalation No information available
Ingestion No information available

Specific effects

Carcinogenic effects No information available
Mutagenic effects No information available
Reproductive toxicity No information available
Sensitization No information available

Target Organ Effects No information available

HMIS

Health	0
Flammability	0
Reactivity	0

4. FIRST AID MEASURES

Skin contact Wash off immediately with plenty of water
Eye contact Rinse thoroughly with plenty of water, also under the eyelids.
Ingestion Never give anything by mouth to an unconscious person
Inhalation Move to fresh air
Notes to physician Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media Dry chemical
Special protective equipment for firefighters Wear self-contained breathing apparatus and protective suit

6. ACCIDENTAL RELEASE MEASURES

Personal precautions Use personal protective equipment
Methods for cleaning up Soak up with inert absorbent material.

7. HANDLING AND STORAGE

Handling No special handling advice required
Storage Keep in properly labelled containers

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure controls

Exposure limits
Engineering measures Ensure adequate ventilation, especially in confined areas

Personal protective equipment

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment
Hand protection Protective gloves
Eye protection Safety glasses with side-shields
Skin and body protection Lightweight protective clothing.

Hygiene measures	Handle in accordance with good industrial hygiene and safety practice
Environmental exposure controls	Prevent product from entering drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

General Information

Form	Liquid

Important Health Safety and Environmental Information

Boiling point/range	**°C** No data available	**°F** No data available
Melting point/range	**°C** No data available	**°F** No data available
Flash point	**°C** No data available	**°F** No data available
Autoignition temperature	**°C** No data available	**°F** No data available
Oxidizing properties	No information available	
Water solubility	No data available	

10. STABILITY AND REACTIVITY

Stability	Stable.
Materials to avoid	No information available
Hazardous decomposition products	No information available
Polymerization	Hazardous polymerisation does not occur.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Principle Routes of Exposure/ Potential Health effects

Eyes	No information available
Skin	No information available
Inhalation	No information available
Ingestion	No information available

Specific effects

Carcinogenic effects	No information available
Mutagenic effects	No information available
Reproductive toxicity	No information available
Sensitization	No information available

Target Organ Effects — No information available

12. ECOLOGICAL INFORMATION

Ecotoxicity effects	No information available.
Mobility	No information available.
Biodegradation	Inherently biodegradable.
Bioaccumulation	Does not bioaccumulate.

13. DISPOSAL CONSIDERATIONS

13. DISPOSAL CONSIDERATIONS

Dispose of in accordance with local regulations

14. TRANSPORT INFORMATION

IATA

Proper shipping name	Not classified as dangerous in the meaning of transport regulations
Hazard Class	No information available
Subsidiary Class	No information available
Packing group	No information available
UN-No	No information available

15. REGULATORY INFORMATION

International Inventories

U.S. Federal Regulations

SARA 313
This product is not regulated by SARA.

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)
This product does not contains HAPs.

U.S. State Regulations

California Proposition 65
This product does not contain chemicals listed under Proposition 65

WHMIS hazard class:
Non-controlled

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR

16. OTHER INFORMATION

This material is sold for research and development purposes only. It is not for any human or animal therapeutic or clinical diagnostic use. It is not intended for food, drug, household, agricultural, or cosmetic use. An individual technically qualified to handle potentially hazardous chemicals must supervise the use of this material.

The above information was acquired by diligent search and/or investigation and the recommendations are based on prudent application of professional judgment. The information shall not be taken as being all inclusive and is to be used only as a guide. All materials and mixtures may be present unknown hazards and should be used with caution. Since Invitrogen Corporation cannot control the actual methods, volumes, or conditions of use, the Company shall not be held liable for any damages or losses resulting from the handling or from contact with the product as described herein. THE INFORMATION IN THIS MSDS DOES NOT CONSTITUTE A WARRANTY, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTCULAR PURPOSE.

End of Safety Data Sheet

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING

Product code 18265017
Product name Subcloning Efficiency ™ DH5alpha™ Competent Cells

Company/Undertaking Identification

INVITROGEN CORPORATON
5791 VAN ALLEN WAY
PO BOX 6482
CARLSBAD, CA 92008
760-603-7200

INVITROGEN CORPORATION
5250 MAINWAY DRIVE
BURLINGTON, ONT
CANADA L7L 6A4
800-263-6236

GIBCO PRODUCTS
INVITROGEN CORPORATION
3175 STALEY ROAD P.O. BOX 68
GRAND ISLAND, NY 14072
716-774-6700

24 hour Emergency Response (Transport): 866-536-0631
301-431-8585
Outside of the U.S. ++1-301-431-8585

For research use only

2. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous/Non-hazardous Components
The product contains no substances which at their given concentration, are considered to be hazardous to health. We recommend handling all chemicals with caution.

3. HAZARDS IDENTIFICATION

Emergency Overview
The product contains no substances which at their given concentration, are considered to be hazardous to health

3. HAZARDS IDENTIFICATION

Form
Liquid

Principle Routes of Exposure/ Potential Health effects

Eyes	No information available
Skin	No information available
Inhalation	No information available
Ingestion	May be harmful if swallowed.

Specific effects

Carcinogenic effects	No information available
Mutagenic effects	No information available
Reproductive toxicity	No information available
Sensitization	No information available

Target Organ Effects No information available

HMIS

Health	0
Flammability	0
Reactivity	0

4. FIRST AID MEASURES

Skin contact	Wash off immediately with plenty of water. If symptoms persist, call a physician.
Eye contact	Rinse thoroughly with plenty of water, also under the eyelids. If symptoms persist, call a physician.
Ingestion	Never give anything by mouth to an unconscious person. If symptoms persist, call a physician.
Inhalation	Move to fresh air. If symptoms persist, call a physician.
Notes to physician	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	Dry chemical
Special protective equipment for firefighters	Wear self-contained breathing apparatus and protective suit

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	Use personal protective equipment
Methods for cleaning up	Soak up with inert absorbent material.

7. HANDLING AND STORAGE

Handling	No special handling advice required
Storage	Keep in properly labelled containers

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure controls

Exposure limits

Engineering measures	Ensure adequate ventilation, especially in confined areas

Personal protective equipment

Respiratory Protection	In case of insufficient ventilation wear suitable respiratory equipment
Hand protection	Protective gloves
Eye protection	Safety glasses with side-shields
Skin and body protection	Lightweight protective clothing.
Hygiene measures	Handle in accordance with good industrial hygiene and safety practice
Environmental exposure controls	Prevent product from entering drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

General Information

Form	Liquid

Important Health Safety and Environmental Information

Boiling point/range	**°C** No data available	**°F** No data available
Melting point/range	**°C** No data available	**°F** No data available
Flash point	**°C** No data available	**°F** No data available
Autoignition temperature	**°C** No data available	**°F** No data available
Oxidizing properties	No information available	
Water solubility	No data available	

10. STABILITY AND REACTIVITY

Stability	Stable.
Materials to avoid	No information available
Hazardous decomposition products	No information available
Polymerization	Hazardous polymerisation does not occur.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Principle Routes of Exposure/ Potential Health effects

Eyes	No information available
Skin	No information available
Inhalation	No information available

Ingestion	May be harmful if swallowed.

Specific effects **(Long Term Effects)**

Carcinogenic effects	No information available
Mutagenic effects	No information available
Reproductive toxicity	No information available
Sensitization	No information available

Target Organ Effects No information available

12. ECOLOGICAL INFORMATION

Ecotoxicity effects	No information available.
Mobility	No information available.
Biodegradation	Inherently biodegradable.
Bioaccumulation	Does not bioaccumulate.

13. DISPOSAL CONSIDERATIONS

Dispose of in accordance with local regulations

14. TRANSPORT INFORMATION

IATA

Proper shipping name	Not classified as dangerous in the meaning of transport regulations
Hazard Class	No information available
Subsidiary Class	No information available
Packing group	No information available
UN-No	No information available

15. REGULATORY INFORMATION

International Inventories

U.S. Federal Regulations

SARA 313
This product is not regulated by SARA.

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)
This product does not contains HAPs.

U.S. State Regulations

California Proposition 65
This product does not contain chemicals listed under Proposition 65

WHMIS hazard class:
Non-controlled

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR

16. OTHER INFORMATION

For research use only

The above information was acquired by diligent search and/or investigation and the recommendations are based on prudent application of professional judgment. The information shall not be taken as being all inclusive and is to be used only as a guide. All materials and mixtures may present unknown hazards and should be used with caution. Since the Company cannot control the actual methods, volumes, or conditions of use, the Company shall not be held liable for any damages or losses resulting from the handling or from contact with the product as described herein. THE INFORMATION IN THIS MSDS DOES NOT CONSTITUTE A WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

End of Safety Data Sheet

SIGMA-ALDRICH

MATERIAL SAFETY DATA SHEET

Date Printed: 04/14/2010
Date Updated: 02/28/2006
Version 1.2

Section 1 - Product and Company Information

Product Name	HB101 COMPETENT CELLS, UNI-PACK
Product Number	H3788
Brand	SIGMA
Company	Sigma-Aldrich Canada, Ltd
Address	2149 Winston Park Drive Oakville ON L6H 6J8 CA
Technical Phone:	9058299500
Fax:	9058299292
Emergency Phone:	800-424-9300

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
HB101 COMPETENT CELLS, UNI-PACK KIT	None	No

The hazards identified with this kit are those associated with the following substances. For additional information, please refer to the individual material safety data sheet(s).
Kit Components:
COMPETENT CELLS WITH 7% DMSO
PUC19 DNA

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Caution: Avoid contact and inhalation. Readily absorbed through skin. Target organ(s): Eyes. Skin.

HMIS RATING

HEALTH: 1*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 1
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

Section 7 - Handling and Storage

STORAGE

Store at -70°C

Section 14 - Transport Information

DOT

Proper Shipping Name: None
Non-Hazardous for Transport: This substance is considered to be non-hazardous for transport.

IATA
Non-Hazardous for Air Transport: Non-hazardous for air transport.

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION
S: 23-24/25
Safety Statements: Do not breathe spray. Avoid contact with skin and eyes.

US CLASSIFICATION AND LABEL TEXT
US Statements: Caution: Avoid contact and inhalation. Readily absorbed through skin. Target organ(s): Eyes. Skin.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Agilent Technologies

Stratagene XL10-Gold Ultracompetent Cells, Catalog #200314

1. Product and company identification

Product name	:	**Stratagene XL10-Gold Ultracompetent Cells, Catalog #200314**
Part No.	:	XL10-Gold Ultracompetent cells 200315-41 pUC18 Control Plasmid DNA 200231-42 XL10-Gold 2-mercaptoethanol mix 200314-43
Manufacturer / Supplier	:	Agilent Technologies, Inc. 1834 State Highway 71 West Cedar Creek, TX 78612
Emergency telephone number	:	1-800-894-1304
Use of the substance/preparation	:	Chemical Kit
Validation date	:	11/19/2008

2. Hazards identification

Physical state	:	XL10-Gold Ultracompetent cells	Liquid.
		pUC18 Control Plasmid DNA	Liquid.
		XL10-Gold 2-mercaptoethanol mix	Liquid.
Odor	:	XL10-Gold Ultracompetent cells	Not available.
		pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Characteristic.
OSHA/HCS status	:	XL10-Gold Ultracompetent cells	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
		pUC18 Control Plasmid DNA	While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.
		XL10-Gold 2-mercaptoethanol mix	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview-Signal Word	:	WARNING !	
Emergency overview-Label Statement	:	XL10-Gold Ultracompetent cells	HARMFUL IF SWALLOWED. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
		pUC18 Control Plasmid DNA	NOT EXPECTED TO PRODUCE SIGNIFICANT ADVERSE HEALTH EFFECTS WHEN THE RECOMMENDED INSTRUCTIONS FOR USE ARE FOLLOWED.
		XL10-Gold 2-mercaptoethanol mix	COMBUSTIBLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED. CAUSES EYE AND SKIN IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION.
		XL10-Gold Ultracompetent cells	Toxic if swallowed. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Contains material that may cause target organ damage, based on animal data. Wash thoroughly after handling.
		pUC18 Control Plasmid DNA	No known significant effects or critical hazards. Avoid prolonged contact with eyes, skin and clothing.
		XL10-Gold 2-mercaptoethanol mix	Combustible liquid. Toxic if swallowed. Irritating to eyes and skin. May cause sensitization by skin contact. Keep away from heat, sparks and flame. Do not breathe vapor or mist.

2 . Hazards identification

		Do not ingest. Do not get on skin or clothing. Avoid contact with eyes. Use only with adequate ventilation. Wash thoroughly after handling.
	XL10-Gold Ultracompetent cells	Contains material which may cause damage to the following organs: blood, kidneys, gastrointestinal tract, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.
	pUC18 Control Plasmid DNA	Not available.
	XL10-Gold 2-mercaptoethanol mix	Not available.
Routes of entry :	XL10-Gold Ultracompetent cells	Inhalation. Ingestion.
	pUC18 Control Plasmid DNA	Eye contact. Ingestion.
	XL10-Gold 2-mercaptoethanol mix	Dermal contact. Inhalation.
Potential acute health effects		
Eyes :	XL10-Gold Ultracompetent cells	No known significant effects or critical hazards.
	pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
	XL10-Gold 2-mercaptoethanol mix	Irritating to eyes.
Skin :	XL10-Gold Ultracompetent cells	No known significant effects or critical hazards.
	pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
	XL10-Gold 2-mercaptoethanol mix	Irritating to skin. May cause sensitization by skin contact.
Inhalation :	XL10-Gold Ultracompetent cells	No known significant effects or critical hazards.
	pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
	XL10-Gold 2-mercaptoethanol mix	No known significant effects or critical hazards.
Ingestion :	XL10-Gold Ultracompetent cells	Toxic if swallowed.
	pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
	XL10-Gold 2-mercaptoethanol mix	Toxic if swallowed.
Medical conditions aggravated by over-exposure :	XL10-Gold Ultracompetent cells	Repeated or prolonged exposure to the substance can produce target organs damage.
	pUC18 Control Plasmid DNA	Not applicable.
	XL10-Gold 2-mercaptoethanol mix	Repeated skin exposure can produce local skin destruction or dermatitis. Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation.
Over-exposure signs/symptoms :	XL10-Gold Ultracompetent cells	Not applicable.
	pUC18 Control Plasmid DNA	Not applicable.
	XL10-Gold 2-mercaptoethanol mix	Not applicable.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
XL10-Gold Ultracompetent cells		
Glycerol	56-81-5	5 - 10
Manganese dichloride	7773-01-5	5 - 10
Sucrose	57-50-1	5 - 10
Dimethyl sulfoxide	67-68-5	5 - 10
Potassium chloride	7447-40-7	1 - 5
XL10-Gold 2-mercaptoethanol mix		
2-Mercaptoethanol	60-24-2	100

There are no ingredients or additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First aid measures

Eye contact	:	XL10-Gold Ultracompetent cells	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if adverse health effects persist or are severe.
		pUC18 Control Plasmid DNA	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if adverse health effects persist or are severe.
		XL10-Gold 2-mercaptoethanol mix	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if adverse health effects persist or are severe.
Skin contact	:	XL10-Gold Ultracompetent cells	In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if adverse health effects persist or are severe.
		pUC18 Control Plasmid DNA	In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if adverse health effects persist or are severe.
		XL10-Gold 2-mercaptoethanol mix	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if adverse health effects persist or are severe.
Inhalation	:	XL10-Gold Ultracompetent cells	If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention if adverse health effects persist or are severe.
		pUC18 Control Plasmid DNA	If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention if adverse health effects persist or are severe.
		XL10-Gold 2-mercaptoethanol mix	If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention if adverse health effects persist or are severe.
Ingestion	:	XL10-Gold Ultracompetent cells	Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention if adverse health effects persist or are severe.
		pUC18 Control Plasmid DNA	Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention if adverse health effects persist or are severe.
		XL10-Gold 2-	Do not induce vomiting unless directed to do so by medical

4. First aid measures

		mercaptoethanol mix	personnel. Never give anything by mouth to an unconscious person. Get medical attention if adverse health effects persist or are severe.
Protection of first-aiders	:	XL10-Gold Ultracompetent cells	Not applicable.
		pUC18 Control Plasmid DNA	Not applicable.
		XL10-Gold 2-mercaptoethanol mix	Not applicable.
Notes to physician	:	No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.	

5. Fire-fighting measures

Flammability of the product	:	XL10-Gold Ultracompetent cells	Non-flammable.
		pUC18 Control Plasmid DNA	Non-flammable.
		XL10-Gold 2-mercaptoethanol mix	Flammable.
Products of combustion	:	XL10-Gold Ultracompetent cells	Decomposition products may include the following materials: carbon oxides sulfur oxides halogenated compounds metal oxide/oxides
		pUC18 Control Plasmid DNA	No specific data.
		XL10-Gold 2-mercaptoethanol mix	Decomposition products may include the following materials: carbon oxides sulfur oxides
Extinguishing media			
Suitable	:	XL10-Gold Ultracompetent cells	Use an extinguishing agent suitable for the surrounding fire.
		pUC18 Control Plasmid DNA	Use an extinguishing agent suitable for the surrounding fire.
		XL10-Gold 2-mercaptoethanol mix	Use dry chemical, CO_2, water spray (fog) or foam.
Not suitable	:	XL10-Gold Ultracompetent cells	Not applicable.
		pUC18 Control Plasmid DNA	Not applicable.
		XL10-Gold 2-mercaptoethanol mix	Do not use water jet.
Special protective equipment for fire-fighters	:	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.	
Special remarks on fire hazards	:	XL10-Gold Ultracompetent cells	Not available.
		pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Not available.
Special remarks on explosion hazards	:	Not available.	

6. Accidental release measures

Personal precautions	:	XL10-Gold Ultracompetent cells	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
		pUC18 Control Plasmid DNA	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep

6 . Accidental release measures

		unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
	XL10-Gold 2-mercaptoethanol mix	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
Environmental precautions :	XL10-Gold Ultracompetent cells	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
	pUC18 Control Plasmid DNA	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
	XL10-Gold 2-mercaptoethanol mix	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
Methods for cleaning up		
Small spill :	XL10-Gold Ultracompetent cells	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
	pUC18 Control Plasmid DNA	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
	XL10-Gold 2-mercaptoethanol mix	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

7 . Handling and storage

Handling :	XL10-Gold Ultracompetent cells	Do not ingest. Wash thoroughly after handling.
	pUC18 Control Plasmid DNA	Wash thoroughly after handling.
	XL10-Gold 2-mercaptoethanol mix	Do not ingest. Avoid contact with eyes, skin and clothing. Keep container closed. Use only with adequate ventilation. Keep away from heat, sparks and flame. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling.
Storage :	Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.	

8 . Exposure controls/personal protection

Product name	Exposure limits
United States	
XL10-Gold Ultracompetent cells	
Glycerol	**ACGIH TLV (United States, 1/2008).** TWA: 10 mg/m³ 8 hour(s). Form: Mist **OSHA PEL (United States, 11/2006).** TWA: 5 mg/m³ 8 hour(s). Form: Respirable fraction TWA: 15 mg/m³ 8 hour(s). Form: Total dust **OSHA PEL 1989 (United States, 3/1989).** TWA: 5 mg/m³ 8 hour(s). Form: Respirable fraction TWA: 10 mg/m³ 8 hour(s). Form: Total dust
Manganese dichloride	**ACGIH TLV (United States, 1/2008).** TWA: 0.2 mg/m³, (as Mn) 8 hour(s). **OSHA PEL 1989 (United States, 3/1989).** CEIL: 5 mg/m³, (as Mn) **NIOSH REL (United States, 12/2001).** TWA: 1 mg/m³, (as Mn) 10 hour(s). STEL: 3 mg/m³, (as Mn) 15 minute(s). **OSHA PEL (United States, 11/2006).** CEIL: 5 mg/m³, (as Mn)
Sucrose	**ACGIH TLV (United States, 1/2008).** TWA: 10 mg/m³ 8 hour(s). **OSHA PEL 1989 (United States, 3/1989).** TWA: 15 mg/m³ 8 hour(s). Form: Total dust TWA: 5 mg/m³ 8 hour(s). Form: Respirable fraction **NIOSH REL (United States, 12/2001).** TWA: 10 mg/m³ 10 hour(s). Form: Total TWA: 5 mg/m³ 10 hour(s). Form: Respirable fraction **OSHA PEL (United States, 11/2006).** TWA: 15 mg/m³ 8 hour(s). Form: Total dust TWA: 5 mg/m³ 8 hour(s). Form: Respirable fraction
Dimethyl sulfoxide	**AIHA WEEL (United States, 1/2008).** TWA: 250 ppm 8 hour(s).
XL10-Gold 2-mercaptoethanol mix	
2-Mercaptoethanol	**AIHA WEEL (United States, 1/2008).** TWA: 0.2 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Engineering measures : If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Personal protection

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts.

Skin : Chemical resistant protective gloves and clothing are recommended. The choice of protective gloves or clothing must be based on chemical resistance and other use requirements. Generally, BUNA-N offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to this chemical may require additional protective clothing.

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Other protection : Not available.

Hygiene measures : Handle as biohazard material (Biosafety level 1).
Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

9 . Physical and chemical properties

Physical state	:	XL10-Gold Ultracompetent cells	Liquid.
		pUC18 Control Plasmid DNA	Liquid.
		XL10-Gold 2-mercaptoethanol mix	Liquid.
Flash point	:	XL10-Gold Ultracompetent cells	Not applicable.
		pUC18 Control Plasmid DNA	Not applicable.
		XL10-Gold 2-mercaptoethanol mix	Closed cup: 74°C (165.2°F).
Flammable limits	:	XL10-Gold Ultracompetent cells	Not applicable.
		pUC18 Control Plasmid DNA	Not applicable.
		XL10-Gold 2-mercaptoethanol mix	Lower: 2.3% Upper: 18%
Color	:	XL10-Gold Ultracompetent cells	Not available.
		pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Colorless.
Odor	:	XL10-Gold Ultracompetent cells	Not available.
		pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Characteristic.
pH	:	XL10-Gold Ultracompetent cells	Not available.
		pUC18 Control Plasmid DNA	Neutral.
		XL10-Gold 2-mercaptoethanol mix	Not available.
Boiling/condensation point	:	XL10-Gold Ultracompetent cells	Lowest known value: 100°C (212°F) (Water). Weighted average: 122.01°C (251.6°F)
		pUC18 Control Plasmid DNA	Lowest known value: 100°C (212°F) (Water).
		XL10-Gold 2-mercaptoethanol mix	157°C (314.6°F)
Melting/freezing point	:	XL10-Gold Ultracompetent cells	May start to solidify at the following temperature: 19.8°C (67.6°F) This is based on data for the following ingredient: Glycerol. Weighted average: 3.02°C (37.4°F)
		pUC18 Control Plasmid DNA	May start to solidify at the following temperature: 0°C (32°F) This is based on data for the following ingredient: Water.
		XL10-Gold 2-mercaptoethanol mix	Not available.
Relative density	:	XL10-Gold Ultracompetent cells	Weighted average: 1.29 (Water = 1)
		pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Only known value: 1.1 (Water = 1) (2-Mercaptoethanol).
Specific gravity	:	XL10-Gold Ultracompetent cells	Not available.
		pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	1.114 g/cm^3 [20°C (68°F)]

9 . Physical and chemical properties

Vapor pressure	:	XL10-Gold Ultracompetent cells	Highest known value: 0.06 kPa (0.4 mm Hg) (at 20°C) (Dimethyl sulfoxide).
		pUC18 Control Plasmid DNA	Highest known value: 2.3 kPa (17.5 mm Hg) (at 20°C) (Water).
		XL10-Gold 2-mercaptoethanol mix	0.1 kPa (1 mm Hg) (at 20°C)
Vapor density	:	XL10-Gold Ultracompetent cells	Highest known value: 3.1 (Air = 1) (Glycerol). Weighted average: 2.91 (Air = 1)
		pUC18 Control Plasmid DNA	Highest known value: 0.62 (Air = 1) (Water).
		XL10-Gold 2-mercaptoethanol mix	2.7 (Air = 1)
Evaporation rate	:	XL10-Gold Ultracompetent cells	0.026 (Dimethyl sulfoxide) compared with Butyl acetate.
		pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Not available.

10 . Stability and reactivity

Stability and reactivity	:	The product is stable.
Incompatibility with various substances	:	Highly reactive or incompatible with the following materials: oxidizing materials and organic materials. Reactive or incompatible with the following materials: acids and alkalis.
Hazardous decomposition products	:	XL10-Gold Ultracompetent cells: Under normal conditions of storage and use, hazardous decomposition products should not be produced. pUC18 Control Plasmid DNA: Under normal conditions of storage and use, hazardous decomposition products should not be produced. XL10-Gold 2-mercaptoethanol mix: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Conditions of reactivity - Flammability	:	Flammable in the presence of the following materials or conditions: open flames, sparks and static discharge.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
2-Mercaptoethanol	LD50 Dermal	Rabbit	150 uL/kg	-
	LD50 Oral	Rat	244 mg/kg	-
Dimethyl sulfoxide	LD50 Dermal	Rat	40 gm/kg	-
	LD50 Oral	Rat	14500 mg/kg	-
Sucrose	LD50 Oral	Rat	29700 mg/kg	-
Manganese dichloride	LD50 Oral	Rat	250 mg/kg	-
Glycerol	LD50 Dermal	Rabbit	>10 gm/kg	-
	LD50 Oral	Rat	12600 mg/kg	-
Potassium chloride	LD50 Oral	Rat	2600 mg/kg	-

Eyes	:	XL10-Gold Ultracompetent cells	No known significant effects or critical hazards.
		pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
		XL10-Gold 2-mercaptoethanol mix	Irritating to eyes.
Skin	:	XL10-Gold Ultracompetent cells	No known significant effects or critical hazards.
		pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
		XL10-Gold 2-mercaptoethanol mix	Irritating to skin. May cause sensitization by skin contact.
Inhalation	:	XL10-Gold Ultracompetent cells	No known significant effects or critical hazards.
		pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
		XL10-Gold 2-mercaptoethanol mix	No known significant effects or critical hazards.

11 . Toxicological information

Ingestion	:	XL10-Gold Ultracompetent cells	Toxic if swallowed.
		pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
		XL10-Gold 2-mercaptoethanol mix	Toxic if swallowed.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
XL10-Gold Ultracompetent cells						
Sucrose	A4	-	-	-	-	-

Potential chronic health effects

Chronic effects	:	Contains material that may cause target organ damage, based on animal data.
Carcinogenicity	:	No known significant effects or critical hazards.
Mutagenicity	:	No known significant effects or critical hazards.
Teratogenicity	:	No known significant effects or critical hazards.
Developmental effects	:	No known significant effects or critical hazards.
Fertility effects	:	No known significant effects or critical hazards.

