

CALIFORNIA STATE UNIVERSITY, FRESNO

CHEMICAL HYGIENE PLAN



Office of
Environmental Health and Safety

March 2004

UNIVERSITY SAFETY POLICY STATEMENT

It is the policy of the California State University, Fresno to maintain, insofar as it is reasonably within its control to do so, campus laboratory environments for faculty, staff, students and the public that will not adversely affect their health and safety nor subject them to avoidable risks of accidental injury or illness. No employee or student shall be required to perform any task which is determined to be unsafe or unreasonably hazardous.

To accomplish this, departments shall provide facilities and equipment that meet all federal, state and local safety laws and regulations, and shall promulgate appropriate policies, standards and procedures for governing laboratory health and safety programs.

In addition to the overall responsibility for campus health and safety which rests with the President, the responsibility for taking corrective action rests with the School Deans and the Department Directors. The immediate responsibility for laboratory workplace health and safety belongs to each campus employee who performs a supervisory role. In addition, individual employees are responsible for preventing laboratory accidents. Accordingly, all faculty and staff are expected to take whatever actions are necessary to ensure that safe and healthful conditions and practices are provided and followed within the areas under their jurisdiction. I ask all members of the campus community to cooperate fully with all aspects of the various campus health and safety programs so that we may become a model for others to follow.

John D. Welty
President

Alexander Gonzalez
Provost and Vice President for Academic Affairs

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CHEMICAL HYGIENE PLAN

1.0 AUTHORITY

California Code of Regulations (CCR), Title 8, Section 5191; CSU Environmental Health and Safety Program Development and Administrative Guide, Section 4.0; California State University, Fresno Injury and Illness Prevention Program.

2.0 REGULATORY AGENCY

California Division of Occupational Safety and Health, Department of Industrial Relations (Cal/OSHA).

3.0 BACKGROUND

- 3.1 The California Code of Regulations, Title 8, Section 5191, "Occupational Exposure To Hazardous Chemicals In Laboratories," adopted April 26, 1991, requires employers to develop and implement a written Chemical Hygiene Plan (CHP). The plan should be capable of protecting employees from health hazards associated with hazardous chemicals in laboratory environments and keeping employee exposures below permissible limits.
- 3.2 The procedures and methods outlined in the CHP shall be regular, continuing efforts, not merely standby or short-term activities.
- 3.3 Colleges and universities have also had to assume the additional challenge of administering instructional laboratories, where relatively inexperienced students must be introduced to the safety precautions necessary to conduct various laboratory operations.

4.0 SCOPE

- 4.1 The provisions of this regulation apply to all personnel who work in laboratory-type environments, including but not limited to: faculty; principal investigators; laboratory and stockroom technicians and supervisors; student assistants and technical assistants; building service engineers; and building trades and maintenance staff.

5.0 POLICY

- 5.1 It is the policy of the University to maintain, insofar as it is reasonably within its control to do so, campus laboratory environments for faculty, staff, students and the public that will not adversely affect their health and safety nor subject them to

avoidable risks of accidental injury or illness. No student or employee shall be required to perform any task which is determined to be unsafe or unreasonably hazardous.

- 5.2 To accomplish this, departments shall provide facilities and equipment that meet all federal, state and local (where applicable) safety laws and regulations, and shall promulgate appropriate policies, standards and procedures for governing campus health and safety programs.
- 5.3 While the overall responsibility for campus health and safety rests with the President, the immediate responsibility for laboratory workplace health and safety belongs to each campus employee who performs a supervisory role. In addition, individual employees are responsible for preventing laboratory accidents. Accordingly, all faculty and staff are to ensure that safe and healthful conditions and practices are provided and followed within the areas under their control, and all members of the campus community are to cooperate fully with all aspects of the various campus health and safety programs.

6.0 OBJECTIVES

- 6.1 When properly designed and implemented, an effective Chemical Hygiene Plan (CHP) will assist management in determining what hazards exist in laboratories, how to correct hazards that may occur, and what steps to take to prevent them from recurring.
- 6.2 When the University has established an effective system for implementing the provisions of the written (CHP), the following objectives can be achieved:
 - a. Employee exposure to hazardous materials is reduced.
 - b. Employee exposures to hazardous materials are below acceptable limits.
 - c. The CHP is readily available to all employees.
 - d. The CHP is reviewed annually and updated as appropriate.
 - e. Laboratory equipment is inspected regularly and maintained in safe working condition.
 - f. Provisions are made for additional controls and employee protection for work with particularly hazardous chemicals.
 - g. Provisions are made for medical consultation and medical examinations.
 - h. Provisions are made for employee information and training.

7.0 RESPONSIBILITIES

7.1 University Administration

- a. The University President has ultimate responsibility for establishing and maintaining effective policies regarding environmental health and safety within the institution and should, with other administrators, provide continuing support for institutional chemical hygiene. Policies which govern the activities and responsibilities of the Environmental Health and Safety (EH&S) program are thereby established under the final authority of the President.
- b. It is recognized that certain responsibilities and expressed procedures in this program cannot be equally applied because of the wide diversity of operations within the University and the necessary differences in organizational structure within various departments. There are, therefore, some details which might be impossible or impractical for one department chair or department head to implement as directed while another would have no difficulty in applying every one. Departments will, therefore, have some latitude in formulating and implementing alternative methods when necessary as long as the total Chemical Hygiene Plan objectives are not compromised.

7.2 Environmental Health and Safety (EH&S) Office

It is the responsibility of the EH&S Office to develop, implement and maintain a campuswide Chemical Hygiene Plan. Further responsibilities are outlined below:

- a. Provide consultation to Department Deans, Directors, Chairpersons and Coordinators regarding program compliance. Consult on issues of hazard identification and evaluation; procedures for correcting unsafe conditions; determining and implementing control measures; employee information and training programs; employee medical monitoring; and recordkeeping.
- b. Provide centralized monitoring of campuswide chemical hygiene activities on a consultative basis.
- c. Maintain centralized environmental and employee monitoring records, allowing employee access as directed by law.

7.3 Chemical Hygiene Officer (CHO)

It is the responsibility of the CHO, in conjunction with the EH&S Office, to do the following:

- a. Work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices.

- b. Provide technical guidance to departments.
- c. Coordinate assessment of employee exposure to hazardous chemicals.
- d. Maintain currency on legal requirements concerning regulated substances.
- e. Seek ways to improve the chemical hygiene program.
- f. Ensure that appropriate audits are conducted. Review and evaluate the effectiveness of the CHP at least annually and update if necessary.
- g. Review all purchases, requisitions, grants and contracts involving the use of hazardous chemicals.

7.4 Deans, Directors, Department Chairs, Department Heads

It is the responsibility of Deans, Directors, Department Chairs and Department Heads to develop departmental procedures to ensure effective compliance with the Chemical Hygiene Plan and other university health and safety policies as they relate to operations under their control. Specific areas include employee and student education and training, identification and correction of unsafe laboratory conditions and recordkeeping. Specifically these individuals will:

- a. Identify all laboratories in the department.
- b. Identify Principal Investigators (PIs) for each laboratory.
- c. Provide training to PIs regarding requirements for compliance, elements of the program and specifics on what/how to train employees.
- d. Review the departmental program quarterly including:
 - 1. checklists
 - 2. accident reports
 - 3. maintenance reports
- e. Provide periodic training as necessary.
- f. Provide Material Safety Data Sheets (MSDSs) to PIs when necessary.
- g. Assist PIs in identifying laboratory hazards.

7.5 Principal Investigators (PIs) and Supervisors

It is the responsibility of the Principal Investigators and Supervisors to:

- a. Identify potential laboratory hazards.

- b. Provide employee training at initial assignment and prior to new exposure situations.
- c. Identify materials considered particularly hazardous (select carcinogens, allergens, embryotoxins, etc.).
- d. Define special circumstances under which employees must request approval before engaging in a given work activity.
- e. Conduct quarterly inspections of the laboratory.

7.6 Laboratory Workers (Technicians, Student Assistants, Technical Assistants, Other Employees)

Employees who work in laboratory environments are responsible for the following:

- a. Plan and conduct each operation in accordance with the institutional and chemical hygiene procedures.
- b. Use common sense and good judgment at all times.
- c. Understand and comply with all Standard Operating Procedures. Report any significant problems arising from the implementation of the Standard Operating Procedures to the PI or Laboratory Instructor/Supervisor.
- d. Report all facts pertaining to every accident/incident and any action or condition that may exist that could result in an accident to the PI or Laboratory Instructor/Supervisor.
- e. Attend established education and training sessions.
- f. Ask questions of supervisors when there is concern about an unknown or hazardous situation.
- g. Understand the function and proper use of all personal protective equipment (PPE). Wear appropriate PPE when required or necessary.
- h. Contact the PI or Laboratory Instructor/Supervisor, and/or the Chemical Hygiene Officer if any of the above procedures are not clearly understood.

7.7 Students

Students are expected to always adhere to safe and healthful work practices defined by written and oral campus and departmental safety and health guidelines. They must also report laboratory hazards that become known to them, to their instructors or other responsible parties.

8.0 ELEMENTS OF THE PLAN

8.1 The Chemical Hygiene Plan addresses the following eight elements:

- a. Standard Operating Procedures (SOPs) relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;
- b. Criteria to be used to determine and implement control measures in order to reduce employee exposure to hazardous chemicals, particularly chemicals that are extremely hazardous;
- c. A requirement that fume hoods comply with existing regulations, and that specific measures be taken to ensure proper and adequate performance of all protective equipment;
- d. Provisions for employee information and training;
- e. The circumstances under which a particular laboratory operation, procedure, or activity shall require prior approval from the employer (or the employer's designee) before implementation;
- f. Provisions for medical consultation and medical examinations based on specified criteria;
- g. Designation of personnel responsible for implementation of the CHP including the assignment of a Chemical Hygiene Officer; and
- h. Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins, and substances which have a high degree of acute toxicity.

9.0 STANDARD OPERATING PROCEDURES (SOPs)

Standard Operating Procedures (SOPs) are written safety and health guidelines for laboratory work with hazardous materials which are required as a part of the Chemical Hygiene Plan (CHP). SOPs are written for hazardous chemicals when the chemical is used routinely in the laboratory and when its use poses a potential hazard to laboratory personnel. Departments shall develop laboratory specific SOPs on a case by case basis for more hazardous materials. The following general SOPs are included in Appendix B:

- a. Handling Chemicals
- b. General Safety Guidelines
- c. General Safety Attitudes

- d. Personal Hygiene
- e. Personal Protective Equipment
- f. Housekeeping
- g. Spills and Accidents
- h. Hazardous Waste Management
- i. Hazardous Waste Reduction

10.0 CRITERIA USED TO DETERMINE AND IMPLEMENT CONTROL MEASURES

10.1 Recognition of Potential Hazards

Departments and PIs/Laboratory Supervisors are responsible for recognizing potential hazards in the work areas under their jurisdiction. This requires familiarity with the processes and work operations involved, maintenance of an inventory of the chemical and physical agents associated with those processes, and periodic review of the different job activities of a work area. Departments shall also study the effectiveness of the existing control measures.

10.2 Hazard Identification

a. Labels

PIs/Laboratory Supervisors shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.

b. Chemical Inventory and Material Safety Data Sheets (MSDSs)

Each laboratory shall maintain a chemical inventory and provide personnel access to MSDSs for all laboratory chemicals.

c. Hazardous Chemicals Produced in the Laboratory

1. If the chemical composition is known and the chemical is produced exclusively for the laboratory of origin, the PI shall determine if it is hazardous as defined in the Appendix A. If it is a hazardous chemical, the PI will provide and document training (see Section 15.0 for toxicological properties, safe handling procedures, etc.).
2. If the chemical produced is a by-product with an unknown composition, the PI shall assume that the substance is a hazardous chemical and shall implement the CHP.
3. If the chemical substance produced is transferred to a user outside the lab, the PI will comply with the University Hazard Communication Program, including labeling and preparation of the MSDS.

4. Laboratory prepared solutions of hazardous chemicals must be labeled with the identity of the chemical and an appropriate health and physical hazard warning. The identification used shall permit cross-referencing to the laboratory's MSDS collection.

10.3 Evaluation of Potential Hazards

Departments shall evaluate the degree of risk arising from exposure to chemical, physical and biological agents. Evaluation involves making a judgment based on observation and measurement of the magnitude of these agents. Evaluation also involves determining:

- a. Toxicity and quantity of chemical agents;
- b. Routes of entry;
- c. Possibility of reaction with another agent (either chemical or physical);
- d. Duration of employee exposure;
- e. Levels of energy or air contaminants arising from a process or work operation (exposure determination); and
- f. Effectiveness of any control measures used.

10.4 Exposure Control

- a. Departments shall ensure that no employee is exposed to levels of hazardous materials greater than or equal to the Action Levels. In the absence of Action Levels, exposure shall not exceed the Permissible Exposure Level (PEL) (see Appendix G for a list of Cal/OSHA PELs).
- b. Departments shall take steps necessary to eliminate or reduce to the lowest practical level, employee exposure to airborne contaminants. This may be done by controlling the amount of the contaminant in the employee's breathing zone, by reducing the amount of time an employee spends in the exposure area, or by some other means.

10.5 Types of Control Measures

- a. Departments shall install control measures, the selection of which will depend on the nature of the harmful substance or agent and its routes of entry into the body.

- b. Control measures are divided into the following categories:
 - 1. Engineering Controls - Methods of controlling employee exposures by modifying the source or reducing the quantity of contaminants released into the workroom environment (e.g., exhaust hoods, glove boxes).
 - 2. Administrative Controls - Methods of controlling employee exposures to contaminants by job rotation, work assignment or time periods away from the contaminant. Although administrative control measures can limit the duration of individual exposures, they are not generally favored by industry because they are difficult to implement and maintain.
 - 3. Personal Protective Equipment - Personal protective equipment includes respirators and other protective equipment/devices. These are usually considered secondary to the use of engineering control methods.

10.6 Selection

Departments shall always attempt to first design safety into a potentially hazardous process. Only when engineering controls are determined to be insufficient shall administrative controls, personal protective equipment and other corrective measures be considered to achieve permissible levels of exposure.

10.7 Review and Updating

Because hazards may change over time, departments shall continually review and update health hazard control measures as necessary.

11.0 CONTROL MEASURES

11.1 General Laboratory Ventilation

- a. The University shall provide general laboratory ventilation systems that:
 - 1. Comply with the American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook of Fundamental Guidelines; the State Building Standards Code, Title 24, Part 2, California Code of Regulations; and Section 5142, Title 8, California Code of Regulations;
 - 2. Operate continuously during working hours;
 - 3. Provide a source of air for breathing and for input to local ventilation devices;

4. Are not relied on for protection from toxic substances released into the laboratory;
 5. Continually replace air, preventing a build-up of toxic air concentrations during the work day;
 6. Direct air flow into the laboratory from non-laboratory areas and out to the exterior of the building; and
 7. Be inspected at least annually. Problems found during these inspections shall be corrected within a reasonable time.
- b. General ventilation shall only be used when local exhaust systems are impractical.
 - c. General ventilation rates within a given workplace shall not only be calculated based on Threshold Limit Values (TLVs), but also on other factors, such a type and location of air diffusers, location of people in the room, and relative toxicity of the vapor.
 - d. The University shall alter the ventilation system only after thorough testing has indicated that worker protection from airborne toxic substances will continue to be adequate.

11.2 Local Exhaust Ventilation

- a. The University shall only use local exhaust ventilation systems when every effort has been made to control the contaminant by isolation, a change in the process, or by substitution of a less harmful material.
- b. Local exhaust systems shall be the proper method of contaminant control if:
 1. air samples show that the contaminant in the atmosphere constitutes a health, fire, or explosion hazard;
 2. state or city codes require local exhaust ventilation at the particular process (i.e. at grinding or buffing wheels and wood-working machines);
 3. maintenance of laboratory machinery would otherwise be difficult;
 4. marked improvement in housekeeping or employee comfort will result;
 5. emission sources are large, few and fixed and/or widely dispersed;
 6. emission sources are near the employee breathing zone; and
 7. emission rates vary widely by time.

11.3 Exhaust Hoods

The local exhaust hood is the point of air entry into the duct system and includes all suction openings regardless of their shape or mounting arrangement. Local exhaust systems can succeed only when the contaminant is drawn into the hood.

11.4 Flammable Solvent Hazard Control

- a. Departments shall provide for safe handling of flammable liquids, regardless of the quantities involved. Problems associated with each flammable liquid shall be analyzed to determine the extent of flammability and health hazards so that appropriate control measures can be taken.
- b. To control these hazards, departments shall consider the characteristics of the specific liquid, the amounts of vapor involved, potential ignition sources, the kinds of operations, unsafe temperature, ventilation and type of building construction.
- c. The EH&S Office or designated competent individuals shall determine the necessity of safeguarding electrical equipment; ventilation requirements; the need for eliminating sparks, open flames and other sources of ignition; safe material handling procedures; proper grounding procedures; and other factors promoting the maintenance of a safe environment (see National Electrical Code, NFPA 70, Chapter 5, Article 500).
- d. Departments shall obtain and use proper safety devices to protect workers from the hazards associated with flammable liquids.

11.5 Emergency Eyewashes and Safety Showers

- a. Location
 1. Emergency eyewash facilities and safety showers shall be installed in accessible locations that require no more than 10 seconds for the injured person to reach in accordance with ANSI Z358.1 - 1981 and CCR, Title 8, Section 5162 specifications.
 2. If both an eyewash and shower are needed, they shall be located so that both can be used at the same time.
 3. The area of the eyewash and shower equipment shall be maintained free of items which obstruct their use.
- b. Performance

1. The control valve shall be designed so that the water flow remains on without requiring the use of the operator's hands, and so that the valve remains activated until intentionally shut off.
 2. Personal eyewash units shall deliver potable water or other eye-flushing solution approved by the consulting physician.
- c. Maintenance
1. Plumbed eyewash and shower equipment shall be activated at least monthly to flush the line and to verify proper operation.
 2. Other units shall be maintained in accordance with the manufacturer's instructions.

12.0 SPECIAL CONTROL MEASURES FOR PARTICULARLY HAZARDOUS CHEMICALS

Departments shall follow special procedures when performing laboratory work with "select carcinogens" (see Appendix C), reproductive toxins (see Appendix D1), and acutely toxic substances (see Appendix E). Work with particularly hazardous chemicals requires that the following provisions be considered and included where appropriate:

12.1 Designated areas should be posted and their boundaries clearly marked.

- a. These areas must be a restricted access exhaust hood, glove box, or portion of a lab designated for use of the particularly hazardous substances, for which all people with access are aware of the substances being used and necessary precautions.
- b. Only those persons with demonstrated knowledge and ability to work with particularly hazardous chemicals shall work with chemicals in the designated area.

12.2 Containment devices, such as fume hoods or glove boxes, shall be used when handling particularly hazardous chemicals which are volatile; when procedures involve manipulations that may result in the generation of an aerosol or airborne dust; and with any manipulation, handling, or reaction that may result in the uncontrollable release of the substance.

12.3 Safety procedures for removal of contaminated wastes shall be used.

12.4 Design decontamination procedures based on laboratory circumstances.

13.0 HAZARDOUS OPERATION APPROVAL PROCEDURES

13.1 Prior Approval and Review by the Chemical Hygiene Officer

- a. PIs/Laboratory Supervisors shall obtain prior approval when a project or process includes the introduction of hazards into the laboratory environment or when existing hazards are discovered or suspected.

- b. Prior approval is required:
 1. When it is likely that the PEL for the chemical (see Appendix G) could be exceeded; or
 2. When members of the laboratory staff become ill, suspect that they or others have been exposed to a chemical, or otherwise suspect a failure of any safeguards.

