

# p44/42 MAP Kinase Assay Kit (Nonradioactive)

✓ 40 assays



**Orders** ■ 877-616-CELL (2355)  
orders@cellsignal.com

**Support** ■ 877-678-TECH (8324)  
info@cellsignal.com

**Web** ■ www.cellsignal.com

rev. 04/27/16

**For Research Use Only. Not For Use In Diagnostic Procedures.**

**Description:** Nonradioactive p44/42 MAP Kinase Assay Kit provides all the reagents necessary for measuring p44/42 MAP kinase activity in the cell. Immobilized Phospho-p44/42 MAPK (Thr202/Tyr204) mAb is used to immunoprecipitate active p44/42 MAP kinase from cell extracts, then an in vitro kinase assay is performed using Elk-1 protein as a substrate. Elk-1 phosphorylation is then detected by Western blotting using Phospho-Elk-1 (Ser383) Antibody.

**Improvements Over Conventional Assays:**  
Improved sensitivity without radioactivity.

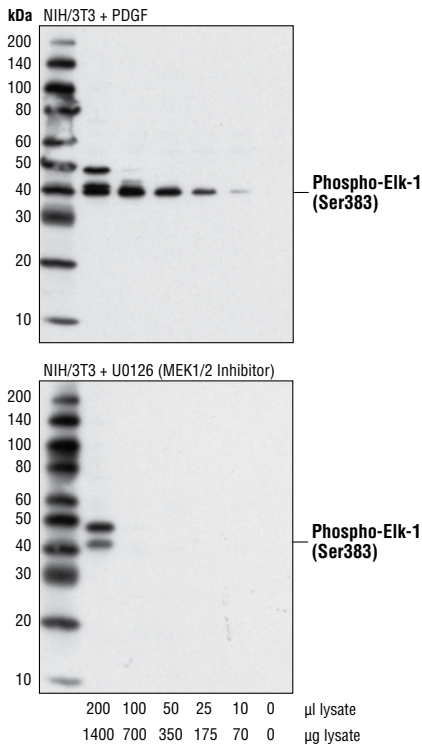
Phospho-specific antibodies allow site-specific analysis.

Dramatically increased signal to noise ratio over conventional IP/kinase assays.

Low background activity.

Includes complete system to assay kinase activity.

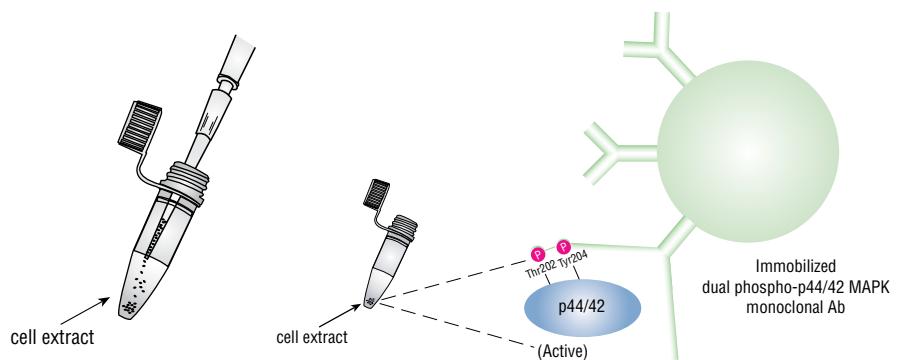
Products Included	Product #	Kit Quantity
Phospho-p44/42 MAPK (Erk1/2) (Thr202/Tyr204) (D13.14.4E) XP® Rabbit mAb (Sepharose® Bead Conjugate)	3510	400 µl
Phospho-Elk-1 (Ser383) (2B1) Mouse mAb	9186	100 µl
Elk-1 Fusion Protein	9184	40 µl
Kinase Buffer (10X)	9802	15 ml
Cell Lysis Buffer (10X)	9803	15 ml
ATP (10 mM)	9804	50 µl
Anti-mouse IgG, HRP-linked Antibody	7076	100 µl
Anti-biotin, HRP-linked Antibody	7075	100 µl
Biotinylated Protein Ladder	7727	100 µl
20X LumiGLO® Reagent and 20X Peroxide	7003	5 ml each