Over-exposure signs/symptoms

Inhalation	:	No specific data.
Ingestion	:	No specific data.
Skin	:	Adverse symptoms may include the following: irritation redness
Eyes	:	Adverse symptoms may include the following: pain or irritation watering redness

Target organs	:	XL10-Gold Ultracompetent cells	Contains material which may cause damage to the following organs: blood, kidneys, gastrointestinal tract, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.
		pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Not available.
Other adverse effects	:	XL10-Gold Ultracompetent cells	Not available.
		pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Product/ingredient name	Test	Result	Species	Exposure
Dimethyl sulfoxide	-	Acute LC50 35 to 37 ml/L Fresh water	Fish	96 hours
	-	Acute LC50 34000000 ug/L Fresh water	Fish	96 hours
Manganese dichloride	-	Acute EC50 4700 ug/L Fresh water	Daphnia	48 hours
Glycerol	-	Acute LC50 54 to 57 ml/L Fresh water	Fish	96 hours
Potassium chloride	-	Acute EC50 83000 ug/L Fresh water	Daphnia	48 hours

12 . Ecological information

-	Acute LC50 337 mg/L Fresh water	Daphnia	48 hours
-	Acute LC50 435000 ug/L Fresh water	Fish	96 hours

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

The information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information

DOT / IMDG / IATA : Not regulated.

15 . Regulatory information

HCS Classification :	XL10-Gold Ultracompetent cells	Toxic material Target organ effects
	pUC18 Control Plasmid DNA	Not regulated.
	XL10-Gold 2-mercaptoethanol mix	Combustible liquid Toxic material Irritating material
U.S. Federal regulations :	XL10-Gold Ultracompetent cells	**United States inventory (TSCA 8b):** All components are listed or exempted.
	pUC18 Control Plasmid DNA	**United States inventory (TSCA 8b):** All components are listed or exempted.
	XL10-Gold 2-mercaptoethanol mix	**United States inventory (TSCA 8b):** All components are listed or exempted.
	XL10-Gold Ultracompetent cells	**SARA 302/304/311/312 extremely hazardous substances**: No products were found. **SARA 302/304 emergency planning and notification**: No products were found. **SARA 302/304/311/312 hazardous chemicals**: Potassium chloride; Glycerol; Manganese dichloride; Sucrose; Dimethyl sulfoxide **SARA 311/312 MSDS distribution - chemical inventory - hazard identification**: Potassium chloride: Immediate (acute) health hazard, Delayed (chronic) health hazard; Glycerol: Immediate (acute) health hazard, Delayed (chronic) health hazard; Manganese dichloride: Delayed (chronic) health hazard; Sucrose: Delayed (chronic) health hazard; Dimethyl sulfoxide: Immediate (acute) health hazard, Delayed (chronic) health hazard
	pUC18 Control Plasmid DNA	**SARA 302/304/311/312 extremely hazardous substances**: No products were found. **SARA 302/304 emergency planning and notification**: No

15 . Regulatory information

		products were found. **SARA 302/304/311/312 hazardous chemicals**: No products were found. **SARA 311/312 MSDS distribution - chemical inventory - hazard identification**: No products were found.
	XL10-Gold 2-mercaptoethanol mix	**SARA 302/304/311/312 extremely hazardous substances**: No products were found. **SARA 302/304 emergency planning and notification**: No products were found. **SARA 302/304/311/312 hazardous chemicals**: 2-Mercaptoethanol **SARA 311/312 MSDS distribution - chemical inventory - hazard identification**: 2-Mercaptoethanol: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard
	XL10-Gold Ultracompetent cells	**Clean Water Act (CWA) 307**: No products were found.
	pUC18 Control Plasmid DNA	**Clean Water Act (CWA) 307**: No products were found.
	XL10-Gold 2-mercaptoethanol mix	**Clean Water Act (CWA) 307**: No products were found.
	XL10-Gold Ultracompetent cells	**Clean Water Act (CWA) 311**: No products were found.
	pUC18 Control Plasmid DNA	**Clean Water Act (CWA) 311**: Edetic acid
	XL10-Gold 2-mercaptoethanol mix	**Clean Water Act (CWA) 311**: No products were found.
	XL10-Gold Ultracompetent cells	**Clean Air Act (CAA) 112 accidental release prevention**: No products were found.
	pUC18 Control Plasmid DNA	**Clean Air Act (CAA) 112 accidental release prevention**: No products were found.
	XL10-Gold 2-mercaptoethanol mix	**Clean Air Act (CAA) 112 accidental release prevention**: No products were found.
	XL10-Gold Ultracompetent cells	**Clean Air Act (CAA) 112 regulated flammable substances**: No products were found.
	pUC18 Control Plasmid DNA	**Clean Air Act (CAA) 112 regulated flammable substances**: No products were found.
	XL10-Gold 2-mercaptoethanol mix	**Clean Air Act (CAA) 112 regulated flammable substances**: No products were found.
	XL10-Gold Ultracompetent cells	**Clean Air Act (CAA) 112 regulated toxic substances**: No products were found.
	pUC18 Control Plasmid DNA	**Clean Air Act (CAA) 112 regulated toxic substances**: No products were found.
	XL10-Gold 2-mercaptoethanol mix	**Clean Air Act (CAA) 112 regulated toxic substances**: No products were found.

SARA 313

		Product name	CAS number	Concentration
Form R - Reporting requirements	:	**XL10-Gold Ultracompetent cells**		
		Manganese dichloride	7773-01-5	5 - 10
		Hexaamminecobalt trichloride	10534-89-1	0.1 - 1
Supplier notification	:	**XL10-Gold Ultracompetent cells**		
		Manganese dichloride	7773-01-5	5 - 10
		Hexaamminecobalt trichloride	10534-89-1	0.1 - 1

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations	:	XL10-Gold Ultracompetent cells	**Connecticut Carcinogen Reporting**: None of the components are listed. **Connecticut Hazardous Material Survey**: None of the components are listed. **Florida substances**: None of the components are listed. **Illinois Chemical Safety Act**: None of the components are listed. **Illinois Toxic Substances Disclosure to Employee Act**: None of the components are listed.

15 . Regulatory information

	Louisiana Reporting: None of the components are listed. **Louisiana Spill**: None of the components are listed. **Massachusetts Spill**: None of the components are listed. **Massachusetts Substances**: The following components are listed: Glycerol;Sucrose **Michigan Critical Material**: None of the components are listed. **Minnesota Hazardous Substances**: None of the components are listed. **New Jersey Hazardous Substances**: The following components are listed: Manganese dichloride **New Jersey Spill**: None of the components are listed. **New Jersey Toxic Catastrophe Prevention Act**: None of the components are listed. **New York Acutely Hazardous Substances**: None of the components are listed. **New York Toxic Chemical Release Reporting**: None of the components are listed. **Pennsylvania RTK Hazardous Substances**: The following components are listed: Glycerol; Manganese dichloride;Sucrose **Rhode Island Hazardous Substances**: None of the components are listed.
pUC18 Control Plasmid DNA	**Connecticut Carcinogen Reporting**: None of the components are listed. **Connecticut Hazardous Material Survey**: None of the components are listed. **Florida substances**: None of the components are listed. **Illinois Chemical Safety Act**: None of the components are listed. **Illinois Toxic Substances Disclosure to Employee Act**: None of the components are listed. **Louisiana Reporting**: None of the components are listed. **Louisiana Spill**: None of the components are listed. **Massachusetts Spill**: None of the components are listed. **Massachusetts Substances**: None of the components are listed. **Michigan Critical Material**: None of the components are listed. **Minnesota Hazardous Substances**: None of the components are listed. **New Jersey Hazardous Substances**: None of the components are listed. **New Jersey Spill**: None of the components are listed. **New Jersey Toxic Catastrophe Prevention Act**: None of the components are listed. **New York Acutely Hazardous Substances**: None of the components are listed. **New York Toxic Chemical Release Reporting**: None of the components are listed. **Pennsylvania RTK Hazardous Substances**: None of the components are listed. **Rhode Island Hazardous Substances**: None of the components are listed.
XL10-Gold 2-mercaptoethanol mix	**Connecticut Carcinogen Reporting**: None of the components are listed. **Connecticut Hazardous Material Survey**: None of the components are listed. **Florida substances**: None of the components are listed. **Illinois Chemical Safety Act**: None of the components are listed. **Illinois Toxic Substances Disclosure to Employee Act**: None of the components are listed. **Louisiana Reporting**: None of the components are listed. **Louisiana Spill**: None of the components are listed. **Massachusetts Spill**: None of the components are listed. **Massachusetts Substances**: The following components are

15 . Regulatory information

listed: 2-Mercaptoethanol
Michigan Critical Material: None of the components are listed.
Minnesota Hazardous Substances: None of the components are listed.
New Jersey Hazardous Substances: None of the components are listed.
New Jersey Spill: None of the components are listed.
New Jersey Toxic Catastrophe Prevention Act: None of the components are listed.
New York Acutely Hazardous Substances: None of the components are listed.
New York Toxic Chemical Release Reporting: None of the components are listed.
Pennsylvania RTK Hazardous Substances: The following components are listed: 2-Mercaptoethanol
Rhode Island Hazardous Substances: None of the components are listed.

State regulations - California Prop. 65 : No products were found.

16 . Other information

Label requirements	: XL10-Gold Ultracompetent cells	HARMFUL IF SWALLOWED. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
	pUC18 Control Plasmid DNA	NOT EXPECTED TO PRODUCE SIGNIFICANT ADVERSE HEALTH EFFECTS WHEN THE RECOMMENDED INSTRUCTIONS FOR USE ARE FOLLOWED.
	XL10-Gold 2-mercaptoethanol mix	COMBUSTIBLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED. CAUSES EYE AND SKIN IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION.

Date of issue : 11/19/2008
Version : 1

Notice to reader

DISCLAIMER: This Material Safety Data Sheet is offered without charge to the clients of Agilent Technologies. Data is the most current available to Agilent Technologies at the time of preparation and is issued as a matter of information only, no warranty as to its accuracy or completeness is expressed or implied.

☑ **Indicates information that has changed from previously issued version.**

Conforms to ANSI Z400.5-2004 Standard (United States).

Material Safety Data Sheet

Agilent Technologies

Stratagene ArcticExpress (DE3)RIL Competent Cells, Catalog #230193

1. Product and company identification

Product name	:	**Stratagene ArcticExpress (DE3)RIL Competent Cells, Catalog #230193**
Part No.	:	pUC18 Control Plasmid DNA 200231-42 XL10-Gold 2-mercaptoethanol mix 200314-43 ArcticExpress (DE3)RIL competent cells 230193-41
Manufacturer / Supplier	:	Agilent Technologies, Inc. 1834 State Highway 71 West Cedar Creek, TX 78612
Emergency telephone number	:	1-800-894-1304
Use of the substance/preparation	:	Chemical Kit
Validation date	:	11/10/2009

2. Hazards identification

Physical state	:	pUC18 Control Plasmid DNA	Liquid.
		XL10-Gold 2-mercaptoethanol mix	Liquid.
		ArcticExpress (DE3)RIL competent cells	Liquid.
Odor	:	pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Characteristic.
		ArcticExpress (DE3)RIL competent cells	Not available.
OSHA/HCS status	:	pUC18 Control Plasmid DNA	While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.
		XL10-Gold 2-mercaptoethanol mix	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
		ArcticExpress (DE3)RIL competent cells	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview-Signal Word	:	WARNING !	
Emergency overview-Label Statement	:	pUC18 Control Plasmid DNA	NOT EXPECTED TO PRODUCE SIGNIFICANT ADVERSE HEALTH EFFECTS WHEN THE RECOMMENDED INSTRUCTIONS FOR USE ARE FOLLOWED.
		XL10-Gold 2-mercaptoethanol mix	HARMFUL IF ABSORBED THROUGH SKIN. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY BE HARMFUL IF SWALLOWED. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.
		ArcticExpress (DE3)RIL competent cells	HARMFUL IF SWALLOWED. MAY CAUSE RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

2 . Hazards identification

	pUC18 Control Plasmid DNA	No known significant effects or critical hazards. Avoid prolonged contact with eyes, skin and clothing.
	XL10-Gold 2-mercaptoethanol mix	Toxic in contact with skin. Harmful if swallowed. Irritating to eyes, respiratory system and skin. May cause sensitization by skin contact. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. Do not get in eyes or on skin or clothing. Contains material that can cause target organ damage. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
	ArcticExpress (DE3)RIL competent cells	Toxic if swallowed. Slightly irritating to the eyes, skin and respiratory system. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Contains material that may cause target organ damage, based on animal data. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
	pUC18 Control Plasmid DNA	Not available.
	XL10-Gold 2-mercaptoethanol mix	Contains material which causes damage to the following organs: upper respiratory tract, eyes, nose/sinuses. Contains material which may cause damage to the following organs: skin, stomach.
	ArcticExpress (DE3)RIL competent cells	Contains material which may cause damage to the following organs: blood, kidneys, liver, gastrointestinal tract, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.
Routes of entry :	pUC18 Control Plasmid DNA	Not applicable.
	XL10-Gold 2-mercaptoethanol mix	Dermal contact. Inhalation. Ingestion.
	ArcticExpress (DE3)RIL competent cells	Dermal contact. Eye contact. Inhalation. Ingestion.
Potential acute health effects		
Eyes :	pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
	XL10-Gold 2-mercaptoethanol mix	Irritating to eyes.
	ArcticExpress (DE3)RIL competent cells	Slightly irritating to the eyes.
Skin :	pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
	XL10-Gold 2-mercaptoethanol mix	Toxic in contact with skin. Irritating to skin. May cause sensitization by skin contact.
	ArcticExpress (DE3)RIL competent cells	Slightly irritating to the skin.
Inhalation :	pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
	XL10-Gold 2-mercaptoethanol mix	Irritating to respiratory system.
	ArcticExpress (DE3)RIL competent cells	Slightly irritating to the respiratory system.
Ingestion :	pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
	XL10-Gold 2-mercaptoethanol mix	Harmful if swallowed.
	ArcticExpress (DE3)RIL competent cells	Toxic if swallowed.

2 . Hazards identification

Medical conditions aggravated by over-exposure	:	pUC18 Control Plasmid DNA	Not applicable.
		XL10-Gold 2-mercaptoethanol mix	Repeated skin exposure can produce local skin destruction or dermatitis. Repeated or prolonged exposure to the substance can produce lung damage. Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to the substance can produce target organs damage.
		ArcticExpress (DE3)RIL competent cells	Repeated skin exposure can produce local skin destruction or dermatitis. Repeated or prolonged exposure to the substance can produce lung damage. Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to the substance can produce target organs damage.
Over-exposure signs/symptoms	:	pUC18 Control Plasmid DNA	Not applicable.
		XL10-Gold 2-mercaptoethanol mix	Not applicable.
		ArcticExpress (DE3)RIL competent cells	Not applicable.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
XL10-Gold 2-mercaptoethanol mix		
Sodium chloride	7647-14-5	10 - 30
2-Mercaptoethanol	60-24-2	1 - 5
ArcticExpress (DE3)RIL competent cells		
Glycerol	56-81-5	5 - 10
Manganese dichloride	7773-01-5	5 - 10
Sucrose	57-50-1	5 - 10
Dimethyl sulfoxide	67-68-5	5 - 10
Potassium chloride	7447-40-7	1 - 5

There are no ingredients or additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First aid measures

Eye contact	:	pUC18 Control Plasmid DNA	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if adverse health effects persist or are severe.
		XL10-Gold 2-mercaptoethanol mix	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if adverse health effects persist or are severe.
		ArcticExpress (DE3)RIL competent cells	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if adverse health effects persist or are severe.

4. First aid measures

Skin contact	:	pUC18 Control Plasmid DNA	In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if adverse health effects persist or are severe.
		XL10-Gold 2-mercaptoethanol mix	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if adverse health effects persist or are severe.
		ArcticExpress (DE3)RIL competent cells	In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if adverse health effects persist or are severe.
Inhalation	:	pUC18 Control Plasmid DNA	If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention if adverse health effects persist or are severe.
		XL10-Gold 2-mercaptoethanol mix	If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention if adverse health effects persist or are severe.
		ArcticExpress (DE3)RIL competent cells	If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention if adverse health effects persist or are severe.
Ingestion	:	pUC18 Control Plasmid DNA	Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention if adverse health effects persist or are severe.
		XL10-Gold 2-mercaptoethanol mix	Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention if adverse health effects persist or are severe.
		ArcticExpress (DE3)RIL competent cells	Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention if adverse health effects persist or are severe.
Protection of first-aiders	:	pUC18 Control Plasmid DNA	Not applicable.
		XL10-Gold 2-mercaptoethanol mix	Not applicable.
		ArcticExpress (DE3)RIL competent cells	Not applicable.
Notes to physician	:	No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.	

5. Fire-fighting measures

Flammability of the product	:	pUC18 Control Plasmid DNA	Non-flammable.
		XL10-Gold 2-mercaptoethanol mix	Flammable.
		ArcticExpress (DE3)RIL competent cells	Non-flammable.

5 . Fire-fighting measures

Products of combustion	:	pUC18 Control Plasmid DNA	No specific data.
		XL10-Gold 2-mercaptoethanol mix	Decomposition products may include the following materials: carbon oxides sulfur oxides
		ArcticExpress (DE3)RIL competent cells	Decomposition products may include the following materials: carbon oxides sulfur oxides halogenated compounds metal oxide/oxides
Extinguishing media			
Suitable	:	pUC18 Control Plasmid DNA	Use an extinguishing agent suitable for the surrounding fire.
		XL10-Gold 2-mercaptoethanol mix	Use dry chemical, CO_2, water spray (fog) or foam.
		ArcticExpress (DE3)RIL competent cells	Use an extinguishing agent suitable for the surrounding fire.
Not suitable	:	pUC18 Control Plasmid DNA	Not applicable.
		XL10-Gold 2-mercaptoethanol mix	Do not use water jet.
		ArcticExpress (DE3)RIL competent cells	Not applicable.
Special protective equipment for fire-fighters	:	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.	

6 . Accidental release measures

Personal precautions	:	pUC18 Control Plasmid DNA	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
		XL10-Gold 2-mercaptoethanol mix	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
		ArcticExpress (DE3)RIL competent cells	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
Environmental precautions	:	pUC18 Control Plasmid DNA	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
		XL10-Gold 2-mercaptoethanol mix	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
		ArcticExpress (DE3)RIL	Avoid dispersal of spilled material and runoff and contact

6 . Accidental release measures

	competent cells	with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill :	pUC18 Control Plasmid DNA	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
	XL10-Gold 2-mercaptoethanol mix	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.
	ArcticExpress (DE3)RIL competent cells	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

7 . Handling and storage

Handling :	pUC18 Control Plasmid DNA	Wash thoroughly after handling.
	XL10-Gold 2-mercaptoethanol mix	Do not ingest. Avoid contact with eyes, skin and clothing. Keep container closed. Use only with adequate ventilation. Avoid breathing vapor or mist. Wash thoroughly after handling.
	ArcticExpress (DE3)RIL competent cells	Do not ingest. Wash thoroughly after handling.

Storage : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Product name	Exposure limits
United States	
XL10-Gold 2-mercaptoethanol mix	
2-Mercaptoethanol	**AIHA WEEL (United States, 1/2008).** TWA: 0.2 ppm 8 hour(s).
ArcticExpress (DE3)RIL competent cells	
Glycerol	**ACGIH TLV (United States, 1/2008).** TWA: 10 mg/m³ 8 hour(s). Form: Mist **OSHA PEL (United States, 11/2006).** TWA: 5 mg/m³ 8 hour(s). Form: Respirable fraction TWA: 15 mg/m³ 8 hour(s). Form: Total dust **OSHA PEL 1989 (United States, 3/1989).** TWA: 5 mg/m³ 8 hour(s). Form: Respirable fraction TWA: 10 mg/m³ 8 hour(s). Form: Total dust
Manganese dichloride	**ACGIH TLV (United States, 1/2008).** TWA: 0.2 mg/m³, (as Mn) 8 hour(s). **OSHA PEL 1989 (United States, 3/1989).** CEIL: 5 mg/m³, (as Mn) **NIOSH REL (United States, 12/2001).**

8 . Exposure controls/personal protection

TWA: 1 mg/m³, (as Mn) 10 hour(s).
STEL: 3 mg/m³, (as Mn) 15 minute(s).
OSHA PEL (United States, 11/2006).
CEIL: 5 mg/m³, (as Mn)

Sucrose

ACGIH TLV (United States, 1/2008).
TWA: 10 mg/m³ 8 hour(s).
OSHA PEL 1989 (United States, 3/1989).
TWA: 15 mg/m³ 8 hour(s). Form: Total dust
TWA: 5 mg/m³ 8 hour(s). Form: Respirable fraction
NIOSH REL (United States, 12/2001).
TWA: 10 mg/m³ 10 hour(s). Form: Total
TWA: 5 mg/m³ 10 hour(s). Form: Respirable fraction
OSHA PEL (United States, 11/2006).
TWA: 15 mg/m³ 8 hour(s). Form: Total dust
TWA: 5 mg/m³ 8 hour(s). Form: Respirable fraction

Dimethyl sulfoxide

AIHA WEEL (United States, 1/2008).
TWA: 250 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Engineering measures : If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Personal protection

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts.

Skin : Chemical resistant protective gloves and clothing are recommended. The choice of protective gloves or clothing must be based on chemical resistance and other use requirements. Generally, BUNA-N offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to this chemical may require additional protective clothing.

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Other protection : Not available.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

9 . Physical and chemical properties

Physical state : pUC18 Control Plasmid DNA — Liquid.
XL10-Gold 2-mercaptoethanol mix — Liquid.
ArcticExpress (DE3)RIL competent cells — Liquid.

9 . Physical and chemical properties

Flash point	:	pUC18 Control Plasmid DNA	Not applicable.
		XL10-Gold 2-mercaptoethanol mix	Closed cup: 74°C (165.2°F).
		ArcticExpress (DE3)RIL competent cells	Not applicable.
Flammable limits	:	pUC18 Control Plasmid DNA	Not applicable.
		XL10-Gold 2-mercaptoethanol mix	Lower: 2.3% Upper: 18%
		ArcticExpress (DE3)RIL competent cells	Not applicable.
Color	:	pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Colorless.
		ArcticExpress (DE3)RIL competent cells	Not available.
Odor	:	pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Characteristic.
		ArcticExpress (DE3)RIL competent cells	Not available.
pH	:	pUC18 Control Plasmid DNA	Neutral.
		XL10-Gold 2-mercaptoethanol mix	Not available.
		ArcticExpress (DE3)RIL competent cells	Not available.
Boiling/condensation point	:	pUC18 Control Plasmid DNA	Lowest known value: 100°C (212°F) (Water).
		XL10-Gold 2-mercaptoethanol mix	157°C (314.6°F)
		ArcticExpress (DE3)RIL competent cells	Lowest known value: 100°C (212°F) (Water). Weighted average: 122.01°C (251.6°F)
Melting/freezing point	:	pUC18 Control Plasmid DNA	May start to solidify at the following temperature: 0°C (32°F) This is based on data for the following ingredient: Water.
		XL10-Gold 2-mercaptoethanol mix	Not available.
		ArcticExpress (DE3)RIL competent cells	May start to solidify at the following temperature: 19.8°C (67.6°F) This is based on data for the following ingredient: Glycerol. Weighted average: 3.02°C (37.4°F)
Specific gravity	:	pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	1.114 g/cm^3 [20°C (68°F)]
		ArcticExpress (DE3)RIL competent cells	Not available.
Vapor pressure	:	pUC18 Control Plasmid DNA	Highest known value: 2.3 kPa (17.5 mm Hg) (at 20°C) (Water).
		XL10-Gold 2-mercaptoethanol mix	0.1 kPa (1 mm Hg) (at 20°C)
		ArcticExpress (DE3)RIL competent cells	Highest known value: 0.06 kPa (0.4 mm Hg) (at 20°C) (Dimethyl sulfoxide).

9 . Physical and chemical properties

Vapor density	:	pUC18 Control Plasmid DNA	Highest known value: 0.62 (Air = 1) (Water).
		XL10-Gold 2-mercaptoethanol mix	2.7 (Air = 1)
		ArcticExpress (DE3)RIL competent cells	Highest known value: 3.1 (Air = 1) (Glycerol). Weighted average: 2.91 (Air = 1)
Evaporation rate	:	pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Not available.
		ArcticExpress (DE3)RIL competent cells	0.026 (Dimethyl sulfoxide) compared with Butyl acetate.
Solubility	:	pUC18 Control Plasmid DNA	Easily soluble in the following materials: cold water and hot water.
		XL10-Gold 2-mercaptoethanol mix	Easily soluble in the following materials: cold water and hot water.
		ArcticExpress (DE3)RIL competent cells	Easily soluble in the following materials: cold water and hot water.

10 . Stability and reactivity

Stability and reactivity	:	The product is stable. Under normal conditions of storage and use, hazardous polymerization will not occur.
Incompatibility with various substances	:	Highly reactive or incompatible with the following materials: oxidizing materials and organic materials. Reactive or incompatible with the following materials: reducing materials, metals, acids, alkalis and moisture.

Hazardous decomposition products	:	pUC18 Control Plasmid DNA	Under normal conditions of storage and use, hazardous decomposition products should not be produced.
		XL10-Gold 2-mercaptoethanol mix	Under normal conditions of storage and use, hazardous decomposition products should not be produced.
		ArcticExpress (DE3)RIL competent cells	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Conditions of reactivity - Flammability	:	Flammable in the presence of the following materials or conditions: open flames, sparks and static discharge.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Dimethyl sulfoxide	LD50 Dermal	Rat	40 gm/kg	-
	LD50 Oral	Rat	14500 mg/kg	-
Sucrose	LD50 Oral	Rat	29700 mg/kg	-
Manganese dichloride	LD50 Oral	Rat	250 mg/kg	-
Glycerol	LD50 Dermal	Rabbit	>10 gm/kg	-
	LD50 Oral	Rat	12600 mg/kg	-
Potassium chloride	LD50 Oral	Rat	2600 mg/kg	-
2-Mercaptoethanol	LD50 Dermal	Rabbit	150 uL/kg	-
	LD50 Oral	Rat	244 mg/kg	-

Eyes	:	pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
		XL10-Gold 2-mercaptoethanol mix	Irritating to eyes.
		ArcticExpress (DE3)RIL competent cells	Slightly irritating to the eyes.

11 . Toxicological information

Skin	:	pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
		XL10-Gold 2-mercaptoethanol mix	Toxic in contact with skin. Irritating to skin. May cause sensitization by skin contact.
		ArcticExpress (DE3)RIL competent cells	Slightly irritating to the skin.
Inhalation	:	pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
		XL10-Gold 2-mercaptoethanol mix	Irritating to respiratory system.
		ArcticExpress (DE3)RIL competent cells	Slightly irritating to the respiratory system.
Ingestion	:	pUC18 Control Plasmid DNA	No known significant effects or critical hazards.
		XL10-Gold 2-mercaptoethanol mix	Harmful if swallowed.
		ArcticExpress (DE3)RIL competent cells	Toxic if swallowed.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
ArcticExpress (DE3)RIL competent cells						
Sucrose	A4	-	-	-	-	-

Potential chronic health effects

Chronic effects	:	Contains material that may cause target organ damage, based on animal data.
Carcinogenicity	:	No known significant effects or critical hazards.
Mutagenicity	:	No known significant effects or critical hazards.
Teratogenicity	:	No known significant effects or critical hazards.
Developmental effects	:	No known significant effects or critical hazards.
Fertility effects	:	No known significant effects or critical hazards.