- c. Prior approval should be considered:
 1. At the start of a new procedure, process or test (even if it is very similar to older practice);
 2. At the restart of an idle project or process;
 3. At the scale-up or scale down of a project or process;
 4. Whenever there is a change (addition, deletion or substitution) in raw materials;
 5. Whenever there is a change in the location of the procedure, process or test;
 6. Whenever there is a change in personnel;
 7. Whenever there is a change in toxicological data (and a new hazard is recognized);
 8. When an unforeseen event occurs (and a new hazard is recognized);
 9. Whenever there is an equipment or instrumentation modification (and a new hazard is introduced into the work environment); or
 10. Whenever an existing hazard is discovered or suspected.

13.2 Approval Procedure

- a. The request for approval shall be made by submitting a proposal to the Chemical Hygiene Officer for review.
- b. The proposal shall include:
 1. Description of the project, process or test;
 2. Hazardous materials that will be used (MSDSs for each material);
 3. Specification of the safety precautions to be used at each step of the process;
 4. Employee exposure hazard;
 5. Control measures (engineering, administrative and/or personal protective equipment);
 6. Flow sheet of the process showing the equipment that will be used;
 7. The handling procedure of the products, by-products, and waste materials; and
 8. Location of the project, process or test.
- c. The Chemical Hygiene Officer shall review each proposal as needed.
- d. If the project or process is approved, the project requestor and the Chemical Hygiene Officer shall meet to ensure that all hazards, prescribed safety procedures and control measures of the project are known. The project requestor and/or PI shall ensure workplace controls are in place prior to starting a new procedure. If there is a potential for an employee exposure, monitoring shall be conducted by the EH&S Office in the beginning phases of the new procedure to ensure exposures are below permissible levels.

14.0 ENVIRONMENTAL MONITORING AND EMPLOYEE EXPOSURE DETERMINATION

14.1 Environmental Monitoring

Regular monitoring of airborne concentrations is not usually justified or practical in laboratories but may be appropriate when testing or redesigning hoods or other ventilation devices or when a highly toxic substance is stored or used regularly (e.g., three times per week).

14.2 Employee Exposure Determination

a. Initial Monitoring

Initial monitoring and measurement shall be conducted if there is reason to believe that exposure levels for a substance exceed the Action Level (or in the absence of the Action Level, the Permissible Exposure Limit (PEL)).

b. Periodic Monitoring

Periodic monitoring shall be conducted in all areas where chemical exposure has been shown to exceed the Action Level (or in the absence of the Action Level, the PEL). Monitoring will be performed in accordance with the applicable Cal/OSHA, OSHA, NIOSH, and EPA standards.

c. Termination of Monitoring

Monitoring may be terminated when exposures are reduced to an appropriate level in accordance with the applicable standards.

d. Exposure Determination

Monitoring needs will be identified during laboratory safety inspections. In addition, if there is a risk or concern of potential employee overexposure, the EH&S Office will evaluate exposures on a case by case basis.

15.0 EMPLOYEE INFORMATION AND TRAINING

15.1 Frequency of Training

Employees shall be informed and trained on the hazards of chemicals present in the work area. Such information shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new hazardous chemical and/or new laboratory work procedures.

15.2 Employee Information

Employees shall be informed of the following:

- a. The content of the Chemical Hygiene Plan (CHP) and its appendices which shall be made available to employees.
- b. The location and availability of the CHP.

1. Master copies of the CHP will be kept by the Deans, Directors, Department Chairs and Department Heads responsible for laboratory areas, and the EH&S Office.
 2. The CHP will be available for review during normal work hours and additional copies may be distributed to employees, as appropriate.
- c. The exposure limits for Cal/OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable Cal/OSHA regulation. The following guides can be used to obtain this information:
1. Cal/OSHA Airborne Contaminants (see Appendix G for Cal/OSHA's list);
 2. Material Safety Data Sheets;
 3. NIOSH Pocket Guide to Chemicals; and
 4. ACGIH Threshold Limit Values and Biological Exposure Indices.
- d. Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory. This information can be found in the MSDSs for the chemical(s) in use.
- e. The location and availability of known reference materials on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, MSDSs received from the chemical supplier.

15.3 Employee Training

Employee training shall include:

- a. Methods and observations that may be used to detect the presence or release of a hazardous chemical (i.e. monitoring conducted by the EH&S Office, continuous monitoring devices, visual appearance or odor of hazardous chemicals, etc.);
- b. The physical and health hazards of chemicals in the work area;
- c. The measures employees can take to protect themselves from these hazards, including specific procedures the University has implemented to protect employees from exposure to hazardous chemicals (i.e. appropriate work practices, emergency procedures, personal protective equipment, etc.); and
- d. Applicable details of the Chemical Hygiene Plan.

16.0 MEDICAL MONITORING

The University Medical Monitoring Program is designed to provide safe placement of employees, maintenance of employee health and to ascertain the effectiveness of hazard control methods. Certain laboratory workers who work with hazardous chemicals shall be provided an opportunity to receive medical consultation and examination. Employees who meet specific criteria shall be provided appropriate medical consultation and exams at no cost to the employees, without loss of pay and at a reasonable time and place.

17.0 RECORDKEEPING

Records relating to occupational injuries and illnesses, medical surveillance, exposure monitoring, inspections and other activities and incidents relevant to occupational safety and health shall be kept by the EH&S Office and various departments, committees and designed PIs and laboratory supervisors. Detailed responsibilities and procedures are contained in the Section 14.0 of the University Injury and Illness Prevention Program Manual.

18.0 EMPLOYEE ACCESS TO EXPOSURE AND MEDICAL RECORDS

Procedures for employee access to occupational safety and health related records is contained in Section 15.0 of the University Injury and Illness Prevention Program Manual.

APPENDIX A

Glossary of Common Toxic Agents

GLOSSARY OF COMMON TOXIC AGENTS

Acutely toxic chemicals are substances falling into one of the following categories:

- A chemical that has a median lethal dose (LD₅₀) of 50 milligrams or less per kilogram of body weight, when administered to albino rats weighing 200g to 300g each; or
- A chemical that has a median lethal dose (LD₅₀) of 2000 milligrams or less per kilogram of body weight, when administered by continuous contact for 24 hours, (or less if death occurs within 24 hours), to the bare skin of albino rabbits weighing 200g to 300g each; or
- A chemical that has a median lethal concentration (LC₅₀) in air of 200 parts per million by volume, or less, of gas, or vapor, or 2 milligrams per liter or less, of mist, fume, or dust, when administered by continuous inhalation for one hour, (or less if death occurs within one hour), to albino rats weighing 200g to 300g each.

Anesthetics have a depressant effect upon the central nervous system, particularly the brain.

Asphyxiants fall into one of two categories:

Simple Asphyxiants deprive the tissue of oxygen. Simple asphyxiants are inert gases that displace oxygen.

Chemical Asphyxiants render the body incapable of maintaining an adequate oxygen supply. They are active at very low concentrations (few ppm).

Carcinogens are any agents that can initiate or speed the development of malignant or potentially malignant tumors, malignant neoplastic proliferation of cells, or cells that possess such material.

A *select carcinogen* is any substance that meets one of the following criteria:

- It is regulated by OSHA as a carcinogen;
- It is listed under the category, "known to be carcinogens" in the National Toxicology Program (NTP), "Annual Report of Carcinogens" (latest edition);
- It is listed under Group 1, "carcinogenic to humans" by the International Agency for Research on Cancer Monographs (IARC);
- It is listed under Group 2A or 2B by IARC or under the category "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals according to any of the following criteria:
 - a. After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime, to doses of less than 10 mg/m³;

- b. After repeated skin application of 300 mg/kg of body weight per week;
- c. After oral doses of less than 50 mg/kg of body weight per day.

Hematopoietic agents act on the blood or bone marrow. The blood cells can be directly affected or the bone marrow can be damaged.

Hepatotoxic agents cause damage to the liver.

Irritants are materials that cause inflammation of the body surface with which they come in contact. The inflammation results from concentrations far below those needed to cause corrosion. Irritants can also cause changes in the mechanics of respiration and lung function.

A *primary irritant* exerts no systemic toxic action, either because the products formed on the tissue of the respiratory tract are non-toxic or because the irritant action is more severe than any systemic toxic action.

A *secondary irritant's* effect on mucous membranes is overshadowed by a systemic effect resulting from absorption.

Mutagens affect the chromosome chains of exposed cells. The effect is hereditary and becomes part of the genetic pool passed on to future generations.

Nephrotoxic agents damage the kidneys.

Neurotoxic agents damage the nervous system. The nervous system is especially sensitive to organometallic compounds and certain sulfide compounds.

Pulmonary agents produce damage in the tissue of the lungs but not by immediate irritant action. Fibrotic changes can be caused by free silica and asbestos. Other dusts can cause a restrictive disease called pneumoconiosis.

Reproductive hazards are chemicals that affect the reproductive capabilities including chromosomal damage (mutagens) and effects on the fetus (teratogens).

Sensitizers cause a majority of the exposed population to develop an allergic reaction in normal tissue after repeated exposure to the chemical. The reaction may be as mild as a rash (contact dermatitis) or as serious as anaphylactic shock.

Teratogens (embryotoxic or fetotoxic agent) are agents that interfere with normal embryonic development without damage to the mother or lethal effect on the fetus. Effects are not hereditary.

APPENDIX B

Recommendations Concerning Chemical Hygiene in Laboratories

Recommendations Concerning Chemical Hygiene in Laboratories

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Foreword

As guidance for each employer's development of an appropriate laboratory Chemical Hygiene Plan, the following recommendations are provided. They were extracted from "Prudent Practices for Handling Hazardous Chemicals in Laboratories" (referred to below as "Prudent Practices"), which was published in 1981 by the National Research Council and is available from the National Academy Press, 2101 Constitution Ave., NW., Washington DC 20418.

"Prudent Practices" is cited because of its wide distribution and acceptance and because of its preparation by members of the laboratory community through the sponsorship of the National Research Council. However, none of the recommendations given here will modify any requirements of the laboratory regulation. This document merely presents pertinent recommendations from "Prudent Practices," organized into a form convenient for quick reference during development and application of a Chemical Hygiene Plan. Users of this document should consult "Prudent Practices" for a more extended presentation and justification for each recommendation.

"Prudent Practices" deals with both safety and chemical hazards while the laboratory regulation is concerned primarily with chemical hazards. Therefore, only those recommendations directed primarily toward control of toxic exposures are cited in this document, with the term "chemical hygiene" being substituted for the word "safety." However, since conditions producing or threatening physical injury often pose toxic risks as well, page references concerning major categories of safety hazards in the laboratory are given in section F.

The recommendations from "Prudent Practices" have been paraphrased, combined, or otherwise reorganized, and headings have been added. However, their sense has not been changed.

Corresponding Sections of the Regulation and this Document

The following table is given for the convenience of those who are developing a Chemical Hygiene Plan which will satisfy the requirements of subsection 5191(e). It indicates those sections of this document which are most pertinent to each of the sections of subsection 5191(e) and related paragraphs.

<i>Paragraph and topic in laboratory standard</i>	<i>Relevant section</i>
(e) (3) (A) Standard operating procedures for handling toxic chemicals.	C, D, E
(e) (3) (B) Criteria to be used for implementation of measures to reduce exposures.	D
(e) (3) (C) Fume hood performance.	C4b
(e) (3) (D) Employee information and training (including emergency procedures).	D10, D9
(e) (3) (E) Requirements for prior approval of laboratory activities.	E2b, E4b
(e) (3) (F) Medical consultation and medical examinations.	D5, E4f

(e) (3) (G) Chemical hygiene responsibilities.

B

(e) (3) (H) Special precautions for work with particularly hazardous substances.

E2, E3, E4

In this document, those recommendations directed primarily at administrators and supervisors are given in sections A - D. Those recommendations of primary concern to employees who are actually handling laboratory chemicals are given in section E. (Reference to page numbers in “Prudent Practices” are given in parentheses.)

A. General Principles for Work with Laboratory Chemicals

In addition to the more detailed recommendations listed below in sections B-E, “Prudent Practices” expresses certain general principles, including the following:

1. It is prudent to minimize all chemical exposures. Because few laboratory chemicals are without hazards, general precautions for handling all laboratory chemicals should be adopted, rather than specific guidelines for particular chemicals (2,10). Skin contact with chemicals should be avoided as a cardinal rule (198).
2. Avoid underestimation of risk. Even for substances of no known significant hazard, exposure should be minimized; for work with substances which present special hazards, special precautions should be taken (10, 37, 38). One should assume that any mixture will be more toxic than its most toxic component (30, 103) and that all substances of unknown toxicity are toxic (3, 34).
3. Provide adequate ventilation. The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by use of hoods and other ventilation devices (32, 198).
4. Institute a chemical hygiene program. A mandatory chemical hygiene program designed to minimize exposures is needed; it should be a regular, continuing effort, not merely a standby or short-term activity (6,11). Its recommendations should be followed in academic teaching laboratories as well as by full-time laboratory workers (13).
5. Observe the exposure limits and TLVs. The Exposure limits of Cal/OSHA and the Threshold Limit Values of the American Conference of Governmental Industrial Hygienists should not be exceeded (13).

B. Chemical Hygiene Responsibilities

Responsibility for chemical hygiene rests at all levels (6, 11, 21) including the:

1. Chief executive officer, who has ultimate responsibility for chemical hygiene within the institution and must, with other administrators, provide continuing support for institutional chemical hygiene (7, 11).
2. Supervisor of the department or other administrative unit, who is responsible for chemical hygiene in that unit (7).
3. Chemical hygiene officers, whose appointment is essential (7) and who must:
 - (a) Work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices (7);
 - (b) Monitor procurement, use, and disposal of chemicals used in the lab (8).;
 - (c) See that appropriate audits are maintained (8);

- (d) Help project directors develop precautions and adequate facilities (10);
 - (e) Know the current legal requirements concerning regulated substances (50); and
 - (f) Seek ways to improve the chemical hygiene program (8, 11).
4. Laboratory supervisor, who has overall responsibility for chemical hygiene in the laboratory (21) including responsibility to:
 - (a) Ensure that workers know and follow the chemical hygiene rules, that protective equipment is available and in working order, and that appropriate training has been provided (21, 22);
 - (b) Provide regular, formal chemical hygiene and housekeeping inspections including routine inspections of emergency equipment (21, 171);
 - (c) Know the current legal requirements concerning regulated substances (50, 231);
 - (d) Determine the required levels of protective apparel and equipment (156, 160, 162); and
 - (e) Ensure that facilities and training for use of any material being ordered are adequate (215).
 5. Project director or director of other specific operation, who has primary responsibility for chemical hygiene procedures for that operation (7).
 6. Laboratory worker, who is responsible for:
 - (a) Planning and conducting each operation in accordance with the institutional and chemical hygiene procedures (7, 21, 22, 230); and
 - (b) Developing good personal chemical hygiene habits (22).

C. The Laboratory Facility

1. Design. The laboratory facility should have:
 - (a) An appropriate general ventilation system (see C4 below) with air intakes and exhausts located so as to avoid intake of contaminated air (194);
 - (b) Adequate, well-ventilated stockrooms/storerooms (218, 219).
 - (c) Laboratory hoods and sinks (12, 162);
 - (d) Other safety equipment including eyewash fountains and drench showers (162, 169); and
 - (e) Arrangements for waste disposal (12, 240).
2. Maintenance. Chemical-hygiene-related equipment (hoods, incinerator, etc.) should undergo continual appraisal and be modified if inadequate (11, 12).
3. Usage. The work conducted (10) and its scale (12) must be appropriate to the physical facilities available and, especially, to the quality of ventilation (13).
4. Ventilation
 - (a) General laboratory ventilation. This system should; Provide a source of air for breathing and for input to local ventilation devices (199); it should not be relied on for protection from toxic substances released into the laboratory (198); ensure that laboratory air is continually replaced, preventing increase of air concentrations of toxic substances during the working day (194); direct air flow into the laboratory from non-laboratory areas and out to the exterior of the building (194).
 - (b) Hoods. A laboratory hood with 2.5 linear feet of hood space per person should be provided for every 2 workers if they spend most of their time working with

- chemicals (199); each hood should have a continuous monitoring device to allow convenient confirmation of adequate hood performance before use (200, 209). If this is not possible, work with substances of unknown toxicity should be avoided (13) or other types of local ventilation devices should be provided (199). See pp. 201-206 for a discussion of hood design, construction, and evaluation.
- (c) Other local ventilation devices. Ventilated storage cabinets, canopy hoods, snorkels, etc. should be provided as needed (199). Each canopy hood and snorkel should have a separate exhaust duct (207).
 - (d) Special ventilation areas. Exhaust air from glove boxes and isolation rooms should be passed through scrubbers or other treatment before release into the regular exhaust system (208). Cold rooms and warm rooms should have provisions for rapid escape and for escape in the event of electrical failure (209);
 - (e) Modifications. Any alteration of the ventilation system should be made only if thorough testing indicates that worker protection from airborne toxic substances will continue to be adequate (12, 193, 204).
 - (f) Performance. Rate: 4-12 room air changes/hour is normally adequate general ventilation if local exhaust systems such as hoods are used as the primary method of control (194).
 - (g) Quality. General air flow should not be turbulent and should be relatively uniform throughout the laboratory, with no high velocity or static areas (194, 195); airflow into and within the hood should not be excessively turbulent (200); hood face velocity should be adequate (typically 60-100 fpm) (200, 204).
 - (h) Evaluation. Quality and quantity of ventilation should be evaluated on installation (202), regularly monitored (at least every 3 months) (6, 12, 14, 195), and reevaluated whenever a change in local ventilation devices is made (12, 195, 207). See pp 195-198 for methods of evaluation and for calculation of estimated airborne contaminant concentrations.

D. Components of the Chemical Hygiene Plan

1. Basic Rules and Procedures (Recommendations for these are given in section E, below)
2. Chemical Procurement, Distribution, and Storage
 - (a) Procurement. Before a substance is received, information on proper handling, storage, and disposal should be known to those who will be involved (215, 216). No container should be accepted without an adequate identifying label (216). Preferably, all substances should be received in a central location (216).
 - (b) Stockrooms/storerooms. Toxic substances should be segregated in a well-identified area with local exhaust ventilation (221). Chemicals which are highly toxic (227) or other chemicals whose containers have been opened should be in unbreakable secondary containers (219). Stored chemicals should be examined periodically (at least annually) for replacement, deterioration, and container integrity (218-19). Stockrooms/storerooms should not be used as preparation or repackaging areas, should be open during normal working hours, and should be controlled by one person (219).

- (c) Distribution. When chemicals are hand carried, the container should be placed in an outside container or bucket. Freight-only elevators should be used if possible (223).
- (d) Laboratory storage. Amounts permitted should be as small as practical. Storage on bench tops and in hoods is inadvisable. Exposure to heat or direct sunlight should be avoided. Periodic inventories should be conducted, with unneeded items being discarded or returned to the storeroom/stockroom (225-6, 229).
- 3. Environmental Monitoring. Regular instrumental monitoring of airborne concentrations is not usually justified or practical in laboratories but may be appropriate when testing or redesigning hoods or other ventilation devices (12) or when a highly toxic substance is stored or used regularly (e.g., 3 times/week) (13).
- 4. Housekeeping, Maintenance, and Inspections
 - (a) Cleaning. Floors should be cleaned regularly (24).
 - (b) Inspections. Formal housekeeping and chemical hygiene inspections should be held at least quarterly (6, 21) for units which have frequent personnel changes and semiannually for others; informal inspections should be continual (21).
 - (c) Maintenance. Eye wash fountains should be inspected at intervals of not less than 3 months (6). Respirators for routine use should be inspected periodically by the laboratory supervisor (169). Safety showers should be tested routinely (169). Other safety equipment should be inspected regularly, (e.g., every 3-6 months) (6, 24, 171). Procedures to prevent restarting of out-of-service equipment should be established (25).
 - (d) Passageways. Stairways and hallways should not be used as storage areas (24). Access to exits, emergency equipment, and utility controls should never be blocked (24).
- 5. Medical Program
 - (a) Compliance with regulations. Regular medical surveillance should be established to the extent required by regulations (12).
 - (b) Routine surveillance. Anyone whose work involves regular and frequent handling of toxicologically significant quantities of a chemical should consult a qualified physician to determine on an individual basis whether a regular schedule of medical surveillance is desirable (11, 50).
 - (c) First aid. Personnel trained in first aid should be available during working hours and an emergency room with medical personnel should be nearby (173). See pp. 176-178 for description of some emergency first aid procedures.
- 6. Protective Apparel and Equipment. These should include for each laboratory:
 - (a) Protective apparel compatible with the required degree of protection for substances being handled (158-161);
 - (b) An easily accessible drench-type safety shower (162, 169);
 - (c) An eyewash fountain (162);
 - (d) A fire extinguisher (162-164);
 - (e) Respiratory protection (164-9), fire alarm and telephone for emergency use (162) should be available nearby; and
 - (f) Other items designated by the laboratory supervisor (156, 160).
- 7. Records
 - (a) Accident records should be written and retained (174).