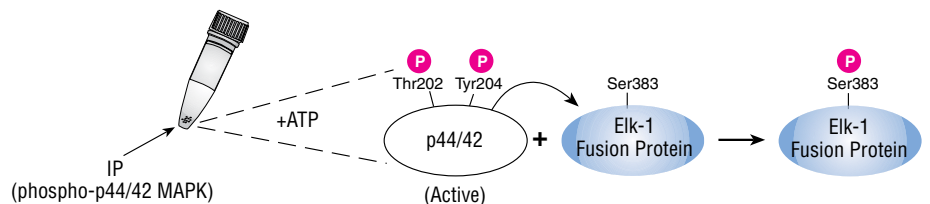
p44/42 MAP Kinase-induced phosphorylation of Elk-1 was measured by immunoblotting with Phospho-Elk-1 (Ser 383) Mouse mAb. Lysate titrations were run by immunoprecipitating various amounts of Phospho-p44/42 from 3T3 + PDGF lysates and 3T3 + U0126 lysates. Phosphorylation of Elk-1 (Ser383) is clearly seen in the positive control lysate compared with the same amounts of the negative control.

## p44/42 Kinase Assay Kit Overview

**Step 1: Selective IP of Phospho-p44/42 MAPK using Immobilized Phospho-p44/42 MAPK (thr202/Tyr204) mAb.**



**Step 2: Incubate IP pellets in Kinase Buffer containing Elk-1 fusion protein and cold ATP.**



**Step 3: Detect Elk-1 phosphorylation using Phospho-Elk-1 (Ser383) Antibody by Western blotting and chemiluminescent detection.**

Sepharose is a registered trademark of GE Healthcare.  
LumiGLO is a registered trademark of Kirkegaard & Perry Laboratories.  
Tween is a registered trademark of ICI Americas, Inc.

**Applications Key:** W—Western IP—Immunoprecipitation IHC—Immunohistochemistry ChIP—Chromatin Immunoprecipitation IF—Immunofluorescence F—Flow cytometry E—ELISA E-P—ELISA Peptide

**Species Cross-Reactivity Key:** H—human M—mouse R—rat Hm—hamster Mk—monkey Mi—mink C—chicken Dm—D. melanogaster X—Xenopus Z—zebrafish B—bovine

Dg—dog Pg—pig Sc—S. cerevisiae All—all species expected Species enclosed in parentheses are predicted to react based on 100% homology.

**Species Cross Reactivity:** H, M, R

**Molecular Weight:** 41, 45 kDa

**Background:** Mitogen-activated protein kinases (MAPKs) are a widely conserved family of serine/threonine protein kinases involved in many cellular programs such as cell proliferation, differentiation, motility, and death. The p44/42 MAPK (ERK1/2) signaling pathway can be activated in response to a diverse range of extracellular stimuli including mitogens, growth factors, and cytokines (1-3) and is an important target in the diagnosis and treatment of cancer (4). Upon stimulation, a sequential three-part protein kinase cascade is initiated, consisting of a MAP kinase kinase kinase (MAPKKK), a MAP kinase kinase (MAPKK), and a MAP kinase. While multiple ERK1/2 MAP3Ks have been identified, including the Raf family, Mos, and Tpl2/Cot, MEK1 and MEK2 are the primary MAPKKs in this pathway (5,6). MEK1 and MEK2 activate ERK1/p44 and ERK2/p42 through phosphorylation of activation loop residues Thr202/Tyr204 and Thr185/Tyr187, respectively. Several downstream targets of ERK1/2 have been identified, including p90RSK (7) and the transcription factor Elk-1 (8,9). ERK1/2 are negatively regulated by a family of dual-specificity (Thr/Tyr) MAPK phosphatases, known as DUSPs or MKPs (10), along with MEK inhibitors such as U0126 and PD98059.