Over-exposure signs/symptoms

Inhalation	:	Adverse symptoms may include the following: respiratory tract irritation coughing
Ingestion	:	No specific data.
Skin	:	Adverse symptoms may include the following: irritation redness
Eyes	:	Adverse symptoms may include the following: pain or irritation watering redness

Target organs	:	pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Contains material which causes damage to the following organs: upper respiratory tract, eyes, nose/sinuses. Contains material which may cause damage to the following organs: skin, stomach.
		ArcticExpress (DE3)RIL competent cells	Contains material which may cause damage to the following organs: blood, kidneys, liver, gastrointestinal tract, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.

11 . Toxicological information

Other adverse effects : pUC18 Control Plasmid DNA — Not available.
XL10-Gold 2-mercaptoethanol mix — Not available.
ArcticExpress (DE3)RIL competent cells — Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Product/ingredient name	Test	Result	Species	Exposure
Dimethyl sulfoxide	-	Acute LC50 35 to 37 ml/L Fresh water	Fish	96 hours
	-	Acute LC50 34000000 ug/L Fresh water	Fish	96 hours
Manganese dichloride	-	Acute EC50 4700 ug/L Fresh water	Daphnia	48 hours
Glycerol	-	Acute LC50 54 to 57 ml/L Fresh water	Fish	96 hours
Potassium chloride	-	Acute EC50 83000 ug/L Fresh water	Daphnia	48 hours
	-	Acute LC50 337 mg/L Fresh water	Daphnia	48 hours
	-	Acute LC50 435000 ug/L Fresh water	Fish	96 hours

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

The information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information

DOT / IMDG / IATA : Not regulated.

15 . Regulatory information

HCS Classification	:	pUC18 Control Plasmid DNA	Not regulated.
		XL10-Gold 2-mercaptoethanol mix	Toxic material Irritating material Sensitizing material Target organ effects
		ArcticExpress (DE3)RIL competent cells	Toxic material Target organ effects
		pUC18 Control Plasmid DNA	Not available.
		XL10-Gold 2-mercaptoethanol mix	Contains material which causes damage to the following organs: upper respiratory tract, eyes, nose/sinuses. Contains material which may cause damage to the following organs: skin, stomach.
		ArcticExpress (DE3)RIL competent cells	Contains material which may cause damage to the following organs: blood, kidneys, liver, gastrointestinal tract, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.
U.S. Federal regulations	:	pUC18 Control Plasmid DNA	**United States inventory (TSCA 8b):** All components are listed or exempted.
		XL10-Gold 2-mercaptoethanol mix	**United States inventory (TSCA 8b):** All components are listed or exempted.
		ArcticExpress (DE3)RIL competent cells	**United States inventory (TSCA 8b):** All components are listed or exempted.
		pUC18 Control Plasmid DNA	**SARA 302/304/311/312 extremely hazardous substances**: No products were found. **SARA 302/304 emergency planning and notification**: No products were found. **SARA 302/304/311/312 hazardous chemicals**: No products were found. **SARA 311/312 MSDS distribution - chemical inventory - hazard identification**: No products were found.
		XL10-Gold 2-mercaptoethanol mix	**SARA 302/304/311/312 extremely hazardous substances**: No products were found. **SARA 302/304 emergency planning and notification**: No products were found. **SARA 302/304/311/312 hazardous chemicals**: 2-Mercaptoethanol **SARA 311/312 MSDS distribution - chemical inventory - hazard identification**: 2-Mercaptoethanol: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard
		ArcticExpress (DE3)RIL competent cells	**SARA 302/304/311/312 extremely hazardous substances**: No products were found. **SARA 302/304 emergency planning and notification**: No products were found. **SARA 302/304/311/312 hazardous chemicals**: Potassium chloride; Glycerol; Manganese dichloride; Sucrose; Dimethyl sulfoxide **SARA 311/312 MSDS distribution - chemical inventory - hazard identification**: Potassium chloride: Immediate (acute) health hazard, Delayed (chronic) health hazard; Glycerol: Immediate (acute) health hazard, Delayed (chronic) health hazard; Manganese dichloride: Delayed (chronic)

15 . Regulatory information

health hazard; Sucrose: Delayed (chronic) health hazard; Dimethyl sulfoxide: Immediate (acute) health hazard, Delayed (chronic) health hazard

pUC18 Control Plasmid DNA	**Clean Water Act (CWA) 307**: No products were found.
XL10-Gold 2-mercaptoethanol mix	**Clean Water Act (CWA) 307**: No products were found.
ArcticExpress (DE3)RIL competent cells	**Clean Water Act (CWA) 307**: No products were found.
pUC18 Control Plasmid DNA	**Clean Water Act (CWA) 311**: Edetic acid
XL10-Gold 2-mercaptoethanol mix	**Clean Water Act (CWA) 311**: No products were found.
ArcticExpress (DE3)RIL competent cells	**Clean Water Act (CWA) 311**: No products were found.
pUC18 Control Plasmid DNA	**Clean Air Act (CAA) 112 accidental release prevention**: No products were found.
XL10-Gold 2-mercaptoethanol mix	**Clean Air Act (CAA) 112 accidental release prevention**: No products were found.
ArcticExpress (DE3)RIL competent cells	**Clean Air Act (CAA) 112 accidental release prevention**: No products were found.
pUC18 Control Plasmid DNA	**Clean Air Act (CAA) 112 regulated flammable substances**: No products were found.
XL10-Gold 2-mercaptoethanol mix	**Clean Air Act (CAA) 112 regulated flammable substances**: No products were found.
ArcticExpress (DE3)RIL competent cells	**Clean Air Act (CAA) 112 regulated flammable substances**: No products were found.
pUC18 Control Plasmid DNA	**Clean Air Act (CAA) 112 regulated toxic substances**: No products were found.
XL10-Gold 2-mercaptoethanol mix	**Clean Air Act (CAA) 112 regulated toxic substances**: No products were found.
ArcticExpress (DE3)RIL competent cells	**Clean Air Act (CAA) 112 regulated toxic substances**: No products were found.

SARA 313

	Product name	CAS number	Concentration
Form R - Reporting requirements :	**ArcticExpress (DE3)RIL competent cells**		
	Manganese dichloride	7773-01-5	5 - 10
	Hexaamminecobalt trichloride	10534-89-1	0.1 - 1
Supplier notification :	**ArcticExpress (DE3)RIL competent cells**		
	Manganese dichloride	7773-01-5	5 - 10
	Hexaamminecobalt trichloride	10534-89-1	0.1 - 1

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations : pUC18 Control Plasmid DNA

Connecticut Carcinogen Reporting: None of the components are listed.
Connecticut Hazardous Material Survey: None of the components are listed.
Florida substances: None of the components are listed.
Illinois Chemical Safety Act: None of the components are listed.
Illinois Toxic Substances Disclosure to Employee Act: None of the components are listed.
Louisiana Reporting: None of the components are listed.
Louisiana Spill: None of the components are listed.
Massachusetts Spill: None of the components are listed.
Massachusetts Substances: None of the components are

15 . Regulatory information

	listed. **Michigan Critical Material**: None of the components are listed. **Minnesota Hazardous Substances**: None of the components are listed. **New Jersey Hazardous Substances**: None of the components are listed. **New Jersey Spill**: None of the components are listed. **New Jersey Toxic Catastrophe Prevention Act**: None of the components are listed. **New York Acutely Hazardous Substances**: None of the components are listed. **New York Toxic Chemical Release Reporting**: None of the components are listed. **Pennsylvania RTK Hazardous Substances**: None of the components are listed. **Rhode Island Hazardous Substances**: None of the components are listed.
XL10-Gold 2-mercaptoethanol mix	**Connecticut Carcinogen Reporting**: None of the components are listed. **Connecticut Hazardous Material Survey**: None of the components are listed. **Florida substances**: None of the components are listed. **Illinois Chemical Safety Act**: None of the components are listed. **Illinois Toxic Substances Disclosure to Employee Act**: None of the components are listed. **Louisiana Reporting**: None of the components are listed. **Louisiana Spill**: None of the components are listed. **Massachusetts Spill**: None of the components are listed. **Massachusetts Substances**: The following components are listed: 2-Mercaptoethanol **Michigan Critical Material**: None of the components are listed. **Minnesota Hazardous Substances**: None of the components are listed. **New Jersey Hazardous Substances**: None of the components are listed. **New Jersey Spill**: None of the components are listed. **New Jersey Toxic Catastrophe Prevention Act**: None of the components are listed. **New York Acutely Hazardous Substances**: None of the components are listed. **New York Toxic Chemical Release Reporting**: None of the components are listed. **Pennsylvania RTK Hazardous Substances**: The following components are listed: 2-Mercaptoethanol **Rhode Island Hazardous Substances**: None of the components are listed.
ArcticExpress (DE3)RIL competent cells	**Connecticut Carcinogen Reporting**: None of the components are listed. **Connecticut Hazardous Material Survey**: None of the components are listed. **Florida substances**: None of the components are listed. **Illinois Chemical Safety Act**: None of the components are listed. **Illinois Toxic Substances Disclosure to Employee Act**: None of the components are listed. **Louisiana Reporting**: None of the components are listed.

15 . Regulatory information

Louisiana Spill: None of the components are listed.
Massachusetts Spill: None of the components are listed.
Massachusetts Substances: The following components are listed: Glycerol;Sucrose
Michigan Critical Material: None of the components are listed.
Minnesota Hazardous Substances: None of the components are listed.
New Jersey Hazardous Substances: The following components are listed: Manganese dichloride
New Jersey Spill: None of the components are listed.
New Jersey Toxic Catastrophe Prevention Act: None of the components are listed.
New York Acutely Hazardous Substances: None of the components are listed.
New York Toxic Chemical Release Reporting: None of the components are listed.
Pennsylvania RTK Hazardous Substances: The following components are listed: Glycerol; Manganese dichloride;Sucrose
Rhode Island Hazardous Substances: None of the components are listed.

State regulations - California Prop. 65 : No products were found.

16 . Other information

Label requirements	: pUC18 Control Plasmid DNA	NOT EXPECTED TO PRODUCE SIGNIFICANT ADVERSE HEALTH EFFECTS WHEN THE RECOMMENDED INSTRUCTIONS FOR USE ARE FOLLOWED.
	XL10-Gold 2-mercaptoethanol mix	HARMFUL IF ABSORBED THROUGH SKIN. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY BE HARMFUL IF SWALLOWED. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.
	ArcticExpress (DE3)RIL competent cells	HARMFUL IF SWALLOWED. MAY CAUSE RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

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Notice to reader

DISCLAIMER: This Material Safety Data Sheet is offered without charge to the clients of Agilent Technologies. Data is the most current available to Agilent Technologies at the time of preparation and is issued as a matter of information only, no warranty as to its accuracy or completeness is expressed or implied.

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1	HB101			
2	DH1			
3	pSV2gpt	HB101	amp	Mulligan & Berg
4	pSVogpt	HB101	amp	S.Meakin
5	pSVOCAT	HB101	amp	Gorman& Howard
6	pSVOCAT(Xho1)	HB101	amp	S.Meakin
7	RSVCAT	HB101	amp	Gorman& Howard
8	pUC9-HMT11a	HB101	amp	D.Hamer
9	pSGM1	HB101	amp	S.Meakin
10	pδcr17	HB101	amp	J.Piatigorsky
11	pRSVβgal	HB101	amp	J.Piatigorsky
12	pUC9	HB101	amp	J.Piatigorsky
13	pKK232-8	HB101	amp	Pharmacia
14	pSV2ACAT	HB101	amp	Kadesch&Berg
15	pSVOATCAT	HB101	amp	Meakin & Lok
16	pSTK7	HB101	amp	M.L.Breitman
17	p91023	HB101	tet	R.Kaufman
18	pM21CR3	HB101	tet	J.Piatigorsky
19	pGem-3	HB101	amp	
20	pSV0ATCAT(Xho1)	HB101	amp	S.Meakin
21	pUC9-γ2βgal	HB101	amp	S.Meakin
22	pSV2CAT	HB101	amp	Gorman& Howard
23	pGem3'γ2βgal1 Œn	HB101	amp	S.Meakin
24	pSGM1X	HB101	amp	S.Meakin
25	pUC-γ2βgal Œn	HB101	amp	S.Meakin
26	pUC-γ2Cat Œn	HB101	amp	S.Meakin
27	KM 392	HB101	amp	
28	pNGFR.1(in PUC 9) p75	HB101	amp	M.Radeke
29	pSV2NEO	HB101	amp	Mulligan&Berg
30	pBAP-NEO	HB101	amp	L.Kedes
31	pUC19	HB101	amp	
32	p19-2GR1(-ve) 5'end rNGFRgene	HB101	amp	S.Meakin
33	p19-2GR(+ve)	HB101	amp	S.Meakin
34	p19-2Ia1(2-1) aka p19-E2(+)	HB101	amp	S.Meakin
35	p19-2Ia2(2-3) aka p19-E2(-)	HB101	amp	S.Meakin
36	p19-21b(4-1) aka p19-E3	HB101	amp	S.Meakin
37	PGem-NGF(+)	HB101	amp	J.Jongstra-Bilen
38	PGem-NGF(-)	HB101	amp	J.Jongstra-Bilen
39	pXP1	HB101	amp	Steve Nordeen
40	pXP2	HB101	amp	Steve Nordeen
41	pH1-3	HB101	amp	Moses Chao
42	pH3	HB101	amp	John Darby
43	pCHTK	HB101	amp	M.Wigler
44	pC-fos(human)-1	HB101	amp	T.Curran
45	pC-fos(rat)-1	HB101	amp	T.Curran
46	pNB-1	HB101	amp	M.Schwab

	NAME	HOST Str	ANTIBIOTIC	SOURCE
47	see 85	HB101	amp	
48	PRβA-1	HB101	amp	L.Kedes
49	PSVC-myc1(mouse)	HB101	amp	Land et al. Nature 304:596
50	pUC9-42A	HB101	amp	Piotr Masiakowski
51	pUC9-42C	HB101	amp	Piotr Masiakowski
52	pE3-1	HB101	amp	S.Meakin
53	pE3-2	HB101	amp	S.Meakin
54	pE3-3	HB101	amp	S.Meakin
55	pE3-4	HB101	amp	S.Meakin
56	pE1-11	HB101	amp	S.Meakin
57	pE1-10	HB101	amp	S.Meakin
58	pE1-9	HB101	amp	S.Meakin
59	pE1-8	HB101	amp	S.Meakin
60	pE1-7	HB101	amp	S.Meakin
61	pE1-6	HB101	amp	S.Meakin
62	pE1-5	HB101	amp	S.Meakin
63	pE1-4	HB101	amp	S.Meakin
64	pE1-3	HB101	amp	S.Meakin
65	pE1-2	HB101	amp	S.Meakin
66	pE1-1	HB101	amp	S.Meakin
67	pB51	HB101	amp	M.Chao
68	pEF1	HB101	amp	M.Chao
69	PDGF	HB101	amp	A.Ulrich
70	pCNGFR(in pCDL1) p75	HB101	amp	M.Radeke
71	PCDL1-NGF	HB101	amp	
72	pE1B(-)	HB101	amp	S.Meakin
73	pE1B(+)	HB101	amp	S.Meakin
74	p2G(-) ŒB	HB101	amp	S.Meakin
75	M106/p3 (p3 plasmid containing amber mutated amp and tet resist. elements—requires a Sup F containing plasmid to confer amp, tet)	HB101	amp tet	B.Seed
76	MoIL2	HB101	amp	Ken-Ichi Arai
77	MoIL2R	HB101	amp	Ken-Ichi Arai
78	HuIL2	HB101	amp	Ken-Ichi Arai
79	HuIL2R	HB101	amp	Ken-Ichi Arai
80	pE2SB	HB101	amp	S.Meakin
81	pE3XB	HB101	amp	S.Meakin
82	CDM8	HB101	amp&tet (inM106/p3)	Brian Seed
83	p19-MoIL2R	HB101	amp	S.Meakin
84	pCH3	HB101	amp	M.Radeke
85	pOD32	HB101	tet	P.Coffno
86	pG43-1.2C3	HB101	amp	P.Skene
87	pMmH4-Hpa	HB101	amp	
88	PCDL-SRα296	HB101	amp	DNAX
89	pN1.8	HB101	amp	D.Baltimore
90	pC4	HB101	amp	Felice Tirone
91	pBJ5	HB101	amp	DNAX
92	pCAL-8Mβ	HB101	amp	Ueli Suter

	NAME	HOST Str	ANTIBIOTIC	SOURCE
94	p5-1(IL2R exoIII clones #94-#122)	HB101	amp	S.Meakin
95	p5-2	HB101	amp	S.Meakin
96	p5-3	HB101	amp	S.Meakin
97	p5-4	HB101	amp	S.Meakin
98	p5-5	HB101	amp	S.Meakin
99	p5-6	HB101	amp	S.Meakin
100	p5-7	HB101	amp	S.Meakin
101	p5-8	HB101	amp	S.Meakin
102	p5-9	HB101	amp	S.Meakin
103	p5-10	HB101	amp	S.Meakin
104	p5-12	HB101	amp	S.Meakin
105	p5-13	HB101	amp	S.Meakin
106	p5-14	HB101	amp	S.Meakin
107	p5-15	HB101	amp	S.Meakin
108	p5-17	HB101	amp	S.Meakin
109	p5-19	HB101	amp	S.Meakin
110	p5-21	HB101	amp	S.Meakin
111	p5-22	HB101	amp	S.Meakin
112	p6-1	HB101	amp	S.Meakin
113	p6-2	HB101	amp	S.Meakin
114	p6-7	HB101	amp	S.Meakin
115	p6-8	HB101	amp	S.Meakin
116	p6-9	HB101	amp	S.Meakin
117	p6-14	HB101	amp	S.Meakin
118	p6-17	HB101	amp	S.Meakin
119	p6-18	HB101	amp	S.Meakin
120	p6-21	HB101	amp	S.Meakin
121	p6-23	HB101	amp	S.Meakin
122	p6-24	HB101	amp	S.Meakin
123	pILNGFR 1(-)	HB101	amp	S.Meakin
124	pILNGFR 7(-)	HB101	amp	S.Meakin
125	pCAL-NGFR	HB101	amp	S.Meakin
126	pILNGFR 1(+)	HB101	amp	S.Meakin
127	pILNGFR 7(+)	HB101	amp	S.Meakin
128	pILNGFR 14(+)	HB101	amp	S.Meakin
129	PNRSB	HB101	amp	S.Meakin
130	PRSVneo	HB101	amp	Gorman& Howard
131	pSP651B15	HB101	amp	Danielsen et al DNA 7:261 '88
132	pMT-2	HB101	amp	R.Kaufman MCB 9:946 '89
133	pMT-ILN 1(+) *clone 1-5*	HB101	amp	S.Meakin
134	pMT-ILN 7(+) *clone 7-3*	HB101	amp	S.Meakin
135	pMT-ILN 14(+) *clone 14-2*	HB101	amp	S.Meakin
136	pBJ-ILN 1(+)	HB101	amp	S.Meakin
137	pBJ-ILN 7(+) *clone 7-6*	HB101	amp	S.Meakin
138	pBJ-ILN 14(+) *clone 14-1*	HB101	amp	S.Meakin
139	pMT-ILN 1(-) *clone 1-3*	HB101	amp	S.Meakin
140	pMT-ILN 7(-) *clone 7-7*	HB101	amp	S.Meakin

	NAME	HOST Str	ANTIBIOTIC	SOURCE
141	pMT-ILN 14(-) *clone 14-6*	HB101	amp	S.Meakin
142	pMT-NGFR(+) *clone MTN-1(rat)* p75	HB101	amp	S.Meakin
143	pMT-NGFR(-) *clone MTN-2(rat)*	HB101	amp	S.Meakin
144	pMT-IL2R(+) *clone MT1R-1(mouse)*	HB101	amp	S.Meakin
145	pMT-IL2R(-) *clone MT1R-6(mouse)*	HB101	amp	S.Meakin
146	pCD-NGFR(+) *clone #4*	M106/p3	Sup F- amp & tet (7.5)	S.Meakin
147	pCD-NGFR(-) *clone #5*	M106/p3	Sup F in M106/p3	S.Meakin
158	PTK1 *clone 1A-1*	HB101	amp	S.Meakin
159	PTK2 *clone 5A-4*	HB101	amp	S.Meakin
160	PTK3 *clone 7-1*	HB101	amp	S.Meakin
161	PTK4 *clone 7-3*	HB101	amp	S.Meakin
162	PTK5 *clone 7-4*	HB101	amp	S.Meakin
163	PTK6 *clone 8B-1 rat Neu*	HB101	amp	S.Meakin
164	PTK7 *clone 8B-2 rat FIK*	HB101	amp	S.Meakin
165	PTK8 *clone 8B-3*	HB101	amp	S.Meakin
166	PTK9 *clone 2-9 elk*	HB101	amp	S.Meakin
167	PTK10 *clone 6-6*	HB101	amp	S.Meakin
168	PTK11 *clone 12-1*	HB101	amp	S.Meakin
170	PTK12 *clone 1A-7*	HB101	amp	S.Meakin
171	PTK13 *clone 1A-9*	HB101	amp	S.Meakin
172	PTK14 *clone 1A-10*	HB101	amp	S.Meakin
173	PTK15 *clone 2-13*	HB101	amp	S.Meakin
174	PTK16 *clone 2-16*	HB101	amp	S.Meakin
175	PTK17 *clone 5A-8*	HB101	amp	S.Meakin
176	PTK18 *clone 6-14*	HB101	amp	S.Meakin
177	PTK19 *clone 7-10*	HB101	amp	S.Meakin
178	PTK20 *clone 7-11*	HB101	amp	S.Meakin
179	PTK21 *clone 7-13*	HB101	amp	S.Meakin
180	PTK22 *clone 8-2*	HB101	amp	S.Meakin
181	PTK23 *clone 11-7*	HB101	amp	S.Meakin
182	PTK24 *clone 8-3*	HB101	amp	S.Meakin
183	PTK25 *clone 8-6*	HB101	amp	S.Meakin
184	PTK26 *clone 12-6*	HB101	amp	S.Meakin
185	pSP72	HB101	amp	Pharmacia
186	pSP72-TRK 5-2	HB101	amp	S.Meakin
187	TRK 5-7 "	HB101	amp (in pSP72)	S.Meakin
188	TRK3-9 PCR of oligo 12 & 13	HB101	Amp (in pSP72)	S.Meakin
189	TRK 3-12 "	HB101	Amp (in pSP72)	S.Meakin
191	PC12 TRK clones 12-1(+)	HB101	Sup F (in CDM8)	S.Meakin
192	" 14-1(+)	HB101	Sup F (in CDM8)	S.Meakin
193	" 17-2(-) TRK(-)	HB101	Sup F (in CDM8)	S.Meakin
194	pCD17-2(+)	HB101	Sup F (in CDM8)	S.Meakin
195	pCD14-1(-)	HB101	Sup F (in CDM8)	S.Meakin
196	SP-TRK6 (in Xba 1 site) TrkA full length	HB101	Amp (in pSP72)	S.Meakin
197	SP-TRK7 (in Xba 1 site)	HB101	Amp (in pSP72)	S.Meakin

	NAME	HOST Str	ANTIBIOTIC	SOURCE
198	CD-TRK(+) *clone T-6*	HB101	Sup F (in CDM8)	S.Meakin
199	CD-NGFRG(+) (in Xho 1 site)	HB101	Sup F (in CDM8)	S.Meakin
200	CD-NGFRG(-) (")	HB101	Sup F (in CDM8)	S.Meakin
201	TRK clone 6-1	HB101	Sup F (in CDM8)	S.Meakin
202	TRK clone 11-1	HB101	Sup F (in CDM8)	S.Meakin
203	TRK clone 11-2	HB101	Sup F (in CDM8)	S.Meakin
204	TRK clone 17-2(+)	HB101	Sup F (in CDM8)	S.Meakin
205	TRK clone 22-1	HB101	Sup F (in CDM8)	S.Meakin
206	pJFE14	HB101	amp	P.Barker
207	PCMX	HB101	amp	Regeneron
208	p139 (in Xba 1 site)	HB101	Amp (in pCMX)	P.Barker
209	p146 (in Xba 1 site)	HB101	amp	P.Barker
210	pBJ-NGF	HB101	Amp (in BJ5)	C.Drinkwater/ Suter/ Barker
211	pCMX-TRK A(+) (in Xho site)	HB101	amp (in pCMX)	S.Meakin
212	pCMX-TRK A(-) (in Xho site)	HB101	amp (in pCMX)	S.Meakin
213	pCMX-TRK A(+) Nde 1	HB101	amp (in pCMX)	S.Meakin
214	pMEX	HB101	amp	Brian Stanton
215	pGEX-4T2	HB101	amp	Pharmacia
216	pMEXneo	HB101	amp, kan/G418	D.M. Zanca
217	pCMX-TRK A(+) S1 *clone 4*	HB101	amp	S. Meakin
218	pMEX-TRK A(-) *clone 4*	HB101		
219	pMEX-TRK A(+) *clone 5*	HB101		
220	pSP72-TRK A , Bgl II *clone 5*	HB101	amp	S.Meakin
221	HB101			Gibco BRL
222	pSP72-TRK A,Bgl II, *clone S2-1*	HB101	amp	J. Ping Yang
223	pCMX-TRK A T2 *clone Not 3*	HB101	amp	S.Meakin
224	pSP72-TRK A T1 *clone Stu 3*	HB101	amp	S.Meakin
225	pCMX-TRK A S2(+) *clone 9*	HB101	amp	J. Ping Yang
226	pCMX-TRK A S2(-) *clone 7*	HB101	amp	J. Ping Yang
227	pMEXNEO-TRK A(+) *clone 6*	HB101	amp/G418	S.Meakin
228	pCMX-HA-TRK A T2(+) *clone 6*	HB101	amp	S.Meakin
229	pCMX-HA-TRK A S2(+) *clone 1*	HB101	amp	S.Meakin
230	pCMX-HA-TRK A S1(+) *clone 1*	HB101	amp	S.Meakin
231	pCMX-XBA *clone 17*	HB101	amp	S.Meakin
232	pCMX-HA-TRK A T2(+) *clone 3*	HB101	amp	S.Meakin
233	pCMXHA-TRK A T1 *clone 4*	HB101	amp	S.Meakin
234	PCMX-NGF *clone 2*	HB101	amp	S.Meakin
235	PCMX-HA-TRK A S3(+) *clone 4*	HB101	amp	S.Meakin
236	PMEX-HA TRK A(+) *clone 7*	HB101	amp	S.Meakin
237	PCMX TRK B	HB101	amp	P. Barker
238	pBJ-BDNF	HB101	amp	P. Barker
239	pTK hygro	HB101	amp/hygromycin	C. Strathdee
240	PCMX TRKA Δ231-368 *clone 40-5*	HB101	amp	H. Schneider
241	PCMX TRKA Δ201-368 *clone 40-52*	HB101	amp	H. Schneider
242	PCMX TRKA Δ 263-368 *clone 30-3*	HB101	amp	H. Schneider
243	PCMX TRKA Δ322-368 *clone 30-5*	HB101	amp	H. Schneider
244	PCMX TRKA Δ 363-368 *clone 5-4*	HB101	amp	H. Schneider