- (b) Chemical Hygiene Plan records should document that the facilities and precautions were compatible with current knowledge and regulations (7).
 - (c) Inventory and usage records for high-risk substances should be kept as specified in sections E3e below.
 - (d) Medical records should be retained by the institution in accordance with the requirements of state and federal regulations (12).
8. Signs and Labels
- Prominent signs and labels of the following types should be posted:
- (a) Emergency telephone numbers of emergency personnel/facilities, supervisors, and laboratory workers (28);
 - (b) Identity labels, showing contents of containers (including waste receptacles) and associated hazards (27, 48);
 - (c) Location signs for safety showers, eyewash stations, other safety and first aid equipment, exits (27) and areas where food and beverage consumption and storage are permitted (24); and
 - (d) Warnings at areas or equipment where special or unusual hazards exist (27).
9. Spills and Accidents
- (a) A written emergency plan should be established and communicated to all personnel; it should include procedures for ventilation failure (200), evacuation, medical care, reporting, and drills (172).
 - (b) There should be an alarm system to alert people in all parts of the facility including isolation areas such as cold rooms (172).
 - (c) A spill control policy should be developed and should include consideration of prevention, containment, cleanup, and reporting (175).
 - (d) All accidents or near accidents should be carefully analyzed with the results distributed to all who might benefit (8, 28).
10. Information and Training Program
- (a) Aim: To ensure that all individuals at risk are adequately informed about the work in the laboratory, its risks, and what to do if an accident occurs (5, 15).
 - (b) Emergency and Personal Protection Training: Every laboratory worker should know the location and proper use of available protective apparel and equipment (154, 169). Some of the full-time personnel of the laboratory should be trained in the proper use of emergency equipment and procedures (6). Such training as well as first aid instruction should be available to (154) and encouraged for (176) everyone who might need it.
 - (c) Receiving and stockroom/storeroom personnel should know about hazards, handling equipment, protective apparel, and relevant regulations (217).
 - (d) Frequency of Training: The training and education program should be a regular, continuing activity - not simply an annual presentation (15).
 - (e) Literature/Consultation: Literature and consulting advice concerning chemical hygiene should be readily available to laboratory personnel, who should be encouraged to use these information resources (14).
11. Waste Disposal Program.
- (a) Aim: to ensure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals (5).

- (b) Content (14, 232, 233, 240): The waste disposal program should specify how waste is to be collected, segregated, stored, and transported and include consideration of what materials can be incinerated. Transport from the institution must be in accordance with DOT regulations (244).
- (c) Discarding Chemical Stocks: Unlabeled containers of chemicals and solutions should undergo prompt disposal; if partially used, they should not be opened (24, 27). Before a worker's employment in the laboratory ends, chemicals for which that person was responsible should be discarded or returned to storage (226).
- (d) Frequency of Disposal: Waste should be removed from laboratories to a central waste storage area at least once per week and from the central waste storage area at regular intervals (14).
- (e) Method of Disposal: Incineration in an environmentally acceptable manner is the most practical disposal method for combustible laboratory waste (14, 238, 241). Indiscriminate disposal by pouring waste chemicals down the drain (14, 231, 242) or adding them to mixed refuse for landfill burial is unacceptable (14). Hoods should not be used as a means of disposal for volatile chemicals (40, 200). Disposal by recycling (233, 243) or chemical decontamination (40, 230) should be used when possible.

E. Basic Rules and Procedures for Working with Chemicals.

The Chemical Hygiene Plan should require that laboratory workers know and follow its rules and procedures. In addition to the procedures of the sub programs mentioned above, these should include the rules listed below.

1. General Rules

The following should be used for essentially all laboratory work with chemicals:

- (a) Accidents and spills - Eye Contact: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention (33, 172). Ingestion: Encourage the victim to drink large amounts of water (178). Skin Contact: Promptly flush the affected area with water (33, 172, 178). and remove any contaminated clothing (172, 178). If symptoms persist after washing, seek medical attention (33). Clean-up: Promptly clean up spills, using appropriate protective apparel and equipment and proper disposal (24, 33). See pp., 233-237 for specific clean-up recommendations.
- (b) Avoidance of "routine" exposure: Develop and encourage safe habits (23); avoid unnecessary exposure to chemicals by any route (23). Do not smell or taste chemicals (32). Vent apparatus which may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices (199). Inspect gloves (157) and test glove boxes (208) before use. Do not allow release of toxic substances in cold rooms and warm rooms, since these have contained recirculated atmospheres (209).
- (c) Choice of chemicals: Use only those chemicals for which the quality of the available ventilation system is appropriate (13).
- (d) Eating, smoking, etc.: Avoid eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present (22, 24, 32, 40); wash hands before conducting these activities (23, 24). Avoid storage,

- handling, or consumption of food or beverages in storage areas, refrigerators, glassware or utensils which are also used for laboratory operations (23, 24, 226).
- (e) Equipment and glassware: Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware (25). Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur (25). Use equipment only for its designed purpose (23, 26).
 - (f) Exiting: Wash areas of exposed skin well before leaving the laboratory (23).
 - (g) Horseplay: Avoid practical jokes or other behavior which might confuse, startle or distract another worker (23).
 - (h) Mouth suction: Do not use mouth suction for pipetting or starting a siphon (23, 32).
 - (i) Personal apparel: Confine long hair and loose clothing (23, 158). Wear shoes at all times in the laboratory but do not wear sandals, perforated shoes, or sneakers (158).
 - (j) Personal housekeeping: Keep the work area clean and uncluttered, with chemicals and equipment being properly labeled and stored; clean up the work area on completion of an operation or at the end of each day (24).
 - (k) Personal protection: Assure that appropriate eye protection (154-156) is worn by all persons, including visitors, where chemicals are stored or handled (22, 23, 33, 154). Wear appropriate gloves when the potential for contact with toxic materials exists (157); inspect the gloves before each use, wash them before removal, and replace them periodically (157). (A table of resistance to chemicals of common glove materials is given p. 159). Use appropriate (164-168) respiratory equipment when air contaminant concentrations are not sufficiently restricted by engineering controls (164-5), inspecting the respirator before use (169). Use any other protective and emergency apparel and equipment as appropriate (22, 157-162). Avoid use of contact lenses in the laboratory unless necessary; if they are used, inform supervisor so special precautions can be taken (155). Remove laboratory coats immediately on significant contamination (161).
 - (l) Planning: Seek information and advice about hazards (7), plan appropriate protective procedures, and plan positioning of equipment before beginning any new operation (22, 23).
 - (m) Unattended operations: Leave lights on, place an appropriate sign on the door, and provide for containment of toxic substances in the event of failure of a utility service (such as cooling water) to an unattended operation (27, 128).
 - (n) Use of hood: Use the hood for operations which might result in release of toxic chemical vapors or dust (198-9). As a rule of thumb, use a hood or other local ventilation device when working with any appreciably volatile substance with a TLV of less than 50 ppm (13). Confirm adequate hood performance before use; keep hood closed at all times except when adjustments within the hood are being made (200); keep materials stored in hoods to a minimum and do not allow them to block vents or air flow (200). Leave the hood "on" when it is not in active use if toxic substances are stored in it or if it is uncertain whether adequate general laboratory ventilation will be maintained when it is "off" (200).

- (o) Vigilance: Be alert to unsafe conditions and see that they are corrected when detected (22).
 - (p) Waste disposal: Assure that the plan for each laboratory operation includes plans and training for waste disposal (230). Deposit chemical waste in appropriately labeled receptacles and follow all other waste disposal procedures of the Chemical Hygiene Plan (22, 24). Do not discharge to the sewer concentrated acids or bases (231); highly toxic, malodorous, or lachrymatory substances (231); or any substances which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage or obstruct flow (242).
 - (q) Working alone: Avoid working alone in a building; do not work alone in a laboratory if the procedures being conducted are hazardous (28).
2. Working with Allergens and Embryotoxins
- (a) Allergens (examples: diazomethane, isocyanates, bichromates): Wear suitable gloves to prevent hand contact with allergens or substances of unknown allergenic activity (35).
 - (b) Embryotoxins (34-5) (examples: organomercurials, lead compounds, formamide): If you are a woman of childbearing age, handle these substances only in a hood whose satisfactory performance has been confirmed, using appropriate protective apparel (especially gloves) to prevent skin contact. Review each use of these materials with the research supervisor and review continuing uses annually or whenever a procedural change is made. Store these substances, properly labeled, in an adequately ventilated area in an unbreakable secondary container. Notify supervisors of all incidents of exposure or spills; consult a qualified physician when appropriate.
3. Work with Chemicals of Moderate Chronic or High Acute Toxicity
Examples: diisopropylfluorophosphate (41), hydrofluoric acid (43), hydrogen cyanide (45). Supplemental rules to be followed in addition to those mentioned above (Procedure B of "Prudent Practices," pp. 39-41):
- (a) Aim: To minimize exposure to these toxic substances by any route using all reasonable precautions (39).
 - (b) Applicability: These precautions are appropriate for substances with moderate chronic or high acute toxicity used in significant quantities (39).
 - (c) Location: Use and store these substances only in areas of restricted access with special warning signs (40, 229). Always use a hood (previously evaluated to confirm adequate performance with a face velocity of at least 60 linear feet per minute) (40) or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance (39); trap released vapors to prevent their discharge with the hood exhaust (40).
 - (d) Personal protection: Always avoid skin contact by uses of gloves and long sleeves (and other protective apparel as appropriate) (39). Always wash hands and arms immediately after working with these materials (40).
 - (e) Records: Maintain records of the amounts of these materials on hand, amounts used, and the names of the workers involved (40, 229).
 - (f) Prevention of spills and accidents: Be prepared for accidents and spills (41). Ensure that at least 2 people are present at all times if a compound in use is highly

- toxic or of unknown toxicity (39). Store breakable containers of these substances in chemically resistant trays; also work and mount apparatus above such trays or cover work and storage surfaces with removable, absorbent, plastic backed paper (40). If a major spill occurs outside the hood, evacuate the area; assure that cleanup personnel wear suitable protective apparel and equipment (41).
- (g) Waste: Thoroughly decontaminate or incinerate contaminated clothing or shoes (41). If possible, chemically decontaminate by chemical conversion (40). Store contaminated waste in closed, suitably labeled, impervious containers (for liquids, in glass or plastic bottles half-filled with vermiculite) (40).
4. Work with Chemicals of High Chronic Toxicity (Examples: dimethylmercury and nickel carbonyl (48), benzo-a-pyrene (51), N-nitrosodiethylamine (54), other human carcinogens or substances with high carcinogenic potency in animals (38).) Further supplemental rules to be followed, in addition to all these mentioned above, for work with substances of known high chronic toxicity (in quantities above a few milligrams to a few grams, depending on the substance) (47). (Procedure A of "Prudent Practices" pp, 47-50).
- (a) Access: Conduct all transfers and work with these substances in a "controlled area": a restricted access hood, glove box, or portion of a lab, designated for use of highly toxic substances, for which all people with access are aware of the substances being used and necessary precautions (48).
- (b) Approvals: Prepare a plan for use and disposal of these materials and obtain the approval of the laboratory supervisor (48).
- (c) Non-contamination/Decontamination: Protect vacuum pumps against contamination by scrubbers or HEPA filters and vent them into the hood (49). Decontaminate vacuum pumps or other contaminated equipment, including glassware, in the hood before removing them from the controlled area (49, 50). Decontaminate the controlled area before normal work is resumed there (50).
- (d) Exiting: On leaving a controlled area, remove any protective apparel (placing it in an appropriate, labeled container) and thoroughly wash hands, forearms, face, and neck (49).
- (e) Housekeeping: Use a wet mop or a vacuum cleaner equipped with a HEPA filter instead of dry sweeping if the toxic substance was a dry powder (50).
- (f) Medical surveillance: If using toxicologically significant quantities of such a substance on a regular basis (e.g., 3 times per week), consult a qualified physician concerning desirability of regular medical surveillance (50).
- (g) Records: Keep accurate records of the amounts of these substances stored (229) and used, the dates of use, and names of users (48).
- (h) Signs and labels: Assure that the controlled area is conspicuously marked with warning and restricted access signs (49) and that all containers of these substances are appropriately labeled with identity and warning labels (48).
- (i) Spills: Assure that contingency plans, equipment, and materials to minimize exposures of people and property in case of accident are available (233-4).
- (j) Storage: Store containers of these chemicals only in a ventilated, limited access (48, 227, 229) area in appropriately labeled, unbreakable, chemically resistant, secondary containers (48, 229).

- (k) Glove boxes: For a negative pressure glove box, ventilation rate must be at least 2 volume changes/hour and pressure at least 0.5 inches of water (48). For a positive pressure glove box, thoroughly check for leaks before each use (49). In either case, trap the exit gases or filter them through a HEPA filter and then release them into the hood (49).
 - (l) Waste: Use chemical decontamination whenever possible; ensure that containers of contaminated waste (including washings from contaminated flasks) are transferred from the controlled area in a secondary container under the supervision of authorized personnel (49, 50, 233).
5. Animal Work with Chemicals of High Chronic Toxicity
- (a) Access: For large scale studies, special facilities with restricted access are preferable (56).
 - (b) Administration of the toxic substance: When possible, administer the substance by injection or gavage instead of in the diet. If administration is in the diet, use a caging system under negative pressure or under laminar air flow directed toward HEPA filters (56).
 - (c) Aerosol suppression: Devise procedures which minimize formation and dispersal of contaminated aerosols, including those from food, urine, and feces (e.g., use HEPA filtered vacuum equipment for cleaning, moisten contaminated bedding before removal from the cage, mix diets in closed containers in a hood) (55, 56).
 - (d) Personal protection: When working in the animal room, wear plastic or rubber gloves, fully buttoned laboratory coat or jumpsuit and, if needed because of incomplete suppression of aerosols, other apparel and equipment (shoe and head coverings, respirator) (56).
 - (e) Waste disposal: Dispose of contaminated animal tissues and excreta by incineration if the available incinerator can convert the contaminant to non-toxic products (238); otherwise, package the waste appropriately for burial in an EPA-approved site (239).

F. Safety Recommendations

The above recommendations from “Prudent Practices” do not include those which are directed primarily toward prevention of physical injury rather than toxic exposure. However, failure of precautions against injury will often have the secondary effect of causing toxic exposures. Therefore, we list below page references for recommendations concerning some of the major categories of safety hazards which also have implications for chemical hygiene:

1. Corrosive agents: (35-6)
2. Electrically powered laboratory apparatus: (179-92)
3. Fires, explosions: (26, 57-74, 162-64, 174-5, 219-20, 226-7)
4. Low temperature procedures: (26, 88)
5. Pressurized and vacuum operations (including use of compressed gas cylinders): (27, 75-101)

G. Safety Data Sheets

Safety data sheets are presented in “Prudent Practices” for the chemicals listed below. (Asterisks denote that comprehensive safety data sheets are provided).

- *Acetyl peroxide (105)
- *Acrolein (106)
- *Acrylonitrile (107)
- Ammonia (anhydrous) (91)
- *Aniline (109)
- *Benzene (110)
- *Benzo[a]pyrene (112)
- *Bis(chloromethyl) ether (113)
- Boron trichloride (91)
- Boron trifluoride (92)
- Bromine (114)
- *Tert-butyl hydroperoxide (148)
- *Carbon disulfide (116)
- Carbon monoxide (92)
- *Carbon tetrachloride (118)
- *Chlorine (119)
- Chlorine trifluoride (94)
- *Chloroform (121)
- Chloromethane (93)
- *Diethyl ether (122)
- Diisopropyl fluorophosphate (41)
- *Dimethylformamide (123)
- *Dimethyl sulfate (125)
- *Dioxane (126)
- *Ethylene dibromide (128)
- *Fluorine (95)
- *Formaldehyde (130)
- *Hydrazine and salts (132)
- Hydrofluoric acid (43)
- Hydrogen bromide (98)
- Hydrogen chloride (98)
- *Hydrogen cyanide (133)
- *Hydrogen sulfide (135)
- Mercury and compounds (52)
- *Methanol (137)
- *Morpholine (138)
- *Nickel carbonyl (99)
- *Nitrobenzene (139)
- Nitrogen dioxide (100)
- N-nitrosodiethylamine (54)
- *Peracetic acid (141)
- *Phenol (142)
- *Phosgene (143)
- *Pyridine (144)
- *Sodium azide (145)
- *Sodium cyanide (147)
- Sulfur dioxide (101)
- *Trichloroethylene (149)
- *Vinyl chloride (150)

APPENDIX C

NIOSH Carcinogen List

NIOSH CARCINOGEN LIST

The following is a list of substances NIOSH (National Institute for Occupational Safety and Health) considers to be potential occupational carcinogens.

A number of the carcinogen classifications deal with groups of substances: aniline and homologs, chromates, dinitrotoluenes, arsenic and inorganic arsenic compounds, beryllium and beryllium compounds, cadmium compounds, nickel compounds, and crystalline forms of silica. There are also substances of variable or unclear chemical makeup that are considered carcinogens, coal tar pitch volatiles, coke oven emissions, diesel exhaust and environmental tobacco smoke.

Some of the potential carcinogens listed in this index may be re-evaluated by NIOSH as new data become available and the NIOSH recommendations on these carcinogens either as to their status as a potential occupational carcinogen or as to the appropriate recommended exposure limit may change.