**Background References:**

- (1) Roux, P.P. and Blenis, J. (2004) *Microbiol Mol Biol Rev* 68, 320–44.
- (2) Baccarini, M. (2005) *FEBS Lett* 579, 3271–7.
- (3) Meloche, S. and Pouyssegur, J. (2007) *Oncogene* 26, 3227–39.
- (4) Roberts, P.J. and Der, C.J. (2007) *Oncogene* 26, 3291–310.
- (5) Rubinfeld, H. and Seger, R. (2005) *Mol Biotechnol* 31, 151–74.
- (6) Murphy, L.O. and Blenis, J. (2006) *Trends Biochem Sci* 31, 268–75.
- (7) Dalby, K.N. et al. (1998) *J Biol Chem* 273, 1496–505.
- (8) Marais, R. et al. (1993) *Cell* 73, 381–93.
- (9) Kortenjann, M. et al. (1994) *Mol Cell Biol* 14, 4815–24.
- (10) Owens, D.M. and Keyse, S.M. (2007) *Oncogene* 26, 3203–13.

**Kit Components:**

**Phospho-p44/42 MAPK (Erk1/2) (Thr202/Tyr204) (D13.14.4E) XP® Rabbit mAb (Sepharose® Bead Conjugate):** Monoclonal antibody is produced by immunizing animals with a synthetic phosphopeptide corresponding to residues surrounding Thr202/Tyr204 of human p44 MAP kinase. The Phospho-p44/42 MAP Kinase (Thr202/Tyr204) mAb is conjugated to Sepharose® beads and supplied in 10 mM Sodium HEPES (pH 7.5) and 150 mM NaCl with 100 µg/ml BSA and 50% glycerol. Store at -20°C.

**Phospho-Elk-1 (Ser383) (2B1) Mouse mAb:** Phospho-Elk-1 (Ser383) Antibody detects Elk-1 protein only when phosphorylated at Ser383. Monoclonal antibodies are produced by immunizing mice with a synthetic phospho-Ser383 peptide corresponding to residues around Ser383 of human Elk-1. Antibodies are supplied in 10 mM HEPES (pH 7.5), 150 mM NaCl, 100 µg/ml BSA and 50% glycerol. Store at -20°C.

**Elk-1 Fusion Protein:** GST fused to Elk-1 codons 307–428. Produced from *E. coli* expressing pGEX30X, a derivative of pGEX3X (4) in which Elk-1 codons 307 to 428 were inserted between the BamH I and Spe I site (1).

**10X Kinase Buffer:** 1X concentration: 25mM Tris (pH 7.5), 5 mM β-Glycerolphosphate, 2 mM DTT, 0.1 mM Na<sub>3</sub>VO<sub>4</sub>, 10 mM MgCl<sub>2</sub>

**10X Cell Lysis Buffer:** 1X concentration: 20mM Tris (pH 7.5), 150 mM NaCl, 1 mM EDTA, 1 mM EGTA, 1% Triton, 2.5 mM sodium pyrophosphate, 1 mM β-Glycerolphosphate, 1 mM Na<sub>3</sub>VO<sub>4</sub>, 1 µg/ml Leupeptin

**10 mM ATP (50 µl)**

**Phototope -HRP Western Detection Kit #7071:** The Phototope Western Detection System contains sufficient reagents for the chemiluminescent detection of rabbit antibodies on 10 (10 cm x 10 cm) western blots. It includes a secondary anti-rabbit antibody conjugated to horseradish peroxidase, anti-biotin antibody conjugated to horseradish peroxidase, for the detection of biotinylated ladder, LumiGLO® chemiluminescent reagent, biotinylated ladder and peroxide.