	NAME	HOST Str	ANTIBIOTIC	SOURCE
245	PCMX TRKA Exo clone 20-7 Δ 328-368	HB101	amp	H. Schneider
246	PCMX-HA-TRK A S5(+) *clone 3*	HB101	amp	H. Schneider
247	pGBT9	HB101	amp	S. Fields
248	PGAD424	HB101	amp	S. Fields
249	PCMX-HA-TRK A S4(+) *clone 2F*	HB101	amp	A. Ho
250	pSP72-TRK A S7-4 * *PCR mistake*	HB101	amp	H. Schneider
251	PCMX HA-TRK A(+) Rat	HB101	amp	S. Meakin
252	PCMX TRK A Nae 1	HB101	amp	S. Meakin
253	pSP72-TRK A S6-3 * *PCR mistake*	HB101	amp	H. Schneider
254	pCMX TRK A Δ 35-58 (60-F)	HB101	amp	J. MacDonald
255	pCMX TRK A Δ 35-76	HB101	amp	J. MacDonald
256	pCMX TRK A Δ 35-102 (45-D)	HB101	amp	J. MacDonald
257	pCMX TRK A Δ 35-107 (40-8)	HB101	amp	J. MacDonald
258	pCMX TRK A Δ 35-114 (20-4)	HB101	amp	J. MacDonald
259	pCMX TRK A Δ 35-139 (60-8)	HB101	amp	J. MacDonald
260	pCMX TRK A Δ 35-150 (60-7)	HB101	amp	J. MacDonald
261	pCMX TRK A Δ 35-174 (60-1)	HB101	amp	J. MacDonald
262	pCMX TRK A Δ 35-290 (FN mutant) clone 1	HB101	amp	J. MacDonald
263	pCMX HA-TRK A S7 *clone 7*	HB101	amp	H. Schneider
264	pCMX HA-TRK A S8 *clone 4*	HB101	amp	H. Schneider
265	pCMX HA-TRK A S8/S9 *clone 1*	HB101	amp	H. Schneider
266	pCMX HA-TRK A S6 clone 4	HB101	amp	H. Schneider
267	pCMXTRK A Δ372-390 clone H1	HB101	amp	S. Meakin
268	pCMX MYC-TRK A S1 clone 5	HB101	amp	S. Meakin
269	pCMX MYC-TRK A clone 5	HB101	amp	S. Meakin
270	pcDNA TRK C clone 1	HB101	amp	S.Meakin/Amgen
271	pB61 rel est	HB101	amp	Amgen
272	pMEX TRK A S8/S9(-) clone 12	HB101	amp	S. Meakin
273	HB101			Gibco
274	HB101			Gibco
275	pAS-1	HB101	amp	C. Brandl
276	pACT I	HB101	amp	C. Brandl
277	pACT II	HB101	amp	C. Brandl
278	pMEX HATRK A Exo III clone 25-1	HB101	amp	H.Schneider
279	pMEX HATRK A Exo III clone 25-5	HB101	amp	H.Schneider
280	pMEX HATRK A S8/S Exo III clone 20-4	HB101	amp	H.Schneider
281	pADB	HB101	amp	C.Strathdee
282	pTKB	HB101	amp	C.Strathdee
283	pCMVBgal	HB101	amp	C.Strathdee
284	pMEX HATRK A Exo III clone 30-4	HB101	amp	H.Schneider
285				
286				
287	pAS-1 SHC full NOTE:re-transformed 2.1.98 by CJK	HB101	amp	Jane McGlade
288	pAS-1 SHC PTB (ShcA)	HB101	amp	Jane McGlade

	NAME	HOST Str	ANTIBIOTIC	SOURCE
289	pG SHC B15 pGem3-human SHC	HB101	amp	Jane McGlade
290	p448 IRS clone	HB101	amp	Thomas Gustafson
291	p390 IRS clone	HB101	amp	Thomas Gustafson
292	pAS-1 lerk 5 clone 3	HB101	amp	H.Schneider
293	pCMX MYC TRK A S3 clone 4	HB101	amp	H.Schneider
294	pGAD424-TRK A clone 4	HB101	amp	H.Schneider
295	pCMX 57 TRK A clone 1	HB101	amp	J. MacDonald
296	pGAD-IR-IRS-1 clone H	HB101	amp	E. Gryz
297	pGAD TRK A S1 clone 1	HB101	amp	H. Schneider
298	pGAD TRK A S3 clone 1	HB101	amp	H. Schneider
299	pGAD TRK A S8 clone 1	HB101	amp	S. Meakin
300	pAS-1 TRK A clone 8	HB101	amp	H. Schneider/S.M.
301	pGAD TRK A S1/S3 clone 3	HB101	amp	H. Schneider
302	pGEX-4T2/ TRKA 25-1 clone 1	HB101	amp	E.Gryz
303				
304	Rat chromograninA Pst 1 insert	HB101	amp	Munoz
305	pGAD-IRS-1 clone J	HB101	amp	E.Gryz
306	pGBT9-IR-IRS-1 clone 5	HB101	amp	E.Gryz
307	pGBT9-IRS-1 clone 8	HB101	amp	E.Gryz
308	pBPXp57TRK A(+) clone 2	HB101	amp	J.MacDonald
309	pCMX-HA TRK A S10 clone 17	HB101	amp	H.Schneider
310	pGEX4T2/TRKA 25-1 clone G	HB101	amp	E.Gryz/H.S.
311	pAS-1/IR-IRS-1 clone 1	HB101	amp	E.Gryz
312	pBPX-TRK A S8 clone 2	HB101	amp	S.Meakin
313	pGAD TRK A S1/S8 clone 1	HB101	amp	H.Schneider
314	pDBH (Dopamine β-hydroxylase)	HB101	amp	Richard Palmiter
315	pSK(+)	HB101	amp	Stratagene(C.S.)
316	pSK(-)	HB101	amp	Stratagene
317	pSKTRK A (+) clone A	HB101	amp	S.Meakin
318	pSKTRK A (-) clone 4	HB101	amp	S. Meakin
319	pGAPDH	HB101	tet	J. Pickering
320	pKS(+)	HB101	amp	Stratagene-M.Lebat
321	pKS(-)	HB101	amp	Stratagene-M.Lebat
322	pCMX-HA TRK A S1/S8 clone 1	HB101	amp	H.Schneider
323	pGUS 299	HB101	amp	T.Gustafson
324	pGUS 306	HB101	amp	T.Gustafson
325	pGUS 318	HB101	amp	T.Gustafson
326	pGUS 392	HB101	amp	T.Gustafson
327	p15γMAG-Fc chimera	HB101	amp	M.Tropak
328	pUChγ?1.1	HB101	amp	M.Tropak
329	pUChγ?1.2	HB101	amp	M.Tropak
330	pCMX-HA TRK A S15 clone 3	HB101	amp	E.Gryz
331	pCMX-HA TRK A S16 clone 3	HB101	amp	E.Gryz
332	pJDM(NGF1A)	HB101	amp	Jeff Milbrandt
333	pJDM(NGF1B)	HB101	amp	Jeff Milbrandt
334	pBS Tα1 tubulin promoter	HB101	amp	Freda Millar

	NAME	HOST Str	ANTIBIOTIC	SOURCE
335	pCMX TRK A S18 clone 1	HB101	amp	H. Schneider
336	pSPR TRK A S17 clone 1	HB101	amp	H. Schneider
337	pSK HA TRK A S11a clone 5#4	HB101	amp	H. Schneider
338	pGST SHC 1-209		amp	Jane McGlade
339	pGST SHC/SH2		amp	Jane McGlade
340	pECE-γ???Xho clone 2	HB101	amp	S.Meakin
341	pSK TRK A S12p clone 4p	HB101	amp	E.Gryz
342	pSK TRK A S12 clone 36	HB101	amp	E.Gryz
343	pSK TRK A S13a clone 3a	HB101	amp	E.Gryz
344	p CMX TRK A S19 clone 2	HB101	amp	E.Gryz
345	pGAD TRK A S11a clone 7	HB101	amp	H.Schneider
346				
347	pCMX HA TRK A S17 clone 1	HB101	amp	H.Schneider
348	pClone73 (Peripherin)	HB101	amp	Ed Ziff
349	pCMX HA TRK A S18 clone 1	HB101	amp	H.Schneider
350	pγ?X-HATRK A lower clone 1(+)	HB101	amp	H.S./S.Meakin
351	pCMXHA TRK A S12 clone 1	HB101	amp	E.Gryz
352	pCMXHA TRK A S12p clone 2	HB101	amp	E.Gryz
353	pCMXHA TRK A S13a clone 2	HB101	amp	E.Gryz
354	pCMXHA TRK A S19 clone 2	HB101	amp	E.Gryz
355	pTK HA TRK A clone 7	HB101	amp	H.Schneider
356	pCMXHA TRK A S1b clone 2	HB101	amp	H.Schneider
357	pBPX HA TRK A S15 clone 3	HB101	amp	E.Gryz
358	pCMXHA TRK A S13b clone 7	HB101	amp	E.Gryz
359	pGST-PTP1C	HB101	amp	K.Siminovitch
360	pUHD 15-1 *tet vector system*	HB101	amp	Bujard ZMBH
361	pUHD 15-1 neo	HB101	amp	Bujard ZMBH
362	pUHD 151-1	HB101	amp	Bujard ZMBH
363	pUHG 17-1	HB101	amp	Bujard ZMBH
364	pUHD 172-1neo	HB101	amp	Bujard ZMBH
365	pUHC 13-3	HB101	amp	Bujard ZMBH
366	pUHG 16-3	HB101	amp	Bujard ZMBH
367	pUHD 10-3	HB101	amp	Bujard ZMBH
368	pUHC 13-6	HB101	amp	Bujard ZMBH
369	pUCN-CAD(N-Cadherin in pUC18)	HB101	amp	M. Takeichi
370	pRSV-N-CAM	HB101	amp	Ted Lo
371	PC12-BR7(phosphatase) Bluescript	HB101	amp	Paul Lombroso
372	pCMXHA TRK A S10T1 clone 1	HB101	amp	H.Schneider
373	pUHD 10-3 MYC TRK A clone 2	HB101	amp	H.Schneider
374	pSP72BglII TRK A Xho 411 clone 1	HB101	amp	H.Schneider
375	pCMXHA TRK A Xho 411 clone 2	HB101	amp	H.Schneider
376	pUHD 10-3 p75 clone 3	HB101	amp	H.Schneider
377	pCMXHA TRK A S9 clone 21	HB101	amp	E.Gryz
378	pCMXHA TRK A S11b clone 2	HB101	amp	H.Schneider
379	pGEX 4T2/TRK A clone 2	HB101	amp	E.Gryz
380	pBPX HATRK A S9 clone 4	HB101	amp	E.Gryz
381	p γ?X TRK A Xho 411(-) clone A	HB101	amp	H.Schneider

	NAME	HOST Str	ANTIBIOTIC	SOURCE
382	pGAD TRK A S11b clone 3	HB101	amp	H.Schneider
383	pAS-1TRK A S11b clone 5	HB101	amp	H.Schneider
384	pCH126A2 clone 2	HB101	amp	Frank Lee
385	pGEX4T2 TRK A S15 clone 3	HB101	amp	E.Gryz
386	pGEX4T2 TRK A S15 clone 5	HB101	amp	E.Gryz
387	BL21(lambda DE3 strain)	HB101	amp	Ted Lo
388	pSK TRK S13(glu,glu) clone 10	HB101	amp	E.Gryz
389	p γ?X TRK Xho 411(+) clone CD5	HB101	amp	H.Schneider
390	pCMX HA TRK A LRM II	HB101	amp	J.MacDonald
391	pBPXHA TRK A S1 clone 2	HB101	amp	H.Schneider
392	pCh110	HB101	amp	Pharmacia
393	pCMX HA TRK A -Bgl I	HB101	amp	J.MacDonald
394	pCMX TRK A S15(QQ)	HB101	amp	E.Gryz
395	pBTM 116	HB101	amp	J.Verdi/S.Fields
396	pBPE	HB101	amp	J.MacDonald
397				
398	pGM2163	HB101	chloramphenicol resistant	NEB
399	pCh126A2	HB101	amp	Frank Lee
400	pCMXHA TRK A S13(gl,gl) clone16	HB101	amp	E.Gryz
401	pCMXHA TRK A S13 (gl,gl) clone13	HB101	amp	E.Gryz
402	pBSK TRK A-Nco I	HB101	amp	J.MacDonald
403	pBPE-NCad	HB101	amp	J.MacDonald
404	pCMX TRK C (rat)	HB101	amp	Phil Barker
405				
406	pUHD 10-3 TRK A S13(gl,gl) clone 3	HB101	amp	E.Gryz
407	pUHD 10-3 TRK A S13b clone 5	HB101	amp	E.Gryz
408	pUHD 10-3 TRK A S13a clone 16	HB101	amp	E.Gryz
409	pATG lac Z(Sal)2	HB101	amp	Qiurong Liu
410	pCDNA3 trk A *human*	HB101	amp,neo	U.Saragovi
411	pKS Bluescript-RN-gATA-4	DH5 α	amp	I. Skerjanc
412	pBluescript II SK¯NBx 2.5	DH5 α	amp	I. Skerjanc
413	pGK-MEF2C-(E15)	DH5 α	amp	I. Skerjanc
414	pEMC IIS-MyoD (probe)	DH5 α	amp	I. Skerjanc
415				
416	pCMXHATRK A S13c-4e(asp,asp)	HB101	amp	E.Gryz
417	pBPXHA TRK A S13 clone 1	HB101	amp	E.Gryz
418	pBPXHA TRK A S13a clone 8	HB101	amp	E.Gryz
419	pGL3 control(for luciferase assay)	HB101	amp	Promega
420	pUHD10-3 HA TRK A S13c clone 2	HB101	amp	E.Gryz
421	pBPXHA TRK A S13c clone 6	HB101	amp	E.Gryz
422	pBPXHA TRK A S13b clone 8	HB101	amp	E.Gryz
423	pAS-1 TRK A S1 clone 4	HB101	amp	E.Gryz
424	pBK/SK	HB101	kanamycin	C.Strathdee
425	pSP72 HA TRK A S17a clone 6	HB101	amp	H.Schneider
426	pSP72 HA TRK A S3a clone 8	HB101	amp	H.Schneider
427	pCMX TRK B S3 clone 14	HB101	amp	G.Z.
428	pCMXHA TRK A S13p57 clone 3	HB101	amp	H.Schneider

	NAME	HOST Str	ANTIBIOTIC	SOURCE
429	pCMXHA TRK A LRM 1	HB101	amp	J.MacDonald
430	pCMXTRK B S3 clone 14	HB101	amp	G.Z.
431	pCMXHA TRK A S17a clone 1	HB101	amp	H.Schneider
432	pCDNA 3 clone 1	HB101	amp	C.Strathdee
433	pCMXHA TRK A S3a clone 21	HB101	amp	H.Schneider
434	pBPXho Baculovirus vector	HB101	amp	J.MacDonald
435	pBPXLRM I TRK A	HB101	amp	J.MacDonald
436	pBPXLRM II TRK A	HB101	amp	J.MacDonald
437	pBPXLRM III TRK A	HB101	amp	J.MacDonald
438	pGexEG2 clone A	BL21	amp	E.Gryz
439	pJG4-5 Grip2 (SH2)	HB101	amp	Gustafson
440	pAcid SYP (SH2)	HB101	amp	Gustafson
441	pJG4-5 p85 acid blob	HB101	amp	Gustafson
442	pCMXHA TRK AS13d clone 2	HB101	amp	E.Gryz
443	pCMXHA TRK AS13e clone 3	HB101	amp	E.Gryz
444	pCMXHA TRK AS13f clone 1	HB101	amp	E.Gryz
445	pCMXHA TRK AS13g clone1	HB101	amp	E.Gryz
446	PLCX (-) MT-2	HB101	amp	McGlade
447	pUHD 10-3HA TRK AS13d clone4	HB101	amp	E.Gryz
448	pUHD 10-3HA TRK A S13eclone2	HB101	amp	E.Gryz
449	pUHD 10-3HA TRK A S13f clone2	HB101	amp	E.Gryz
450	pGex TRK A (from stock #302)	BL21	amp	E.Gryz
451	pGex SHC/PTB (from #338)	BL21	amp	McGlade
452	pGex SHC/SH2 (from #339)	BL21	amp	McGlade
453	pBPX HA TRK AS13d clone 3	HB101	amp	E.Gryz
454	pBPX HA TRK AS13e clone 2	HB101	amp	E.Gryz
455	pBPX HA TRK AS13f clone 4	HB101	amp	E.Gryz
456	pBPX HA TRK AS13g clone 2	HB101	amp	E.Gryz
457	pUHD 10-3HA TRK AS13g cloneC	HB101	amp	E.Gryz
458	pGEX 4T2 EG1 B	BL21	amp	E.Gryz
459	pUHD 10-3HA S1HA TRK A clone 1	HB101	amp	H.Schneider
460	pSP72 TRK B (1.3kb) clone 2	HB101	amp	G.Z.
461	pSP72 TRK B (3.0kb, (-)) clone 2	HB101	amp	G.Z.
462	pSP72 TRK B (3.0kb?, (+)) clone 6	HB101	amp	G.Z.
463	PBRX-HA-TrkA	HB101	Amp	James
464	pCMX HA TRK A S1d clone 1	HB101	amp	H.Schneider
465	DH10B			
466	pCol.luc.3	HB101	amp	
467	pAS-1 TRK A S3 clone 1	DH10B	amp	E.Gryz
468	pSP72 HA TRK B clone 2	HB101	amp	G.Z.
469	pSP72 HA TRK B clone 4	HB101	amp	G.Z.
470	pGex 4T2	BL21	amp	E.Gryz
471	pBS-SK(-) TRK C(Ki14) Rat	HB101	amp	P.Tsoulfas
472	pBS-SK(-) TRK C(Ki25) Rat	HB101	amp	P.Tsoulfas
473	pCMXHA trk B (rat) clone 1	HB101	amp	GZ
474	pBR322	HB101	amp,kan	Gibco
475	pAS EG1 clone a	HB101	amp	E.Gryz

	NAME	HOST Str	ANTIBIOTIC	SOURCE
476	pAS EG1 clone b	HB101	amp	E.Gryz
477	pRK172-p13 suc-1	BL21(DE3)	amp	D.Litchfield
478	pCMX HA trk B S3 clone 1	HB101	amp	GZ
479	pCMX HA trk B S3 clone 2	HB101	amp	GZ
480	pSP72 HA trk B (-) clone 1	HB101	amp	GZ
481	pCDM8 EG1 clone 13-1	M106/p3	supF/amp/tet	S.Meakin
482	pCDM8 EG1 clone 13-3	M106/p3	supF/amp/tet	S.Meakin
483	pCDM8 EG1 clone 13-4	M106/p3	supF/amp/tet	S.Meakin
484	pCDM8 EG1 clone 2-1	M106/p3	supF/amp/tet	S.Meakin
485	pCDM8 EG1 clone 3-1	M106/p3	supF/amp/tet	S.Meakin
486	pGEX 5X-3	HB101	amp	Pharmacia
487	pCMX HA trk B ShcF-Y S8	HB101	amp	GZ
488	pCMX HA trk B Xho	HB101	amp	GZ
489	pAS-1 BNTRK A(LRM) clone 3	HB101	amp	H.Schneider
490	pSP72 HA TRK B(+) clone 4	HB101	amp	GZ
491	pEGFP N1	HB101	kan	Clontech(C.S.)
492	pEGFP C1	HB101	kan	Clontech(C.S.)
493	pSP72HA TRK B S9 clone 1	HB101	amp	GZ
494	pCMXHA TRK A(2Eco R1, 1 Xho 1)	HB101	amp	GZ
495	pBPX HA γ??TRK A II	HB101	amp	J.MacDonald
496	pGEX TRK 128	HB101	amp	J.MacDonald
497	pCDM8 EG1 clone 7-1b,a	M106/p3	sup F	S.Meakin
498	pCDM8 EG1 clone 7-1b,b	M106/p3	sup F	S.Meakin
499	pCMXHA TRK B S9	HB101	amp	GZ
500	pGEX TRK 47	HB101	amp	J.MacDonald
501	pEGFPN1 HA TRK A XP clone 3	HB101	kan	H.Schneider
502	pCMXHA TRK B S8S9 clone 5	HB101	amp	GZ
503	pAS-1 p13 suc 1	HB101	amp	S.Meakin
504	pAS-1 HA TRK A LRM	HB101	amp	J.MacDonald
505	pGEX-1N	JM109	amp	D.Litchfield
506	pGEX-2T	HB101	amp	D.Litchfield
507	pGEX-3X	DH5 ?	amp	D.Litchfield
508	p γ?X HA TRK A LRM(-)	HB101	amp	S.Meakin
509	pCMX-cyclin D2(R1-Xho) clone3	HB101	amp	G.Z.
510	pCMXHA TRK A X411(2R,1X)	HB101	amp	GZ.
511	pBTM116.p13 suc 1.	HB101	amp	K.Manto
512	pUHD10-3 HA TRK A (-) clone 1	HB101	amp	E.Gryz
513	pEGFPN1HA TRK A 60-7 clone 1	HB101	kan	H.Schneider
514	pGEX-1N trk 5	HB101	amp	J.MacDonald
515	pGEX-1N trk 59	HB101	amp	J.MacDonald
516	pAD-D2/R1/R1 clone 3	HB101	amp	GZ
517	pCMX HA TRK AB clone 4	HB101	amp	GZ
518	pCMX HA TRK BA clone 5	HB101	amp	GZ
519	pGEX-1N	BL21	amp	J.MacDonald
520	pGEX 1N trk 5	BL21	amp	J.MacDonald
521	pGEX 1N trk 59	BL21	amp	J.MacDonald
522	pBTM116 LRM HA TRK A	HB101	amp	J.MacDonald

	NAME	HOST Str	ANTIBIOTIC	SOURCE
523	p γ?LRM HA TRK (+) clone 32	HB101	amp	H.Schneider
524	pUHD 10-3 cyclin D2 clone 12	HB101	amp	GZ
525	pGEX 1N trk 86	BL21	amp	J.MacDonald
526	pUHD 10-3 HA TRKA(+)clone 2	HB101	amp	E.Gryz
527	pCMX HA TRK A S25 clone 14	HB101	amp	H.Schneider
528	pGEX-4T1 trk 47	BL21	amp	J.MacDonald
529	pGEX-4T1 trk52	BL21	amp	J.MacDonald
530	pGEX human Grb2 SH3 (N) 1- 58 a.a.	BL21	amp	M. Anafi/T. Pawson
531	pGEX human Grb2 SH3 (C) 159-217 a.a.	BL21	amp	M. Anafi
532	pGEX mouse Grb2 full length 2-217 a.a.	BL21	amp	M. Anafi
533	pGEX SH2 domain (PLCΩSH2)	BL21	amp	M. Anafi
534	pGEX mouse SOS tail	BL21	amp	M. Anafi
535	pcDNA3-HA Grb2	HB101	amp	M.Anafi
536	pGEX-4T1 trk 68	BL21	amp	J.MacDonald
537	pGEX-4T1 trk 76	BL21	amp	J.MacDonald
538	pGEX-4T1 trk 110	BL21	amp	J.MacDonald
539	pGEX-4T2 trk 23	BL21	amp	J.MacDonald
540	pGEX-4T2 trk 17	BL21	amp	J.MacDonald
541	pGEX-4T2 trk 105	HB101	amp	J.MacDonald
542	pHYB LEX ZEO TRK	HB101	zeocin	J.MacDonald
543	pcDNA3 HACrk II	HB101	amp	M.Anafi
544	pCMX-CYCLIN D2(R1/R1) +	HB101	amp	GZ
545	pCMX-CYCLIN D2(R1/R1) -	HB101	amp	GZ
547	pWWP.LUC	HB101	chloramphen.	B.Vogelstein
548	pGEX4T2(back up)	BL21	amp	E.Gryz
549	pGEXSHC-PTB(back up) -- ShcA	BL21	amp	J.McGlade
550	pGEX EG1(back up)	BL21	amp	E.Gryz
551	pBPX γHA LRM TRK A(-) clone 4	HB101	amp	H.Schneider
552	pBPX γHA LRM TRK A(-) clone27	HB101	amp	H.Schneider
553	p53/T1198	HB101	amp	K.Huppi
554	p107(1-4E)	HB101	amp	K.Huppi
555	pGEM3Z-mo MYC antisense	HB101	amp	K.Huppi
556	pGEM4Zp21-9C	HB101	amp	Erhardt/Pitman
557	p3'SS	HB101	amp	Erhardt/Pitman
558	pOPRSVICAT(p21)	HB101	amp	Erhardt/Pitman
559	pBPX HA TRK A S17 clone 5	HB101	amp	B.Napier
560	pBABE-hygro	HB101	amp	Morgenstern(Verdi)
561	pBABE-hygro	HB101	amp	Morgenstern(Verdi)
562	pBABE-bleo	HB101	amp	Morgenstern(Verdi)
563	pBABE-puro	HB101	amp	Morgenstern(Verdi)
564	pLXSHD	HB101	amp	Morgenstern(Verdi)
565	pLHDCX	HB101	amp	Morgenstern(Verdi)
566	pBPXHA TRK A Sllb clone 5	HB101	amp	B.Napier
567	pGEX 5X-3 clone 73	HB101	amp	J.MacDonald