Acetaldehyde
2-Acetylaminofluorene
Acrylamide
Acrylonitrile
Aldrin
4-Aminodiphenyl
Amitrole
Aniline and homologs
o-Anisidine
p-Anisidine
Arsenic and inorganic arsenic compounds
Arsine
Asbestos
Asphalt fumes
Benzene
Benzidine
Benzidine-based dyes
Beryllium
Butadiene
tert-Butyl chromate; class, chromium hexavalent
Cadmium dust and fume
Captan
Carbon black (exceeding 0.1% PAHs)
Carbon tetrachloride
Chlordane
Chlorinated camphene
Chlorodiphenyl (42% chlorine); class polychlorinated biphenyls
Chlorodiphenyl (54% chlorine); class polychlorinated biphenyls
Chloroform
Chloromethyl methyl ether
bis(Chloromethyl) ether
B-Chloroprene
Chromium, hexavalent [Cr(VI)]
Chromyl chloride; class, chromium hexavalent
Chrysene

Coal tar pitch volatiles; class, coal tar products
Coke oven emissions
DDT (dichlorodiphenyltrichloroethane)
Di-2-ethylhexyl phthalate (DEHP)
2,4-Diaminoanisole
o-Dianisidine-based dyes
1,2-Dibromo-3-chloropropane (DBCP)
Dichloroacetylene
p-Dichlorobenzene
3,3'-Dichlorobenzidine
Dichloroethyl ether
1,3-Dichloropropene
Dieldrin
Diesel exhaust
Diglycidyl ether (DGE); class, glycidyl ethers
4-Dimethylaminoazobenzene
Dimethyl carbomoyl chloride
1,1-Dimethylhydrazine; class, hydrazines
Dimethyl sulfate
Dinitrotoluene
Dioxane
Environmental tobacco smoke
Epichlorohydrin
Ethyl acrylate
Ethylene dibromide
Ethylene dichloride
Ethylene oxide
Ethyleneimine
Ethylene thiourea
Formaldehyde
Gallium arsenide
Gasoline
Heptachlor
Hexachlorobutadiene
Hexachloroethane
Hexamethyl phosphoric triamide (HMPA)
Hydrazine
Kepone
Malonaldehyde
Methoxychlor
Methyl bromide; class, monohalomethanes
Methyl chloride
Methylhydrazine
Methyl iodide; class, monohalomethanes
Methyl hydrazine; class, hydrazines
4,4'-Methylenebis(2-chloroaniline) (MBOCA)
Methylene chloride
4,4-Methylenedianiline (MDA)
a-Naphylamine
B-Naphylamine
Nickel, metal, soluble, insoluble, and inorganic; class, nickel, inorganic
Nickel carbonyl
Nickel sulfide roasting
4-Nitrobiphenyl
p-Nitrochlorobenzene
2-Nitronaphthalene

2-Nitropropane
N-Nitrosodimethylamine
Pentachloroethane; class, chloroethanes
N-Phenyl-*b*-naphthylamine; class, *b*-naphthalene
Phenyl glycidyl ether; class, glycidyl ethers
Phenylhydrazine; class, hydrazines
Propane Sultone
B-Propiolactone
Propylene dichloride
Propylene imine
Propylene oxide
Radon
Rosin core solder, pyrolysis products (containing formaldehyde)
Silica, crystalline cristobalite
Silica, crystalline quartz
Silica, crystalline Tripoli
Silica, crystalline tridymite
Silica, fused
Soapstone, total dust silicates
Tremolite silicates
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD) (dioxin)
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
Titanium dioxide
o-Tolidine-based dyes
o-Tolidine
Toluene diisocyanate (TDI)
Toluene diamine (TDA)
o-Toluidine
p-Toluidine
1,1,2-Trichloroethane; class, chloroethanes
Trichloroethylene
1,2,3-Trichloropropane
Uranium, insoluble compounds Uranium, soluble compounds
Vinyl bromide; class, vinyl halides
Vinyl chloride
Vinyl cyclohexene dioxide
Vinylidene chloride (1,1-dichloroethylene); class, vinyl halides
Welding fumes, total particulates
Wood dust
Zinc chromate; class, chromium hexavalent

APPENDIX D1
Reproductive Hazards

Reproductive Hazards

Following is a listing of materials and substances that are given as having teratogenic and/or mutagenic properties, and/or are suspected or known as hazards to reproductive health (both male and female).

Keep in mind that there are MANY common lab chemicals whose properties have not been fully investigated, and that this list is not necessarily inclusive of all substances and mixtures that could have undesirable effects on human reproduction and reproductive organs. On the other hand, the presence of any of these or other teratogenic materials in your lab does not mean that you have been exposed, nor that you are likely to experience teratogenic or embryotoxic effects. **ALL** chemicals can be handled safely; some simply require more care in handling than others. For detailed information on how to handle the matter of pregnancy in the lab, please see Appendix D2 "Pregnant Women in Laboratories".

- Abovis
- Acebutolol
- Acebutolol hydrochloride
- Acemetacin
- Acepreval
- Acetaldehyde
- Acetamide
- 5-Acetamide-1,3,4-thiadiazole-2-sulfonamide
- Acetazolamide sodium
- Acetic acid methyl nitrosaminomethyl ester
- Acetohydroxamic acid
- Acetonitrile
- 3-(alpha-Acetyl-para-nitrobenzyl)-4-hydroxy-coumarin
- para-Acetophenetidine
- 17-Acetoxy-19-nor-17-alpha-pregn-4-en-20-yn-3-one
- Acetoxyphenylmercury
- Acetoxytriphenylstannane
- 1-alpha-Acetylmethadol hydrochloride
- Acetylsalicylic acid
- Acetyltryptophan
- Acid red 92
- 4-(9-Acridinylamino) methanesulphon-meta-anisidide
- Acrylic acid
- Acrylonitrile
- Actihaemyl
- Actinomycin
- Actinomycin C
- Actinomycin D
- Acyclovir
- Acyclovir sodium salt
- Adalat
- 1-Adamantanamine hydrochloride
- Adapin
- Adenine
- Adenosine-3'-(alpha-amino-p-methoxyhydrocinnamamido)-3'-deoxy-N,N-dimethyl

- Adipic acid bis (2-ethylhexyl) ester
- Adipic acid dibutyl ester
- Adipic acid di(2-hexyloxyethyl) ester
- Adobiol
- Adona trihydrate
- 1-Adrenaline chloride
- Adrenocorticotrophic hormone
- Adriamycin
- Aflatoxin
- Aflatoxin B1
- Afridol blue
- Agent orange
- Alclometasone dipropionate
- Alcohol sulphate
- Aldactazide
- Aldecin
- Aldimorph
- Aldrin
- alpha-Alkenesulfonic acid
- Alkyl dimethylbenzyl ammonium chloride
- 3-(Alkylamino) propionitrile
- Alkylbenzenesulfonate
- Allantoxanic acid, potassium salt
- Alloxan
- Allyl chloride
- Allyl glucosinolate
- Allyl isothiocyanate
- 6-Allyl-6,7-dihydro-5h-dibenz (c,e) azepine phosphate
- Allylestrenol
- (4-Allyloxy-3-chlorophenyl)acetic acid
- Alternariol
- Alternariol monomethyl ether and alternariol (1:1)
- Alternariol-9-methyl ether
- Aluminum aceglutamide
- Aluminum chloride
- Aluminum chloride hexahydrate
- Aluminum lactate
- Aluminium (III) nitrate, nonahydrate (1:3:9)
- Aluminium potassium sulfate, dodecahydrate
- Ambroxol hydrochloride
- Ametycin
- Amfenac sodium monohydrate
- Amicardine
- N1-Amidinosulfanilamide
- Amidoline
- 5-((2-Aminoacetamido) methyl)-1-(4-chloro-2-(orthochlorobenzoyl) phenyl) -N,N-dimethyl-1H-S-triazole-3-carboxamide, hydrochloride, dihydrate
- Aminoacetonitrile bisulfate
- Aminoacetonitrile sulfate
- 2-Aminobenzimidazole
- 2-Amino-6-benzimidazolyl phenylketone
- Aminobenzylpenicillin
- 5-Amino-1-bis (dimethylamide) phosphoryl-3-phenyl-1,2,4- triazole
- 2-Amino-5-bromo-6-phenyl-4 (1h)-pyrimidinone

- 4-Amino-2-(4-butanoylhexahydro-1h-1,4-diazepin-1-yl)-6,7- dimethoxyquinazoline hydrochloride
- 2-Amino-5-butylbenzimidazole
- 5-Amino-1,6-dihydro-7h-v-triazolo (4,5-d) pyrimidin-7-one
- 3-(2-aminoethyl) indol-5-ol
- 3-(2-aminoethyl) indol-5-ol creatinine sulfate
- trans-4-Aminoethylcyclohexane-1-carboxylic acid
- Aminoglutethimide
- 2-Amino-3-hydroxybenzoic acid
- 8-Amino-7-hydroxy-3,6-naphthalenedisulfonic acid, sodium salt
- 4-Amino-N-(6-methoxy-3-pyridazinyl)-benzenesulfonamide
- 3-Amino-4-methylbenzenesulfonylcyclohexylurea
- 2-Amino-6-(1,-methyl-4,-nitro-5,-imidazolyl) mercaptopurine
- 1-(4-Amino-2-methylpyrimidin-5-yl)methyl-3-(2-chloroethyl)-3- nitrosoourea
- 2-Amino-4-(methylsulfinyl) butyric acid
- 5-Amino-2-naphthalenesulfonic acid sodium salt
- 6-Aminonicotinamide
- 2-Amino-4-nitroaniline
- 4-Amino-2-nitroaniline
- Aminonucleoside puromycin
- meta-Aminophenol
- 2-Aminophenol
- 4-Aminophenol
- meta-Aminophenol, chlorinated
- 7-(d-alpha-aminophenylacetamido) desacetoxycephalosporanic acid
- 3-Aminopropionitrile
- beta-Aminopropionitrile fumarate
- Aminopropyl aminoethylthiophosphate
- 3-(2-Aminopropyl) indole
- Aminopteridine
- 2-Aminopurine-6-thiol
- Aminopyrine sodium sulfonate
- Aminopyrine-barbital
- 5-Amino-2-beta-d-ribofuranosyl-as-triazin-3- (2H) -one
- 4-Amino-2,2,5,5-tetrakis (trifluoromethyl) -3-imidazoline
- 2-Amino-1,3,4-thiadiazole
- 2-Amino-1,3,4-thiadiazolehydrochloride
- 2-Amino-1,3,4-thiadiazole-5-sulfonamide sodium salt
- 1-Amino-2-(4-thiazolyl)-5-benzimidazolecarbamic acid isopropyl ester
- Amitriptyline-N-oxide
- Amitrole
- Ammonium vanadate
- Amosulalol hydrochloride
- Amoxicillin trihydrate
- dl-Amphetamine sulfate
- Ampicillin trihydrate
- Amrinone
- Amsacrine lactate
- Amygdalin
- Anabasine
- Anatoxin I
- Androctonus amoreuxi venom
- Androfluorene
- Androfurazanol

- Androstanazol
- Androstenediol dipropionate
- Androstenedione
- Androstenolone
- Androstestone-M
- Angel dust
- Angiotonin
- Anguidin
- Aniline violet
- 6-(para-anilinosulfonyl) metanilamide
- 2-Anthracenamine
- Antibiotic BB-K8
- Antibiotic BB-K8 sulfate
- Antibiotic BL-640
- Antibiotic MA 144A1
- Antimony oxide
- Apholate
- 9-beta-d-Arabino furanosyl adenine
- Arabinocytidine
- Ara-C palmitate
- Araten phosphate
- Arathane
- 1-Arginine monohydrochloride
- Aristocort
- Aristocort acetonide
- Aristocort diacetate
- Aristolic acid
- Aristospan
- Aromatol
- Arotinoic acid
- Arotinoic methanol
- Arotinoid ethyl ester
- Arsenic
- ortho-Arsenic acid
- Arsenic acid, disodium salt, heptahydrate
- Arsenic acid, sodium salt
- Arsenic trioxide
- Asalin
- 1-Ascorbic acid
- 1-Asparaginase
- Atrazine
- Atromid S
- Atropine
- Atropine sulfate (2:1)
- Auranofin
- Aureine
- 1-Aurothio-d-glucopyranose
- Ayush-47
- Azabicyclane citrate
- Azactam
- Azacytidine
- Azaserine
- Azathioprine

- Azelastine hydrochloride
- 1-2-Azetidinecarboxylic acid
- Azinphos methyl
- Azo blue
- Azo ethane
- Azosemide
- Azoxyethane
- Azoxymethane
- Baccidal
- Bacmecillinam
- Bal
- Barbitol sodium
- Barium ferrite
- Barium fluoride
- Bayer 205
- Baythion
- Befunolol hydrochloride
- Bendacort
- Bendadryl hydrochloride
- Benedectin
- Benomyl
- Benzarone
- d-Benzedrine sulfate
- Benzenamine hydrochloride
- Benzene
- Benzene hexachloride-g-isomer
- 1-Benzhydryl-4-(2-(2-hydroxyethoxy)ethyl)piperazine
- Benzidamine hydrochloride
- 2-Benzimidazolecarbamic acid
- 1-(2-Benzimidazolyl)-3-methylurea
- 1,2-Benzisothiazol-3 (2H)-one-1,1-dioxide
- 1,2-Benzisoxazole-3-methanesulfonamide
- Benzo (alpha) pyrene
- Benzo (e) pyrene
- Benzoctamine hydrochloride
- para-Benzoquinone monoimine
- Benzothiazole disulfide
- 2-Benzothiazolethiol
- 2-Benzothiazolyl-N-morpholinosulfide
- 2-(meta-Benzoylphenyl) propionic acid
- 2-Benzylbenzimidazole
- Benzyl chloride
- Benzyl penicillinic acid sodium salt
- Beryllium chloride
- Beryllium oxide
- Bestrabucil
- Betamethasone
- Betamethasone acetate and betamethasone phosphate
- Betamethasone benzoate
- Betamethasone dipropionate
- Betamethasone disodium phosphate
- Betel nut
- Betnelan phosphate

- BHT (food grade)
- Bindon ethyl ether
- Binocide
- 4-Biphenylacetic acid
- 2-Biphenylol
- 2-Biphenylol, sodium salt
- 3-(4-Biphenylcarbonyl) propionic acid
- 2,2-Bipyridine
- Bis(para-acetoxyphenyl)-2-methylcyclohexylidenemethane
- 4,4-Bis(1-amino-8-hydroxy-2,4-disulfo-7-naphthylazo)-3,3,- bitolyl,tetrasodium salt
- 1,4-Bis(3-bromopropionyl)-piperazine
- 1,3-Bis(carbamoylthio)-2-(N,N-dimethylamino)propane hydrochloride
- trans-N,N,-Bis(2-chlorobenzyl)-1,4 cyclohexanebis (methylamine) dihydrochloride
- Bis(2-chloroethyl) amine hydrochloride
- 4,-(Bis (2-chloroethyl) amino) acetanilide
- 4,-(Bis (2-chloroethyl) amino)-2-fluoro acetanilide
- dl-3-(para-(Bis (2-chloroethyl) amino) phenyl)alanine
- Bis(beta-chloroethyl) methylamine
- Bis(2-chloroethyl) methylamine hydrochloride
- Bis (2-chloroethyl) sulfide
- N,N,-Bis (2-chloroethyl)-N-nitrosourea
- N,N,-Bis (2-chloroethyl)-para-phenylenediamine
- Bis (para-chlorophenyl) acetic acid
- 2,2-Bis (ortho, para-chlorophenyl)-1,1,1-trichloroethane
- 1,1-Bis (para-chlorophenyl)-2,2,2-trichloroethanol
- Bis (beta-cyanoethyl) amine
- Bis (dichloroacetyl) -1,8-diaminooctane
- 3,5-Bis-dimethylamino-1,2,4-dithiazolium chloride
- Bis (dimethyldithiocarbamate) zinc
- (((3,5-Bis(1,1-dimethylethyl)-4-hydroxyphenyl)methyl)thio)acetic acid 2-ethylhexyl ester
- Bis (dimethylthiocarbamoyl) sulfate
- 2,4-Bis (ethylamino)-6-chloro-s-triazine
- Bis (ethylmercuri) phosphate
- Bis-HM-A-TDA
- Bishydroxycoumarin
- Bis (4-hydroxy-3-coumarin) acetic acid ethyl ester
- 1,4-Bis ((2- ((2-hydroxyethyl) amino) ethyl) amino)-9,10- atracenedione diacetate
- Bis (isooctyloxycarbonylmethylthio) dioctyl stannane
- Bis (2-methoxy ethyl) ether
- Bisphenol A
- 1,4-Bis (phenyl amino) benzene
- Bis (tributyl tin) oxide
- 2-(3,5-Bis (trifluoromethyl) phenyl) -N-methyl- hydrazinecarbothioamide (9CI)
- Bladex
- Bleomycin sulfate
- Bomt
- Bracken fern, dried
- Bradykinin
- Bredinin
- Bremfol
- Bromacil
- Bromazepam
- Bromocriptine

- Bromocriptine mesilate
- 5-Bromo-2, -deoxyuridine
- 2-Bromo-d-lysergic acid diethylamide
- 6-Bromo-1,2-naphthoquinone
- Bromoperidol
- Bromophenophos
- 4-Bromophenyl chloromethyl sulfone
- Buclizine dihydrochloride
- Budesonide
- Bunitrolol hydrochloride
- Buprenorphine hydrochloride
- 1,3-Butadiene
- Butamate citrate
- 1,4-Butanediamine
- 1,4-Butanediol dimethyl sulfonate
- 4-Butanolide
- Butobarbital
- Butoctamide semisuccinate
- Butorphanol tartrate
- Butoxybenzyl hyoscyamine bromide
- 2-Butoxyethanol
- para-Butoxyphenylacetohydroxamic acid
- Butriptyline
- Bromoperidol
- Bromophenophos
- 4-Bromophenyl chloromethyl sulfone
- Buclizine dihydrochloride
- Budesonide
- Bunitrolol hydrochloride
- Buprenorphine hydrochloride
- 1,3-Butadiene
- Butamate citrate
- 1,4-Butanediamine
- 1,4-Butanediol dimethyl sulfonate
- 4-Butanolide
- Butobarbital
- Butoctamide semisuccinate
- Butorphanol tartrate
- Butoxybenzyl hyoscyamine bromide
- 2-Butoxyethanol
- para-Butoxyphenylacetohydroxamic acid
- Butriptyline
- n-Butyl acetate
- n-Butyl alcohol
- sec-Butyl alcohol
- tert-Butyl alcohol
- alpha,-((tert-Butyl amino) methyl) -4-hydroxy-meta-xylene- alpha,alpha-diol
- Butyl carbamate
- Butyl carbobutoxymethyl phthalate
- Butyl dichlorophenoxyacetate
- Butyl ethyl acetic acid
- Butyl flufenamate
- n-Butyl glycidyl ether

- n-Butyl mercaptan
- n-Butyl-3,ortho-acetyl-12-b-13-alpha-dihydrojervine
- 1-(tert-Butylamino)-3-(2-chloro-5-methylphenoxy) -2-propanol hydrochloride
- alpha-Butylbenzenemethanol
- 5-Butyl-2-benzimidazolecarbamic acid methyl ester
- 5-Butyl-1-cyclohexylbarbituric acid
- 2-sec-Butyl-4,6-dinitrophenol
- 4-Butyl-1,2-diphenyl-3,5-dioxo pyrazolidine
- n-Butyl-N-nitroso-1-butamine
- N-Butyl-N-nitroso ethyl carbamate
- n-Butylnitrosourea
- 1-Butyl-2',6'-pipercoloxylidide
- 1-Butyl-3-sulfanilyl urea
- 1-Butyl-3-(para-tolyl sulfonyl) urea
- 1-Butyl-3-(para-tolylsulfonyl) urea, sodium salt
- Butyl-2,4,5-trichlorophenoxyacetate
- 1-Butyryl-4-(phenylallyl) piperazine hydrochloride
- Buzepide methiodide
- Cadmium
- Cadmium (II) acetate
- Cadmium chloride
- Cadmium chloride, dihydrate
- Cadmium compounds
- Cadmium oxide
- Cadmium sulfate (1:1)
- Cadmium sulfate (1:1) hydrate (3:8)
- Cadralazine
- Caffeic acid
- Caffeine
- Calcium ELIA complex
- Calcium fluoride
- Calcium phosphonomycin hydrate
- Calcium trisodium diethylene triamine pentaacetate
- Calcium valproate
- Calcium-N-2-ethylhexyl-beta-oxybutyramide semisuccinate
- Cambendazole
- Camphorated oil
- Candida albicans glycoproteins
- Cannabidiol
- Cannabinol
- Cannabis
- Cap
- Caprolactam
- Captafol
- Captan
- Carbamates
- Carbaryl
- Carbendazim and sodium nitrite (5:1)
- Carbidopa
- Carbinilic acid isopropyl ester
- Carbofuran
- Carbon dioxide
- Carbon disulfide