**Reagents Not Supplied:**

3X SDS Sample Buffer  
10X Tris-Buffered Saline

**Companion Products:**

SAPK/JNK Kinase Assay Kit (Nonradioactive) #9810  
Phospho-p44/42 MAP Kinase (Thr202/Tyr204) Antibody #9101  
Phospho-p38 MAP Kinase (Thr180/Tyr182) Antibody #9211  
Phospho-ATF-2 (Thr71) Antibody #9221  
Phospho-MKK3/MKK6 (Ser189/207) Antibody #9231  
Phospho-SEK1/MKK4 (Thr261) Antibody #9151  
Prestained Protein Marker, Broad Range (Premixed Format) #7720  
Biotinylated Protein Ladder #7727

## Nonradioactive IP-Kinase Assay Protocol

### A Solutions and Reagents

- Note:** Prepare solutions with Milli-Q or equivalently purified water.
- 1X Cell Lysis Buffer:** May be stored at 4°C for short-term use (1–2 weeks). Note: Supplied 10X Cell Lysis Buffer should be vortexed before being used to make 1X solution.
- 1X Kinase Buffer:** May be stored at 4°C for short-term use (1–2 weeks).
- Elk-1 Fusion Protein:** Concentration = 0.25 mg/ml. Use 0.25 µg assay.
- 10mM ATP #9804:** 2-(Methylthio)adenosine 5'-triphosphate tetra-sodium salt.
- \* **Transfer Buffer:** 25 mM Tris base, 0.2 M glycine, 20% methanol (pH 8.5).
- \* **3X SDS Sample Buffer:** 187.5 mM Tris-HCl (pH 6.8 at 25°C), 6% w/v sodium dodecyl sulfate (SDS), 30% glycerol, 150 mM dithiothreitol (DTT), 0.03% w/v bromophenol blue. For 100 mL, use 2.27g Tris-HCl, 6g SDS, 30 mL glycerol and 30 mg w/v bromophenol blue or bromophenol blue dye. Store at –20°C. Add DTT fresh just before use.
- \* **10X Tris-Buffered Saline with Tween®-20 (TBS/T):** 0.2 M Tris base, 1.36 M NaCl, 1.0% Tween®-20. To prepare 1 liter, dissolve 24.2g Tris, 80g NaCl in dH<sub>2</sub>O and adjust pH to 7.6 with HCl. Add 10 ml Tween® –20°C and store at room temperature.
- \* **Blocking Buffer:** 1X TBS/T with 5% w/v nonfat dry milk. For 150 mL, dissolve 7.5g nonfat dry milk in 15 mL 10X TBS/T and 135 mL dH<sub>2</sub>O. Mix well. Prepare freshly for each experiment.
- \* **Wash Buffer:** 1X TBS, 0.1% Tween®-20 (TBS/T).
- \* **Primary Antibody Dilution Buffer:** 1X TBS/T with 5% bovine serum albumin (BSA).
- Phototope-HRP Western Blot Detection System #7071, #7072:** Includes biotinylated protein ladder (#7727), secondary anti-rabbit (#7074) antibody conjugated to horseradish peroxidase (HRP), Anti-biotin, HRP-linked (D5A7) Rabbit mAb (#5571), 20X LumiGLO® chemiluminescent reagent and 20X peroxide (#7003).
- LumiGLO® Substrate #7003:** 0.5 mL 20X LumiGLO®, 0.5 mL 20X peroxide and 9.0 mL Milli-Q water.

### B Preparing Cell Lysates

- Aspirate media. Treat cells by adding fresh media containing regulator for desired time.
- To harvest cells under **nondenaturing conditions**, remove media and rinse cells once with ice-cold PBS.
- Remove PBS and add 0.5 mL ice-cold 1X Cell Lysis Buffer plus 1 mM phenylmethylsulfonyl fluoride (PMSF) to each plate (10cm<sup>2</sup>) and incubate the plate on ice for 5 minutes.
- Scrape cells off the plate and transfer to an appropriate tube. Keep on ice.
- Sonicate lysates on ice.
- Microcentrifuge for 10 minutes at 4°C and transfer the supernatant to a new tube. The supernatant is the cell lysate. Store at –80°C.