	NAME	HOST Str	ANTIBIOTIC	SOURCE
568	pCMX-p21 (+) (R1/R1)	HB101	amp	GZ
569	pCMX-p21 (-) (R1/R1)	HB101	amp	GZ
570	pUMD10-3-p21	HB101	amp	GZ
571	pBABE-hygro-p21	HB101	amp	GZ
572	pRSV-cyclin D1 (mouse)	HB101	amp	C.J. Sherr
573	pSRα mSV p19 tk CD8	HB101	amp	C.J. Sherr
574	pBPX HA S3	DH5α	amp	James
575	trk 18-3 pGEX-1N	BL21	amp	James
576	trk 118-2 pGEX-1N	BL21	amp	James
577	trk 78(A) pGEX-1N	BL21	amp	James
578	trk 4 pGEX-1N	BL21	amp	James
579	trk 16 pGEX-1N	BL21	amp	James
580	trk 124 pGEX-4T1	BL21	amp	James
581	trk 107 pGEX-4T1	BL21	amp	James
582	trk 38 pGEX2T	BL21	amp	K. Manto
583	trk 100 pGEX-4T1	BL21	amp	K. Manto
584	cyclin D2 pGEX-5X-3	BL21	amp	J. MacDonald
585	trk43 pGEX-4T1	BL21	amp	J. MacDonald
586	trk 111 pGEX-4T1	BL21	amp	K. Manto
587	trk 136 pGEX-4T1	BL21	amp	K. Manto
588	trk 33 pGEX-4T1	BL21	amp	K. Manto
589	trk 32 pGEX-4T1	BL21	amp	K. Manto
590	trk 72 pGEX-4T1	BL21	amp	K. Manto
591	trk 105 pGEX-1N	BL21	amp	K. Manto
592	phyblexA Zeo	HB101	zeocin	Invitrogen
593	pBPX HA S8	HB101	amp	James
594	pCMX-p19 (+)	HB101	amp	GZ
595	pCMX-p19 (-)	HB101	amp	GZ
596	pUHD10-3-p19 (+)	HB101	amp	GZ
597	pUHD10-3-p19 (-)	HB101	amp	GZ
598	pCMX-cyclinD1 (+)/R1 clone 5	HB101	amp	GZ
599	pCMX-cyclinD1 (-)/R1 clone 8	HB101	amp	GZ
600	pBSSK EG-1	HB101	amp	James
601	pBSSK EG-2	HB101	amp	James
602	pGEX-abl	HB101	amp	S. Ferguson
603	pGEX-crk N-SH3	HB101	amp	S. Ferguson
604	pGEX-crk full length	HB101	amp	S. Ferguson
606	pUHD10-3-D1 (+)	HB101	amp	GZ
607	pBABE-hygro-D2 (+)	HB101	amp	GZ
608	pBABE-hygro-D2 (-)	HB101	amp	GZ
609	pBSSK- TRK Jux	HB101	amp	S. Meakin
610	pAS-1- **FRS2** (mutant)	HB101	amp	S. Meakin
611	pGEX-Grb2 SH3(N) 1-58 a.a. (backup) (human)	BL21	amp	T. Pawson
612	pGEX-Grb2 SH3 (C) 159-217 a.a. (backup) (human)	BL21	amp	T. Pawson

	NAME	HOST Str	ANTIBIOTIC	SOURCE
613	pGEX-Grb2 SH2 (backup) (human)	BL21	amp	T. Pawson
614	pGEX-Grb2 full 2-217 a.a. (backup) (mouse)	BL21	amp	T. Pawson
615	pGEX-HA- **FRS2** (mutant)	BL21	amp	S. Meakin
616	pAS-2.1	HB101	amp	S. Meakin
617	pAS-2.1- **FRS2** (1.5 kb) (Nco-Sal) (mutant)	HB101	amp	S. Meakin
618	pcDNA3-HA- **FRS2** (1.5 kb) (Nhe-Sal/Xho) (mutant)	HB101	amp	S. Meakin
619	pGST-Rb-(terminus) a.a. 792-928	BL21	amp	Ed Harlow MCB 142:2077-2086
620	pCMV-p16	HB101	amp	Ed Harlow
621	pcdk4-dN	HB101	amp	Ed Harlow Science, 262: 2050-2054 1993
623	plexhybzeo-LRM	HB101	zeocin	James
624	pGAD-trk17	HB101	amp	Verdi/James
625	pGEX4T1-trk128	HB101	amp	James
626	pcDNA-trk86	HB101	amp	James
627	pAS-2.1-LRM	HB101	amp	James
628	SCS 110 (dam-,dcm-)			Strathdee / Stratagene
629	pGAD10-GRB2 (mouse)	HB101	amp	CJK
630	pGAD424-p13	HB101	amp	CJK
631	pBPX-HA-TRKB	HB101	amp	CJK
632	pCMX-HA-TRKC (rat)	HB101	amp	S. Meakin
633	pCR2.1-SOM1 (new mutant)	HB101	amp	J. Verdi
634	pGADtrk5-II	HB101	amp	James
635	pGADtrk86-II	HB101	amp	James
636	pGEX-trk128	BL21	amp	James
637	pcDNAtrk47	HB101	amp	James
638	pcDNAtrk52	HB101	amp	James
639	pAS-2.1-TRKA	HB101	amp	S. Meakin
640	pAS-2.1- **FRS2** (PTB)	HB101	amp	CJK
641	pBPX-HA-TRKC (rat)	HB101	amp	CJK
642	pAS-2.1-SHC (full)	HB101	amp	CJK
643	pCR2.1- **FRS2**	HB101	amp	CJK—sequenced—this one is actually **full length** and has stop codon (SL)
644	pBPX-HA-TRKC (#5)	HB101	amp	CJK
645	pGST-PTPIC	BL21	amp	K. Siminovitch
646	pGAD424-SHCA (full)	HB101	amp	CJK
647	pGEX4T1-SHC (full)	BL21	amp	CJK
648	pGEX4T2-trk70	HB101	amp	James
649	pGEX4T2- **FRS2**	BL21	amp	CJK
650	pGEX4T2- **FRS2** (PTB)	BL21	amp	CJK
651	pAS-1- **FRS2**	HB101	amp	CJK
652	pAS-2.1- **FRS2**	HB101	amp	CJK
653	pGEX-4T1-trk63	BL21	amp	James
655	PGV16-RasGrf	HB101	amp	D. Lowy
656	pGEX-5X3-peripherin	BL21	amp	James
657	pGEX-RBD Ras Binding Domain	BL21	amp	Shalloway

	NAME	HOST Str	ANTIBIOTIC	SOURCE
658	pGEX2T-PLCγ1 (N+C) (SH2)	JM101	amp	Pawson
659	pGEX2T-Syp NC SH2	DH5α	amp	Pawson
660	pBABE-IRES Ap-puro	HB101	amp	J. Verdi
661	pGEX2T-Syp NC SH2	BL21	amp	Pawson
662	pGEX2T-PLCγ1 (N+C) (SH2)	BL21	amp	Pawson
663	GST-abl (SH3)		amp	P. Di Fiore
664	GST-yes (SH3)		amp	P. Di Fiore
665	GST-nckl (SH3)		amp	P. Di Fiore
666	pAS. 1-S9 (TrkA)	HB101	amp	James
667	pBABE-AP-puro-p21 (-) C1	HB101	amp	GZ
668	pBABE-AP-puro-p21 (+) C2	HB101	amp	GZ
669	GST-GAP (SH3)	DH5α	amp	Pawson
670	GST-p85 (SH3)	JM101	amp	Pawson
671	GST-V-SRC (SH3)	JM101	amp	Pawson
672	myc-GRF-pBABE-puro	HB101	amp	J. Jackson JBC 273:1782-1787
673	pCRScript- **FRS2** (carboxy term)	DH5α	amp	CJK
674	pBABE-IRES-AP-puro-D1 (+)	DH5α	amp	GZ
675	pcDNA3.1-myc-His- **FRS2** (pure)	HB101	amp	CJK missing last 5 aa
676	pMIAORI (βgal)	HB101	amp	J. Verdi
677	pGFP-N2- **FRS2**	HB101	kan	CJK –sequenced – missing last 5 aa
678	pGAD424-HA- **FRS2**	HB101	amp	CJK
679	pGAD424-peripherin	HB101	amp	JM
680	DH5α			Gibco
681	pGAD424-peripherin	HB101	amp	JM
682	pAS1-S8 (TRKA)	DH5α	amp	JM
683	pLEN-FGFR	DH5α	amp	J Verdi
684	pEGFP-N1-numb1	DH5α	kan	CJK
685	pEGFP-N1-numb3	DH5α	kan	CJK
686	pBACPAK8-GST(4T2)	DH5α	amp	CJK
687	pCRScript- **FRS2**-5'Race (human)	DH5α	amp	CJK
688	pCRScript- **FRS2**-3'Race (human)	DH5α	amp	CJK
689	PTR	DH5α	amp	J Verdi
690	pCRET-1	DH5α	amp	J Verdi
691	pMCRET	DH5α	amp	J Verdi
692	pcDNA3-**HA-FRS2** (HA on 5' end)	DH5α	amp	CJK
694	pBPX-HA-TRKA S8/S9	XL10 gold	amp	CJK
695	pRc-**cSRC** (human) ?vSRC	DH5α	amp	S. Ferguson/D. Fujita
696	pCRScript	DH5α	amp	Stratagene
697	pAS2.1- **FRS2** (c-terminus)	DH5α	amp	CJK
698	pGEX4T1- **FRS2** (c-terminus)	DH5α	amp	CJK
699				
700				
701	pEGFP-N2- **FRS2** (full length)	DH5α	kan	CJK—Change last 5 aa
702	pEGFP-N1- **FRS2** (PTB) (Bam site)	DH5α	kan	CJK
703	pIRES-EGFP- **FRS2**	DH5α	amp	CJK missing last 5 aa
704	pBACPAK8-GST(4T2)-trk5	DH5α	amp	JM

	NAME	HOST Str	ANTIBIOTIC	SOURCE
705	pBACPAK8-GST(4T2)-trk86	DH5α	amp	CJK/JM
706	pBACPAK8-GST(4T2)-trk52	DH5α	amp	JM
707	pCRScript- **FRS2** Interactor #5	DH5α	amp	CJK
708	pSE380-trkA T1 (3' Nco-Xba fragment)	DH5α	amp	CJK
709	pBACPAK8- **FRS2**-myc	DH5α	amp	CJK
710	pBACPAK8-GST(4T2)- **FRS2**	DH5α	amp	CJK
711	pAS2.1-trkA T1	DH5α	amp	CJK
712	GST-crk SH3 (N)	DH5α	amp	Pawson/M. Gold
713	GST-crk SH2	DH5α	amp	Pawson/M. Gold
714	pCR2.1-**FRS3** (human)	DH5α	amp	CJK
715	pUHD- **FRS2** -EGFP	DH5α	amp	CJK missing last 5 aa
716	pUHD- **FRS2** (PTB)-EGFP	DH5α	amp	CJK
717	pUHD- **FRS2**-myc	DH5α	amp	CJK
718	pGEX4T1-**FRS3** (human)	DH5α	amp	CJK
719	pBS Tα1- **FRS2**	DH5α	amp	CJK
720	pBS Tα1-NECDIN	DH5α	amp	CJK
721	pBS Tα1-MAGY	DH5α	amp	CJK
722	pINTRON2-NECDIN	DH5α	amp	CJK
723	pCR2.1-trk105-5' Race (rat)	DH5α	amp	CJK
	The next ones are Gina's yeast screen clones for trkA as bait			
725	pACT2-mouse3 Human chr7 cosmid	HB101	amp	GMG
726	pACT2-mouse5 Ribosomal protein	HB101	amp	GMG
727	pACT2-mouse10 Novel	HB101	amp	GMG
728	pACT2-mouse12 Ribosomal protein	HB101	amp	GMG
729	pACT2-mouse14 Ribosomal protein	HB101	amp	GMG
730	pACT2-mouse22 GADIO	HB101	amp	GMG
731	pACT2-mouse28	HB101	amp	GMG
732	pACT2-HFB3 Alu Repeats	BL21	amp	GMG
733	pACT2-HFB6 Soares mRNA	BL21	amp	GMG
734	pACT2-HFB10 GADIO	BL21	amp	GMG
735	pACT2-HFB12 Soares Transcr. Factor	BL21	amp	GMG
736	pACT2-Mam32	BL21	amp	GMG
737	pACT2-Mam36 ATP Synthase	HB101	amp	GMG
738	pACT2-Mam60	HB101	amp	GMG
739	pACT2-Mam65	HB101	amp	GMG
740	pACT2-Mam67 Zfp 7	HB101	amp	GMG
741	pACT2-Mam75 Hum. RNA helicase p68	BL21	amp	GMG
742	pACT2-Mam80 P1-3 Kinase	HB101	amp	GMG
743	pACT2-Mam81 ATP Synthase	HB101	amp	GMG
744	pACT2-Mam86 SH3-Domain interact. prot.	HB101	amp	GMG
745	pACT2-Mam87 Nebulin	BL21	amp	GMG
746	pACT2-Mam95 Kox3 Zincfinger protein	HB101	amp	GMG
747	pACT2-Mam97	HB101	amp	GMG

	NAME	HOST Str	ANTIBIOTIC	SOURCE
748	pACT2-Mam98Zingfinger protein ZFp6	HB101	amp	GMG
749	pACT2-Mam103 GT4-2 Homolog	BL21	amp	GMG
750	pACT2-Mam116 N-Rap	HB101	amp	GMG
751	pACT2-Mam119 Chr 16 Zincfinger prot.	HB101	amp	GMG
752	pACT2-Mam122	HB101	amp	GMG
753	pACT2-Mam130	HB101	amp	GMG
754	pACT2-Mam133	HB101	amp	GMG
755	pACT2-Mam140 Human Bac clone chr7	HB101	amp	GMG
756	pACT2-Mam150	HB101	amp	GMG
757	pACT2-Mam156 Novel	HB101	amp	GMG
758	pACT2-Mam157	HB101	amp	GMG
759	pACT2-Mam164 Human chr7	HB101	amp	GMG
760	pACT2-Mam170 Zincfinger protein	HB101	amp	GMG
761	pACT2-Mam171	HB101	amp	GMG
762	pACT2-Mam174	HB101	amp	GMG
763	pACT2-Mam187	HB101	amp	GMG
764	pACT2-Mam212 Synapse - Assoc.protein	HB101	amp	GMG
765	pACT2-Mam213	HB101	amp	GMG
766	pACT2-Mam219	HB101	amp	GMG
767	pACT2-Mam224	HB101	amp	GMG
768	pACT2-Mam249 CyclinG1 interact. prot.	HB101	amp	GMG
769	pACT2-Mam269	HB101	amp	GMG
770	pACT2-Mam282 Dead box protein p72	HB101	amp	GMG
771	pACT2-mouse1 -Nesca	HB101	amp	GMG
	we now resume with our regularly scheduled clones			
772	pEBG	DH5α	amp	P. Angborg
773	pEBG-**RasGRF1**	DH5α	amp	P. Angborg
774	pGEX 2T -**crkl** (see 94/85 pubs from lab)	BL21	amp	John Groffen
775	**nestin-c**	DH5α	amp	J Verdi
776	nestin-H-tk g11 TKZ (flipped)	DH5α	amp	J Verdi
777	pBridge- **FRS2**	DH5α	amp	CJK
778	pINTRON2- **FRS2**	DH5α	amp	CJK
779	pBS-**trk 105** (full)	DH5α	amp	CJK
780	pBS-**MAGY** (5' UTR-400 bp)	DH5α	amp	CJK
781	pCR2.1-**numb (PRR+)**	DH5α	amp	CJK
782	pBridge- **FRS2-lexA-trkA**	DH5α	amp	CJK
783	pCR2.1-**numb (PRR-)**	DH5α	amp	CJK
784	pBS Tα1-**MAGY** (new start site)	DH5α	amp	CJK
785	pINTRON2-**MAGY** (new start site	DH5α	amp	CJK
786	pINTRON2- **FRS2**-nestin-C	DH5α	amp	CJK
787	pINTRON2-**MAGY**-nestin-C	DH5α	amp	CJK

	NAME	HOST Str	ANTIBIOTIC	SOURCE
788	pINTRON2-**NECDIN**-nestin-C	DH5α	amp	CJK
789	pGEX4T2-**MAM80** (PI3 kinase)	DH5α	amp	CJK
790	pCR2.1-**trk105 3' race (rat)**	DH5α	amp	CJK
791	pCR2.1- **FRS2-Y^{306}A mutant**	DH5α	amp	CJK
792	pCR2.1- **FRS2-Y^{349}A mutant**	XL10-gold	amp	CJK
793	pCR2.1- **FRS2-Y^{436}A mutant**	DH5α	amp	CJK
794	pCR2.1- **FRS2-Y^{471}A mutant**	DH5α	amp	CJK
795	pCR2.1-**FRS2-Y^{392}A** mutant	XL10-gold	amp	CJK
796	pGEX4T2	DH5α	amp	CJK
797	pNSE-lacZ	DH5α	amp	P. Danielson
798	pCR2.1-**FRS2-Y^{196}A** mutant	DH5α	amp	CJK
799	pBS-**NUMB (PRR+)**	DH5α	amp	CJK
800	pBS-**NUMB (PRR-)**	DH5α	amp	CJK
801	pBS-**trk105 5' race (rat)**	DH5α	amp	CJK
802	pBPX-HA-**TrkA S8/S9/Y^{679}A S27**	XL10-gold	amp	CJK
803	pIRES-EGFP-**FRS2-Y^{306}A**	XL10-gold	amp	CJK
804	pIRES-EGFP-**FRS2-Y^{436}A**	XL10-gold	amp	CJK
805	pIRES-EGFP-**FRS2-Y^{471}A**	XL10-gold	amp	CJK
806	cβS-FLAG	XL10-gold	amp	M. Cole
807	pBPX-HA-**trkA-Y^{679}A**	XL10-gold	amp	JM
808	pIRES-EGFP-**FRS2-Y^{196}A**	XL10-gold	amp	CJK
809	pIRES-EGFP-**FRS2-Y^{349}A**	XL10-gold	amp	CJK
810	pIRES-EGFP-**FRS2-Y^{392}A**	XL10-gold	amp	CJK
811	pBPX-HA-**TrkA T1**	XL10-gold	amp	CJK
812	pGEX4T2-**Mam282**	XL10-gold	amp	JM
813	pGEX4T2-**Mam156**	XL10-gold	amp	JM
814	pGEX4T2-**mouse1**	XL10-gold	amp	JM
815	pEBG-**trk47**	XL10-gold	amp	JM
816	pEBG-**trk86**	XL10-gold	amp	JM
817	pEBG-**trk5**	XL10-gold	amp	JM
818	pGEX-4T2 **Mam157**	XL10-gold	amp	JM
819	pGEX-4T2 **Mam171**	XL10-gold	amp	JM
820	pEBG **Peripherin**	XL10-gold	amp	CJK
821	pGEMT-**Rat-5'SNT Race**#2	XL10-gold	amp	CJK
822	pGEMT-**Rat-5'SNT Race**#3	XL10-gold	amp	CJK
823	pGEMT-Mouse-**5'FRS2 Race**#2	XL10-gold	amp	CJK **(in situ probe)**
824	pGEMT-Mouse-**5'FRS2 Race**#3	XL10-gold	amp	CJK
825	p38LoxpNeo **(Frs2 KO vector 5' and 3' arms)**	DH10	amp	Genome Systems
826	pBELO-BAC-**Som1** #1850	DH10	Chlorampen.	Genome Systems
827	pGEX4T1-**MAGY**	XL10-gold	amp	JV
828	Lox-Neo (lox-lox)	XL10-gold	amp	Bryce Vissel (Salk)
829	pEBG-**ras GRF L^{263}Q mutant**	XL10-gold	amp	CJK
830	pBSTα1-**NUMB1 (++)**	XL10-gold	amp	CJK
831	pBSTα1-**NUMB3 (+-)**	XL10-gold	amp	CJK
832	pGEX4T2 **Mam122**	XL10-gold	amp	JM
833	pGEX4T1	XL10-gold	amp	CJK -- *NOT PRESENT??*
834	pGEX4T3	XL10-gold	amp	CJK

	NAME	HOST Str	ANTIBIOTIC	SOURCE
835	pEBG **Trk52**	XL10-gold	amp	JM
836	pBAKPAK8	XL10-gold	amp	Invitrogen
837	**SCG10** (pan neuronal marker - linearize w BamHI, transribe w SP6 for antisense)	XL10-gold	amp	JV/Andy Groves (Caltech)
838	pGEX4T2-**MAGY** (5'Bam band)	XL10-gold	amp	CJK
839	pZero-**MAGY** A14	XL10-gold	Zeocin	CJK
840	XL10-GOLD (competent cells-RKB)	XL10-gold	Chloramphen.	Stratagene
841	pAS2.1-**TrkB**(IC) RI/Sal	XL10-gold	amp	CJK
842	pBSTα1-Intron 2 XbaI	XL10-gold	amp	CJK
843	RET.INS.AP	XL10-gold	amp	D. Anderson, Caltech
844	RET.TK.AP	XL10-gold	amp	D. Anderson, Caltech
845	pEBG-**rasGRF cluster mutant** (Bam/Not)	XL10-gold	amp	CJK/P. Anborgh
846	pBPX-HA-TrkA S8/S9/Y^{679}**A**/Y^{683}**D**/Y^{684}**E (S30)**	XL10-gold	amp	JM
847	p38LoxpNeo-**MAGY** 1st arm Sac/RI	XL10-gold	amp	CJK
848	pGEXT-human **EG1**pcr (3' RACE3-REV2)	XL10-gold	amp	CJK
849	p38Loxpeo-**PITS** Knockout	XL10-gold	amp	CJK
850	pBABE-IRES-AP-PURO-**PITS** (RI)	XL10-gold	amp	CJK
851	pGEX4T2 **Mam65**	XL10-gold	amp	JM
852	pGEXT-human **EG1** 5' Race	XL10-gold	amp	CJK
853	TrkA KO (pJM4-3)	XL10-gold	amp	JV
854	TrkA 3' probe (129-105)	XL10-gold	amp	JV
855	TrkA 5' probe (pMM2)	XL10-gold	amp	JV
856				
857	pEBG-3	XL10-gold	amp	JM
858	pX^2Z-1 (lox-lox)	XL10-gold	amp	JV/MJ
859	pX^2Z-2(lox-lox)	XL10-gold	amp	JV/MJ
860	pX^2Z-3(lox-lox)	XL10-gold	amp	JV/MJ
861	plox-ex (lox-lox)	XL10-gold	amp	JV/MJ
862	pX^2Z-2-Sac1335 B-RI-RI-H (6848 bp) LoxP (cloned Into Bgl II/H) contains mFRS-2 exons 1-4 <<pFLOX-1>>	XL10-Gold	amp	MJ (K.O.)
863	pZero Sac 1335 (**FRS-2** exons 1-4 Sac 1 fragments)	XL10-Gold	Zeocin	Genome Systems
864	pCDNA-HA-ShcB Y296A	XL10-Gold	amp	RKB
865	pCDNA-HA-ShcB Y296A & Y296A	XL10-Gold	amp	RKB
866	pCDNA-HA-ShcB Y296A,Y296A, Y372A	XL10-Gold	amp	RKB
867	pBS(SK)-Numb1 (++;$^{PTB/PRR}$) full length ~ 2.8 kb	XL10-Gold	amp	JV
868	pBS(SK)-Numb3 (+-;$^{PTB/PRR}$) full length ~ 2.8 kb	XL10-Gold	amp	JV
869	pBS(SK)-Numb12 (-+;$^{PTB/PRR}$) full length ~ 2.8 kb	XL10-Gold	amp	JV
870	pBS(SK)-Numb13 (--;$^{PTB/PRR}$) full length ~ 2.8 kb	XL10-Gold	amp	JV
871	pEBG-3Mouse1	XL10-gold	amp	JM

	NAME	HOST Str	ANTIBIOTIC	SOURCE
872	pBABE-puro-MAPKKH	XL10-gold	amp	Ferguson
873	pEFP-Ras615A	XL10-gold	amp	Ferguson
874	pBPX-HA-TrkAS8S9 $Y^{683}D:Y^{684}E$ **S32**	XL10-gold	amp	JM
875	pEBG-Mam 282	XL10-gold	amp	JM
876	pBABE-IRES-AP-PURO-**FRS2** + EGFP	XL10-Gold	amp	CJK –sequenced – missing last 5 aa
877	pBABE-IRES-AP-PURO-**FRS2 (PTB-Bam site)** + EGFP	XL10-Gold	amp	CJK
878	pBPX-HA-TrkA: $Y^{679}A:Y^{683}D:Y^{684}E$ **(S28)**	XL10-Gold	amp	JM
879	pEBG-Mam 156	XL10-gold	amp	JM
880	pEBG-Mam 171	XL10-gold	amp	JM
881	pEBG-Mam 122	XL10-gold	amp	JM
882	pEBG-Mam 103	XL10-Gold	amp	JM
883	pEBG-Mam 140	XL10-Gold	amp	JM
884	pCMX-HA-TrkA $Y^{679}A$ = S26	XL10-gold	amp	CJK
885				
886	pX^2Z-2 - Sac1335 B-H (3378 bp) LoxP (cloned Into BglII/H) contains **mFRS-2 exon 1** **<< pFLOX-2>>**	XL10-Gold	amp	MJ
887	pEBG-Mam 60	XL10-gold	amp	JM
888	pEBG-Mam 157	XL10-gold	amp	JM
889	pSE280	XL10-gold	amp	Invitrogen
890	p38LoxPNeo	XL10-gold	amp	Genome Systems
891	pX^2Z-2 - Sac1335 RI-H (2264 bp) LoxP	SCS110	amp	MJ
892	pBS-mouse-5'SNT Race	XL10-gold	amp	MJ
893	pSE280-2A	XL10-gold	amp	MJ
894	pBPX-HA-TrkA S9 (Alanine)	XL10-gold	amp	CJK
895	pSE280-1B-L (floxed neo)	XL10-gold	amp	MJ
896	pSE280-IB-R (floxed neo)	XL10-gold	amp	MJ
897	pEGFP-N2-PITS	XL10-gold	amp	CJK
898	pZero-C9 (FRS2 exons 2-5; RI fragment)	XL10-gold	amp	Genome Systems
899	----------	Stable-2	-------	Stratagene
900	----------	Sure	Kan	Stratagene
901	pGem-SNT1 3' UTR (mouse)	XL10-gold	amp	CJK
902	pAS211-PITS (5'Bam)	XL10-gold	amp	CJK
903= S31	pBPX-HA-TrkAS8 Y^{679}: $Y^{683}D:Y^{684}E$	XL10-Gold	amp	JM
904= S29	pBPX-HA-TrkAS9 Y^{679}: $Y^{683}D:Y^{684}E$	XL10-Gold	amp	JM
905	----------	XL1-Blue	Tet	Stratagene
906	pCR2.1-p16	XL10-gold	kan/amp	CJK
907	GST ATF-2		amp	J. Woodgett
908	GST c-Jun	BL21	amp	J. Woodgett
909	pBIG 2i HA TrkA clone #2	DH5-α	amp	E. Gryz
910	pBIG 2i HA TrkS13a clone #12	DH5-α	amp	E. Gryz
911	pBIG 2i HA TrkA13b clone #1	DH5-α	amp	E. Gryz
912	pBABE-IRES-AP-PURO p16	XL10-gold	amp	CJK

