

## Guidance for identification of highly hazardous chemical substances

These tables list OSHA hazard categories and Safety Data Sheet (SDS)/label information for chemicals that are in the most hazardous health and/or physical hazard classifications. OSHA hazard categories generally range from 1 to 4 with category 1 being the most hazardous. Chemicals in these categories must be judiciously evaluated prior to procuring and using them for experiments. **Creating SOPs with safety information for these or including safety information in existing protocols using them is very important.** References to locate lists of some hazardous chemicals are also included below.

### Toxic chemicals, including carcinogens

OSHA Hazard Classification	OSHA Hazard Category	OSHA Pictogram	Signal Word on Label or SDS	Hazard Statement on Label or SDS
Carcinogenicity	1A, 1B		Danger	May cause cancer
Carcinogenicity	2		Warning	Suspected of causing cancer
Acute Toxicity, Oral	1,2		Danger	Fatal if swallowed
Acute Toxicity, Oral	3		Danger	Toxic if swallowed
Acute Toxicity, Dermal	1,2		Danger	Fatal in contact with skin
Acute Toxicity, Dermal	3		Danger	Toxic in contact with skin
Acute Toxicity, Inhalation	1,2		Danger	Fatal if inhaled
Acute Toxicity, Inhalation	3		Danger	Toxic if inhaled
Skin Corrosion/Irritation	1A, 1B, 1C		Danger	Causes severe skin burns and eye damage
Eye Damage/Irritation	1		Danger	Causes serious eye damage
Sensitization, Respiratory	1A, 1B		Danger	May cause allergy or asthma symptoms or breathing difficulties if inhaled
Sensitization, Skin	1A, 1B		Warning	May cause an allergic skin reaction
Germ Cell Mutagenicity	1A, 1B		Danger	May cause genetic defects
Toxic to Reproduction	1A, 1B		Danger	May damage fertility or the unborn child
Specific Target Organ Toxicity, single exposure	1		Danger	Causes damage to organs (specific organs may be listed)
Specific Target Organ Toxicity, single exposure	2		Warning	May cause damage to organs (specific organs may be listed)
Specific Target Organ Toxicity, repeated exposure	1		Danger	Causes damage to organs though prolonged or repeated exposure
Aspiration hazard	1		Danger	May be fatal if swallowed and enters airways

Examples may be found in the following references (carcinogenicity):














[California Proposition 65 List of Chemicals \(known to cause cancer or reproductive toxicity\)](#)



[National Toxicology Program \(NTP\), "Report on Carcinogens" \(latest edition\)](#)

[International Agency for Research on Cancer \(IARC\), "Monographs on the Evaluation of Carcinogenic Risks to Humans" \(latest editions\)](#)

OSHA 29 CFR part 1910, Subpart Z, Toxic and Hazardous Substances

## Other hazardous chemical substances with physical hazards

OSHA Hazard Classification	OSHA Hazard Category	OSHA Pictogram	Signal Word on Label or SDS	Hazard Statement on Label or SDS
Self-reactive chemicals	Varies: Type A Type B Type C Type D	Varies:  A   B  C,D	Danger	Varies: <ul style="list-style-type: none"> <li>• Heating may cause an explosion (A)</li> <li>• Heating may cause a fire or explosion (B)</li> <li>• Heating may cause a fire (C,D)</li> </ul>
Pyrophoric liquids Pyrophoric solids Pyrophoric gas	1		Danger	Catches fire spontaneously if exposed to air
Self-Heating Substances	1		Danger	Self-heating; may catch fire
Water-reactive, emit flammable gases	1 2		Danger Danger	<ul style="list-style-type: none"> <li>• In contact with water releases flammable gases, which may ignite spontaneously (1)</li> <li>• In contact with water releases flammable gas (2)</li> </ul>
Explosive chemicals	Varies: <ul style="list-style-type: none"> <li>• Unstable explosive</li> <li>• Division 1.1</li> <li>• Division 1.2</li> <li>• Division 1.3</li> </ul>		Danger	Varies: <ul style="list-style-type: none"> <li>• Unstable explosive</li> <li>• Explosive; mass explosion hazard (1.1)</li> <li>• Explosive; severe projection hazard (1.2)</li> <li>• Explosive; fire, blast or projection hazard (1.3)</li> </ul>
Organic Peroxides	Type A Type B Type C Type D	 A  B  C, D	Danger	Heating may cause an explosion (A) Heating may cause an explosion (B) Heating may cause a fire (C) Heating may cause a fire (D)
Gas Under Pressure	Compressed Gas Liquefied Gas Dissolved Gas		Warning	Contains gas under pressure; may explode if heated
Flammable Gases, Liquids, Aerosols, Solids	1, 2		Danger	Varies: <ul style="list-style-type: none"> <li>• Extremely flammable gas (1)</li> </ul>