### C IP with Immobilized Antibodies

- For immunoprecipitations with immobilized p44/42 primary antibody: Dilute by adding 10 µl of immobilized antibody bead slurry to 200 µL cell lysate; incubate with gentle rocking overnight at 4°C. For optimal results, different volumes of cell lysate may be used. If lower volume is used, add cell lysis buffer to a final volume of 200 µl.
- Instructions For Use:** Prior to use, put the tube on ice for 5 minutes to lower viscosity of buffer. Then beads should be resuspended to a 50% slurry by inversion or gentle vortexing.

### D Kinase Assay

- Microcentrifuge cell lysate/immobilized antibody at 14,000 x G for 30 seconds at 4°C. Wash pellet two times with 500 µL of 1X Cell Lysis Buffer. Keep on ice during washes.
- Wash pellet twice with 500 µL of 1X Kinase Buffer. Keep on ice.
- Suspend pellet in 50 µL of 1X Kinase Buffer supplemented with 200µM ATP and appropriate quantity of kinase substrate. (1µl)
- Incubate for 30 minutes at 30°C.
- Terminate reaction with 25 µL 3X SDS Sample Buffer. Vortex, then microcentrifuge for 30 seconds.

### E Western Immunoblotting

- Heat the sample to 95–100°C for 2–5 minutes.
- Load 5–15 µl of sample per well sample on SDS-PAGE gel.
- Note:** CST recommends loading prestained molecular weight markers (#7720, 10 µL/lane) to verify electrotransfer and biotinylated protein marker (#7727, 10 µL/lane) to estimate molecular weights.
- Run SDS-page and electrotransfer to nitrocellulose or PVDF membrane.
- (Optional)** After transfer, wash nitrocellulose membrane with 25 mL TBST for 5 minutes at room temperature.
- Incubate membrane in 10 mL Blocking Buffer for 1-2 hours at room temperature.
- Wash three times for 5 minutes each with 15 mL 1 x TBS/T.
- Incubate membrane and Phospho-Elk (Ser383) Antibody (1:1000 dilution) in 10 mL Primary Antibody Dilution Buffer with gentle agitation overnight at 4°C.
- Wash three times for 5 minutes each with 15 mL 1 x TBS/T.
- Incubate membrane with HRP-conjugated secondary antibody (1:2000) and HRP-conjugated anti-biotin antibody (1:1000) to detect biotinylated protein markers in 10 mL of Blocking Buffer with gentle agitation for 1 hour at room temperature.
- Wash three times for 5 minutes each with 15 mL Wash Buffer.
- Incubate membrane with 10 mL LumiGLO® Substrate with gentle agitation for 1 minute at room temperature.
- Drain membrane of excess LumiGLO® Substrate (but do not let dry), wrap in plastic wrap and expose to X-ray film. An initial 10-second exposure should indicate the proper exposure time.
- Note:** Due to the kinetics of the detection reaction, signal is most intense immediately following LumiGLO® incubation and declines over the following 1–2 hours. LumiGLO® Substrate can be further diluted if signal response is too fast.

# Material Safety Data Sheet (MSDS) for Cell Lysis Buffer (10X)



rev. 08/09/07

## I. Identification:

**Product name:** Cell Lysis Buffer (10X)

**Product Catalog:** 9803

**CAS number:** Not applicable to mixtures

**Manufacturer Supplier:** Cell Signaling Technology  
3 Trask Lane  
Danvers, MA 01923 USA  
1-978-867-2300 TEL  
1-978-867-2400 FAX  
1-978-578-6737 Emergency Phone

## II. Composition/Information on Ingredients:

**Note:** Other than the ingredient listed below, this product is a mixture that contains > 1% hazardous chemicals. According to 29CFR 1910.1200(d), ingredients at >1% concentration are not considered hazardous.