- Carbon monoxide
- Carbon tetrachloride
- Carboprost tromethamine
- Cargutocin
- Carmetizide
- Carmofur
- 1-Carnitine hydrochloride
- Carnosine
- Carzinophilin
- Cassava, manihot utilissima
- Catatoxic steroid No. 1
- d-Catechol
- CAZ pentahydrate
- Cefamandole sodium
- Cefatoxime sodium
- Cefazedone
- Cefazolin sodium salt
- Cefmetazole
- Cefmetazole sodium
- Cefroxadin
- Cefuroxim
- Celestan-depot
- Cellryl
- Cellulose acetate monophthalate
- Centbucridine hydrochloride
- Centchroman
- Cephalothin
- Cervagem
- Cesium arsenate
- Cethylamine hydrofluoride
- alpha-Chaconine
- Chenodeoxycholic acid
- Chlodithane
- Chlorambucil
- Chloramphenicol
- Chloramphenicol monosuccinate sodium salt
- Chloramphenicol palmitate
- Chlorcyclizine hydrochloride
- Chlorcyclizine hydrochloride A
- Chlorcyclohexamide
- Chlordane
- Chlorimipramine
- Chlorinated camphene
- Chlorinated dibenzo dioxins
- Chlorisopropamide
- Chlormadinon
- para-Chloro dimethylaminoazobenzene
- 2-Chloroadenosine
- 1-(3-Chloroallyl) -3,5,7-triaza-1-azoniaadamantane chloride
- 3-Chloro-4-aminoaniline
- 1-((para-(2-(Chloro-ortho-anisamido)ethyl)phenyl)sulfonyl)-3- cyclohexyl urea
- Chlorobenzene
- ortho-Chlorobenzylidene malononitrile

- 1-para-Chlorobenzyl-1H-indazole-3-carboxylic acid
- 7-Chloro-5-(ortho-chlorophenyl)-1,3-dihydro-3-hydroxy-2H-1,4- benzodiazepin-2-one
- Chlorocycline
- 6-Chloro-5-Cyclohexyl-1-indancarboxylic acid
- 6-Chloro-5-(2,3-dichlorophenoxy)-2-methylthio-benzimidazole
- 5-Chloro-2-(2-(diethylamino)ethoxy)benzanilide
- 7-Chloro-1,3-dihydro-5-phenyl,2H-1,4-benzodiazepin-2-one
- Chloroethyl mercury
- 1-(2-Chloroethyl)-3-cylcohexyl-1-nitrosourea
- 1-Chloro-3-ethyl-1-penten-4-YN-3-OL
- Chloroform
- 4-Chloro-N-furfuryl-5-sulfamoylanthranilic acid
- Chlorogenic acid
- endo-4-Chloro-N-(hexahydro-4,7-methanoisindol-2-YL)-3- sulfamoylbenzamide
- (-)-N-((5-Chloro-8-hydroxy-3-methyl-1-OXO-7-isochromanyl) carbonyl)-3-phenylalanine
- 5-Chloro-7-iodo-8-quinolinol
- (4-Chloro-2-methylphenoxy) acetic acid
- 2-(4-Chloro-2-methylphenoxy) propanoic acid (R) (9CI)
- 4-Chloro-2-methylphenoxy-alpha-propionic acid
- 7-Chloro-1-methyl-5-phenyl-1H-1,5-benzodiazepine-2,4(3H,5H)-dione
- 2-Chloro-11-(4-methylpiperazino) dibenzo (b,f) (1,4) thiazepine
- 4-((5-Chloro-2-OXO-3(2H)-benzothiazolyl)acetyl)-1- piperazineethanol
- 4-(3-(2-Chlorophenothiazin-10-YL)propyl)-1-piperazineethanol
- 4-Chlorophenylalanine
- 1-(para-Chloro-alpha-phenylbenzyl)-4-(2-((2-hydroxyethoxy) ethyl)piperazine)
- 1-(meta-Chlorophenyl)-3-N,N-dimethylcarbamoyl-5-methoxypyrazole
- 3-(para-Chlorophenyl)-1,1,dimethylurea
- 5,(2-Chlorophenyl)-7-ethyl-1-methyl-1,3-dihydro-2H-thieno (2,3-e) (1,4) diazepin-2-one
- N-3-Chlorophenylisopropylcarbamate
- 3-(4-Chlorophenyl)-1-methoxy-1-methylurea
- 2-(ortho-Chlorophenyl)-2-(methylamino)cyclohexanone hydrochloride
- 3-(para-Chlorophenyl)-1-methyl-1-(1-methyl-2-propynyl) urea
- 4-(para-Chlorophenyl)-2-phenyl-5-thiazoleacetic acid
- 1-(para-Chlorophenylsulfonyl)-3-propylurea
- para-Chlorophenyl-2,4,5-trichlorophenyl sulfone
- 4-Chlorophenyl-2,4,5-trichlorophenylazosulfide mixed with 1,1- bis(4-chlorophenyl)ethanol
- Chloropromazine
- Chloropromazine hydrochloride
- Chloroquine
- Chloroquine diphosphate
- N-(3-Chloro-ortho-tolyl) anthranilic acid
- 2-((4-Chloro-ortho-tolyl)oxy)propionic acid potassium salt
- Chloro(triethylphosphine)gold
- Chlorovinylarsine dichloride
- 4-Chloro-3,5-xlenol
- Chlorphentermine
- g-(4-(para-Chlorphenyl)-4-hydroxiperidino)-para- fluorbutyrophenone
- Cholecalciferol
- Cholesterol
- Cholestyramine
- Chorionic gonadotropin
- Chromium chloride
- Chromium (VI) oxide (1:3)

- Chromium trichloride hexahydrate
- Chromomycin A3
- C.I. 45405
- C.I. Direct blue 1, tetrasodium salt
- C.I. Direct blue 6, tetrasodium salt
- C.I. Direct blue 14, tetrasodium salt
- C.I. Direct blue 15, tetrasodium salt
- Cilostazol
- Cinoxacin
- Citreoviridin
- Citrinin
- Citrus hystrix DC., fruit peel extract
- Clavacin
- Clindamycin-2-palmitate monohydrochloride
- Clindamycin-2-phosphate
- Cloazepam
- Clobetasone butyrate
- Cloconazole hydrochloride
- Clofedanol hydrochloride
- Clofexamide phenylbutazone
- Clomiphene
- racemic-Clomiphene citrate
- trans-Clomiphene citrate
- Clonidine hydrochloride
- Clonixic acid
- Cloxazolazepam
- Clozapine
- Coagulase
- Cobalt (II) chloride
- Corn oil
- Corticosterone
- Corticosterone acetate
- Cortisol
- Cortisone
- Cortisone-21-acetate
- Cottonseed oil (unhydrogenated)
- Coumarin
- Cravetin
- meta-Cresol
- Cumoesterol
- S-1-Cyano-2-hydroxy-3-butene
- Cyanotrimethylandrostenolone
- Cycasin
- Cyclocytidine hydrochloride
- Cycloguanyl
- Cyclohexanamine hydrochloride
- Cycloheximide
- Cyclohexylamine
- Cyclohexylamine sulfate
- 2-(Cyclohexylamino)ethanol
- N-Cyclohexyl-2-benzothiazolesulfenamide
- 4-(4-Cyclohexyl-3-chlorophenyl)-4-oxobutyric acid
- 1-Cyclohexyl-3-para-tolysulfonylurea

- Cyclonite
- Cyclopamine
- Cyclophosphamide hydrate
- Cyclophosphoramide
- alpha-Cyclopiazonic acid
- 5-(Cyclopropylcarbonyl)-2-benzimidazolecarbamic acid methyl ester
- Cyprosterone acetate
- Cysteine-germanic acid
- Cytochalasin B
- Cytochalasin E
- Cytostasan
- Cytochal alcohol
- Cytoxyl amine
- Demeton-O + Demeton-S
- Demeton-O-methyl
- Demetrin
- Denopamine
- 11-Deoxo-12-beta,13-alpha-dihydro-11-alpha-hydroxyjervine
- 11-Deoxojervine-4-EN-3-one
- 2,-Deoxy-5-fluorouridine
- 2-Deoxyglucose
- 2,-Deoxy-5-iodouridine
- 4-Deoxypyridoxol hydrochloride
- Dephosphate bromofenofos
- Depofemin
- Depo-medrate
- N-Desacetylthiocolchicine
- Desoxymetasone
- 2-Desoxyphenobarbital
- Detergents, Liquid containing AES
- Detergents, Liquid containing LAS
- Dexamethasone acetate
- Dexamethasone 17,21-dipropionate
- Dexamethasone palmitate
- Dextran 1
- Dextran 70
- Dextropropoxyphene napsy
- alpha-DFMO
- Diabenor
- Diacetylmorphine hydrochloride
- Dialifor
- Diamicron
- 2,4-Diamino-6-methyl-5-phenylpyrimidine
- 2,4-Diamino-5-phenyl-6-ethylpyrimidine
- 2,4-Diamino-5-phenyl-6-propylpyrimidine
- 2,4-Diamino-5-phenylpyrimidine
- 2,5-Diaminotoluene dihydrochloride
- Diazepam
- Diazinon
- 6-Diazo-5-oxonorleucine
- Diazoxide
- Dibekacin
- 5H-Dibenz (b,f) azepine-5-carboxamide

- 5H-Dibenz (b,f) azepine, 3-chloro-5- (3- (4-carbamoyl-4- piperidinopiperine
- Dibenz (b,f) (1,4) oxazepine
- Dibenzacepin
- Dibenzylidene hydrochloride
- 1,2-Dibromo-3-chloropropane
- 3,5-Dibromo-4-hydroxyphenyl-2-ethyl-3-benzofuranyl ketone
- Dibromomaleinimide
- 1,6-Dibromomannitol
- Dibutyl phthalate
- N,N-Di-n-butylformamide
- Dibutyryl cyclic amp
- Dicarbododecaboranylmethylethyl sulfide
- Dicarbododecaboranylmethylpropyl sulfide
- 1-(2,4-Dichlorbenzyl)indazole-3-carboxylic acid
- Dichloroacetonitrile
- (ortho-((2,6-Dichloroanilino)phenyl) acetic acid sodium salt
- ortho-Dichlorobenzene
- para-Dichlorobenzene
- 4,5-Dichloro-meta-benzenedisulfonamide
- 2,2,-Dichlorobiphenyl
- Dichloro-1,3-butadiene
- 1,4-Dichloro-2-butene
- 2,2-Dichloro-1,1-difluorethyl methyl ether
- 5,5-Dichloro-2,2,-dihydroxy-3,3,-dinitrobiphenyl
- Dichloroethane
- 1,1-Dichloroethane
- 2,3-Dichloro-N-ethylmaleinimide
- Dichloromaleimide
- Dichloro-N-methylmaleimide
- 2,4-Dichloro-4,-nitrodiphenyl ether
- 2,4-Dichlorophenol
- (2,4-Dichlorophenoxy) acetic acid butoxyethyl ester
- (2,4-Dichlorophenoxy) acetic acid dimethylamine
- 4-(2,4-Dichlorophenoxy) butyric acid
- 2-(2,4-Dichlorophenoxy) propionic acid
- (+)-2-(2,4-Dichlorophenoxy) propionic acid
- 3,4-Dichlorophenoxyacetic acid
- 2,4-Dichlorophenoxyacetic acid propylene glycol butyl ether ester
- 2-(2,6-Dichlorophenylamino)-2-imidazoline
- 3,6-Dichloro-2-pyridinecarboxylic acid
- Dichlorvos
- Dicyclohexyl adipate
- Dicyclohexyl-18-crown-6
- Dicyclopentadienyldichlorotitanium
- 7,8-Didehydroretinoic acid
- Dieldrin
- Diethyl carbitol
- Diethyl carbonate
- Diethyl mercury
- Diethyl phthalate
- Diethyl sulfate
- 2-(Diethylamino)-2',6'-acetoxylidide
- 2-Diethylamino-2',6'-acetoxylidide hydrochloride

- ortho-(Diethylaminoethoxy) benzanilide
- 2-(2-(Diethylamino)ethoxy)-5-bromobenzanilide
- 2-(2-(Diethylamino)ethoxy)-2,-chloro-benzanilide
- 2-(2-(Diethylamino)ethoxy)-3,-chloro-benzanilide
- 2-(2-(Diethylamino)ethoxy)-3,-chloro-methylbenzanilide
- (para-2-Diethylaminoethoxyphenyl)-1-phenyl-2-para-anisylethanol
- 1-(2-(Diethylamino)ethyl)reserpine
- 7-Diethylamino-5-methyl-s-triazolo(1,5-alpha) pyrimidine
- N,N-Diethylbenzenesulfonamide
- Diethylcarbamazine
- Diethylcarbamazine acid citrate
- Diethyldiphenyl dichloroethane
- Diethylene glycol
- Diethylene glycol monomethyl ether
- 1,2-Diethylhydrazine
- 1,2-Diethylhydrazine dihydrochloride
- N,N-Diethylsergamide
- N,N-Diethyl-4-methyl-3-oxo-5-alpha-4-azaandrostane-17-beta- carboxamide
- 3,3-Diethyl-1-(meta-pyridyl)triazene
- a,a-Diethyl-(E)-4,4,-stilbenediol bis(dihydrogen phosphate)
- a,a-Diethyl-4,4,-stilbenediol disodium salt
- Diethylstilbesterol
- Diethylstilbestrol dipalmitate
- Diethylstilbestrol dipropionate
- Diflorasone diacetate
- Diflucortolone valerate
- dl-alpha-Difluoromethylornithine
- 5-(2,4-Difluorophenyl) salicylic acid
- Difluprednate
- Digoxin
- Dihydantoin
- Dihydrocodeinone bitartrate
- Dihydrodiethylstilbestrol
- 3,4-Dihydro-6-(4-(3,4-dimethoxybenzoyl)-1-piperazinyl)-2(1H)- quinolinone
- 5,6-Dihydro-N-(3-(dimethylamino)propyl)-11H-dibenz(b,e)azepine
- 10,11-Dihydro-5-(3-(dimethylamino)propyl)-5H-dibenz(b,f)azepine hydrochloride
- 5,6-Dihydro-para-dithiin-2,3-dicarboximide
- 12,b,13,alpha-Dihydrojervine
- 10,11-Dihydro-5-(3-(methylamino)propyl)-5H-dibenz(b,f)azepine hydrochloride
- 1,7-Dihydro-6H-purin-6-one
- 7,8-Dihydroretinoic acid
- Dihydrostreptomycin
- 4-Dihydrotestosterone
- 3-alpha,17-beta-Dihydroxy-5-alpha-androstane
- 3-alpha,7-beta-Dihydroxy-6-beta-cholan-24-OIC acid
- 1 alpha,25-Dihydroxycholecalciferol
- 3,4-Dihydroxy-alpha-((isopropylamino)methyl)benzyl alcohol
- 1-Dihydroxyphenyl-1-alanine
- 1-(-)-3-(3,4-Dihydroxyphenyl)-2-methylaniline
- 17R,21-alpha-Dihydroxy-4-propylajmalanum hydrogen tartrate
- DI(2-Hydroxy-n-propyl) amine
- Diisobutyl adipate
- Diisobutyl phthalate

- alpha-(2-(Diisopropylamino)ethyl)-alpha-phenyl-2- pyridineacetamide
- Dilantin
- Dilaudid
- Diltiazem hydrochloride
- Dimatif
- Dimethoxy ethyl phthalate
- 1,2-Dimethoxyethane
- 3,6-Dimethoxy-4-sulfanilamidopyridazine
- Dimethyl adipate
- O,O-Dimethyl methylcarbamoylmethyl phosphordithioate
- Dimethyl phthalate
- Dimethyl sulfate
- Dimethyl sulfoxide
- O,S-Dimethyl phosphoramidothioate
- N,N-Dimethylacetamide
- O,O-Dimethyl-S-(2-(acetylamino)ethyl) dithiophosphate
- 4-(Dimethylamine)-3,5-XYLYL-N-methylcarbamate
- Dimethylaminoantipyrine
- 4-Dimethylaminoazobenzene
- para-Dimethylaminobenzenediazosodium sulphonate
- 5-(3-(Dimethylamino)propyl)-2-hydroxy-10,11-dihydro-5H- dibenz(b,f)azepine
- 11-(3-Dimethylaminopropylidene-6,11- dihydrodibenzo(b,e)thiepine hydrochloride
- 10-(2-(Dimethylamino)propyl)phenothiazine
- Dimethylbenzanthracene
- 1,1-Dimethylbiguanide
- 1-(2-(1,3-Dimethyl-2-butenylidene)hydrazino)phthalazine
- Dimethyldicetylammonium chloride
- 9,9-Dimethyl-10-dimethylaminopropylacridan hydrogen tartrate
- 6-alpha,21-Dimethylethisterone
- N-(5-(((1,1-Dimethylethyl)amino)sulfonyl)-1,3,4-thiadiazol-2- YL)acetamide monosodium salt
- N,N-Dimethyl-para((para-fluorophenyl)azo)aniline
- Dimethylformamide
- 1,1-Dimethylhydrazine
- 1,2-Dimethylhydrazine
- 2,6-Dimethylhydroquinone
- Dimethylimipramine
- 1,3-Dimethylisothiourea
- 1,3-Dimethylnitrosourea
- 3,3-Dimethyl-1-phenyltriazene
- Dimethylthiomethylphosphate
- N,N-Dimethyl-4-(para-tolylazo)aniline
- 5-(3,3-Dimethyl-1-triazeno)imidazole-4-carboxamide citrate
- 2,6-Dimethyl-4-tridecylmorpholine
- 1,3-Dimethylurea
- 2,4-Dinitroaniline
- 4,6-Dinitro-ortho-cresol ammonium salt
- 2,6-Dinitro-N,N-dipropyl-4-(trifluoromethyl)benzenamine
- 2,4-Dinitrophenol
- 2,4-Dinitrophenol sodium salt
- Dinitrosopiperazine
- Dinitrotoluene
- Dinoprost methyl ester
- Dinoprostone

- n-Dioctyl phthalate
- Dioxane
- meta-Dioxane-4,4-dimethyl
- 1,4-Di-N-oxide of dihydroxymethylquinoxaline
- 1,3-Dioxolane-4-methanol
- 3-(2-(1,3-Dioxo-2-methylindanyl)) glutarimide
- 3-(2-(1,3-Dioxo-2-phenylindanyl)) glutarimide
- 3-(2-(1,3-Dioxo-2-phenyl-4,5,6,7-tetrahydro-4,7- dithiaindanyl)) glutarimide
- 2-(2,6-Dioxopiperiden-3YL)phthalimide
- N-(2,6-Dioxo-3-piperidyl)phthalimidine
- 1,3-Dioxo-2-(3-pyridylmethylene)indan
- Diphenylamine
- Diphenylguanidine
- Diphenylhydantoin and phenobarbital
- 3-(3,3-Diphenylpropylamino)propyl-3',4',5'-trimethoxybenzoate hydrochloride
- Dipropyl adipate
- Diquat
- DI-sec-octyl phthalate
- Disodium ethylene-1,2-bisidithiocarbamate
- Disodium etidronate
- Disodium inosinate
- Disodium methanearsenate
- Disodium molybdate dihydrate
- Disodium phosphonomycin
- Disodium selenate
- Disulfiram
- Dithane M-45
- 2,2-Dithiobis(pyridine-1-oxide)magnesium sulfate trihydrate
- 2,2-Dithiodipyridine-1,1,-dioxide
- Diuron
- alpha-DFMO
- Dobutamine hydrochloride
- Domperidone
- Dopamine
- Dopamine hydrochloride
- Doriden
- Doxifluridine
- Doxycycline
- 1-Dromoran tartrate
- Duazomycin
- Durabolin
- Duricef
- Dydrogesterone
- Dye C
- Econazole nitrate
- Eflornithine hydrochloride
- Elasiomycin
- Elavil
- Elavil hydrochloride
- Elymoclavine
- EM 255
- Emoquil
- Emorfazone