	NAME	HOST Str	ANTIBIOTIC	SOURCE
913	pCMX-HA Trk ($Y^{683}Y^{684}\rightarrow F^{683}F^{684}$)	XL10-gold	amp	CJK
914	pCMX-HA Trk ($Y^{683}Y^{684}\rightarrow N^{683}Q^{684}$)	XL10-gold	amp	CJK
915	pCMX-HA Trk ($Y^{683}Y^{684}\rightarrow Q^{683}N^{684}$)	XL10-gold	amp	CJK
916	pEBG MAM 86	XL10-gold	amp	JM
917	pBSTα1-nestin express	XL10-gold	amp	CJK
918	pEGFP-N1-HA-Trk (full)	XL10-gold	amp	CJK
919	pEBG MAM 65	XL10-gold	amp	JM
920	pEGB MAM 249	XL10-gold	amp	JM
921	pEBG MAM 122	XL10-gold	amp	JM
922	- - -	XL1-BLUE MRA	- - -	Stratagene
923	- - -	XL1-BLUE MRA (P2)	- - -	Stratagene
924	pEFP-rasGRF1	XL10-gold	kan	Pieter/Ferguson
925	pMT3-ΔN158rasGRF1	XL10-gold	amp	Kato Kaelin/L Feig
926	pEGFP-N3-EG1 (human-full)	XL10-gold	kan	CJK
927	pMT3-1Q(-) - rasGRF1	XL10-gold	amp	Kato Kaelin/L Feig
928	pMT3-n-PH(-) - rasGRF1	XL10-gold	amp	Kato Kaelin/L Feig
929	pMT3-cc(-) - rasGRF1	XL10-gold	amp	Kato Kaelin/L Feig
930	pMT3-ΔN59 - rasGRF1	XL10-gold	amp	Kato Kaelin/L Feig
931	pBSKS-FRS2-E1<lox> (Xba/Spe frag.from pFLOX2)	XL10-GOLD	amp	MJ
932	pBSKS-floxNEO-L (RI fragment)	XL10-gold	amp	MJ
933	pBSKS-floxNEO-R (RI fragment)	XL10-gold	amp	MJ
934	pBSKS-FRS2-E1<lox>E2-4	XL10-gold	amp	MJ
935	pGEMT-EZ-mouseSNT3'UTR(polyA)	XL10-gold	amp	CJK
936	Tα1-nestin~overexpress-Numb1(++)	XL10-gold	amp	CJK
937	Tα1-nestin~overexpress-Numb3(+-)	XL10-gold	amp	CJK
938	pAS2.1-rat TrkC (ICD) SalI	XL10-gold	amp	CJK
939	pcDNA3.1 myc HIS A	XL10-gold	amp	Invitrogen
940	pcDNA3.1 myc HIS B	XL10-gold	amp	Invitrogen
941	pcDNA3.1 myc HIS C	XL10-gold	amp	Invitrogen
942	pBPXY-5-4	XL10-gold	amp	JM
943	pBPXY-30-5	XL10-gold	amp	JM
944	pBS(KS) MIG A (RI fragment 1900bp)	XL10-gold	amp	Mina/Ferguson
945	pSE280-rat TrkC HindIII/Xba	XL10-gold	amp	CJK
946	pEGFP-C2	XL10-gold	kan	Clontech
947	pAS2.1-EG1 (PRR)	XL10-gold	amp	CJK
948	pGBKT7-trkB (kinase dead)	XL10-gold	kan	CJK
949	pLNCXZ-HAWT trkA	XL10-gold	amp	CJK
950	pADTRACK-cmv-SNT1-myc HIS	XL10-gold	kan	CJK
951	pADTRACK-cmv-SNT2-myc HIS	XL10-gold	kan	CJK
952	**pCDNA3.1-mycHISB-som1 Y436A**	**XL10-gold**	**amp**	**MJ Wrong**
953	**pCDNA3.1-mycHIS-som1 y471a**	**XL10-gold**	**amp**	**MJ Wrong**
954	pCDNA-mouse1 (HA tagged)	HB101	amp	JM
955				

	NAME	HOST Str	ANTIBIOTIC	SOURCE
956	pCMX-HA-trkB (kinase dead)	XL-GOLD	amp	CJK
957	pEGFP-N1 DEL (no kozak or atg)	XL-GOLD	kan	CJK
958				
959	pEGFP-N3 DEL (no kozak or atg)	XL-GOLD	kan	CJK
960	PEGFP-N3	XL-Gold	Kan	ferguson
961	pEGFP-C1-EG1	XL-GOLD	kan	CJK
962	pEGFP-N(DEL Kozak)-FRS-2	XL-GOLD	kan	CJK
963				
964				
965				
966				
967				
968	pTag FRS2-Flag (clone 1)	DH5α	kan	KV
969	pIRES	DH5α	amp	clontech
970	pTag-FRS3-FLAG	DH5α	kan	KV
971	pGEMT-EZ-FRS3- 3' UTR (mouse)	XL-GOLD	amp	CJK **in vitro/insitu probes**
972	pEBG-MAM171 (full length)	XL-GOLD	amp	JM
973				
974	pCMX-HA-trkC (kinase dead)	XL-GOLD	amp	CJK
975				
976	pEGFP-C1-MAM171 (full length)	XL-GOLD	kan	CJK
977				
978	pCDNA-mouse1-mycHIS (NESCA)	XL-GOLD	amp	JM
979	pEGFP-N1 DEL (no kozak or ATG)	XL-GOLD	kan	CJK
980				
981				
982				
983				
984				
985				
986				
987				
988	pECFP-N1DEL-HA-trkA	XL-GOLD	kan	CJK
989				
990				
991				
992				
993	pcDNA3.1-mycHISA-human FRS3	XL-GOLD	amp	CJK
994				
995				
996				
997				
998				
999				
1000				
1001	pCDNA3.1-mycHIS-h**FRS2** (ptb)	XL10-gold	amp	KM
1002				

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1003				
1004				
1005				
1006				
1007				
1008				
1009				
1010				
1011				
1012	pEGFP-N3DEL-mouse1 (Nesca)	XL10-gold	kan	CJK
1013				
1014				
1015				
1016				
1017				
1018				
1019				
1020				
1021				
1022				
1023				
1024				
1025				
1026	pGAD10-trkB-ca24 (Casp/RIPK1-adapter)	HB101	amp	WL
1027	pGAD10-trkB-ca69 (Not 56-like)	HB101	amp	WL
1028				
1029	pGAD10-trkB-ca109 (PI-BIP Phosphatase)	HB101	amp	WL
1030	pACT2-trkB-br45 (Mouse/Human EsST 130882)	HB101	amp	WL
1031				
1032				
1033				
1034				
1035	pACT2-trkB-M2 (p66 Shc)	HB101	amp	WL
1036				
1037				
1038	pACT2-trkB-M38/Tid1	HB101	amp	WL
1039				
1040				
1041				
1042	pACT2-trkC-M38 (sck)	HB101	amp	WL
1043				
1044				
1045				
1046				
1047				

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1048	pACT2-trkC-M138 (Human BR2 cDNA)	XL10-gold	amp	WL
1049				
1050				
1051	pBPX-HA-trkA S21	XL10-gold	amp	CJK
1052				
1053	pCMX-HA-trkA ADE = S28	XL10-gold	amp	JM
1054	pCMX-HA-trkA S9 ADE = S29	XL10-Gold	amp	JM
1055	pCMX-HA-trkA S8/S9 ADE = S30	XL10-gold	amp	JM
1056	pAS1-mouse1 (Nesca)	XL10-gold	amp	JM
1057				
1058	pCR2.1-mouse1/Nesca (SH3minus)	XL10-gold	amp/kan	JM
1059				
1060				
1061				
1062				
1063	pEGFP-C1-Nesca (SH3 minus)	XL10-Gold	kan	JM
1064				
1065				
1066				
1067	pEGFP-N3DEL-nesca (2Y-A mutant)	XL10-gold	kan	CJK
1068	pGEX4T2-hSNT2 (PTB domain)	XL10-gold	amp	CJK
1069	pEBG-trkC-M38 (ShcB fragment)	XL10-gold	amp	WL
1070	pCDNA-HA-EG1 (deleted PEST)	XL10-gold	amp	JM
1071	pGEX4T2-nesca (SH3-)	XL10-gold	amp	JM
1072	pTADV-EG1-deleted PEST	XL10-gold	amp/kan	JM
1073	pTADV-MAM171-EE (Tao1, EE mutant)	XL10-gold	amp/kan	JM
1074	pEGFP-N3DEL-human FRS3	XL10-gold	kan	CJK
1075				
1076	FRS-2 KO1 1-0	XL10-gold	amp	JV
1077				
1078				
1079				
1080				
1081	nestin Xpress-LACZ	XL10-gold	amp	CJK
1082				
1083				
1084	pEBG3- trkB-M34 (human EST)	XL10-gold	amp	WL
1085	pEBG3-trkB-M38 ($Tid1_L$-L^{215}~S^{480})	XL10-gold	amp	WL
1086	pEBG3- trkB-M53 (K1AA1091)	XL10-gold	amp	WL
1087	pEBG3- trkB-br45 (Mouse/Human EsST 130882)	XL10-gold	amp	WL
1088	pEBG3- trkC-M94 (Kruppel, HKR3)	XL10-gold	amp	WL
1089	pEBG3-trkC-M109	XL10-gold	amp	WL
1090	pEBG3- M138 (Human BR2 cDNA)	XL10-gold	amp	WL
1091	pEBG3-trkC-M29 (TSC-22)	XL10-gold	amp	WL

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1092	pCDNA3.1 (+)-HA-sck (ShcB)	XL10-gold	amp	WL
1094	pRFP-N1DEL (no kozak or ATG)	XL10-gold	kan	CJK
1095	pRFP-N2DEL (no kozak or ATG)	XL10-gold	kan	CJK
1096	pRFP-N3DEL (no kozak or ATG)	XL10-gold	kan	CJK
1097	pCDNA-HA-MAM171 (Tao1, EE mutant)	XL10-Gold	amp	JM
1107	pEGFP-N1del-Nesca (SH3minus)	XL10-gold	kan	JM
1108	pIRES2-EGFP-**FRS2**-mycHIS	XL10-gold	kan	CJK—7th last aa has a silent mutation
1109	pIRES2-EGFP-**FRS3**-mycHIS	XL10-gold	kan	CJK
1110	pRFP-N3DEL-**FRS2**	XL10-gold	kan	CJK
1111	pCDNA-IRS1 (PH-PTB)	DH5α	amp	RKB
1113	FGFR1.1	XL10-gold	amp	JV
1114	trkC-ca17 (Unknown interactor)	XL10-gold	amp	WL
1115	pEGB3-Mam212 (Synapse Associated Protein)	XL10-Gold	amp	WL
1116	KO1.1	XL10-gold	amp	CJK
1117	KO2	XL10-gold	amp	CJK
1118	pGEX4T2-nesca(SH3 minus)	BL21	amp	JM
1119				
1120	pcDNA3.1-mouse FGFR-1	XL10-gold	amp	CJK
1121	pGEM-T-Easy-FRS2 (mychis) NheI/SelI	DH5α	amp	RKB – *Duplicated T7 Site*
1122	pGEM-T-Easy- FRS2 (mychis) NheI/SelI	DH5α	amp	RKB -- *Duplicated T7 Site*
1123	pGEM-T-Easy-FRS2 (flag) NheI/SelI	DH5α	amp	RKB -- *Duplicated T7 Site*
1124				
1125	pEGFP-N2DEL-**FRS2 (PTB domain)**	XL10-gold	kan	KM
1126		XL10-gold		
1127	pNESTIN-**hFRS2**-mycHIS-IRES-LACZ	XL10-gold	amp(lac Z not in frame)	CJK stops at 5'mychis
1128	pNESTIN-**hFRS3**-mycHIS-IRES-LACZ	XL10-gold	amp (lac Z not in frame)	CJK stops at 5'mychis
1129				
1130	DS Red pRFP-N1DEL-HA-trkA	XL10-gold	kan	CJK
1131	pBIG2i	XL10-gold	amp	CJK/Strathdee

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1132	pBIG2i-**hFRS2**-mycHIS	XL10-gold	amp	CJK
1133	pBIG2i-**hFRS2**-RFP	XL10-gold	amp	CJK
1134	pBIG2i-**hFRS3**-mycHIS	XL10-gold	amp	CJK
1135	pBIG2i-**hFRS3**-EGFP	XL10-gold	amp	CJK
1136				
1137				
1138	pBIG2i-**Nesca**-EGFP	XL10-gold	amp	CJK
1139	pAS1-trkA (S8/Y679A/S9)=S27	XL10-gold	amp	JM
1140	pAS1-trkA (S8/Y679A/Y683D/Y684E)	XL10-gold	amp	JM
1141	pAS1-trkA (S9/Y679A/ Y683D/Y684E)=S29	XL10-Gold	amp	JM
1142	pGEMT-MAM171 **(human Tao1)**	XL10-Gold	amp	JM
1143	pBIG2i-Nesca(SH3-)-EGFP	XL10-gold	amp	CJK
1144	pBPX-GST-Nesca	XL10-gold	amp	
1145	pBPX-GST-Nesca (SH3minus)	XL10	amp	JM
1146	pBlueBac HISA	XL10	amp	Invitrogen
1147	pBlueBac HISB	XL10	amp	Invitrogen
1148	pBlueBac HISC	XL10	amp	Invitrogen
1149	pGAD-Nesca	XL10	amp	JM
1150	pGAD-Nesca (SH3-)	XL10	amp	JM
1151	pAS-2-trkA-S1	XL10	amp	JM
1152	pAS-2-trkA-S3	XL10	amp	JM
1153	pAS-2-trkA-S8	XL10	amp	JM
1154	pAS-2-trkA-S9	XL10	amp	JM
1155	pAS-2-trkA-S11	XL10	amp	JM
1156	pAS-2-trkA-S19	XL10	amp	JM
1157	pAS-2-trkA-Y679A/Y683D/Y684E (S28)	XL10	amp	JM
1158	pBackpack8 FRS3-mycHIS	XL10	amp	JM
1159	pGADT7	XL10	amp	Clontech
1160	pGADT7-T	XL10	amp	Clontech
1161	pBP-8-nesca-mycHIS	XL10	amp	JM
1162	pACTII-nesca screen 1	XL10	amp	JM
1163	pACTII-nesca screen 11 (DRAL)	XL10	amp	JM
1164	pACTII-nesca screen 15 (GRAP)	XL10	amp	JM
1165	pACTII-nesca screen 26 (STAT3)	XL10	amp	JM
1166	pACTII-nesca screen 31 (PP6)	XL10	amp	JM
1167	pACTII-nesca screen 38 (RIL)	XL10	amp	JM
1168	pACTII-nesca screen 43 (ACK)	XL10	amp	JM
1169	pACTII-nesca screen 46 (NPCIP)	XL10	amp	JM
1170		XL10	amp	
1171	pGEX-SHC (full length)	Bl21 RIL	amp	Chris/JM
1172	pGEX-SHC (full length)	BL21 RP	amp	Chris/JM
1173	pGEX-SHC (PTB)	BL21 RP	amp	JM
1174	pGEX-SHC (PTB)	BL21 RIL	amp	JM
1175	pCDNA-M171 (RI/SacII)		amp	JM
1176	pEBG P68		amp	
1177		XL10gold	chloramphenicol	Stratagene
1178	pCDNA-HA-N31 (PP6)	XL10Gold	amp	JM

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1179	pCDNA-HA-N38 (RIL)	XL10Gold	amp	JM
1180	pCDNA-HA-N43 (Ack1)	XL10Gold	amp	JM
1181	pACTII-NUP214 (nesca1)	XL10Gold	amp	JM
1182	pGEX4T2 PP6 (nesca31)	BL21 RP	amp	JM
1183	pGEX4T2 RIL (nesca 38)	BL21 RP	amp	JM
1184	pGEX4T2 ACK (nesca43)	BL21 RP	amp	JM
1185	pGEX4T2 PP6 (nesca31)	XL10Gold	amp	JM
1186	pGEX4T2 RIL (nesca 38)	XL10Gold	amp	JM
1187	pGEX4T2 ACK (nesca 43)	XL10Gold	amp	JM
1188	pAS2.1-trkA S21	XL10Gold	amp	CJK/SJD
1189	pAS2.1-FRS3 (PTB)	XL10Gold	amp	CJK/SJD
1190	pAS2.1-FRS3 (full length)	XL10Gold	amp	SJD remade 06/02 good!
1191	pAD Track	XL10Gold	kan	L. Dagnino
1192	pAD Track-CMV	XL10Gold	kan	L. Dagnino
1193	pAD Easy-1	XL10Gold	amp	L. Dagnino
1194	pIND TID1/Long	DH5α	amp	K. Munger
1195	pIND TID1/Short	DH5α	amp	K. Munger
1196	pBP EG-1	XL10Gold	amp	JM
1197	pBP GST Peripherin	XL10Gold	amp	JM
1198	pGEX4T2 NUP214 (nesca1)	XL10Gold	amp	JM
1199	pLNCX2	XL10Gold	amp	Clontech
1200	pEBG3-trkB-ca43 (unknown)	XL10Gold	amp	HYL
1201	pEBG3-trkB-ca69 (Not 56-like)	XL10Gold	amp	HYL
1202	pEBG3-trkB-ca73 (Unknown)	XL10Gold	amp	HYL
1203	pEBG3-trkB-ca81 (Unknown)	XL10Gold	amp	HYL
1204	pEBG3-trkB-ca109 (PI-BIP-phosphatase)	XL10Gold	amp	HYL
1205	pBridge #2	DH5 α	amp	KV (clontech)
1206	pIND/Pme1 (-)	XL10Gold	amp	HYL
1207	pGEXK6-Pin1	DH5α	amp	SJD
1208	pEBG3-trkB-ca24 (Casp/RIPK1 adapter)	DH5α	amp	HYL
1209	pEBG3-trkB-ca123 (Unknown)	DH5α	amp	HYL
1210				
1211	PGADT7 – TRK – KD	XL10Gold		
1212	pEBG DRAL (nesca 11)	XL10Gold	amp	JM
1213	pEBG PP6 (nesca 31)	XL10Gold	amp	JM
1214	pEBG RIL (nesca 38)	XL10Gold	amp	JM
1215	pEBG ACK (nesca 43)	XL10Gold	amp	JM
1216	pADEasy HA trkA #4	XL10Gold	kan	EG
1217	pADEasy HA S11b #6	XL10Gold	kan	EG
1218	pADEasy HA S13a #4	XL10Gold	kan	EG
1219	pADEasy HA S13b #1	XL10Gold	kan	EG
1220	pGEX2T-GST **Suc1 (p13)**	DE3-RP	amp	SJD
1221	pLNCX2-mycHIS-nesca	XL10Gold	amp	JM
1222	pLNCX2-nesca-R	XL10Gold	amp	JM
1223	pEGB3-trkB-ca91 (937223 Unknown cDNA)	DH5α	amp	HYL
1224	pLNCX2-EGFP-nesca	XL10Gold	amp	JM

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1225	pAS2.1 **CKS1**	XL10Gold	amp	JM
1226	pAS2.1 **CKS2**	XL10Gold	amp	JM
1227	pRK5-myc-hTID1$_L$	DH5α	amp	Hui-Yu Liu
1228	pRK5-myc-hTID1$_S$	DH5α	amp	Hui-Yu Liu
1229	pAD Easy TrkA clone 5 (doesn't work)	XL10Gold	kan	EG
1230	pAD Easy S11b clone 6	XL10Gold	kan	EG
1231	pAD Easy S13a clone 4	XL10Gold	kan	EG
1232	pAD Easy S13b clone1	XL10Gold	kan	EG
1233	pCDNA HA DRAL (nesca 11)	XL10Gold	amp	JM
1234				
1235	pGADT7 **CKS1**	XL10Gold	amp	JM
1236	pGADT7 **CKS2**	XL10Gold	amp	JM
1237	pACT II nesca 46 (NPIP)	XL10Gold	amp	JM
1238	pGEMT trkA CAV(-) frag	XL10Gold	amp	JM
1239	pcDNA HA NUP214 (nesca1)	XL10Gold	amp	JM
1240	pcDNA HA NPIP (nesca 46)	XL10Gold	amp	JM
1241	pcDNA HA GRAP1 (nesca 15)	XL10Gold	amp	JM
1242	pcDNA mycHIS **CKS1**	XL10Gold	amp	JM
1243	pGEMT M171 EE Frag Xba-SalI			James
1244	pGEX-**ENIGMA** (LIM1,2,3)	XL10Gold	amp	Gordon Gill
1245	pGEX-**ENIGMA** (LIM1,2,3)	BL21-RP	amp	Gordon Gill
1246	pGEMT **Tao1** Xba/Sal EE frag	XL10Gold	amp	JM
1247	pcDNA mycHIS **CKS1**	XL10Gold	amp	JM
1248	pcDNA mycHIS **CKS2**	XL10Gold	amp	JM
1249	pcDNA HA PP6	XL10Gold	amp	JM
1250	pEBG nesca 1 (NUP214)	XL10Gold	amp	JM
1251	pEBG nesca 46 (NPIP)	XL10Gold	amp	JM
1252	pEYFP-N1	DH5α	amp	CLONTECH
1253	pRFP-N1DEL HA trkA S8	XL10Gold	kan	CJK
1254	pRFP- N1DEL HA trkA S17	XL10Gold	kan	CJK
1255	pGEMT-EZ-200bpfrag nestin coding	XL10Gold	amp	KMcD
1256	pRFP-N1DEL-HA trkA S9	XL10Gold	kan	CJK
1257	pGEMT PP6	XL10Gold	amp	JM
1258	pGEMT trkA CAV(-) Neo/Kpn frag	XL10Gold	amp	JM
1259	pBKS PP6	XL10Gold	amp	JM
1260	pGEX4T2 GRAP (nesca 15)	BL21 RP	amp	JM
1261	pGEX4T2 NPIP (nesca 46)	BL21 RP	amp	JM
1262	pEGFP SH3 (nesca)	XL10Gold	kan	JM
1263	pCMX HA trkA CAV(-)	XL10 Gold	amp	JM
1264	pcDNA3.1-HA-TrkC-m138 (Br2 cDNA Human EST)	DH5α	amp/neo	HYL
1265	pEYFP-C1	DH5α	amp/neo	Clontech
1266				
1267				
1268	pRK5-myc-ShcB[SH2(-)]	DH5α	amp	HY Liu
1269	pGEX4T2 nesca 15 (GRAP)	XL10Gold	amp	JM
1270	pGEX 4T2 nesca 46 (NPIP)	XL10Gold	amp	JM

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1271	pBKS M171 HA	XL10Gold	amp	JM
1272	pBKS HA M171 EE	XL10Gold	amp	JM
1273				
1274	pEGFP N1 nesca DEL1	XL10Gold	kan	JM
1275	pEGFP N1 nesca DEL2	XL10 Gold	kan	JM
1276	pAS2.1 trkA T1	XL10Gold	amp	JM
1277	pACTII nesca screen 50 (ART-4)	XL10Gold	amp	JM
1278	pcDNA HA nesca screen 50 (ART-4)	XL10Gold	amp	JM
1279	pcDNA HA nesca screen 26 (STAT3)	XL10Gold	amp	JM
1280	pAD Track-human FRS3-$Y^{417}A$ (no tags)	XL10 Gold	kan	SJD
1281	pAD Track-human FRS3-$Y^{485}A$ (no tags)	XL10 Gold	kan	SJD
1282	PAdTrack FRS3-1A mutant	DH5α	amp	KV
1283				
1284				
1285	pGEX4T2 trkB-m38 (Tid1 part)	DH5α	amp	HYL
1286	pFLAG-CMV2-NPIP	XL10Gold	amp	Graham Goodwin
1287	pcDNA mycHIS A nesca 50 (ART-4)	XL10Gold	amp	JM
1288	pCMX trkA CAV(-) $W^{714}A$ $F^{716}A$	XL10Gold	amp	JM
1289	pRK5 myc SH2-B	XL10 Gold	amp	Ginty
1290	pMT 35 CMV-cjun-HIS_6	?	amp	D. Bowman
1291	pMT 107 CMV-ubiquitin-HIS_6	?	amp	D. Bowman
1292	pMT 123 CMV-ubiquitin-HA	?	amp	D. Bowman
1293	pGEX4T2-Sck (ShcB)	DH5α	amp	Hui-Yu Liu
1294	pCMX trkA $W^{721}A$ $F^{724}A$	XL10Gold	amp	JM
1295	pACT II Nesca 40	XL10Gold	amp	JM
1296	pAd Track Trk A-1	XL10 Gold	kan	EG
1297	pAd Track Trk A-3	XL10 Gold	kan	EG
1298	pAd Track Trk A-6	XL10 Gold	kan	EG
1299	pAd Track Trk A-8	XL10 Gold	kan	EG
1300	pAd Track Trk A-11	XL10 Gold	kan	EG
1301	pGEX 4T2 SH2B-1	BL21 RIL	amp	EG
1302	pGEX4T2 SH2B-7	BL21 PR	amp	EG
1303	pGEX4T2 SH2B-7	BL21 RIL	amp	EG
1304	BJ5183 (cells for AV work)		strp	Dr. Dagnino
1305	pEGFP HA nesca	XL10 gold	kan	JM
1306	pcDNA cdc42 T17N **(DN)**	DH5α	amp	R. Cerione
1307	pcDNA cdc42 Q61L **(CA)**	DH5α	amp	R. Cerione
1308	pcDNA cdc42	DH5α	amp	R. Cerione
1309	pcDNA HA-ACK2	JM109	amp	R. Cevione
1310				
1311	pGEX4T2-hTid-1	BL21 RIL	amp	Hui-Yu Liu
1312	pGBKT7	XL10 gold	kan	Clontech
1313	pLNCX2-**FRS2**-EGFP (DEL kozak)	XL10 gold	amp	SJD sequenced –missing last 5 aa
1314	pLNCX2-**FRS3**-EGFP (DEL kozak)	XL10 gold	amp	SJD
1315	pEGFP nesca DELNLS	XL10 gold	kan	JM