OSHA Hazard Classification	OSHA Hazard Category	OSHA Pictogram	Signal Word on Label or SDS	Hazard Statement on Label or SDS
				<ul style="list-style-type: none"> <li>Extremely flammable liquid and vapor (1)</li> <li>Highly flammable liquid and vapor (2)</li> <li>Extremely flammable aerosol (1)</li> <li>Flammable solid (1)</li> </ul>
Oxidizing Gases Oxidizing Liquids Oxidizing Solids	1		Danger	May cause or intensify fire; oxidizer (gas) May cause fire or explosion; strong oxidizer (liquid, solid)
Corrosive to Metals	1		Warning	May be corrosive to metals

## OSHA-Regulated Carcinogens and Other Chemicals

### OSHA 13 carcinogens:

OSHA Carcinogen	Chemical Abstracts Service Register Number (CAS No.)
4-Nitrobiphenyl	92933
alpha-Naphthylamine	134327
methyl chloromethyl ether	107302
3,3'-Dichlorobenzidine (and its salts)	91941
bis-Chloromethyl ether	542881
beta-Naphthylamine	91598
Benzidine	92875
4-Aminodiphenyl	92671
Ethyleneimine	151564
beta-Propiolactone	57578
2-Acetylaminofluorene	53963
4-Dimethylaminoazo-benzene	60117
N-Nitrosodimethylamine	62759

### Other OSHA-regulated chemicals that are carcinogens or potential carcinogens:

Asbestos  
 Vinyl chloride  
 Inorganic arsenic  
 Cadmium  
 Benzene  
 Coke oven emissions  
 1,2-Dibromo-3-chloropropane  
 Acrylonitrile  
 Ethylene oxide  
 Formaldehyde  
 Methylenedianiline  
 1,3-Butadiene  
 Methylene Chloride

## Other OSHA-Regulated Chemicals

Please see the OSHA-regulated chemicals at the OSHA web site:

[OSHA-Regulated Chemicals](#)



## Hazardous drugs including chemotherapy/antineoplastic and investigational drugs

Using the NIOSH definition, drugs considered hazardous include those that exhibit one or more of the following six characteristics in humans or animals:

- Carcinogenicity
- Teratogenicity or other developmental toxicity
- Reproductive toxicity
- Organ toxicity at low doses
- Genotoxicity
- Structure and toxicity profiles of new drugs that mimic existing drugs determined hazardous by the above criteria

Examples of hazardous drugs may be found in the following references:

NIOSH publication [NIOSH List of Antineoplastic and Other Hazardous Drugs in Healthcare Settings 2012 or most current](#)  
OSHA Technical Manual "Controlling Occupational Exposure to Hazardous Drugs"  
[Appendix VI:2-1. Some Common Drugs Considered Hazardous](#)

OSHA Hazard Classification	OSHA Hazard Category	OSHA Pictogram	Signal Word on Label or SDS	Hazard Statement on Label or SDS
Carcinogenicity	1A, 1B		Danger	May cause cancer
Carcinogenicity	2		Warning	Suspected of causing cancer

Additional examples of potential carcinogens may be found in the following references:




[National Toxicology Program \(NTP\), "Report on Carcinogens" \(latest edition\)](#)

[International Agency for Research on Cancer \(IARC\), "Monographs on the Evaluation of Carcinogenic Risks to Humans" \(latest editions\)](#)

OSHA 29 CFR part 1910, Subpart Z, Toxic and Hazardous Substances

## Reproductive hazards

Include mutagens, teratogens, developmental reproductive toxicity

OSHA Hazard Classification	OSHA Hazard Category	OSHA Pictogram	Signal Word on Label or SDS	Hazard Statement on Label or SDS
Germ Cell Mutagenicity	1A, 1B		Danger	May cause genetic defects
Toxic to Reproduction	1A, 1B		Danger	May damage fertility or the unborn child
Toxic to Reproduction	2		Warning	Suspected of damaging fertility or the unborn child

Examples of reproductive hazards may be found in the following reference:

[California Proposition 65 List of Chemicals \(known to cause cancer or reproductive toxicity\)](#)

### **Biological Toxins with Acute Toxicity Hazards**

Biological toxins are substances produced by biological organisms. Many are toxic to health. Work with these should be planned in advance to minimize hazards to these toxins similar to planning work with hazardous chemicals.

### **Engineered Nanomaterials/Nanoparticles**

Hazards of engineered nanomaterials can be much different than for the same chemical with a normal scale particle size. Consider any engineered nanomaterial/nanoparticle in the size range 1-100 nanometers. Include the name of the material, the particle size/dimensions, and the form of the material such as aerosol, liquid suspension, etc. in SOPs. Also consider whether or not the material is believed to be biodegradable if used in an animal protocol. Safe handling guidance for nanomaterials can be located at the following EHS web link: <http://ehs.research.uiowa.edu/nanomaterials-handling-safety-guide-laboratories>.

### **Other Resources**

The Dow Company has developed some Lab Safety Resources. One resource you can customize for your own use is located on their Dow Safety web site. They offer a customizable template to use for developing a Safe Operation Card. It is a tool to assist you conduct a hazard assessment and plan to safely conduct your experiment or process.

[Dow Company Safe Operation Card Template](#)

The OSHA web site below includes many links to resources for chemical hazard recognition, hazard evaluation, and control and prevention.

[OSHA Chemical Reactivity Hazards Guidance](#)