Ingredient	CAS#	Percent	Hazardous
Triton X-100 (polyethylene glycol octylphenol ether)	9002-93-1	1%	Yes

## III. Hazard Identification:

**Emergency Overview of Hazardous ingredient: Triton X-100 (polyethylene glycol octylphenol ether):**

**Caution!** Causes burns. Harmful if swallowed or inhaled. Aspiration may cause lung damage. Causes irritation to skin and respiratory tract.

**Health Rating:** 1 - Slight

**Flammability Rating:** 1 - Slight

**Reactivity Rating:** 1 - Slight

**Contact Rating:** 2 - Moderate

**Lab Protective Equip:** Goggles; Lab Coat; Fume Hood, Proper Gloves

**Potential Health Effects:**

**Inhalation:** Irritant to respiratory system. May cause coughing, shortness of breath.

**Ingestion:** Irritant. May cause nausea, vomiting and diarrhea. Aspiration during vomiting may cause lung damage.

**Skin contact:** Brief contact may have no effect. Prolonged or repeated contact may cause irritation, redness, itching, pain.

**Eye contact:** Irritant. May cause inflammation, tearing, blinking, redness, swelling of the conjunctiva, chemical burns to the retina.

**Chronic exposure:** No information found.

**Aggravation of pre-existing conditions:** No information found.

## IV. First Aid Measures for hazardous ingredient:

**Triton X-100 (polyethylene glycol octylphenol ether):**

**Inhalation:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

**Ingestion: DO NOT INDUCE VOMITING.** Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician.

**Skin contact:** Wash skin with soap or mild detergent and water for at least 15 minutes. Get medical attention if irritation develops or persists.

**Eye contact:** Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

## V. Fire Fighting Measures:

**Flash point:** Data not known.

**Explosion:** Not considered to be an explosion hazard.

**Fire extinguishing media:** Use fire extinguisher appropriate for surrounding fire.

## VI. Accidental Release Measures:

**Note:** Product container volume is only 15 µl.

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., vermiculite, dry sand, earth), and place in a chemical waste container.

## VII. Handling And Storage:

Store at -20°C in tightly closed container. For short term storage (1-2 weeks) Cell Lysis Buffer can be stored at 4°C.

## VIII. Exposure Controls/Personal

**Ventilation System:** A system of local and/or general exhaust is recommended to keep employee exposures below the airborne exposure limits.

**Skin Protection:** Rubber Or Neoprene Gloves and lab coat.

**Eye protection:** Chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

## IX. Exposure Controls/Personal Protection:

**Appearance and odor:**

Odorless, colorless liquid

**Boiling Point:**

Data not known

**Melting Point:**

Data not known

**Vapor pressure:**

Data not known

**Vapor Density (Air=1):**

Data not known

**Solubility:**

Soluble in water.

## X. Stability and Reactivity:

**Stability:** Stable under ordinary conditions.

**Hazardous polymerization:** Will not occur.

**Incompatibilities:** Strong oxidizing agents, strong reducing agents.

**Conditions to avoid:** Heat.

## XI. Toxicological Information:

**For Triton X-100:** Oral Rat LD50 1800 mg/kg.

**For polyethylene glycol octylphenol ether:** Oral Rat LD50: 4190 mg/kg; Investigated as a mutagen.

### CANCER LISTS:

Ingredient	NTP Carcinogen Known	NTP Carcinogen Anticipated	IARC Category
Triton X-100, polyethylene glycol octylphenol ether	No	No	None

## XII. Ecological Information:

**For Triton X-100:**

**Environmental Fate:** Data not found.

**Environmental Toxicity:** Expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between<sup>®</sup> 1 and 10 mg/l.

## XIII. Disposal Considerations:

Dispose of in accordance with federal, state and local requirements.