- Enalapril maleate
- Enavid
- Endosulfan
- Endrin
- Enflurane
- Enoxacin
- Epe
- Ephedrine
- Epichlorohydrin
- Epidehydrocholesterin
- 2-alpha,3-alpha-Epithio-5-alpha-androstan-17-beta-OL
- 4,5-Epithiovaleronitrile
- EPN
- Epocelin
- 1,2-Epoxyethylbenzene
- Eraldin
- Ergochrome AA (2,2)-5-beta,6-alpha,10-beta-5',6'-alpha,1-, -beta
- Ergocornine methanesulfonate (salt)
- Ergotamine tartrate
- Ergoterm TGO
- Erythromycin
- Escherichia coli endotoxin
- Escin
- beta-Escin
- Escin, sodium salt
- Estradiol
- Estradiol dipropionate
- Estradiol polyester with phosphoric acid
- Estradiol-17-valerate
- Estradiol-3-benzoate
- Estradiol-3-benzoate mixed with progesterone (1:14 moles)
- Estradiol-17-caprylate
- Estramustin phosphate sodium
- Estra-1,3,5(10)-triene-17-beta-diol-17-tetrahydropyranyl ether
- Estriol
- Estrone
- Ethanolamine
- Ethinamate
- Ethinyl estradiol
- Ethinyl estradiol and norethindrone acetate
- 17-alpha-Ethinyl-5,10-estrenolone
- dl-Ethionine
- Ethisterone and diethylstilbestrol
- 6-Ethoxy-2-benzothiazolesulfonamide
- 2-Ethoxyethanol
- 2-Ethoxyethyl acetate
- Ethyl alcohol
- Ethyl all-trans-9-(4-methoxy-2,3,6-trimethylphenyl)-3,7-dimethyl- 2,4,6,8-nonatetraenoate
- Ethyl apovincaminat
- Ethyl benzene
- Ethyl (2,4-dichlorophenoxy) acetate
- Ethyl fluclozepate
- Ethyl hexylene glycol

- Ethyl methacrylate
- Ethyl methanesulfonate
- Ethyl methyl 1,4-dihydro-2,6-dimethyl-4-(meta-nitrophenyl)-3,5- pyridinedicarboxylate
- Ethyl morphine hydrochloride dihydrate
- Ethyl thiourea
- alpha-((Ethylamino)methyl)-meta-hydroxybenzyl alcohol
- 2-Ethylamino-1,3,4-thiadiazole
- 1-Ethyl-1,4-dihydro-7-methyl-4-oxo-1,8-naphthyridine-3-carboxylic acid
- Ethyl-S-dimethylaminoethyl methylphosphonothiolate
- Ethyl-N,N-dimethyl carbamate
- Ethylene bis(dithiocarbamate)) zinc
- Ethylene chlorohydrin
- 1,2-Ethylene dibromide
- Ethylene dichloride
- Ethylene glycol
- Ethylene glycol diethyl ether
- Ethylene glycol methyl ether
- Ethylene oxide
- Ethylenebis (dithiocarbamate) manganese and zinc acetate (50:1)
- Ethylenediamine hydrochloride
- Ethylenediaminetetraacetic acid
- Ethylenediaminetetraacetic acid, disodium salt
- Ethyleneimine
- Ethylestrenol
- 2-Ethylhexanol
- Ethyl-para-hydroxyphenyl ketone
- Ethylmercuric phosphate
- Ethyl-N-methyl carbamate
- Ethyl-2-methyl-4-chlorophenoxyacetate
- 5-Ethyl-N-methyl-5-phenylbarbituric acid
- 2-Ethyl-2-methylsuccinimide
- 1-Ethyl-4-(2-morpholinoethyl)-3,3-diphenyl-2-pyrrolidinone
- N-Ethyl-N-nitrosobiuret
- 1-Ethyl-1-nitrosourea
- Ethylnorgestrienone
- 17-Ethyl-19-nortestosterone
- N-Ethyl-para-(phenylazo) aniline
- 5-Ethyl-5-phenylbarbituric acid
- 1-5-Ethyl-5-phenylhydantoin
- 3-Ethyl-5-phenylhydantoin
- 5-(2-Ethylphenyl)-3-(3-methoxyphenyl)-s-triazole
- 2-Ethylthioisonicotinamide
- Ethyltrichlorphon
- Ethyl-3,7,11-trimethyldodeca-2,4-dienoate
- Ethylurea and sodium nitrite (1:1)
- Ethylurea and sodium nitrite (2:1)
- Ethynodiol
- Ethynylestradiol mixed with norethindrone
- 2-alpha-Ethynyl-alpha-nor-17-alpha-pregn-20-YNE-2-beta,17-beta- diol
- Etizolam
- Etoperidone
- ETP
- E. typhosa lipopolysaccharide

- False hellebore
- Famfos
- Famotidine
- FD&C red No. 2
- FD&C yellow NO. 5
- Feldene
- Fencahlonine
- Fenestrel
- Fenoprofen calcium dihydrate
- Fenoterol hydrobromide
- Fenthion
- Fenthium
- Ferbam
- Ferrous sulfate
- Fertodur
- Fiboran
- Firemaster BP-6
- Firemaster FF-1
- Flavoxate hydrochloride
- Flomoxef sodium
- Floxapen sodium
- Flubendazole
- Flucortolone
- Flunarizine dihydrochloride
- Flunisolide
- Flunitrazepam
- Fluoracizine
- N-Fluoren-2-YL acetamide
- Fluorobutyrophenone
- Fluorocortisone
- 5-Fluoro-2,-deoxycytidine
- 3-Fluoro-4-dimethylaminoazobenzene
- Fluorohydroxyandrostenedione
- 2-Fluoro-alpha-methyl-(1,1,-biphenyl)-4-acetic acid 1-(acetyloxy) ethyl ester
- 4,-Fluoro-4-(4-methylpiperidino)butyrophenone hydrochloride
- 3-Fluoro-4-phenylhydratropic acid
- 5-Fluoro-1-(tetrahydrofuran-2-YL)uracil
- Fluorouracil
- Flutamide
- Flutazolam
- Flutoprazepam
- Flutropium bromide hydrate
- Folic acid
- Fominoben hydrochloride
- Fonazine mesylate
- Formaldehyde
- Formamide
- Formhydroxamic acid
- Formoterol fumarate dihydrate
- N-Formyl-N-hydroxyglycine
- N-Formyljervine
- Forphenicol
- Fortimicin A

- Fortimicin A sulfate
- Fotrin
- Fulvine
- Fumidil
- Furapyrimidone
- Furazosin hydrochloride
- 2-(2-Furyl)-3-(5-nitro-2-furyl)acrylamide
- Fusarenone X
- Fusaric acid calcium salt
- Fusariotoxin T 2
- Fusidine
- Fyrol FR 2
- Gabexate mesylate
- Galactose
- Gastrozepin
- Gentamycin
- Gentamycin sulfate
- Gentisic acid
- Germanium dioxide
- Gestoral
- Gindarine hydrochloride
- Glucagon
- 2-(beta-d-Glucopyranosyloxy) isobutyronitrile
- d-Glucose
- Gludiase
- Glutaraldehyde
- Lutril
- Glycidol
- Glycinonitrile
- Glycinonitrile hydrochloride
- Glycol ethers
- Glycyrrhizic acid, ammonium salt
- Gold sodium thiomalate
- Gonadotropin releasing hormone agonist
- Gossypol acetic acid
- Grisofulvin
- Guanabenz acetate
- Guanazodine
- Guanfacine hydrochloride
- Guanine-3-N-oxide
- Guanosine
- HBK
- Haloanisone
- Halofantrine hydrochloride
- Haloperidol decanoate
- Halopredone acetate
- Halothane
- Haloxazolam
- HCDD
- Heliotrine
- Hematoidin
- Heptamethylphenylcyclotetrasiloxane
- Heptyl phthalate

- Heroin
- Hexabromonaphthalene
- Hexachlorobenzene
- 2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl
- 3,3',4,4',5,5'-Hexachlorobiphenyl
- Hexachlorobutadiene
- Hexachlorocyclopentadiene
- 1,2,3,4,7,8-Hexachlorodibenzofuran
- Hexachlorophene
- 4,5,6,7,8,8-Hexachlor-D1,5-tetrahydro-4,7-methanoinden
- 1-Hexadecanamine
- Hexadecyltrimethylammonium bromide
- Hexafluoroacetone
- Hexafluoro acetone trihydrate
- Hexamethonium bromide
- Hexamethylmelamine
- n-Hexane
- 1,6-Hexanediamine
- 2-Hexanone
- Hexocyclium methylsulfate
- Hexone
- Hexoprenaline dihydrochloride
- Hexoprenaline sulfate
- n-Hexyl carborane
- Histamethizine
- Histamine diphosphate
- Homofolate
- Human immunoglobulin COG-78
- Hyaluronic acid, sodium salt
- Hycanthone methanesulfonate
- Hydantoin
- Hydralazine
- Hydralazine hydrochloride
- Hydrazine
- Hydrochlorbenzethylamine dimaleate
- Hydrochloric acid
- Hydrocortisone sodium succinate
- Hydrocortisone-21-acetate
- Hydrocortisone-17-butyrate
- Hydrocortisone-17-butyrate-21-propionate
- Hydrocortisone-21-phosphate
- Hydrofluoric acid
- 10-beta-Hydroperoxy-17-alpha-ethynyl-4-estren-17-beta-OL-3-one
- Hydroquinone-beta-d-glucopyranoside
- N-Hydroxy ethyl carbamate
- 4-Hydroxyacetanilide
- N-Hydroxy-N-acetyl-2-aminofluorene
- N-Hydroxyadenine
- 6-N-Hydroxyadenosine
- 3-alpha-Hydroxy-17-androstan--one
- 17-beta-Hydroxy-5-beta-androstan-3-one
- 3-Hydroxybenzoic acid
- para-Hydroxybenzoic acid ethyl ester

- 5-(alpha-Hydroxybenzyl)-2-benzimidazolecarbamic acid methyl ester
- 1-Hydroxycholecalciferol
- Hydroxydimethylarsine oxide
- Hydroxydimethylarsine oxide, sodium salt
- 9-Hydroxyellipticine
- 2-(2-Hydroxyethoxy)ethyl-N-(alpha,alpha,alpha-trifluoro-meta- tolyl)anthranilate
- Hydroxyethyl starch
- beta-Hydroxyethylcarbamate
- 1-Hydroxyethylidene-1,1-diphosphonic acid
- 17-beta-Hydroxy-7-alpha-methylandrost-5-ENE-3-one
- 7-Hydroxymethyl-12-methylbenz(alpha)anthracene
- 1-Hydroxymethyl-2-methylditmidate-2-oxide
- 5-Hydroxymethyl-4-methyluracil
- 2-Hydroxymethylphenol
- 5-(1-Hydroxy-2-((1-methyl-3-phenylpropyl)amino)ethyl) salicyclamide hydrochloride
- N-(Hydroxymethyl)phthalimide
- 3-(1-Hydroxy-2-piperidinoethyl)-5-phenylisoxazole citrate
- 2-Hydroxy-N-(3-(meta- (piperidinomethyl)phenoxy)propyl)acetamide acetate (ester hydrochloride)
- Hydroxyprogesterone caproate
- beta-(N-(3-Hydroxy-4-pyridone))-alpha-aminopropionic acid
- 4-Hydroxysalicylic acid
- 5-Hydroxytetracycline
- 5-Hydroxytetracycline hydrochloride
- 17-beta-Hydroxy-4,4,17-alpha-trimethyl-androst-5-ENE(2,3-d) isoxazole
- Hydroxytriphenylstannane
- dl-Hydroxytryptophan
- 5-Hydroxy-1-tryptophan
- dl-Hydroxytryptophan
- 5-Hydroxy-1-tryptophan
- Hydroxyurea
- 3-Hydroxyxanthine
- Hydroxyzine pamoate
- Hyoscine hydrobromide
- Hypochlorous acid
- Hypoglycine B
- Ibuprofen piconol
- Ifenprodil tartrate
- IMET 3106
- 4-Imidazo (1,2-alpha) pyridin-2-yl-alpha-methylbenzeneacetic acid
- Imidazole mustard
- 2-Imidazolidinethione
- 2-Imidazolidinethione mixed with sodium nitrite
- 2-Imino-5-phenyl-4-oxazolidinone
- Improsulfan tosylate
- Indacrinone
- Indanazoline hydrochloride
- 1,3-Indandione
- Indapamide
- Indeloxazine hydrochloride
- Inderal
- Indium
- Indium nitrate
- 1H-Indole-3-acetic acid

- Indole-3-carbinol
- Indomethacin
- Inolin
- Insulin
- Insulin protamine zinc
- Iocarmate meglumine
- Iodoacetic acid
- Ionizing radiation (e.g., X-rays and gamma rays)
- Iopramine hydrochloride
- Iotroxate meglumine
- Ipratropium bromide
- Iron-dextran complex
- Iron nickel zinc oxide
- Iron-poly (sorbitol-gluconic acid) complex
- Iron-sorbitol
- Isoamygdalin
- Isoamyl 5,6-dihydro-7,8-dimethyl-4,5-dioxo-4H-pyrano (3,2-c) quinoline-2-carboxylate
- Isobutyl methacrylate
- para-Isobutylhydratropic acid
- Isocarboxazid
- Isodecyl methacrylate
- Isodonazole nitrate
- Isoflurane
- Isonicotinic acid hydrazide
- Isonicotinic acid-2-isopropylhydrazide
- Isooctyl-2,4-dichlorophenoxyacetate
- Isophosphamide
- Isoprenaline hydrochloride
- Isoprenyl chalcone
- Isopropyl alcohol
- Isopropyl-2,4-D ester
- Isopropylidene azastreptonigrin
- 4,4'-Isopropylidenediphenol, polymer with 1-chloro-2,3- epoxypropane
- Isopropylmethanesulfonate
- Isosafrole-n-octylsulfoxide
- Isothiocyanic acid, ethylene ester
- Isothiocyanic acid, phenyl ester
- Isothiourea
- Jervine
- Jervine-3-acetate
- Josamycin
- Kanamycin
- Kanamycin sulfate (1:1) salt
- KAO 264
- Karminomycin
- Kepone
- Kerlone
- Ketamine
- Ketoprofen sodium
- Ketotifen fumarate
- KF-868
- Khat leaf extract
- KM-1146

- KPE
- Lactose
- Latamoxef sodium
- Lead
- Lead acetate (II), trihydrate
- Lead chloride
- Lead diacetate
- Lead (II) nitrate (1:2)
- Lecithin iodide
- Lenampicillin hydrochloride
- Lendormin
- Lente insulin
- Lentinan
- Leptophos
- l-Leucine
- Leurocristine
- Leurocristine sulfate (1:1)
- Levamisole hydrochloride
- Levorin
- Levothyroxine sodium
- Librium
- d-Limonene
- Linear alkylbenzenesulfonate, sodium salt
- Linoleic acid (oxidized)
- Liothyronine
- Lipopolysaccharide, escherichia coli
- Lipopolysaccharide, from B. Abortus Bang.
- Lithium carbonate (2:1)
- Lithium carmine
- Lithium chloride
- Lividomycin
- Lobenzarit disodium
- Locoweed
- Lofetensin hydrochloride
- Lucanthone metabolite
- Luteinizing hormone antiserum
- Luteinizing hormone-releasing hormone
- Luteinizing hormone-releasing hormone, diacetate (salt)
- Luteinizing hormone-releasing hormone, diacetate, tetrahydrate
- Lyndiol
- Lysenyl hydrogen maleate
- d-Lysergic acid diethylamide tartrate
- Lysergide tartrate
- Lysine
- Mafenide acetate
- Magnesium glutamate hydrobromide
- Magnesium sulfate (1:1)
- Malathion
- Maleimide
- Malotilate
- Maltose
- Manganese (II) chloride (1:2)
- Manganese (II) ethylenebis (dithiocarbamate)

- Manganese (II) sulfate (1:1)
- Maprotiline hydrochloride
- Marezine hydrochloride
- Maytansine
- Mazindol
- Mec
- Meclizine dihydrochloride
- Meclizine hydrochloride
- Medemycin
- Medrogestone
- Medroxyprogesterone
- Medroxyprogesterone acetate
- Medullin
- Melengestrol acetate
- Mentha arvensis, oil
- Mepiprazole dihydrochloride
- Mepyrapone
- Mequitazine
- 2-Mercapto-1-methylimidazole
- 1-(d-3-Mercapto-2-methyl-1-oxopropyl)-1-proline (S,S)
- N-(2-Mercapto-2-methylpropanoyl)-1-cysteine
- 6-Mercaptopurine monohydrate
- 6-Mercaptopurine 3-N-oxide
- Mercaptopurine ribonucleoside
- d,3-Mercaptovaline
- Mercuric acetate
- Mercuric oxide
- Mercury
- Mercury (II) chloride
- Mercury (II) iodide
- Mercury methylchloride
- Merthiolate sodium
- Mervan ethanolamine salt
- Mescaline
- Mesoxalylurea monohydrate
- Mestranol mixed with norethindrone
- Metalutin
- Metaproterenol sulfate
- Methadone
- Methadone hydrochloride
- dl-Methadone hydrochloride
- Methallyl-19-nortestosterone
- Methaminodiazepoxide hydrochloride
- 1-Methamphetamine hydrochloride
- Methaqualone hydrochloride
- Methedrine
- dl-Methionine
- l-Methionine
- Methionine sulfoximine
- Methofadin
- Methophenazine difumarate
- Methotrexate
- Methotrexate sodium

- Methoxyacetic acid
- 3-Methoxycarbonylaminophenyl-N-3,-methylphenylcarbamate
- Methoxychlor
- 2-methoxyethanol
- 5-Methoxyindoleacetic acid
- 4-(6-Methoxy-2-naphthyl)-2-butanone
- (+)-2-(Methoxy-2-naphthyl)-propionic acid
- 2-(3-Methoxyphenyl)-5,6-dihydro-s-triazolo (5,1-alpha) isoquinoline
- 2-(para-(6-Methoxy-2-phenyl-3-indenyl)phenoxy)triethylamine hydrochloride
- 2-(para-(para-Methoxy-alpha-phenylphenethyl)phenoxy)triethylamine hydrochloride
- N1-(3-Methoxy-2-pyrazinyl)sulfanilamide
- Methyl alcohol
- Methyl azoxymethyl acetate
- Methyl benzimidazole-2-YL carbamate
- 2-Methyl butylacrylate
- Methyl chloride
- Methyl chloroform
- Methyl (beta)-11-alpha-16-dihydroxy-16-methyl-9-oxoprost-13-EN-1- OATE
- Methyl ethyl ketone
- Methyl hydrazine
- Methyl isocyanate
- Methyl mesylate
- Methyl methacrylate
- Methyl (methylthio) mercury
- Methyl parathion
- Methyl pentachlorophenate
- Methyl phenidyl acetate
- Methyl salicylate
- Methyl thiourea
- Methyl urea and sodium nitrite
- Methylacetamide
- Methyl-5-benzoyl benzimidazole-2-carbamate
- 1-Methyl-2-benzylhydrazine
- 1-Methyl-5-chloroindoline methylbromide
- Methylchlortetracycline
- 3-Methylcholanthrene
- N-Methyl-4-cyclohexene-1,2-dicarboximide
- N-Methyl-N-desacetylcolchicine
- N-Methyl-dibromomaleinimide
- beta-Methyldigoxin
- 17-alpha-Methyldihydrotestosterone
- N-Methyl-3,6-dithia-3,4,5,6-tetrahydrophthalimide
- Methylene chloride
- Methylene dimethanesulfonate
- N,N,-Methylenebis(2-amino-1,3,4-thiadiazole)
- 2-Methylenecyclopropanylalanine
- Methylergonovine maleate
- 3-(1-Methylethyl)-1H-2,1,3-benzothiazain-4(3H)-one-2,2-dioxide
- 4-Methylethylenethiourea
- 3-Methyl-5-ethyl-5-phenylhydantoin
- 3-Methylethynylestradiol
- x-Methylfolic acid
- N-Methylformamide