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1316				
1317				
1318	pAS2.1 nesca DEL1	XL10 gold	amp	JM
1319	pAS2.1 Nesca DEL2	XL10 gold	amp	JM
1320	pGADT7 trkA T1	XL10 gold	amp	SJD
1321	pXJ4-HA- ACK1	XL10 Gold	amp	Ed Manser
1322	pGEXIN SH3 (N)	BL21	amp	JM
1323	pGEX FRS3-PTB	BL21RIL	amp	JM
1324	pGEX FRS3-PTB	BL21RP	amp	JM
1325	pRK5 EGFR	HB101		Mike Moran
1326	pECL-v-src	XL10Gold		Mike Moran
1327	pLNCX2-EGFP	XL10gold	amp	SJD
1328	pMT3-Cat (**RasGRF**)	XL10gold	amp	colin (L.Feig)
1329	pMT3-PH1-Cat (**RasGRF**)	XL10gold	amp	colin (L.Feig)
1330	pMT3-PH1-CC-Cat (**RasGRF**)	XL10gold	amp	colin (L.Feig)
1331	pMT3-PH1-CC-IQ-Cat (**RasGRF**)	XL10gold	amp	colin (L.Feig)
1332	pGEX4T1 Filamin	BL21 RP	amp	JM
1333	pGEX4T1 Filamin	HB101	amp	JM
1334	pGEX4T3 NPIP	BL21 RP	amp	JM
1335	pGEX4T3 NPIP	HB101	amp	JM
1336	pLNSX-EGFP	XL10gold	amp	SJD
1337	pSV42	XL10gold	amp	SJD
1338	pHM840	HB101	amp	T. Stamminger
1339	pHM829	HB101	amp	Jane Rylett
1340	pAdTrack TrkA-1	Hb101	kan	EG
1341	pAdTrack TrkA-3	Hb101	kan	EG
1342	pAdTrack TrkA-5	Hb101	kan	EG
1343	pAdTrack TrkA-7	Hb101	kan	EG
1344	pAdTrack TrkA-11	Hb101	kan	EG
1345	Ap2 Retrovector	XL10 gold	amp	Jacques Galipeau
1346	pcDNA FGFR1(Xho frag)	Hb101	amp	JM
1347	pcDNA myc FGFR	HB101	amp	JM
1348	pAdTrack trkC kinase dead	HB101	kan	CR
1349	pAdTrack trkC-3	HB101	kan	CR
1350	pAdTrack trkC-4	HB101	kan	CR
1351	pAdEasy Trk A5-4	BJ5183	kan	EG
1352	pAdEasy Trk A5-5	BJ5183	kan	EG
1353	pAdEasy Trk A5-6	BJ5183	kan	EG
1354	pAdEasy Trk A7-3	BJ5183	kan	EG
1355	pAdEasy Trk 7-4	BJ5183	kan	EG
1356	pAdEasy Trk A-18	BJ5183	kan	EG
1357	pcDNA3.1-mycHIS-'A'-human FRS3 $Y^{192}A/Y^{322}A$ Grb2 sites mutant	HB101	amp	SJD
1358	pEBG R Ras GRF2	HB101	amp	CJR (P.Anborg)
1359	pEFP R RasGRF2	HB101	kan	CJR (P.Anborg)
1360	pMT3 RasGRF-GAP-PH	HB101	amp	CJR (L.Feig)
1361	pGAD424-human FRS3	HB101	amp	SJD
1362	pAdEasy TrkC 20	HB101	kan	CR

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1363	pAdEasy TrkB (kinase dead) clone 11	HB101	kan	CR
1364	pAdEasy TrkB (kinase dead) clone 18	HB101	kan	CR
1365	pAdEasy TrkB clone 20	HB101	kan	CR
1366	pAdEasy TrkB (kinase dead) clone 12	HB101	kan	CR
1367	pAdEasy TrkB clone 17	HB101	kan	CR
1368	pHM829 nesca NLS short	HB101	amp	JM
1369				
1370				
1371	pcDNA3.1-mycHIS-human **FRS3** -$Y^{322}A$ (Grb2'C')	HB101	amp	SJD
1372	pcDNA3.1-mycHIS-human **FRS3** - $Y^{192}A/Y^{287}A/Y^{322}A$ "3A"	HB101	amp	SJD
1373	pHM829 nesca NLS long	HB101	amp	JM
1374	Ngn1 (neurogenin 1) new plasmid	HB101	amp	D. Anderson
1376	Ngn2 (neurogenin 2)	HB101	amp	D. Anderson
1377	pGEMT Easy myc-FGFR 5'frag PCR	HB101	amp	JM
1378	pGEMT Easy HA-EGFR 5'frag PCR	HB101	amp	JM
1379	pGEMT Easy **hFRS3**-$Y^{417}A/Y^{455}A$ "2A"	HB101	amp	SJD
1380	pcDNA3.1 mycHISA-**hFRS3**-$Y^{417}A/Y^{455}A$ "2A"	HB101	amp	SJD
1381	pGAD424-human **FRS3**-PTB	HB101	amp	SJD
1382	pGEX4T2-Sck-CH1	BL21 RIL	amp	Hui-Yu Liu
1383	pGAD424-human **FRS2**-PTB	HB101	amp	SJD
1384	pEGFP N1 nesca DEL A	HB101	kan	JM
1385	pEGFP N1 nesca DEL B	HB101	kan	JM
1386	pEGFP N1 nesca DEL C	HB101	kan	JM
1387	pEGFP N1 nesca DEL D	HB101	kan	JM
1388	Mo/FGFR 3-1 cQ	HB101	amp	D. Ornitz *-need his*
1389	Mo/FGFR 3 iii c myc	HB101	amp	D. Ornitz *permission*
1390	pCS FGFR 3 iii c myc	HB101	amp	D. Ornitz *to use*
1391	pCS FGFR 2 iii b myc	HB101	amp	D. Ornitz *these*
1392	pcDNA mychisC-human **FRS3**-PTB	HB101	amp	SJD
1393				
1394	pcDNA 3.1 mychis FGFR1	HB101	amp	JM
1395	LTR2HX FGFR4*contains a 3kb Bgal	HB101	amp	Alitalo*recloned pcDNA glyc 1457
1396				
1397	pGEMT-EZ-human **FRS3**- $Y^{192}A/Y^{287}A/Y^{322}A/Y^{455}A$ "4A"	HB101	amp	SJD
1398	pcDNA3.1-FGFR4 *not in frame*	HB101	amp	subcloned from Dr. Alitalo's FGFR4 *new gyc 1457
1399	pcDNA3.1-myc HISA- human **FRS3** $Y^{192}A/Y^{287}A/Y^{322}A/Y^{455}A$ ('4A')		amp	SJD
1400	pcDNA3.1 FGFR 2 * fusion to FRS3*	HB101	amp	subcloned from Ornitz 1391 - need permission
1401	pGBKT7-p53	?	kan	Clontech
1402	pGADT7-SV40 large T antigen	?	amp	Clontech
1403	pGEMT-FRS3 mouse	?	amp	JV
1404				

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1405	pGEX-Crk SH2	BL21	amp	L.Z.
1406	pGEX-Crk full length	BL21	amp	LZ
1407	pEGFP N1 nesca DEL 3-4	DH5a	kan	JM
1408	Ap2-h**FRS3**-myc	HB101	amp	SJD
1409				
1410	pRK5-myc-**Tid1** DNA J Domain	XL10 Gold	amp	Hui-Yu Liu
1411	pcDNA3.1-myc-HIS-B_**p66ShcA** (human)	XL10 Gold	amp	HYL
1412	Ap2-h**FRS3**-PTB (myc?)	HB101	amp	SJD
1413	Mo/FR1/IRES	HB101	amp	D. Ornitz
1414	pEGFPN1 Nesca Del 1-2	HB101	kan	JM
1415	pEGFPN3 Nesca NES1	HB101	kan	JM
1416	pEGFPN3 Nesca NES2	HB101	kan	JM
1418	pEGFPN3 Nesca NES3	HB101	kan	JM
1419	pGEX2T-C-**Raf RBD**	HB101	amp	Hermann
1420	pGEX2T-**RalGEF RBD**	HB101	amp	"
1421	pRK5-myc-mShcC p55 (Sal-Not)	DH5a	amp	Hui-Yu Liu
1422	pRK5-myc-mShcC p55 (Sal-Bam)	DH5a	amp	HYL
1423	pGEX4T2-Sck full	BL21 RP	amp	HYL
1424	pGEX4T2-Sck full	BL21 RIL	amp	HYL
1425	pGEX4T2-Sck PTB	BL21 RP	amp	HYL
1426	pGEX4T2-Sck PTB	BL21 RIL	amp	HYL
1427	pGEX4T1-Sck SH2	BL21 RP	amp	Hui-Yu Liu
1428	pGEX4T1-Sck SH2	BL21 RIL	amp	HYL
1429	pGEX4T2-Sck CH1	BL21 RP	amp	HYL
1430	pGEMTeasy hSNT2 '5A' Y192A, Y287A, Y322A, Y417A, Y455A ('5A' mutant)	HB101	amp	SJD
1431	pEGFP N1del hTid1L (new 4/23/03)	XL10 gold	kan	Hui-Yu Liu
1432	pEGFP N1 Nesca A118	HB101	kan	JM
1433	pEGFP N3 Nesca NES 205	HB101	kan	JM
1434	pGEMT-EZ FRS2-2MG hSNT1 transgene	XL10 gold	amp	KMcD
1435	pGEMT-EZ FRS2-1X1 hSNT1 transgene	XL10 gold	amp	KMcD
1436	pGEMT-EZ FRS2-21Y1 hSNT1 transgene	XL10 gold	amp	KMcD
1437	pGEMT murine Nesca Carb. term.	XL10 gold	amp	JM
1438	pGEMT murine Nesca NH4 term.	XL10 gold	amp	JM
1439	pcDNAmychis hSNT1 transgene FRS2-21Y1	XL10 gold	amp	KMcD
1440	pcDNAmychis hSNT1 transgene FRS2-1X1	XL10 gold	amp	KMcD
1441	pAS2.1 p13 HA	HB101	amp	SJD
1442	pGEX PAK CRIB	DH5?	amp	Bosco
1443	pGEX PBD	DH5?	amp	Bosco
1445	pcDNAmychis hSNT1 transgene FRS2-2MG	XL10 gold	amp	KMcD
1446	pGEMT murine Nesca full length	HB101	amp	JM
1447	pEGFP N3 KSRR	HB101	amp	JM
1448	pET-3d	HB101	amp	JM
1449	pGEMT easy RasGRF1	XL10 gold	amp	K Manto
1450	pDs-RED N1 NPIP	HB101	kan	JM
1451	p5X-NF κB-Luc	DH5α	amp	Dr. Greene, W.C., UCSF

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1452	pGAD T7 P75 ICD	XL10 gold	amp	CJK
1453	pET-3d Nesca	BL21 De3 RP	amp	JM
1454	pET-3d-FRS2-PTB	BL21 De3 RP	amp	SJD
1455	pET-3d-FRS3-PTB	BL21 De3 RP	amp	SJD
1456	pLXSH c-Cbl	XL10 gold	amp/hygro	Dr. Bisson, U. Calgary
1457	pcDNA3.1(c) - FGFR4 (no myc)	XL10gold	amp	KMcD
1458	pEGFP-calmodulin	XL10gold	kan	(Andy) S. Ferguson
1459	pMT-HA-ubiquitin	XL10 gold	amp	J. Wrana (S. Bonni)
1460	pCMV5-BIF1	XL10 gold	amp	J. Wrana
1461	pSUPER	DH5α	amp	Dr. R. Agami (see note)
1462	pVgRXR	DH5α	Zeo	Invitrogen
1463	pGEMT mouse NESCA 2	XL10 gold	amp	JM
1464	pGEMT mouse NESCA 3	XL10 gold	amp	JM
1465	pGEMT mouse NESCA 4	XL10 gold	amp	JM
1466	~~pcDNA myc his B Rasgrf1~~	~~XL10 gold~~	~~amp~~	~~K Manto~~ *No Myc KR*
1467	pIND-HA-trkA WT (Not1 deleted)	DH5α	amp	Hui-Yu Liu
1468	pSuper-anti-Tid1 control	XL10 gold	amp	Hui-Yu Liu
1469	pY16	DH5 α	amp	C. Kappen
1470	pY16	XL10 gold	amp	C. Kappen
1471				
1472	pcDNA- Gab-2 (HA tag)x1 fused directly to the start codon	XL10-gold	amp	GenFeng MTA signed do not distribute
1473	pcDNA-HA-Gab-1 (3x HA tag)	XL10-gold	amp	GenFeng MTA signed-do not distribute
1474	PGEMTEZ-Rasgrf2 3' end BstX1-Xhol PCR fragment	XL10-gold	amp	K. Manto
1475	PLHCX	DH5 α	amp/Hygro	Hui-Yu Liu
1476	pDS-Red ERK2	HB101	Kan	Ferguson
1477	pEGFP-Erk2	HB101	Amp	Ferguson
1478	p20 – Nestin (human) intronic region	XL10 Gold	Amp	C. Kappen (do not distribute)
1479	p20 – Nestin (human) intronic region (back-up)	XL10 Gold	Amp	C. Kappen (do not distribute)
1480	pCMV-Tag4A (FLAG cloning vector)	XL10 Gold	Kan	Stratagene
1481	pCMV-Tag4A (back-up)	XL10 Gold	Kan	Stratagene
1482	pCMV-Tag4B (FLAG cloning vector)	XL10 Gold	Kan	Stratagene
1483	pCMV-Tag4B (back-up)	XL10 Gold	Kan	Stratagene
1484	pCMV-Tag4C (FLAG cloning vector)	XL10 Gold	Kan	Stratagene
1485	pCMV-Tag4C (back-up)	XL10 Gold	Kan	Stratagene
1486	pCMV5L-His6-HA-Erk1	DH5-alpha	Amp	Dr. M. Cobb (do not distribute)
1487	pMCL-MKK1 (R4F) Ha-tagged	DH5-alpha	Amp	Dr. N. Ahn (do not distribute)
1488	pGADT7-trk ICD	XL10 Gold	Amp	A. Vilos
1489	pET28a	HB101	Kan	Novagen

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1490	pCAGGS	DH5-α	Amp	Jun-Ichi Miyayaki (do not distribute)
1491	phrGFP	HB101	Amp	Stratagene
1492	AP2-hTid1s-myc	DH5-alpha	Amp	Hui-Yu Liu
1493	pGemT-Run I (Nesca)	XL10 Gold	Amp	James
1494	pGemT-Run II (Nesca)	XL10 Gold	Amp	James
1495	pET28a-Run I (Nesca)	BL21 DE3 RIL	Kan	James
1496	pET28a-Run II (Nesca)	BL21 DE3 RIL	Kan	James
1497	pcDNA-MycHis-FGFR4 (full)	XL10 Gold	Amp	Kathy McD.
1498	pGex4T2-ShcC-PTB (mouse)	BL21 DE3 RIL	Amp	Hui-Yu Liu
1499	pGemT-mouse Nesca- 3' UTR	XL10 Gold	Amp	Fahreen/James
1500	pZeo-myc-Tid1S	XL10 Gold	Zeo	Chunhui Li/HYL
1501	pGex4T2-Mek	BL21 DE3 RIL	Amp	James
1502	pGex4T2-Erk2	BL21 DE3 RIL	Amp	James
1503	pMT-HA-ubiquitin	XL10 Gold	Amp	A. Vilos (back-up)
1504	pcDNA-hrGFP (ATG Deleted)	HB101	Amp	James
1505	pcDNA-HA-EGFR	XL10 Gold	XL10 Gold	James
1506	BL21 DE3 RIL Codon Plus bacteria	BL21 DE3 RIL	Chloramph.	Stratagene
1507	pCEP4L Control vector for MKK1 R4F	DH5-α	Amp	Dr. N. Ahn (do not distribute)
1508	pEGFP-C2-Rab5	DH5-α	Kan	Steve Fergusson
1509	pProExHTa	DH5-α	Amp	Invitrogen
1510	pCMX-TrkA-S11b (No tag)	XL10 Gold	Amp	L. Zhou
1511	pCMV5L-His6-HA-Erk2 ($L^{73}P,S^{151}D$)	XL10 Gold	Amp	Dr. N. Ahn (do not distribute)
1512	pEYFP-Golgi	XL10 Gold	Kan	Clontech
1513	pEYFP-Endoplasmic reticulum	XL10 Gold	Kan	Clontech
1514	pEYFP-mitochondria	XL10 Gold	Kan	Clontech
1515	pGex-Pak		Amp	N. Lamarche-Vane
1516	pGex-WASP		Amp	N. Lamarche-Vane
1517	pZeo-myc-Tid1L	XL10 Gold	Zeo	Hui-Yu Liu
1518	pZeo-anti-Tid1 (control)	XL10 Gold	Zeo	Hui-Yu Liu
1519	pEGFP-Golgi	XL10 Gold	Kan	Hui-Yu Liu
1520	pGex4T2-N part of Tid1L	BL21 DE3 RIL	Amp	Hui-Yu Liu
1521	pGex4T2-C part of Tid1L	BL21 DE3 RIL	Amp	Hui-Yu Liu
1522	pGex4T2-5Tyrs of C part of Tid1L	BL21 DE3 RIL	Amp	Hui-Yu Liu
1523	pGex4T2-DNA J Domain of Tid1L	BL21 DE3 RIL	Amp	Hui-Yu Liu
1524	pCMV5-His6-Erk2 (L73P/S151D, Constitutively Active)	XL10 Gold	Amp	Natalie Ahn (do not distribute without permission)

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1525	pcDNAhrGFPΔATG	XL10 Gold	Amp	J. MacDonald
1526	pGemT-Easy-Rat Nesca-PC12	XL10 Gold	Amp	J. MacDonald
1527	pGemT-Easy- BMP2-2 (mouse) 200bp	DH5-α	Amp	
1528	pGemT-Easy- TrkC (200bp ECD fragment)	DH5-α	Amp	K. Volkening
1529	pGemT-Easy- FGFR1 (200bp ECD fragment)	DH5-α	Amp	K. Volkening
1530	pGemT-Easy TGFB1 (200bp fragment)	XL10 Gold	Amp	K. Volkening
1531	pGemT-Easy Snail (200bp fragment)	XL10 Gold	Amp	K. Volkening
1532	pGemT-Easy Pax3 (200bp fragment)	XL10 Gold	Amp	K. Volkening
1533	pGemT-Easy BMP4 (200bp fragment)	XL10 Gold	Amp	K. Volkening
1534	pAS2.1-TrkAS13 ($YY^{683/684}EE$)	XL10 Gold	Amp	Hui-Yu Liu
1535	pAS2.1-TrkAS13e ($Y^{684}E$)	XL10 Gold	Amp	Hui-Yu Liu
1536	pAS2.1-TrkAS13g ($Y^{683}E$)	XL10 Gold	Amp	Hui-Yu Liu
1537	pSilencer RNESCA 112	XL10 Gold	Amp	J. M.
1538	pSilencer RNESCA 412	XL10 Gold	Amp	J. M.
1539	pSilencer RNESCA 1027	XL10 Gold	Amp	J. M.
1540	β1- Arrestin	XL10 Gold	Amp	S. Ferguson
1541	β2- Arrestin	XL10 Gold	Amp	S. Ferguson
1542	pRcCMV-nSrc	DH5α	Amp	L. Kalia
1543	pc- SRC-iGFP	DH5α	Kan	L. Kalia
1544				
1545	pCS-CDF-CG-PRE (GFP only), Lentivirus vector	XL10 Gold	Amp/Zeo	Hui-Yu Liu
1546	pMDLg/p.RRE, lentivirus helper 1	XL10 Gold	Amp	Hui-Yu Liu
1547	pRSV-Rev, lentivirus helper 2	XL10 Gold	Amp	Hui-Yu Liu
1548	pMD.G, lentivirus helper 3	XL10 Gold	Amp	Hui-Yu Liu
1549	pGemT-Easy-βgal for riboprobes	XL10 Gold	Amp	K. Volkening
1550	pGemT-Easy TrkA 200bp fragment	XL10 Gold	Amp	K. Volkening
1551	pGemT-Easy TrkB 200bp fragment	XL10 Gold	Amp	K. Volkening
1552	pGemT-Easy FRS3 int frag	XL10 Gold	Amp	K. Volkening
1553	pGemT-Easy-MASH1 for riboprobes	XL10 Gold	Amp	K. Volkening
1554	pCMV-HA-hFRS2-flag	XL10 Gold	Neo/Kan	K. Manto –sequenced – 7th last aa has a silent mutation – otherwise, full length (except stop codon, obviously)
1555	pXJ40-HA-ACK1-K158R (Kinase Dead)	XL10 Gold	Amp	Dr. Ed Manser
1556	pIRES2-EGFP	XL10 Gold	Kan	Invitrogen
1557	pSilencer3-1-H1-hygro	XL10 Gold	Amp	Ambion
1558	pSilencer3-1-H1-hygro-αTid1 new	XL10 Gold	Amp	Hui-Yu Liu
1559	pLentiLox 3.7 (Lenti-SiRNA-EGFP)	XL10 Gold	Amp	Luk Van Parijs (MIT) *MTA signed*
1560	pcDNA 3.1A FRS2 [cc-term) / (a.a.410->)	XL10 Gold	Amp	Angelo
1561	pcDNA3.1A FRS2M123 [T452,455,458-->A]	XL10 Gold	Amp	Angelo *Not sure if correct*
1562	pGemT-Easy FRS2M123 [T452,455,458-->A]	XL10 Gold	Amp	Angelo *Not sure if correct*

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1563	pLenti-hTid1L (no tag)	XL10 Gold	Amp/Zeo	Hui-Yu Liu
1564	pLenti-anti-Tid1-EGFP	XL10 Gold	Amp/Zeo	Hui-Yu Liu
1565	Ap2 FRS2-myc	XL10 Gold	Amp	Kara Manto—sequenced – missing last 5 aa
1566				
1567	pLenti-Tid1S (no tag)	XL10 Gold	Amp/Zeo	Hui-Yu Liu
1568	pcDNA3-HA-RasGrf1-DN (W1056E) for Ras	XL10 Gold	Amp	L. Alberghina JBC 274: 36656 (1999)
1569	pcDNA3-HA-RasGrf1	XL10 Gold	Amp	L. Alberghine
1570	pEGFP-Erk2	XL10 Gold	Kan	P. Stork
1571	pCDNA3-CBR (C3G)	DH5α	Amp	P. Stork
1572	pGEMT-Easy-RasGrf1-PH1	DH5α	Amp	K. Robinson
1573	pGEMT-Easy-RasGrf1-PH1-1Q	DH5α	Amp	K. Robinson
1574	pGST-Ran (G19V); Mimics GTP-bound form	XL10 Gold	Amp	B. Paschal
1575	pFLAG-CRT (Calreticulin)	XL10 Gold	Amp	B. Paschal JCB 152: 127-149 (2001)
1576	pcDNA-CRM1 (WT) Myc-His	XL10 Gold	Amp	C. Dargemont Exp. Cell Res. 252: 236-241 (1999)
1577	pGEMT-Easy-Shh (200bp)	DH5α	Amp	K. V.
1578	pGEMT-Easy-NheI-RasGrf1	DH5α	Amp	K. R.
1579	pRC-TAP	DH5α	Amp	D. Litchfield
1580	pRC-cKIP TAP	DH5α	Amp	D. Litchfield
1581	pRC- TAP cKIP	DH5α	Amp	D. Litchfield
1582	pcDNA-mychisB-RasGrf1-PH1	DH5α	Amp	K. R.
1583	pcDNA-mychisB-RasGrf1-PH1, CC, 1Q	DH5α	Amp	K. R.
1584	pADEasy cells (DH10B)	DH10B	Amp	
1585	pGEM-T EasySNT2Exon2,3 (Clone 3)	XL10 Gold	Amp	Li Zhou
1586	pGEM-T EasySNT2Exon2,3 (Clone 9)	XL10 Gold	Amp	Li Zhou
1587	pGEM-T EasySNT2 5'UTR (Clone 1)	XL10 Gold	Amp	Li Zhou
1588	pGEM-T EasySNT2 5'UTR (Clone 5)	XL10 Gold	Amp	Li Zhou
1589	pGEM-T EasySNT2Exon2,4 (Clone 2)	XL10 Gold	Amp	Li Zhou
1590	pGEM-T EasySNT2Exon2,4 (Clone 3)	XL10 Gold	Amp	Li Zhou
1591	pGEM-T EasySNT2Exon4,5-1	XL10 Gold	Amp	Li Zhou
1592	pGEM-T EasySNT2Exon4,5-2	XL10 Gold	Amp	Li Zhou
1593	pGEM-T EasySNT2Exon5	XL10 Gold	Amp	Li Zhou
1594	pAdEasySNT1 (Clone 6)	BJ5183	Amp	Li Zhou missing last 5 aa
1595	pAdEasySNT1 (Clone 9)	BJ5183	Amp	Li Zhou missing last 5 aa
1596	pAdEasySNT1 (Clone 1)	XL10 Gold	Amp	Li Zhou missing last 5 aa
1597	pAdEasySNT1 (Clone 2)	XL10 Gold	Amp	Li Zhou missing last 5 aa

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1598	pAdEasySNT2	BJ5183	Amp	Li Zhou
1599	pAdEasySNT2	XL10 Gold	Amp	Li Zhou
1600	pcDNA3.1MycHisBSNT1Y436A (Clone 2)	XL10 Gold	Amp	Li Zhou—sequenced—missing last 5 aa
1601	pcDNA3.1MycHisBSNT1Y436A (Clone 3)	XL10 Gold	Amp	Li Zhou
1602	pcDNA3.1MycHisASNT1 4A (Clone 2)	XL10 Gold	Amp	Li Zhou
1603	pcDNA3.1MycHisASNT1 4A (Clone 6)	XL10 Gold	Amp	Li Zhou
1604	pcDNA3.1MycHisBSNT1Y471A	XL10 Gold	Amp	Li Zhou
1606	pcDNA3.1MycHisBSNT1Y436, 471A (Clone 2)	XL10 Gold	Amp	Li Zhou
1607	pcDNA3.1MycHisBSNT1 6A	XL10 Gold	Amp	Li Zhou
1608	pAdTrack-CMV SNT1Y436A	XL10 Gold	Kan	Li Zhou
1609	pAdTrack-CMV SNT1Y471A	XL10 Gold	Kan	Li Zhou
1610	pAdTrack-CMV SNT1Y436, 471A	XL10 Gold	Kan	Li Zhou
1611	pAdTrack-CMV SNT1 4A	XL10 Gold	Kan	Li Zhou
1612	pAdTrack-CMV SNT1 6A	XL10 Gold	Kan	Li Zhou
1613	pAdEasySNT1Y436A	BJ5183	Amp	Li Zhou
1614	pAdEasySNT1Y471A	BJ5183	Amp	Li Zhou
1615	pAdEasySNT1Y436, 472A (Clone 6)	BJ5183	Amp	Li Zhou
1616	pAdEasySNT1Y436, 472A (Clone 7)	BJ5183	Amp	Li Zhou
1617				
1618	pAdEasySNT1 4A (Clone 3)	BJ5183	Amp	Li Zhou
1619	pAdEasySNT1 4A (Clone 4)	BJ5183	Amp	Li Zhou
1620	pAdEasySNT1 6A	BJ5183	Amp	Li Zhou
1621	pAdEasySNT1Y436A	XL10 Gold	Amp	Li Zhou
1622	pAdEasySNT1Y471A	XL10 Gold	Amp	Li Zhou
1623	pAdEasySNT1Y436, 471A	XL10 Gold	Amp	Li Zhou
1624	pAdEasySNT1 4A	XL10 Gold	Amp	Li Zhou
1625	pAdEasySNT1 6A	XL10 Gold	Amp	Li Zhou
1626	pCMXTrkA S11b (no HA tag)	XL10 Gold	Amp	Li Zhou
1627	pcDNA3.1mychisA SNT1T5A (Clone 1) (T376A)	XL10 Gold	Amp	Li Zhou
1628	pcDNA3.1mychisA SNT1T5A (Clone 3)	XL10 Gold	Amp	Li Zhou
1629	pcDNA3.1mychisA SNT1T1,2,3A (Clone 1)	XL10 Gold	Amp	Li Zhou
1630	pcDNA3.1mychisA SNT1T1,2,3A (Clone 2) ($T^{452,455,458}A$)	XL10 Gold	Amp	Li Zhou
1631	pGEM-Teasy-RasGRF1-DH/PH2	DH5a	Amp	K. Robinson
1632	pLenti-HA-TrkA	DH5a	Amp	Hui-Yu Liu
1633	pSCA1, Semliki Forest virus vector	DH5a	Amp	Rod Bremner, (Toronto) *MTA signed*
1634	pSCAhelper, for SFV producing	DH5a	Amp	Rod Bremner, (Toronto) *MTA signed*