## XIV. Transport Information:

Not regulated.

# Material Safety Data Sheet (MSDS) for Cell Lysis Buffer (10X)

## XV. Regulatory Information:

### Chemical Inventory Status - part 1

Ingredient	TSCA	EC	Japan	Australia
polyethylene glycol octylphenol ether (9002-93-1)	Yes	No	Yes	Yes

### Chemical Inventory Status - part 2

Ingredient	Korea	DSL	NDSL	Phil.
polyethylene glycol octylphenol ether (9002-93-1)	Yes	Yes	No	Yes

### Federal, State & International Regulations - part 1

Ingredient	SARA 302		SARA 313	
	RQ	TPQ	List	Chemical catg.
polyethylene glycol octylphenol ether (9002-93-1)	No	No	No	No

### Federal, State & International Regulations - part 2

Ingredient	CERCLA	RCRA	TSCA
		261.33	8(d)
polyethylene glycol octylphenol ether (9002-93-1)	No	No	Yes
<b>Chemical Weapons Convention:</b>	No	<b>TSCA 12(b):</b> No	<b>CDTA:</b> No
<b>SARA 311/312</b>	<b>Acute</b>	<b>Chronic</b>	<b>Fire Pressure</b>
	Yes	No	No
<b>Reactivity</b>	No	(Mixture / liquid)	

## XVI. Other Information:

This mixture is sold only in microliter quantities for use in biological research use by personnel familiar with the toxicology of chemicals and who are well trained in good laboratory habits, such as avoiding spills, keeping hands clean at all times and not rubbing eyes with hands while working in the laboratory.

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide for experienced personnel. Cell Signaling Technology, Inc., shall not be held liable for any damage resulting from the handling of or from contact with the above product. The burden of safe use of this material rests entirely with the user.

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# Material Safety Data Sheet (MSDS) for 20X LumiGLO® and 20X Peroxide



## I. Identification:

**Product name:** 20X LumiGLO® and 20X Peroxide  
**Product Catalog:** 7003  
**CAS number:** None  
**Manufacturer Supplier:** Cell Signaling Technology  
 3 Trask Lane  
 Danvers, MA 01923 USA  
 1-978-867-2300 TEL  
 1-978-867-2400 FAX  
 1-978-578-6737 Emergency TEL

## II. Composition/Information on Ingredients:

Hazardous Reagent:	Percent	CAS#
Dimethyl sulfoxide	≤20%	67-68-5

**This product is For Research Use Only.** According to 29 CFR 1910.1200(d), mixtures with hazardous ingredients at less than <1% and carcinogens at less than <0.1% are considered non-hazardous.

## III. Hazard Identification:

**CAUTION:** This product is not for use in humans. It is intended for research purposes only. To the best of our knowledge, the chemical, physical, and toxicological properties of this material have not been established.

**Emergency Overview:** Irritant. Irritating to eyes, respiratory system, skin.

### Potential Health Effects:

**Inhalation:** May be harmful if inhaled. May cause respiratory tract irritation.

**Eye Contact:** May cause eye irritation.

**Skin Contact:** May be harmful if absorbed through skin. Prolonged or repeated contact may cause skin irritation.

**Ingestion:** May be harmful if swallowed.

## IV. First Aid Measures:

**Inhalation:** Remove to fresh air. If breathing is difficult, get medical attention.

**Ingestion:** If person is conscious, wash out mouth with water. Get medical attention.

**Skin exposure:** Wash skin with soap and water. If irritation develops or persists, get medical attention.

**Eye exposure:** Immediately flush eyes water for at least 15 minutes. Get medical attention.

## V. Fire Fighting Measures:

**Flash Point:** N/A

**Autoignition Temperature:** N/A

**Explosion:** N/A

**Fire extinguishing media:** water spray, dry chemical, alcohol foam, or carbon dioxide.

**Firefighting:** wear protective clothing and self-contained breathing apparatus to prevent contact with skin and eyes. May emit toxic fumes under fire conditions.

## VI. Accidental Release Measures:

Wear appropriate personal protective equipment as indicated in Section VIII. Absorb liquid with an absorbent material. Transfer contaminated absorbent to a closed chemical waste container for disposal. Wash spill site after material has been picked up for disposal.

## VII. Handling And Storage:

Store at 4°C in tightly closed container.

Avoid inhalation of vapor or mist. Avoid contact with eyes, skin, and clothing. Wash thoroughly after handling. Avoid prolonged or repeated exposure.

## VIII. Exposure Controls/Personal:

**Ventilation System:** a system of local and/or general exhaust is recommended.

**Skin Protection:** wear compatible chemical resistant gloves and protective clothing.

**Eye protection:** wear protective safety glasses or chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

## IX. Physical And Chemical Properties:

<b>Appearance:</b>	clear faint yellow colored liquid
<b>Odor:</b>	data not available
<b>pH:</b>	data not available
<b>Boiling Point:</b>	>100°C/212°F (water)
<b>Melting or Freezing Point:</b>	<0°C/32°F (water)
<b>Flash Point:</b>	data not available
<b>Volatile Organic Compounds (VOC):</b>	data not available
<b>Autoignition temp.</b>	data not available
<b>Solubility (water)</b>	miscible in water

## X. Stability and Reactivity:

**Stability:** Stable under normal conditions.

**Conditions to avoid:** strong oxidizing agents, strong acids, strong bases.

**Hazardous Decomposition:** carbon monoxide, carbon dioxide.

**Hazardous polymerization:** will not occur.

## XI. Toxicological Information:

Acute toxicity: data not available. Chronic exposure: data not available

### Potential Health Effects:

**Inhalation:** May be harmful if inhaled. Causes respiratory tract irritation.

**Skin:** May be harmful if absorbed through skin. Causes skin irritation.

**Eyes:** Causes eye irritation.

**Ingestion:** Harmful if swallowed.

Toxicity Data on Hazardous ingredient Dimethyl Sulfoxide, CAS#67-68-5

RTECS: PV6210000

LD50 Oral rat 14,500 mg/kg

LC50 Inhalation rat 4 h 40250 ppm

LD50 Dermal rabbit > 5,000 mg/kg

## XII. Ecological Information:

No data available.

**XIII. Disposal Considerations:** Dispose of in accordance with federal, state and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

## XIV. Transport Information:

D.O.T. Proper Shipping Name: None. This substance is considered non-hazardous for transport.

IATA Proper Shipping Name: None. This substance is considered non-hazardous for air transport.

## XV. Regulatory Information:

EU: Not classified

OSHA: Ingredient Dimethyl Sulfoxide, CAS#67-68-5: Combustible Liquid, Target Organ Effect

Canadian DSL: Listed: Ingredient Dimethyl Sulfoxide, CAS#67-68-5

SARA 302, 313 Ingredients Not Listed.

SARA 311/312: Ingredient Dimethyl Sulfoxide, CAS#67-68-5: Fire Hazard, Chronic Health Hazard.

Massachusetts Right To Know: Ingredients Not Listed.

Pennsylvania Right To Know: Ingredient Dimethyl Sulfoxide, CAS#67-68-5

New Jersey Right To Know: Ingredient Dimethyl Sulfoxide, CAS#67-68-5

California Prop. 65: Ingredients Not Listed.

## XVI. Other Information:

This product is for research use only and is not intended for use in humans. To the best of our knowledge, this document is accurate. It is intended to serve as a guide for safe use of this product in a laboratory setting by experienced personnel. The burden of safe use of this material rests entirely with the user. The above information is believed to be accurate but is not necessarily all-inclusive and shall be used only as a guide. Cell Signaling Technology, Inc., shall not be held liable for any damage resulting from the handling of or from contact with the above product.