- Methylhesperidin
- (alpha-(2-Methylhydrazino)-para-toluoyl)urea, monohydrobromide
- 4-Methyl-7-hydroxycoumarin
- Methyl-ortho-(4-hydroxy-3-methoxycinnamoyl) reserpate
- 2-Methyl-1,3-indandione
- N-Methyljervine
- N-Methylorazepam
- Methylmercuric dicyandiamide
- Methylmercuric phosphate
- Methylmercury
- Methylmercury hydroxide
- 1-Methyl-6-(1-methylallyl)-2,5-dithiobiurea
- d-3-Methyl-N-methylmorphinan phosphate
- N-Methyl-alpha-methyl-alpha-phenylsuccinimide
- 2-Methyl-1,4-naphthoquinone
- 2-Methyl-5-nitroimidazole-1-ethanol
- N-Methyl-N,-nitro-N-nitrosoguanidine
- 4-(N-Methyl-N-nitrosamino)-1-(3-pyridyl)-1-butanone
- N-Methyl-N-nitrosoaniline
- N-Methyl-N-nitrosoethylcarbamate
- N-Methyl-N-nitroso-1-propanamine
- N-Methyl-N-nitrosoarea
- (3-Methyl-4-oxo-5-piperidino-2-thiazolidinylidene) acetic acid ethyl ester
- 10-Methylphenothiazine-2-acetic acid
- N-Methyl-para-(phenylazo) aniline
- 3-Methyl-2-phenylmorpholine hydrochloride
- N-Methyl-2-phenyl-succinimide
- Methyl-4-phthalimido-dl-glutaramate
- N-Methyl-2-phthalimidoglutaramide
- N-Methylpyrrolidone
- Methylsulfonyl chloramphenicol
- 17-Methyltestosterone
- N-Methyl-3,4,5,6-tetrahydrophthalimide
- Methylthioinosine
- 6-Methylthiouracil
- 6-Methyluracil
- Metiapine
- Meticrane
- Metoprime
- Metoprolol tartrate
- Metrizamide
- Mexiletine hydrochloride
- Mezinium methyl sulfate
- Mezlocillin
- Mibolerone
- Miconazole nitrate
- Micromycin
- Midodrine
- Mikelan
- Miloxacin
- Miltown
- Mineral oil
- Mineral oil, petroleum extracts, heavy naphthenic distillate solvent

- Mirex
- Mithramycin
- MN-1695
- Mobilat
- Molybdenum
- Monoethylhexyl phthalate
- Monoethylphenyltriazene
- 8-Monohydro mirex
- Monosodium glutamate
- Morphine hydrochloride
- Morphine sulfate
- Morphocycline
- Moxestrol
- Moxnidazole
- Mucopolysaccharide, polysulfuric acid ester
- Muldamine
- Mycosporin
- Nafoxidine hydrochloride
- Naftidrofuryl oxalate
- Naja nigricollis venom
- Naloxone hydrochloride
- Naphthalene
- beta-Naphthoflavone
- 1-Naphthol
- Navaron
- Neem oil
- Nembutal sodium
- Neocarcinostatin
- Neoprene
- Neoproserine
- Neosynephrine
- Netilmicin sulfate
- Nickel
- Nickel carbonyl
- Nickel compounds
- Nickel subsulfide
- Nickelous chloride
- Nicotergoline
- Nicotine
- Nicotine tartrate (1:2)
- N-Nicotinoyltryptamide
- Nipradilol
- Nisentil
- Nitric acid
- Nitrioltriacetic acid trisodium salt monohydrate
- Nitrobenzene
- Nitrofurantoin
- Nitrofurazone
- 4-((5-Nitrofurfurylidene)amino)-3-methylthiomorpholine-1,1- dioxide
- Nitrogen dioxide
- Nitrogen oxide
- Nitroglycerin
- 1-(2-Nitroimidazol-1-yl)-3-methoxypropan-2-ol

- Nitromifene citrate
- 2-Nitropropane
- 4-Nitroquinoline-N-oxide
- Nitroso compounds
- N-Nitroso compounds
- N-Nitrosobis(2-oxopropyl)amine
- Nitrosocimetidine
- N-Nitrosodiethylamine
- N-Nitrosodimethylamine
- N-Nitrosodi-N-propylamine
- N-Nitroso-N-ethyl aniline
- N-Nitroso-N-ethylurethan
- N-Nitroso-N-ethylvinylamine
- N-Nitrosohexahydroazepine
- N-Nitrosoimidazolidinethione
- N-Nitrosopiperidine
- 1-(Nitrosopropylamino)-2-propanol
- N-Nitroso-N-propylurea
- Nizofenone fumarate
- Norchlorcyclizine
- Norchlorcyclizine hydrochloride
- 1-Norepinephrine
- 19-Norethisterone
- Norethisterone enanthate
- Norgestrel
- 1-Norgestrel
- 19-Norpregn-4-ene-3,20-dione
- 19-Nor-17-alpha-pregn-5(10)-en-20-yne-3-alpha,17-diol
- 19-Nor-17-alpha-pregn-5(10)-en-20-yne-3-beta,17-diol
- 19-Nor-17-alpha-pregn-4-en-20-yn-17-ol
- Novadex
- Nutmeg oil, East Indian
- Nystatin
- Ochratoxin
- Ochratoxin A sodium salt
- Octabromodiphenyl
- Octachlorodibenzodioxin
- Octoclothepine
- Ofloxacin
- Oleamine
- Oleylamine hydrofluoride
- Oncodazole
- Ophthazin
- Orgoteins
- Orphenadrine hydrochloride
- Oxaprozin
- Oxatimide
- Oxazolazepam
- Oxepinac
- Oxfendazole
- Oxibendazole
- Oxiranecarboxylic acid, 3-(((3-methyl-1-(((3-methylbutyl)amino) carbonyl)-ethyl ester, (2S-(2-alpha-3-beta)R*))
- N-(2-Oxo-3,5,7-cylcoheptatrien-1-yl)aminooxoacetic acid ethyl ester

- 2-(3-Oxo-1-indanylidene)-1,3-indandione
- Oxolamine citrate
- N-(2-Oxo-3-piperidyl)phthalimide
- Oxybutynin chloride
- Oxygen
- Oxymorfinone hydrochloride
- beta-Oxypropylpropylnitrosamine
- Ozone
- Padrin
- Palm oil
- Panoral
- d-Pantethine
- Pantocrin
- Papain
- Papaverine chlorohydrate
- Paradione
- Paramathasone acetate
- Paraquat dichloride
- Parathion
- Paraxanthine
- Pavisoid
- PE-043
- Penfluridol
- Penicillic acid
- Penitrem A
- Pentachlorobenzene
- 2,3,4,7,8-Pentachlorodibenzofuran
- Pentachloronitrobenzene
- Pentachlorophenol
- Pentafluorophenyl chloride
- Pentazocine hydrochloride
- Pentostatin
- Pentothal
- Pentothal sodium
- Pentoxyphylline
- Perchloroethylene
- Perdipine
- Perfluorodecanoic acid
- Periactin hydrochloride
- Periactinol
- Perphenazine hydrochloride
- Pharmagel A
- 1,10-Phenanthroline
- Phenazin-5-oxide
- Phenethyl alcohol
- Phenfloramine hydrochloride
- Phenol
- 4-Phenoxy-3-(pyrrolidinyl)-5-sulfamoylbenzoic acid
- Phenyl salicylate
- Phenylacetic acid
- (Phenylacetyl) urea
- 1-Phenylalanine
- 17-beta-Phenylaminocarbonyloxyoestra-1,3,5(10)-triene-3- methyl ether

- para-(Phenylazo)aniline
- 2-Phenyl-5-benzothiazoleacetic acid
- 1-Phenyl-3,3-diethyltriazene
- 2-Phenyl-5,5-dimethyl-tetrahydro-1,4-oxazine hydrochloride
- 1-Phenyl-2-(1',1'-diphenylpropyl-3'-amino)propane
- 4-Phenyl-1,2-diphenyl-3,5-pyrazolidinedione
- meta-Phenylenediamine
- 2-Phenylethylhydrazine
- Phenylmethylcylosiloxane, mixed copolymer
- N-Phenylphthalimidine
- Phenyl-2-pyridylmethyl-beta-N,N-dimethylaminoethyl ether succinate
- 2-(Phenylsulfonylamino)-1,3,4-thiadiazole-5-sulfonamide
- 1-Phenyl-2-thiourea
- Phomopsin
- Phorbol myristate acetate
- Phosphonacetyl-1-aspartic acid
- Phosphoramidate mustard cyclohexylamine salt
- Phthalazinol
- Phthalic anhydride
- Phthalimide
- Phthalimidomethyl-O,O-dimethyl phosphorodithioate
- N-Phthaloyl-1-aspartic acid
- N-Phthalylisoglutamine
- Physostigmine sulfate
- Phytohemagglutinin
- Picloram
- Pilocarpine monohydrochloride
- Pimozide
- 2,6-Piperazinedione-4,4,-propylene dioxopiperazine
- Piperidine
- 3-Piperidine-1,1-diphenyl-propanol-(1) methanesulphonate
- Piperin
- Piperonyl butoxide
- Pipethanate ethylbromide
- Pipram
- Pituitary growth hormone
- Plafibrine
- cis-Platinous diammine dichloride
- Platinum thymine blue
- Podophyllin
- Podophyllotoxin
- Polybrominated biphenyls
- Polychlorinated biphenyl (Aroclor 1248)
- Polychlorinated biphenyl (Aroclor 1254)
- Polychlorinated biphenyl (Kanechlor 300)
- Polychlorinated biphenyl (Kanechlor 400)
- Polychlorinated biphenyl (Kanechlor 500)
- Polyoxyethylene sorbitan monolaurate
- Potassium bichromate
- Potassium canrenoate
- Potassium chromate (VI)
- Potassium clavulanate
- Potassium cyanide

- Potassium fluoride
- Potassium iodide
- Potassium nitrate
- Potassium nitrite (1:1)
- Potassium perchlorate
- Potassium thiocyanate
- Potato blossoms, glycoalkaloid extract
- Potato, green parts
- Pranoprofen
- Prednisolone succinate
- Prednisone 21-acetate
- Predonin
- 9-beta,10-alpha-Pregna-4,6-diene-3,20-dione and 17-alpha- hydroxypregn-4-ene-3,20-ortho-dione (9:10)
- 5-alpha-17-alpha-Pregna-2-en-20-yn-17-ol, acetate
- Premarin
- Primaquine phosphate
- Primobolan
- Prinadol hydrobromide
- Procarbazine
- Procarbazine hydrochloride
- Procaterol hydrochloride
- Prochlorpromazine
- Progesterone
- Prolinomethyltetracycline
- Promethazine hydrochloride
- Propadrine hydrochloride
- Propane sultone
- 1,3-Propanediamine
- 1,2-Propanediol
- Propanidide
- 3-Propanolamine
- Proparthrin
- Propazone
- Propionitrile
- Propoxur
- 2-Propoxyethyl acetate
- d-Propoxyphene hydrochloride
- Propyl carbamate
- Propyl cellosolve
- n-Propyl gallate
- Propylene glycol diacetate
- Propylene glycol monomethyl ether
- Propylene oxide
- 2-Propylpentanoic acid
- 2-Propylpiperidine
- 6-Propyl-2-thiouracil
- Propylthiouracil and iodine
- 2-Propylvaleramide
- 2-Propylvaleric acid sodium salt
- Prostaglandin A1
- Prostaglandin E1
- Prostaglandin E2 sodium salt
- Prostaglandin F1-alpha

- Prostaglandin F2-alpha
- Prostaglandin F2-alpha-tham
- Protizinic acid
- Proxil
- Pseudolaric acid A
- Pseudolaric acid B
- Purapuridine
- Purine-6-thiol
- Pyrantel pamoate
- Pyrazine-2,3-dicarboxylic acid imide
- Pyrazole
- Pyrbuterol hydrochloride
- Pyridinamine (9CI)
- 2,3-Pyridinedicarboximide
- 3,4-Pyridinedicarboximide
- 1-(Pyridyl-3)-3,3-dimethyl triazene
- 1-Pyridyl-3-methyl-3-ethyltriazene
- 5-(para-(2-Pyridylsulfamoyl)phenylazo)salicyclic acid
- Pyrimidine-4,5-dicarboxylic acid imide
- N1-2-Pyrimidinyl-sulfanilamide
- Pyrogallol
- Pyronaridine
- N-(1-Pyrrolidinylmethyl)-tetracycline
- Quaalude
- Quercetin
- Quinine
- 2-Quinoline thioacetamide hydrochloride
- Ralgro
- Refosporen
- Reptilase
- Reserpine
- Retinoid etretin
- all-trans-Retinylidene methyl nitrone
- Rhodamine 6G extra base
- 2-beta-d-Ribofuranosyl-as-triazine-3,5(2H,4H)-dione
- 1-beta-d-Ribofuranosyl-1,2,4-triazole-3-carboxamide
- Ricin
- Rifamycin AMP
- Rifamycin SV
- Ripcord
- Ritodrine hydrochloride
- Rizaben
- Robaveron
- Ronnel
- Rose bengal sodium
- Rotenone
- Rowachol
- Rowatin
- R Salt
- Rubratoxin B
- Rythmodan
- Salicylaldehyde
- Salicyclamide

- Salicyclic acid
- Salicyclic acid, compounded with morpholine (1:1)
- ortho-Salicylsalicylic acid
- Salipran
- Salmonella enteritidis endotoxin
- Sarkomycin
- SCH 20569
- Scopolamine
- Sefril
- Selenium
- Selenodiglutathione
- Semicarbazide hydrochloride
- Serum gonadotropin
- Sfericase
- Silicone 360
- Sisomicin
- S. Marcescens lipopolysaccharide
- Smoke condensate, cigarette
- Smokeless tobacco
- Sodium para-aminosalicylate
- Sodium arsenite
- Sodium benzoate
- Sodium bicarbonate
- Sodium chloride
- Sodium chlorite
- Sodium chondroitin polysulfate
- Sodium cobaltinitrite
- Sodium colistinmethanesulfonate
- Sodium cyanide
- Sodium cyclamate
- Sodium dehydroacetic acid
- Sodium dichlorocyanurate
- Sodium diethyldithiocarbamate
- Sodium diphenyldiazo-bis(alpha-naphthylaminesulfonate)
- Sodium fluoride
- Sodium (E)-3-(para-(1H-imidazol-1-methyl)phenyl)-2-propenoate
- Sodium iodide
- Sodium lauryl sulfate
- Sodium luminal
- Sodium nigericin
- Sodium nitrite
- Sodium nitrite and carbendazime (1:1)
- Sodium nitrite and 1-citrulline (1:2)
- Sodium nitrite and 1-(methylethyl) urea
- Sodium nitroferricyanide
- Sodium pentachlorophenate
- Sodium picosulfate
- Sodium piperacillin
- Sodium retinoate
- Sodium saccharin
- Sodium salicylate
- Sodium selenite
- Sodium selenite pentahydrate

- Sodium sulfate (2:1)
- Sodium d-thyroxine
- Sodium tolmetin dihydrate
- Sodium-2,4-dichlorophenoxyacetate
- (22s,25r)-5-alpha-Solanidan-3-beta-OL
- Solanid-5-ENE-3-beta, 12-alpha-diol
- (22s,25r)-Solanid-5-EN-3-beta-OL
- Solanine
- Solcoseryl
- Spectogard
- Spiclomazine hydrochloride
- Spiramycin
- Spiroperidol
- SRC-II, heavy distillate
- 1-ST-2121
- Sterculia foetida oil
- Steroids
- Stimulexin
- Streptomycin
- Streptomycin and dihydrostreptomycin
- Streptomycin sesquisulfate
- Streptomycin sulphate
- Streptonigran
- Streptonigrin methyl ester
- Streptozotacin
- STS 557
- Styrene
- Subtigen
- Succinic anhydride
- Succinonitrile
- Sucrose
- Sulfadiazine silver salt
- Sulfadimethoxypyrimidine
- Sulfadimethyldiazine
- Sulfamonomethoxin
- Sulfamoxole-trimethoprim mixture
- Sulfanilamide
- 6-Sulfanilamido-2,4-dimethoxypyrimidine
- 5-Sulfanilamido-3,4-dimethyl-isoxazole
- Sulfanilylurea
- N-Sulfanylacetamide
- alpha-Sulfobenzylpenicillin disodium
- Sulfur dioxide
- Sulfuric acid
- Suloctidyl
- Sultopride hydrochloride
- Supercortyl
- Superprednol
- Surgam
- Surital sodium
- Surmontil maleate
- Suxibuzone
- Sweet pea seeds

- Sygethin
- meta-Syneprine hydrochloride
- Synephrine tartrate
- Symsac
- 2,4,5-T
- T-1982
- T-2588
- Tagamet
- Tarweed
- TCDD
- Tellurium
- Tellurium dioxide
- Temephos
- Tenormin
- Terbutaline sulphate
- Terodiline hydrochloride
- Testosterone
- Testosterone heptanoate
- Testosterone propionate
- 1,1,3,3-Tetrabutylurea
- 2,3,7,8-Tetrachlododibenzofuran
- Tetrachloroacetone
- 1,1,3,3-Tetrachloroacetone
- 3,3',4,4'-Tetrachloroazobenzene
- 1,2,3,4-Tetrachlorobenzene
- 3,3',4,4'-Tetrachlorobiphenyl
- 2,4,5,6-Tetrachlorophenol
- Tetracycline
- Tetracycline hydrochloride
- Tetraethyl lead
- 1-trans-D9-Tetrahydrocannabinol
- 2-(para-(1,2,3,4-Tetrahydro-2-(para-chlorophenyl)naphthyl) phenoxy) triethyl amine
- 2,3,4,5-Tetrahydro-2,8-dimethyl-5-(2-(6-methyl-3-pyridyl)ethyl)- 1H-pyrid 0-(4,3-beta) indole
- Tetrahydro-3,5-dimethyl-4H,1,3,5-oxadiazine-4-thione
- 5,6,7,8-Tetrahydrofolic acid
- 2-(1,2,3,4-Tetrahydro-1-naphthylamino)-2-imidazoline hydrochloride
- 4-O-Tetrahydropyranladriamycin hydrochloride
- para-(1,1,3,3-Tetramethylbutyl)phenol, polymer with ethylene oxide and formaldehyde
- 2,2,9,9-Tetramethyl-1,10-decanediol
- Tetramethyl lead
- Tetramethylsuccinonitrile
- Tetramethylthiourea
- 1,1,3,3-Tetramethylurea
- Tetranicotylfructose
- Tetrapotassium hexacyanoferrate
- Tetrasodium fosfestrol
- Tetrazosin hydrochloride dihydrate
- Thalidomide
- (+)-Thalidomide
- (-)-Thalidomide
- Thallium acetate
- Thallium chloride
- Thallium compounds