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1635	pSHAME2a, SFV vector	DH5a	Amp	Rod Bremner, (Toronto) *MTA signed*
1636	pSCA1-EGFP	DH5a	Amp	Hui-Yu Liu
1637	pSHAME2a-myc-Tid1$_L$	DH5a	Amp	Hui-Yu Liu
1638	pSHAME2a-myc-Tid1$_S$	DH5a	Amp	Hui-Yu Liu
1639	pSHAME2a-HA-TrkA	DH5a	Amp	Hui-Yu Liu
1640	pSHAME2a-HA-TrkAS89	DH5a	Amp	Hui-Yu Liu
1641	pSHAME2a-HA-TrkA13a	DH5a	Amp	Hui-Yu Liu
1642	pRSETB-mRFP1 (good)	DH5a	Amp	Roger Y. Tsien (UCSD)\ *(MTA signed)* PNAS 2002 99:7877-7882
1643	pRK5-myc-Tid1S dam-; dcm- (don't use)	SCS101	Amp	Hui-Yu-Liu
1644	pMT2-SHP2 DM: D^{425}A, C^{459}S: substrate trapping dominant -ve	DH5α	Amp	M. Hayman JBC 278:13952-13958, 2003
1645	pMT2-SHP2 wt	DH5 α	Amp	M. Hayman, Stoney Brook University, NY
1646	pMT2-SHP2 R^{465}E: phosphate minus	DH5 α	Amp	M. Hayman Mol.Cell. Biol. 23: 7875-7886, 2003
1647	pSFVPD	DH5 α	Amp	Alaa El Din El-Husseini
1648	pEBG3-DNAJ (Y^{94}-S^{159})	DH5 α	Amp	Hui-Yu Liu
1649	pEBG3-Tid1N (A^{2}-E^{214})	DH5 α	Amp	Hui-Yu Liu
1650	pEBG3-TidC308 (V^{308}-S^{480})	DH5 α	Amp	Hui-Yu Liu
1651	pEBG3-Tid1L (full length)	DH5 α	Amp	Hui-Yu Liu
1652	pRK5-myc-TidN	DH5 α	Amp	Hui-Yu Liu
1653	pRK5-myc-Tid1L 3' (T215C)	DH5 α	Amp	Hui-Yu Liu
1654	pRK5-myc-TidL 5(Tyr)s (3'end) (R277C)	DH5 α	Amp	Hui-Yu Liu
1655	pRK5-myc-Tid DnaJ (see stock #1410)	DH5 α	Amp	Hui-Yu Liu
1656	pHelper 2 (for pSFV PD)	DH5 α	Amp	Hui-Yu Liu
1657	pRK5-myc-Tid1L 5'	DH5 α	Amp	Hui-Yu Liu
1658	pSFVpD-EGFP	DH5 α	Amp	Hui-Yu Liu
1659	pSFVpD-HA-TrkA	DH5 α	Amp	Hui-Yu Liu
1660	pSCAβ	DH5 α	Amp	Rod Bremner (Toronto)
1661	pSHAME-LacZ	DH5 α	Amp	Rod Bremner (Toronto)
1662	pRK5-myc-Tid J→ C region (Y^{94}~S^{480})	DH5 α	Amp	Hui-Yu Liu
1663	pEBG3-myc-Tid J→C region (Y^{94}~S^{480})	DH5 α	Amp	Hui-Yu Liu
1664	pEFP-RasGrf1-Y130A	XL1Blue	Kan	K.R.
1665	pEFP-RasGrf1-Y66G	XL1Blue	Kan	K.R.
1666	PEFP-RasGrf1-Y95A	XL1Blue	Kan	K.R.
1667	pEFP RasGrf1-Y66A	XL1Blue	Kan	K.R.
1668	pSHAME-EGFP	DH5 α	Amp	Hui-Yu Liu
1669	pRK5-myc-NJ (Tid1A^{2}~S^{169})	DH5 α	Amp	Hui-Yu Liu
1670	pRK5-myc-NV (Tid1A^{2}~V^{304})	DH5 α	Amp	Hui-Yu Liu
1671	pRK5-myc-NE (Tid1A^{2}~E^{429})	DH5 α	Amp	Hui-Yu Liu

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1672	pRK5-myc-NG^{223} (Tid)	DH5 α	Amp	Hui-Yu Liu
1673	pGAD-21Y1-PTB domain (FRS3 trans mice)	DH5 α	Amp	K.V.
1674	pGAD-1X1-PTB domain (FRS3 trans mice)	DH5 α	Amp	K.V.
1675	pCMV-Tid1S H121Q	XL10 Gold	amp	K. Munger (Harvard)
1676	pCMV-Tid1L (H121Q) (DNA J domain mutant)	XL10 Gold	amp	K. Munger (Harvard)
1677	pEFP-RasGrfl-Y95A, Y130A	DH5α	kan	K. Robinson
1678	pEFP-RasGrfl-W1056E	DH5α	kan	K. Robinson
1679	pcDNA3-ShcB-3F	DH5α	amp	Tony Pawson (Toronto)
1680	pCDNAmychisB-RasGrf1 PH-1Q Y130A	DH5α	amp	K. Robinson
1681	pEFP-RasGrf1 S916A	DH5α	kan	K. Robinson
1682	pBridge-v-src	DH5α	amp	T. Hryciw
1683	pSFVPD-Tid1 E GFP fusion	XL10 Gold	amp	Hui-Yu Liu
1684	pSFVPD-Golgi-EYFP	DH5α	amp	Hui-Yu Liu
1685	pSFVPD-mitochondrion-EYFP	DH5α	amp	Hui-Yu Liu
1686	pTag-FRS3-FLAG	DH5α	kan	KV
1687	pBridge-v-src-ShcBSH2	DH5α	amp	T. Hryciw
1688	pBridge-v-src-FRS3-nomyr	DH5α	amp	KV
1689	pBridge-v-src-FRS3-COOH	DH5α	amp	KV
1690	pAS2.1-FGFR1-myc-his	DH5α	amp	KV
1691	HA-H-Ras	?	amp	James Keller
1692	pGEX4T2-hTid1L (full length)	BL21 RIL	amp	Hui-Yu Liu
1693	pGEX4T2-hTid1L (full length)	BL21 RP	amp	Hui-Yu Liu
1694	pSuper-FRS3-siRNA-#1	DH5α	amp	Shaochon Yan
1695	pSuper-FRS3-siRNA-#2	DH5α	amp	Shaochon Yan
1696	pSuper-FRS3-siRNA-#3	DH5α	amp	Shaochon Yan
1697	pSuper-FRS3-siRNA-control	DH5α	amp	Shaochon Yan
1698	pRC656 Bc12	DH5α	amp	Sean Cregan
1699	pcDNA3.1mychis human FRS3 (5A)	DH5α	amp (stop codon prior to mychis)	Shaochon Yan
1700	pIRES	DH5α	amp	Clontech
1701	pBridge	DH5α	amp	Clontech
1702	pTag-FRS2-Flag (clone 2)	DH5α	amp	KV missing last 5 aa
1703	pcDNA3.1 mychis mouse FRS3 (with 3'UTR)	DH5α	amp	Shaochon Yan
1704	pcDNA3.1 mychisB FRS2 ^{Y436,471}A	DH5α	amp	RML (same as 1605, diff. cell line) sequenced—missing last 5 aa (SL)
1705	pGBKT7 Nesca SH3 only	DH5α	kan	RML
1706	pcDNA3.1 mychis FRS2T^{452,455,458,473}A	DH5α	amp	RML (PxTP mutant)
1707	pCDX HA-NuP214	DH5α	amp	RML
1708	pSuper-FRS3-SiRNA- #4	DH5α	amp	Shaochon Yan

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1709	pSuper-FRS3-SiRNA- #5	DH5α	amp	Shaochon Yan
1710	pEGFP-NS-Nesca-W261A	DH5α DH5α	kan	Matt C.
1711	pRK5-mycShc B (mouse, CH2-)	DH5α	amp	RML(same as 1268, diff. cell line)
1712	pcDNAmychisB-RasGrfPHIQ Y66A, Y130A	DH5α	amp	K. Robinson
1713	pGBKT7myc FRS2T1234A (^{452,455,458,473})	DH5α	kan	RML
1714	pEGFPN3 Nesca W284A	DH5α	kan	Matt
1715	pEGFPN3 Nesca LZ mutant	DH5α	kan	J.M.
1716	pcDNAmychisBRasGrf PHIQ Y66A, Y95A, Y130A	DH5α	amp	K. Robinson
1717	pcDNA3-ShcB-3F-Y316A	DH5α	amp	RKB
1718	pcDNAmychisB Y66,95,130,233A PHIQ	DH5α	Amp	K. Robinson
1719	pcDNAmychisB Y66,95,130,146,233A PH1IQ	DH5α	Amp	K. Robinson
1720	pcDNAmychisC-FRS3-5A no stop	DH5α	Amp	Kim Bertens
1721	pAS2.1FRS2T1234A($T^{452,455,458,473}A$)	DH5α	Amp	RML
1722	pSuper Ras Grf si909	DH5α	Amp	KR
1723	pSuper Ras Grf si2090	DH5α	Amp	KR
1724				
1725				
1726				
1727				
1728	pGAD424-Grb2SH2 domain	DH5α	Amp	KV
1729	pcDNA3.1mychis ShcBΔPTB-Flag	DH5α	Amp	Todd
1730	pcDNA3.1mychis FRS2 N-T12A ($T^{145,148}A$)	DH5α	Amp	RML
1731				
1732				
1733	pcDNA3.1mychis FRS2 N-T1234A ($T^{145,148,150,151}A$)	DH5α	Amp	RML
1734	pSCA-HA-TrkA wt	DH5α	Amp	Hui-Yu Lui
1735	pADTrack-si #4	DH5α	Kan	KV
1736	pAS2.1-FGFR2	DH5α	Amp	Kim Bertens
1737	pAS2.1-FGFR3	DH5α	Amp	Kim Bertens
1738	pcDNA3-ShcB-3A-3Flag ($Y^{316,317,395}A$)	DH5α	Amp	Kim Bertens
1739	pEBG CKS1	XL10	Amp	JM
1740	pEBG CKS2	XL10	Amp	JM
1741	pEBG $p13^{suc1}$	XL10	Amp	JM
1742	pBridge-Leu (replaced Trp→ Leu)	DH5α	Amp	KV
1743	pCMV-Tag4c-c-cbl	DH5α	Kan	RML

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1744	pAdEasy si hFRS3 #1-5	DH5α	Kan	KV
1745	pAdEasy si hFRS3 #2-1	DH5α	Kan	KV
1746	pAdEasy si hFRS3 #3-9	DH5α	Kan	KV
1747	p CW7 myc-ubiquitin	DH5α	Amp	RML
1748	pAd Track-CMV-hFRS3 $Y^{192}A$, $Y^{322}A$ (Grb 2)	DH5α	Kan	JG
1749	pAd Track-CMV-FRS3-5A	DH5α	Kan	JG
1750	pBridge(leucine)-FRS3-COOH-vsrc	DH5α	amp	KV
1751	pBridge(leucine)-FRS3-NM-vsrc	DH5α	amp	KV
1752	pEGFP N3 RasGrf1	DH5α	kan	JG
1753	pEGB ShcB CH1	XL10 gold	amp	J.M.
1754	pcDNAmychis-Grf2	DH5α	amp	JG
1755	pcDNA3.1 Nesca-ΔSH3	XL10 gold	amp	JM
1756	pRFPmut		kan	JM
1757	pShuttle	DH10B	kan	Bert Vogelstein
1758	pADTrack CMV-TrkA S8	DH5α	kan	Todd H.
1759	pShuttle CMV	DH5α	kan	KV
1760	GST-PBD (PAK binding domain)	DH5α	amp	David Scott/ Martin Schwartz
1761				
1762				
1763	pGEX4T3-hFynTSH2	DH5α	amp	Shawn Li
1764	pRc/CMV-FynTmyc	DH5α	amp	Shawn Li
1765	pGEM-FRS3-Flag (Mlu primer sites) clone 1	DH5α	amp	KV
1766	pGEM-FRS3-Flag (Mlu primer sites) clone 2	DH5α	amp	KV
1767	pAdTrack CMV-FRS3 1A mutant $Y^{322}A$	DH5α	kan	KV
1768	pcDNA3.1 PSD-95 myc	DH5α	amp	Kevin Holmes
1769	pcDNA3.1 STEP61wt	DH5α	amp	P.J. Lombroso
1770	pcDNA3.1 STEP61 C4725	DH5α	amp	P.J. Lombroso
1771	pcDNA3.1 STEP46 wt	DH5α	amp	P.J. Lombroso
1772	pcDNA3.1 STEP46 C300S	DH5α	amp	P.J. Lombroso
1773	GFP-NR1-1a	DH5α	amp	Stefano Vincni
1774	GFP-NR2A	XL10 gold	amp	Stefano Vincni
1775	GFP-NR2B	XL10 gold	amp	Stefano Vincni
1776	pBridge-ShcB SH2	DH5α	amp	Todd Hryciw
1777	pShuttle-CMV-Nesca-EGFP	DH5α	kan	JG
1778	pcDNAmychis Nesca L174A, L195A	XL10 gold	amp	JM
1779	pNTAPCmychis Nesca L174A, l195A	XL10 gold	kan	JM
~~1780~~	~~pSuperFRS2 si #2~~	~~DH5α~~	~~amp~~	~~KV—Do Not Use~~

	NAME	HOST Str	ANTIBIOTIC	SOURCE
~~1781~~	~~pSuperFRS2 si#1~~	~~DH5α~~	~~amp~~	~~KV~~ *Do Not Use*
~~1782~~	~~pSuper RasGrf 909siRNA~~	~~DH5α~~	~~amp~~	~~KV~~ *Do Not Use*
~~1783~~	~~pSuper RasGrf 2009siRNA~~	~~DH5α~~	~~amp~~	~~KV~~ *Do Not Use*
1784	pcDNA3.1ShcB-flag-myc-his	DH5α	amp	Todd Hryciw
1785	pIRES-EGFP-DBH-hFRS3	DH5α	amp	KV
1786	pcDNA-Flag-mGluR5	DH5α	amp	S Ferguson
1787	pAdTrack-CMV-FRS3-Y192A,Y287A,Y322A	DH5α	Kan	KV
1788	pAdTrack-CMV-FRS3-Y192A,Y287A, Y322A, Y455A	DH5α	Kan	KV
1789	pCMX-FRS3 (no tag)	DH5α	Amp	KV
1790	pAdTrack-FRS3 Y417A, Y455A	DH5α	Kan	KV
1791	pAdTrack-NESCA	DH5α	KAN	JG
~~1792~~	~~pSUPER-RasGRF1 shRNA311~~	~~DH5α~~	~~Amp~~	~~KV~~ *Do Not Use*
~~1793~~	~~pSUPER-RasGRF1 shRNA1082~~	~~DH5α~~	~~Amp~~	~~KV~~ *Do Not Use*
~~1794~~	~~RASGRF1-EGFP (clone 1)~~	~~DH5α~~	~~Kan~~	~~KV~~ *Do Not Use*
1795	RasGRF1-EGFP (clone 9) in pEFP	DH5α	Kan	KV
1796	pcDNA beta-catenin (Xenopus)	DH5α	Amp	T Drysdale
1797	pCS2-MT-beta-catenin (Xenopus)	DH5α	Amp	T Drysdale
1798	pCMX-FRS2 (no tag)	DH5α	Amp	KV missing last 5 aa
~~1799~~	~~pSUPER-RasGrf1/2 shRNA627~~	~~DH5α~~	~~Amp~~	~~KV~~ *Do Not Use*
1800	pcDNA-myc-hisB PH1-Y95A	DH5α	Amp	KR
1801	pGEMTEasy-EGFP-BamH1	DH5α	Amp	KR
1802	pGEMTEasy-EGFP-Xho1	DH5α	Amp	KR
1803	beta-arrestin1-GFP	DH5α	Kan	S. Ferguson
1804	beta-arrestin2-GFP	DH5α	Kan	S. Ferguson
1805	beta-arrestin1-Flag	DH5α	Amp	S. Ferguson
1806	beta-arrestin2-Flag	DH5α	Amp	S. Ferguson
1807	pcDNA-HA Rac V12 (CA)	DH5α	Amp	S. Ferguson
1808	pcDNA-HA Rac N17 (DN)	DH5α	Amp	S. Ferguson
1809	pcDNA-HA Rac WT	DH5α	Amp	S. Ferguson
1810	pcDNA-myc-hisB-PH1-Y95A,Y130A	DH5α	Amp	KR
1811	pCS2-mapk (xenopus)	DH5α	Amp	(KV) T Drysdale
1812	pCS2MT	DH5α	Amp	(KB) T Drysdale
1813	pcmx-TrkA K485A	DH5α	Amp	KV
1814	HA Ubiquitin	DH5α	Amp	KV Wooten lab? (ask Rosslynn for details & maps
1815	HA Ubiquitin K29R	DH5α	Amp	" " "
1816	HA Ubiquitin K48R	DH5α	Amp	" " "
1817	HA Ubiquitin K63R	DH5α	Amp	" " "
1818	HA Ubiquitin	DH5α	Amp	Geetha et al 2005
1819	HA Ubiquitin K29R	DH5α	Amp	Geetha et al 2005
1820	HA Ubiquitin K48R	DH5α	Amp	Geetha et al 2005
1821	HA Ubiquitin K63R	DH5α	Amp	Geetha et al 2005

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1822	pCMX-TrkB K464R a	DH5α	Amp	KV
1823	pCMX-TrkB K464R b (diff. clone)	DH5α	Amp	KV
1824	pCMX-TrkC K465R a	DH5α	Amp	KV
1825	pCMX-TrkC K465R b (diff. clone)	DH5α	Amp	KV
1826	pCMX-HA-TRKB-S10 (HIKE)	DH5α	Amp	KR
1827	pcDNA-myc-hisB-Ras Grf1	DH5α	Amp	KR
1828				
1829				
1830				
1831				
1832	pBABE mycSin	DH5α	Amp	Jan Sap
1833	pEX Lox Sin	DH5α	Amp	Jan Sap
1834	pBABE IEG SinSD	DH5α	Amp	Jan Sap
1835	pRK5 SinSD	DH5α	Amp	Jan Sap
1836	pBABE IEG	DH5α	Amp	Jan Sap
1837	pBABE IEG Sin	DH5α	Amp	Jan Sap
1838	pRK5 Sin	DH5α	Amp	Jan Sap
1839	Sin DSR	DH5α	Amp	Jan Sap
1840	pCMX-HA-TrkB S21	DH5α	amp	Andrew Lu
1841	pcDNA3 flag-axin	xl10gold	amp	F Costantini Columbia U. Do not distribute
1842	pcs2mt myc-axin	xl10gold	amp	F Costantini Columbia U. Do not distribute
1843	pEGFP(N1)ShcB	DH5α	Kan	Todd Hryciw
1844	pcdna-rasgrf1, y130a, y233a	DH5α	kan	kr
1845	pcdna-rasgrf1, y95a, y130a, y233a	DH5α	kan	kr
1846	pCALNL5	DH5α	amp	Riken BRC (Japan)
1847	pENTR2B-∃Catenin	transformation did not work yet - tba	amp	David Mulholland
1848	pDEST53-GFP	XL10gold	amp	David Mulholland
1849	pEGFP-∃Catenin wild type	DH5α	kan	Chin-Yin Tai, Caltech
1850	pEGFP-∃Catenin Y654F	DH5α	kan	Chin-Yin Tai, Caltech
1851	pEGFP-∃Catenin Y654E	DH5α	kan	Chin-Yin Tai, Caltech
1852	pcDNA3.1myc-HISc-p55ShcC	DH5α	amp	Todd Hryciw
1853	pcDNA3.1myc-HISc-p55ShcCΔSH2	DH5α	amp	Todd Hryciw
1854	pEGFP-N1-p55ShcC	DH5α	kan	Todd Hryciw
1855	mRFP-Rab5	DH5α	kan	Ferguson (Pieter)
1856	mRFP-Rab7	DH5α	kan	Ferguson (Pieter)
1857	pCALNL5-Frs2-EGFP	DH5α	Amp	S. LeMay missing last 5aa
1858	pCMX-hFrs3 myr(-)	DH5α	amp	Todd Hryciw
1859	pSuperRasGrf1-si909	DH5α	amp	KR
1860	pSuperRasGrf1-si2009	DH5α	amp	KR
1861	pEGFPN1-Frs2	DH5α	kan	Sara LeMay

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1863	pcDNA3.1mycHIS-ShcC CH1	DH5α	amp	Todd Hryciw
1864	pcDNA3.1mycHIS-Frs3(myr⁻)	DH5α	amp	Todd Hryciw
1865	pShuttle hrGFP-1	xl10gold	kan	stratagene
1866	pgex4t1 shcC-sh2	DH5α	amp	ian
1867	pcs2mt-frs2	xl10gold	amp	james
1868	pAd Track	dh10b	kan	Bert Vogelstein
1869	pAd Track-CMV	DH10B	kan	Bert Vogelstein
1870	pEGFP-LC-3	DH5α	kan	Yoshimori(NIPPON)
1871	pEGFP-dn-Rab5	DH5α	kan	Ferguson(pieter)
1872	pEGFP-dn-Rab7	DH5α	kan	Ferguson(pieter)
1873	pRS	DH5α	amp	OriGene
1874	pRS-shGFP(29)non-effective	DH5α	amp	OriGene
1875	pRS-sh Beclin1 -29	DH5α	amp	OriGene
1876	pRS-sh Beclin1 -30	DH5α	amp	OriGene
1877	pRS-sh Beclin1 -31	DH5α	amp	OriGene
1878	pRS-sh Beclin1 -32	DH5α	amp	OriGene
1879	pEGFP-N1-Frs3	DH5α	kan	sara lemay
1880	pCAL-Frs2-EGFP (full length Frs2)	DH5α	amp	sara lemay***needs to be re-cloned
1881	pRS-sh Frs2 -69	DH5α	amp	OriGene
1882	pRS-sh Frs2 –70	DH5α	amp	OriGene
1883	pRS-sh Frs2 –71	DH5α	amp	OriGene
1884	pRS-sh Frs2 -72	DH5α	amp	OriGene
1885	pCDNA-TrkC	DH5α	amp	Jen F
1886	pCAL-Frs3-EGFP	DH5α	amp	sara lemay
1887	pAD Cre	DH5α	Kan\	
1888	pBridge-v-src-shcC SH2	DH5α	amp	Ian G
1889	NR2B-CFP	DH5α	amp	
1890	PSD95-YFP	DH5α	kan	
1891	pGex ShcC	DH5α	AMP	Ian G
1892	pBridge ShcC SH2	DH5α	Amp	Ian G
1893	pGex2t Step 46	DH5α	Amp	Ian G
1894	pGex2T Step 46 CS	DH5α	Amp	Ian G
1895	P Gex2T Step 61	DH5α	Amp	Ian G
1896	pcDNA 3.1 HA PKC zeta	DH5α	Amp	Wooten/Moocat
1897	pcDNA 3.1 HA PKC zeta CA	DH5α	Amp	Wooten/Moocat
1898	pcDNA 3.1 HA Myc-PKC zeta	DH5α	Amp	Wooten/Moocat
1899	pcDNA 3.0-MKK7-JNK1	DH5α	Amp	Davis R
1900	pcDNA 3.0-MKK7JNK1 (apf)	DH5α	Amp	Davis R
1901	pcDNA 3.0-Flag-Rap1	DH5α	Amp	Stork/Oregon
1902	pcDNA 3.0-Myc-Rap1	DH5α	Amp	Stork/Oregon
1903	pcDNA 3.1 DN-PKC zeta	XL10 Gold	Amp	Jupinder
1904	pcDNA 4-myc HisA	DH5α	Amp	Zhong/U Montreal
1905	pcDNA 4 Foxo3-DN + Myc	DH5α	Amp	Zhong/U Montreal
1906	pcDNA 4 Foxo 3-CA + Myc	DH5α	Amp	Zhong/U Montreal

	NAME	HOST Str	ANTIBIOTIC	SOURCE
1907	Monomeric RFP ShcC	XL10Gold	Kan	Alphonso
1908	pcDNA 3.1 Myc His CK1α	DH5α	Amp	Paul Greengard
1909	pcDNA 3.1 Myc His CK1ε	DH5α	Amp	Paul Greengard
1910	pcDNA 3.1 Myc His CK1δ	DH5α	Amp	Paul Greengard
1911	pcDNA 3.1 Myc His CK1γ3	DH5α	Amp	Paul Greengard
1912				
1913	pcDNA 3.1 Myc His ShcC FL	DH5α	Amp	Ian Grant
1914	pcDNA 3.1 Myc His ShcC ΔSH2	DH5α	Amp	Ian Grant
1915	pBIG2i	DH5α	Amp	Craig A.Strathdee/ Amgen
1916	pBIG2r	DH5α	Amp	Craig A.Strathdee/ Amgen
1917	pBIG3i	DH5α	Amp	Craig A.Strathdee/ Amgen
1918	pBIG3r	DH5α	Amp	Craig A.Strathdee/ Amgen
1919	GST - NBD	DH5α	Amp	A. Luini
1920	GST - SBD	DH5α	Amp	A. Luini
1921	pUC52 – Frs3 5'UTR	DH5α	Amp	GenScript
1922	pcmx – 5' UTR hFrs3	DH5α	Amp	Todd Hryciw
1923	pET28a Prot A	XL10G	Kan	MacDonald
1924	pET28a Prot A	BL21	Kan	MacDonald
1925	pET28a Prot A ShcC SH2	XL10G	Kan	MacDonald
1926	pET28a Prot AShcC SH2	BC21	Kan	MacDonald
1927	pGEX 4T2 DREBRIN	XL10G	Amp	MacDonald/Stamnes
1928	pGEX 4T2 DREBRIN	Arctic Express	Amp	MacDonald/Stamnes
1929	pEGFPSyntabulin	XL10G	Kan	Somebody
1930	pGEXMT-2	XL10G	Amp	Cryslin D'Souza-Schorey
1931				
1932				
1933				
1934				
1935	pEBG ShcC SH2	DH5α	Amp	Kayla
1936	pEBG ShcC PTB	DH5α	Amp	Kayla
1937	pXSHA-Arf6 N48R	XL10Gold	Amp	
1938	pXSHA-Arf6 N48I	XL10Gold	Amp	
1939	pNesca-RFP	XL10Gold	Kan	JM