- Thallium sulfate
- Thebaine hydrochloride
- para-(2-Thenoyl) hydratropic acid
- Theobromine
- Theobromine sodium salicylate
- Theophylline
- 1-(Theophyllin-7-YL)ethyl-2-(2-(para-chlorophenoxy)-2- methylpropionate
- Thiamine chloride
- 2-(Thiazol-4-YL) benzimidazole
- 2-(4-Thiazolyl)-5-benzimidazolecarbamic acid methyl ester
- Thioacetamide
- Thioinosine
- Thiotriethylenephosphoramidate
- 2-Thiouracil
- Thiram
- Thymidine
- Thyroid
- 1-Thyroxin
- Thyroxine
- Tiapride hydrochloride
- Ticarcillin sodium
- Ticlodone
- Timepidium bromide
- Timiperone
- Tinactin
- Tindurin
- Tinidazole
- Tinoridine hydrochloride
- Tiquizium bromide
- 2,4,5-T isooctyl ester
- Titanium (wet powder)
- Tizanidine hydrochloride
- Tobacco
- Tobacco leaf, nicotiana glauca
- Tobramycin
- Todralazine hydrochloride hydrate
- Togonal
- Tolmetine
- Toluene
- para-Toluenediamine sulfate
- ortho-Toluidine
- Tormosyl
- 2,4,5-T propylene glycol butyl ether ester
- Traxanox sodium pentahydrate
- Triaminoguanidine nitrate
- para,para,-Triazenylenedibenzenesulfonamide
- Triazolam
- Trichloroacetonitrile
- 1,2,4-Trichlorobenzene
- Trichloroethylene
- 2,4,4,-Trichloro-2,-hydroxydiphenyl ether
- (2,2,2-Trichloro-1-hydroxyethyl) dimethylphosphonate
- N-(Trichloromethylthio)phthalimide

- 4-(2,4,5-Trichlorophenoxy) butyric acid
- alpha-(2,4,5-Trichlorophenoxy) propionic acid
- Trichloropropionitrile
- Triclopyr
- Tricosanthin
- Tridemorph
- Tridiphane
- Triethyl lead chloride
- Triethylenetetramine
- 2,2,2-Trifluoroethyl vinyl ether
- 3,-Trifluoromethyl-4-dimethylaminoazobenzene
- Trifluoromethylperazine
- 2-(8,-Trifluoromethyl-4,-quinolylamino)benzoic acid, 2,3- dihydroxy propyl ester
- Trifluoperidol
- Triglyme
- Trimebutine maleate
- (beta)-Trimethoquinol
- Trimethoxazine
- 5-(3,4,5-Trimethoxybenzyl)-2,4-diaminopyrimidine
- Trimethyl lead chloride
- Trimethyl phosphate
- Trimethyl phosphite
- 3,3,5-Trimethyl-2,4-diketooxazolidine
- Trimethylenedimethanesulfonate
- exo-Trimethylenenorbornane
- 1,1,3-Trimethyl-3-nitrosoarea
- 1,3,5-Trimethyl-2,4,6-tris(3,5-DI-tert-butyl-4-hydroxybenzyl) benzene
- Triparanol
- Tris
- Tris (1-aziridinyl)-para-benzoquinone
- Tris- (1-aziridinyl) phosphine oxide
- Trisaziridinyltriazine
- Tris (1-methylethylene) phosphoric triamide
- Tritolyl phosphate
- Tropacaine hydrochloride
- 1-Tryptophan
- TSH-releasing hormone
- Tungsten
- dl-meta-Tyrosine
- 1-Tyrosine
- Ubiquinone 10
- Uracil
- Uracil mixture with tegafur (4:1)
- Uranyl acetate dihydrate
- Urapidil
- Urbacide
- Urbason soluble
- Urethane
- Urfamicin hydrochloride
- Uridion
- Urokinase
- Valbazen
- Valison

- Vanadium pentoxide (dust)
- Vasodilan
- Vasodilian
- Vasodistal
- Vasotonin
- Venacil
- Ventipulmin
- Veratramine
- Veratrine
- Veratrylamine
- Vincalokoblastine
- Vincalokoblastine sulfate (1:1) (salt)
- Vinyl chloride
- Vinyl toluene
- Vinylidene chloride
- R-5-Vinyl-2-oxazolidinethione
- Viomycin
- Vipera berus venom
- Viriditoxin
- Visken
- Vistaril hydrochloride
- Vitamin A
- Vitamin A acetate
- Vitamin A acid
- 13-cis-Vitamin A acid
- Vitamin A palmitate
- Vitamin B7
- Vitamin B12 complex
- Vitamin B12, methyl
- Vitamin D2
- Vitamin K
- Vitamin MK 4
- Volidan
- Vomitoxin
- Wait's green mountain antihistamine
- Warfarin
- Warfarin sodium
- White spirit
- Xamoterolfumarate
- Xanax
- Xanthinol nicotinate
- Xylene
- meta-Xylene
- ortho-Xylene
- para-Xylene
- Xylostatin
- N-(2,3-Xylyl)anthranilic acid
- Ytterbium chloride
- Zaroxolyn
- Zearalenone
- Zimelidine dihydrochloride
- Zinc carbonate (1:1)
- Zinc chloride

- Zinc (II) ELIA complex
- Zinc oxide
- Zinc (N,N,-propylene-1,2-bis(dithiocarbamate))
- Zinc pyridine-2-thiol-1-oxide
- Zinc sulfate
- Zoapatle, crude leaf extract
- Zoapatle, semi-purified leaf extract
- Zotepine
- Zygosporin A
- Zylprim

APPENDIX D2

Pregnant Women in Laboratories

PREGNANT WOMEN IN LABORATORIES

The use of chemicals in campus laboratories by pregnant women should be evaluated by the instructor and the student's physician. The Office of Environmental Health and Safety recommends that pregnant women do not take chemistry laboratory classes.

Each instructor on the first day of class shall announce to the class that if a woman is pregnant or becomes pregnant during the semester she is to see the instructor as soon as possible. The instructor shall discuss with the student the implications of possible exposure to chemicals in the laboratory setting and present her the department policy concerning pregnant women in laboratories. The student may also wish to consult with her doctor.

The University can not refuse a student access to a class on the basis of pregnancy. If a student wants to take a laboratory class and is pregnant, the following procedures should be followed:

- A list of chemicals to be used in the laboratory experiment shall be made available to the student and her doctor.
- Material Safety Data Sheets of each chemical shall be made available to the student and her doctor as requested.
- If a student takes a laboratory class, she has the right to refuse to perform an experiment if it requires her to use chemicals she and/or her doctor deem to be hazardous to her or her baby's health. Alternate work will be required, the nature of which will be at the discretion of the instructor.

APPENDIX E

Acutely Toxic Chemicals

ACUTELY TOXIC CHEMICALS

This list is provided as a guide and is not intended to be all inclusive. Review the MSDS (material safety data sheet) whenever there is concern if a chemical is acutely toxic or not.

Acrolein
Acrylyl chloride
2-Aminopyridine
Benzyl chloride
Bromine
Chlorine dioxide
Chlorine trifluoride
Chlorpicrin
Cyanogen chloride
Cyanuric fluoride
Decaborane
Dichloro acetylene
Dimethyl disulfide
Dimethylsulfate
Dimethylsulfide
Ethylene chlorohydrin
Ethylene fluorohydrin
Hexamethylene diisocyanate
Hexamethyl phosphoramidate
Iodine
Iron pentacarbonyl
Isopropyl formate
Methacryloyl chloride
Methacryloxyethyl isocyanate
Methyl acrylonitrile
Methyl chloroformate
Methylene biphenyl isocyanate
Methyl fluoroacetate
Methyl fluorosulfate
Methyl hydrazine
Methyl Mercury (and other organic forms)
Methyltrichlorosilane
Methyl vinyl ketone
Nickel carbonyl
Nitrogen tetroxide
Nitrogen trioxide
Organo Tin compounds
Osmium tetroxide
Oxygen difluoride
Ozone
Pentaborane
Perchloromethyl mercaptan
Phosphorus oxychloride
Phosphorus trichloride
Sarin
Sulfur monochloride

Sulfur pentafluoride
Sulfuryl chloride
Tellurium hexafluoride
Tetramethyl succinonitrile
Tetranitromethane
Thionyl chloride
Toluene-2,4-diisocyanate
Trichloro (chlormethyl) silane

APPENDIX F

Incompatible Chemicals

INCOMPATIBLE CHEMICALS

The following are examples of chemical incompatibilities. This list should not be considered complete and persons unsure as to the status of a particular chemical are advised to refer to more recent literature, the manufacturer, as well as MSDS databases. Source: *Safety in Academic Chemistry Laboratories*, Sixth Edition, American Chemical Society: Washington, D.C., 1995.

Chemical	Incompatible with
Acetic acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetone	Concentrated nitric and sulfuric acid mixtures
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Alkali and alkaline earth metals (such as powdered aluminum or magnesium, calcium, lithium, sodium, potassium)	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury (e.g., in manometers), chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, finely divided organic combustible materials
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Any reducing agent
Azides	Acids
Bromine	See chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents

Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
Chromic acid and chromium trioxide	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Copper	Acetylene, hydrogen peroxide
Cumene hydroperoxide	Acids (organic or inorganic)
Cyanides	Acids
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Fluorine	All other chemicals
Hydrocarbons (such as butane, propane, benzene)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrocyanic acid	Nitric acid, alkalis
Hydrofluoric acid	Ammonia (aqueous or anhydrous)
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane, combustible materials
Hydrogen sulfide	Fuming nitric acid, oxidizing gases
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Acids

Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids and gases, copper, brass, any heavy metals
Nitrites	Acids
Nitroparaffins	Inorganic bases, amines
Oxalic Acid	Silver, mercury
Oxygen	Oils, grease, hydrogen; flammable liquids, solids, and gases
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohols, paper, wood, grease, oils
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorus (white)	Air, oxygen, alkalis, reducing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulfuric and other acids
Potassium perchlorate	Sulfuric and other acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl and methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulfides	Acids

Sulfuric acid

Potassium chlorate, potassium perchlorate,
potassium permanganate (similar compounds of
light metals, such as sodium, lithium)

Tellurides

Reducing agents

APPENDIX G

Regulations and Standards
(CCR Title 8 Sec. 5191)

TITLE 8. Industrial Relations
Division 1. Department of Industrial Relations
Chapter 4. Division of Industrial Safety
Subchapter 7. General Industry Safety Orders
Group 16. Control of Hazardous Substances
Article 109. Hazardous Substances and Processes

§5191. Occupational Exposure to Hazardous Chemicals in Laboratories.

- (a) Scope and application.
- (1) This section shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.
 - (2) Where this section applies, it shall supersede, for laboratories, the requirements of Title 8 of the California Code of Regulations Section 5190 and Article 110, Regulated Carcinogens of the General Industry Safety Orders, except as follows:
 - (A) The requirement to limit employee exposure to the specific exposure limit.
 - (B) When that particular regulation states otherwise, as in the case of Section 5209(c)(6).
 - (C) Prohibition or prevention of eye and skin contact where specified by any health regulation shall be observed.
 - (D) Where the action level (or in the absence of an action level, the exposure limit) is exceeded for a regulated substance with exposure monitoring and medical surveillance requirements.
 - (E) The “report of use” requirements of Article 110, (Section 5200 et. seq.) Regulated Carcinogens regulations.
 - (F) Section 5217 shall apply to anatomy, histology and pathology laboratories.
 - (3) This regulation shall not apply to:
 - (A) Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant regulations in Title 8, California Code of Regulations, even if such use occurs in a laboratory.
 - (B) Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:
 1. Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and
 2. Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.
- (b) Definitions
- Action level.** A concentration designated in Title 8, California Code of Regulations for a specific substance, calculated as an eight (8)-hour time weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.
- Carcinogen** (see “select carcinogen”).
- Chemical Hygiene Officer.** An employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.
- Chemical Hygiene Plan.** A written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that:
- (1) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular work place; and
 - (2) meets the requirements of subsection 5191(e).
- Chief.** The Chief of the Division of Occupational Safety and Health.
- Combustible liquid.** Any liquid having a flashpoint at or above 100° F (37.8° C), but below 200° F (93.3° C) except any mixture having components with flashpoints of 200° F (93.3° C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

Compressed gas.

- (1) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70° F (21.1° C); or
- (2) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130° F (54.4° C) regardless of the pressure at 70° F (21.1° C); or
- (3) A liquid having a vapor pressure exceeding 40 psi at 100° F (37.8° C) as determined by ASTM D-323-72.

Designated area. An area which may be used for work with “select carcinogens,” reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

Emergency. Any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

Employee. An individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

Explosive. A chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Flammable. A chemical that falls into one of the following categories:

- (1) “Aerosol, flammable” means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;
- (2) “Gas, flammable” means:
 - (A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or
 - (B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air greater than 12 percent by volume, regardless of the lower explosive limit.
- (3) “Liquid, flammable” means any liquid having a flashpoint below 100° F (37.8° C), except any mixture having components with flashpoints of 100° F (37.8° C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.
- (4) “Solid, flammable” means a solid, other than a blasting agent or explosive as defined in 29 CFR 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

Flashpoint. The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

- (1) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 - 1979 (ASTM D 56-79) - for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100° F (37.8° C), or that do not contain suspended solids, and do not have a tendency to form a surface film under test; or
- (2) Pensky-Martens Closed Tester (see American National Standard Method of Test for Flash Point by Pensky-Martens closed tester), Z11.7 - 1979 (ASTM D 93-79) for liquids with a viscosity equal to or greater than 45 SUS at 100° F (37.8° C), or that contain suspended solids, or that have a tendency to form a surface film under test; or
- (3) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)). Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

Hazardous chemical. A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term “health hazard” includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes.

Appendices A and B of the Hazard Communication Standard (Section 5194) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this regulation.

Laboratory. A facility where the “laboratory use of hazardous chemicals” occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory scale. Work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person. “Laboratory scale” excludes those workplaces whose function is to produce commercial quantities of materials.

Laboratory-type hood. A device located in a laboratory, enclosed on five sides with a movable sash or fixed partial enclosure on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.

Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

Laboratory use of hazardous chemicals. Handling or use of such chemicals in which all of the following conditions are met:

- (1) Chemical manipulations are carried out on a “laboratory scale”;
- (2) Multiple chemical procedures or chemicals are used;
- (3) The procedures involved are not part of a production process, nor in any way simulate a production process; and
- (4) “Protective laboratory practices and equipment” are available and in common use industry-wide to minimize the potential for employee exposure to hazardous chemicals.

Medical consultation. A consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

Organic peroxide. An organic compound that contains the bivalent -o-o- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

Oxidizer. A chemical other than a blasting agent or explosive as defined in Section 5237(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

Physical hazard. A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

Protective laboratory practices and equipment. Those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

Reproductive toxins. Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Select carcinogen. Any substance which meets one of the following criteria:

- (1) It is regulated by Cal/OSHA as a carcinogen; or
- (2) It is listed under the category, “known to be carcinogens,” in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (1985 edition); or
- (3) It is listed under Group 1 (“carcinogenic to humans”) by the International Agency for Research on Cancer Monographs (IARC) (Volumes 1-48 and Supplements 1-8); or
- (4) It is listed in either Group 2A or 2B by IARC or under the category, “reasonably anticipated to be carcinogens” by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:
 - (A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m³;
 - (B) After repeated skin application of less than 300 mg/kg of body weight per week; or
 - (C) After oral dosages of less than 50 mg/kg of body weight per day.

Unstable (reactive). A chemical which is the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

Water-reactive. A chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

- (c) Exposure limits. For laboratory uses of Cal/OSHA regulated substances, the employer shall ensure that laboratory employees' exposures to such substances do not exceed the exposure limits specified in Title 8, California Code of Regulations, Group 16, Section 5139 et seq., of the General Industry Safety Orders.
- (d) Employee exposure determination
 - (1) Initial monitoring. The employer shall measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance exceed the action level (or in the absence of an action level, the exposure limit). The person supervising, directing or evaluating the monitoring shall be competent in industrial hygiene practice.
 - (2) Periodic monitoring. If the initial monitoring prescribed by subsection 5191(d)(1) discloses employee exposure over the action level (or in the absence of an action level, the exposure limit), the employer shall immediately comply with the exposure monitoring provisions of the relevant regulation.
 - (3) Termination of monitoring. Monitoring may be terminated in accordance with the relevant regulation.
 - (4) Employee notification of monitoring results. The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing either individually or by posting results in an appropriate location that is accessible to employees.
- (e) Chemical hygiene plan.
 - (1) Where hazardous chemicals as defined by this regulation are used in the workplace, the employer shall develop and carry out the provisions of a written Chemical Hygiene Plan which is:
 - (A) Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory and
 - (B) Capable of keeping exposures below the limits specified in subsection 5191(c).
 - (2) The Chemical Hygiene Plan shall be readily available to employees, employee representatives and, upon request, to the Chief.
 - (3) The Chemical Hygiene Plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection;
 - (A) Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;
 - (B) Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous;
 - (C) A requirement that fume hoods comply with Section 5154.1, that all protective equipment shall function properly and that specific measures shall be taken to ensure proper and adequate performance of such equipment;
 - (D) Provisions for employee information and training as prescribed in subsection 5191(f);
 - (E) The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation;
 - (F) Provisions for medical consultation and medical examinations in accordance with subsection 5191(g);
 - (G) Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene officer and, if appropriate, establishment of a Chemical Hygiene Committee; and
 - (H) Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate;
 - 1. Establishment of a designated area;

2. Use of containment devices such as fume hoods or glove boxes;
 3. Procedures for safe removal of contaminated waste; and
 4. Decontamination procedures.
- (4) The employer shall review and evaluate the effectiveness of the Chemical Hygiene Plan at least annually and update it as necessary.
- Note:** Appendix A of this section is non-mandatory but provides guidance to assist employers in the development of the Chemical Hygiene Plan.
- (f) Employee information and training.
- (1) The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area. Information and training may relate to an entire class of hazardous substances to the extent appropriate.
 - (2) Such information shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. The frequency of refresher information and training shall be determined by the employer.
 - (3) Information. Employees shall be informed of:
 - (A) The contents of this regulation and its appendices which shall be available to employees;
 - (B) The location and availability of the employer's Chemical Hygiene Plan;
 - (C) The exposure limits for Cal/OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable Cal/OSHA regulation;
 - (D) Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and
 - (E) The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets received from the chemical supplier.
 - (4) Training.
 - (A) Employee training shall include;
 1. Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
 2. The physical and health hazards of chemicals in the work area; and
 3. The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.
 - (B) The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.
- (g) Medical consultation and medical examinations.
- (1) The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances;
 - (A) Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.
 - (B) Where exposure monitoring reveals an exposure level above the action level (or in the absence of an action level, the exposure limit) for a Cal/OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.
 - (C) Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.
 - (2) All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.

- (3) Information provided to the physician. The employer shall provide the following information to the physician;
 - (A) The identity of the hazardous chemical(s) to which the employee may have been exposed;
 - (B) A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and
 - (C) A description of the signs and symptoms of exposure that the employee is experiencing, if any.
- (4) Physician's written opinion.
 - (A) For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following;
 - 1. Any recommendation for further medical follow-up;
 - 2. The results of the medical examination and any associated tests, if requested by the employee;
 - 3. Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace; and
 - 4. A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.
 - (B) The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.
- (h) Hazard identification.
 - (1) With respect to labels and material safety data sheets;
 - (A) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.
 - (B) Employers shall maintain in the workplace any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees during each work shift when they are in their work area(s).
 - (2) The following provisions shall apply to chemical substances developed in the laboratory;
 - (A) If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in subsection 5191(b). If the chemical is determined to be hazardous, the employer shall provide appropriate training as required under subsection 5191(f).
 - (B) If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement subsection 5191(e).
 - (C) If the chemical substance is produced for commercial purposes by another user outside of the laboratory, the employer shall comply with the Hazard Communication Standard (Section 5194) including the requirements for preparation of material safety data sheets and labeling.
- (i) Use of respirators.

Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide, at no cost to the employee, the proper respiratory equipment. Respirators shall be selected and used in accordance with the requirements of Section 5144.
- (j) Recordkeeping.
 - (1) The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations including tests or written opinions required by this regulation.
 - (2) The employer shall ensure that such records are kept, transferred, and made available in accordance with Section 3204.
- (k) Dates.
 - (1) Employers shall have developed and implemented a written Chemical Hygiene Plan no later than October 31, 1991.
 - (2) Subsection (a) (2) shall not take effect until the employer has developed and implemented a written Chemical Hygiene Plan.
- (l) Appendices. The information contained in the appendices is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligation.