Bleil Laboratories, Inc.

Chemical Hygiene Plan

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1. Introduction

Safety is the responsibility of everybody. This may sound cliché, but it is the cornerstone statement of any successful safety plan, because it is only by working together and watching out for one another's safety that we can hope to achieve the goal of any good safety plan; zero injuries. The second most critical component of minimizing risk of injury is through the adaptation of a safety plan of action, continually improved by peer review, such that we all know our responsibilities and actions to take to prevent accidental injury, and how to respond if it should occur despite our best efforts. We, the employees of Bleil Laboratories, Inc. (BL), have adapted this plan in an effort to ensure uniform and appropriate behaviors and attitudes regarding specifically chemical and laboratory safety.

This Chemical Hygiene Plan (CHP) is founded upon several simple but fundamental principles:

1. That the safety of all employees of BL is the paramount priority;
2. That laboratory and chemical safety begins with a well thought out plan (the CHP), which all personnel are not only aware of, but also follow and into which they all have input;
3. That said plan incorporates safety features of the laboratories and safety procedures when the labs are in use and when they are not in use;
4. That said plan covers emergency procedures, and;
5. That said plan includes the manner in which all reagents present are to be handled from the time of acquisition to the time of disposal (the "cradle to grave" concept).

2. Key Safety Personnel

Although safety is indeed the responsibility of all involved in a laboratory, there are still a few key players with additional responsibility. Following is a list of these positions and their definitions. The list of individuals required for each of these given roles is presented in appendix C of this document along with the means of contacting them.

Chief Executive Officer: (CEO) The person ultimately responsible for the safety of all persons at BLI. Appoints the Chemical Hygiene Officer, and is responsible to see to the development and faithful implementation of the CHP.

Chemical Hygiene Officer: (CHO) Reports to the CEO. Responsible for development, implementation, review and update of the CHP, and regular employee safety training. The CHO must be qualified for this position, either through training or experience in an appropriate setting.

Laboratory Manager: (LM) Reports to the CEO. Responsible for the safety of all laboratories and personnel, and maintaining any chemical storage facility. Maintenance includes but is not limited to maintaining a complete chemical inventory, chemical waste handling, segregation of incompatible chemicals and general facility maintenance. The LM is responsible for periodic inspection of the laboratories to ensure they are in good working conditions and for ensuring that the CHP is being implemented. Some or all of these tasks may be delegated, but the LM is ultimately responsible to see that they are done.

Laboratory Personnel: (LP) Reports to LM or CEO. May be assigned duties to ensure the safety of a given laboratory through specific tasks such as cleaning, preparation and proper labeling of reagents, checking of inventory, etc. LP also includes personnel who work in laboratories whether or not it is as a standard laboratory position.

Procurement Officer: (PO) Responsible for maintaining a complete chemical inventory, updated no less than once annually, maintaining an appropriate collection of Material Safety Data Sheets (MSDS's), and ensuring that duplicate reagent purchases are avoided. Additionally, the PO oversees the annual removal of waste chemicals.

3. Laboratory Procedures

Although appropriate laboratory procedures can fluctuate drastically for different applications, there are none the less a certain set of safety procedures that can be considered to be general enough that they should be adapted by all laboratories in use. The procedures delineated within this section represent our attempt to outline laboratory practices that should be considered to be minimally required for prudent safety standards. It must be noted that any or all of these procedures may be superceded by laboratory procedures that more appropriately fit the specific details of the laboratory application *provided these procedures do not undermine the intent or integrity of this section*. The LM is directly and solely responsible for such modifications, and answerable to the CEO should the modifications be insufficient.

3.1 Procedures for LP

Laboratory personnel are often those who work "behind the scenes" to keep a laboratory safe, through cleaning of the laboratories, preparation of reagents, checking of inventories, maintenance of safety equipment, or other miscellaneous tasks too numerous to delineate. They also include those who work in laboratories for developmental purposes, for example an individual who is developing a new procedure for an upcoming project or performing personal research, or maintenance of instrumentation of the physical space of the lab. All laboratory personnel must be granted permission to be in a laboratory by an appropriate superior. The individual granting said permission is responsible for the safety of the LP, including but not limited to ensuring that appropriate measures have been taken to train the LP for the task(s) at hand.

When working within a laboratory environment, the LP's actions should conform to the following guidelines:

1. No personnel will be authorized to work within a laboratory setting without proper safety training and documentation of said training. All BL employees are required to take a safety exam and pass with a minimum of 90% at least once a year.
2. Although it is not always possible, all LP's are strongly encouraged to avoid working in a laboratory alone. If it is not feasible to wait until another person is present, it is encouraged that LP's at least work when others are in the building and inform at least one other person of their intention to work in a laboratory. When working alone in a laboratory, activities should be restricted to general maintenance procedures and procedures that are well known to be safe and familiar to the LP. Any personnel working

alone in a laboratory are doing so with the express knowledge that it is of their own free will and take sole responsibility for their well being and safety while in the laboratory.

3. The purpose of a lab coat is to avoid accumulation of possibly hazardous chemicals on clothing through either spillage or contact with contaminated surfaces. All LP's are to wear lab coats at all times when working in a lab. To avoid as much as possible bringing chemicals into the environment outside of the laboratory, these lab coats are not to leave the laboratory and should be cleaned only in the laboratory itself.
4. All LP's must wear safety glasses whenever working in a laboratory. Said safety glasses must be ANSI approved for use in a chemical laboratory.
5. LP's must be careful to ensure that there are no flammable liquids in the vicinity when flames are to be used.
6. Transportation of hazardous reagents must be done in as cautious a fashion as possible. The method of transportation includes but is not limited to ensuring that the reagent is in a container appropriate for transportation (including being in shatter proof bottles when appropriate) and avoiding transporting chemicals through hallways whenever possible. If a chemical must be transported through a heavily traveled hallway, it should be done at a time when traffic can be expected to be minimal.
7. If the LP is to handle any chemicals determined to be corrosive or toxic through skin contact are strongly encouraged to wear appropriate protection.
8. Any spill will be cleaned up immediately and with due regard to safety procedures by the LP.
9. The LP will work to keep the workplace uncluttered and clean as a matter of safety.

The preceding procedures are designed to protect the safety and well being of any personnel within a laboratory setting. Failure to comply with these guidelines is the sole responsibility of the individual who assumes all responsibility for any injury that results.

3.2 Procedures for LM

Laboratory managers have additional responsibilities to protect the safety of those who will be under their supervision as well as their own. They are expected to assume the role as the expert not only for the laboratory procedures, but also for safety of the LP. For this reason, a LM is subject to all of the guidelines of the LP, but should also follow these additional guidelines:

1. The LM will ensure that all personnel receive appropriate safety training for the type of procedures to be utilized before any LP first perform the procedure, with refresher training minimally once a year. As part of this safety training, the LM assumes responsibility for documenting that this safety training was received and understood by all students. Only when this is completed will the LM grant permission for LP's to work in a laboratory.
2. For any given procedure, the LM will assume responsibility of learning the particular chemical and physical hazards of the procedure, and will make the LP aware of these hazards, including how to minimize their risks, as appropriate.
3. The LM is to ensure that all LP are following proper safety procedures and assumes full responsibility for the safety and well being of LP while working in the laboratories.
4. The LM is to ensure that the risks of a given procedure are minimized as much as possible, and that no procedure is performed if appropriate safety equipment is unavailable or if available equipment is deemed unsatisfactory for the procedure either by design or lack of maintenance.

5. The LM not only has the right but the responsibility to refuse to allow LP to perform any experiment which they deem puts the student at unreasonable risk for any reason. If necessary, the LM will follow up by taking appropriate actions to ensure that the safety shortcomings that caused any such cancellations are addressed for the future.

Ultimately, any laboratory manager must take responsibility for all aspects of safety during a procedure, and is expected to model correct safety procedures as well as to enforce them.

3.3 Procedures for LP

The well being of LP *must* be protected by direct supervision of a laboratory expert. The following guidelines are designed to protect LP:

1. No LP shall ever be permitted to work in a laboratory without direct supervision of at least one LM.
2. No LP shall ever be permitted to work in a laboratory without first receiving appropriate safety training and having documentation that said training has occurred.
3. Students shall always be required to wear appropriate safety attire during a procedure.

The LM must be especially aware of the activity during a procedure with special attention to be given to minimizing risks.

4. Risk Minimization

Risk minimization involves special procedures designed to protect all members of the community, both inside a laboratory as well as outside, from the risks and hazards of laboratories. Involved are general procedures for handling reagents, safety equipment for laboratories, and training of employees. Like anything else, these guidelines may be superseded by guidelines that are more appropriate for specific situations that are handed down from an appropriate expert provided the standards and intention of these guidelines are not compromised.

In most situations, however, these guidelines should be generally applicable to any laboratory setting.

It is the policy of the BL that any and all complaints involving chemical or physical hazards are immediately investigated and addressed. This includes but is not limited to complaints that may be related to safety issues, spillages, and oversights. A complete record of all such concerns and responses to these concerns is kept on file by the CEO.

4.1 Procedures Involving Reagents

Reagents pose special problems unique to laboratory settings. All reagents are to be considered hazardous to health and environment, reactive, and in the wrong hands can cause serious damage to health or property either through accidental misuse or by design. For this reason, special precautions must be put into place to protect personnel from the hazardous effects of reagents as well as to ensure that said reagents do not fall into the wrong hands. The following guidelines are based on two fundamental assumptions; that all reagents are to be treated as hazardous materials, and that minimization of reagents leads to minimization of the hazards associated with these materials.

4.1.1 Procurement

Accumulation of large quantities of any given reagent or a large number of unused reagents for an extended period of time can lead to degradation products of these reagents with unpredictable consequences. For this reason, the simple rule of thumb that “less is more” will be strictly adhered to, and all efforts will be made to prevent the accumulation of unused or unwanted reagents. The following guidelines should be followed at all times:

1. The PO will maintain at all times a current chemical inventory, which is to include all chemicals in storage at BL, updated no less frequently than once a year. This inventory is

to minimally include the chemical name, approximate quantity, storage location(s), and unusual hazards (such as, for example, shock sensitive explosives that any individual should be aware of even before having the opportunity to read the label). An electronic database with all stored chemicals will be made available to all BL personnel.

2. The PO will ensure that a single and complete collection of MSDS sheets is up to date with all reagents in the inventory represented in the collection. This collection is to be kept in the front office, deemed to be a location where all BL personnel can have access at all times.
3. Before any new chemicals are ordered, the PO must be given the opportunity to see if the chemicals desired are present already in appropriate amounts to cover the current needs. If so, no new reagents will be ordered.
4. If new reagents must be purchased, the quantity of reagent purchased will be only enough to cover the current needs. Ordering large quantities based on price minimization is strongly discouraged.
5. The PO must be informed of all purchases. On receipt of the reagent, it is the responsibility if the PO to make the appropriate entry in the chemical inventory and ensure that the MSDS has been procured and placed in the appropriate location. In addition, the date received and the initials of the PO will be placed on all new procurements such that the age of said procurements can be ascertained on inspection.
6. It is the responsibility of the purchaser, PO or LM to ensure that the reagent and any excess from the experiment for which it was purchased is appropriately stored.

The importance of effective communication cannot be stressed enough in the minimization of chemical inventory. A single point of reference, specifically the PO, is critical to the task, and

special care must be taken by all personnel to go through this individual before putting forward any new purchase requests.

4.1.2 Reagent Storage

Three primary concerns must be addressed with chemical storage: appropriate separation of incompatible materials; protection of safety of all personnel; and preventing the reagents from falling into the wrong hands. Towards these ends, the following guidelines will be used in the storage of reagents:

1. There will be one primary storage area, which will contain all chemicals for long-term storage or disposal. The chemical storage area is the responsibility of the LM who is ultimately responsible to ensure that the following guidelines are met.
2. The storage area will have appropriate security such that it can be locked independently from any working laboratories to prevent inappropriate persons from entering the chemical storage area. This area is to be kept locked as a matter of routine.
3. Ventilation of the storage area will be appropriate for the task of the area. Accumulation of possibly toxic fumes can only be avoided by appropriate ventilation.
4. Reagents will be appropriately segregated to keep incompatible materials from coming into contact with one another.
5. Acids are to be stored independently from other reagents in cabinets appropriate for handling any possible fumes that may emanate from their containers.
6. Chemical waste may not be stored for longer than one year. Chemical waste disposal procedures will be followed thoroughly.
7. Volatile reagents that must be refrigerated will be kept in an explosion proof refrigerator.

8. Reagents that have not been used recently or are not anticipated to be used within the near future will be disposed of either as chemical waste or through a chemical exchange program. Exceptions to this rule include chemicals that are used in small quantities but frequently (such as chemical indicators in their solid form, the solutions of which are used regularly but rarely need replenishment because of the quantities typically used) or reagents that are deemed both safe for extended storage and expensive to replace should the need for the reagent arise. Searches specifically for infrequently used chemicals are to be performed no less frequently than once every five years. A convenient method for identifying infrequently used reagents is to "mark" all reagents with a removable sticker. As the reagent is used, the sticker is removed. At the end of an appropriate period of time (ideally two years), bottles that still have a marking sticker will be considered for disposal due to infrequent use.

Additional guidelines for materials with specific hazards associated with them may have additional guidelines imposed.

4.1.3 Reagent Usage

Reagent usage refers to the handling of reagent between the times that it is in storage and when it becomes classified as chemical waste. Typical usage includes the use of the reagent in a procedure, or in preparation of a solution or other material for use in a procedure, but may also include temporary storage in preparation for an upcoming procedure. The following guidelines are designed to protect personnel during such usage:

1. Appropriate attire will be donned whenever reagents are in use, including but not limited to laboratory coats and safety glasses.

2. Dilutions are to be performed slowly, always adding any acidic material to basic when appropriate, with careful attention paid to prevent excessive heat formation. Labels for diluted solutions should minimally contain the solution name (including all components of the solution), concentration, date of creation and initials of the individual responsible for making the reagent.
3. Excess reagents in diluted form may be stored subject to the guidelines of reagent storage.
4. Reagents may be stored outside of regular storage areas for up to 24 hours provided they are to be used in an experiment during that time. These reagents must be returned to the chemical storage facility when the individual using said reagents are out of the laboratory for any length of time.
5. Reagent labels will under no circumstances be removed or defaced until the container is completely empty. Should it be necessary due to age and corrosion, labels may be recreated as needed and should contain as much identical information as possible as the original label.

Other guidelines specific to the usage and reagents involved will also apply.

4.1.4 Chemical Waste

All chemical waste is to be considered hazardous and disposal of which will inevitably be expensive. To minimize the hazards and costs associated with chemical waste, special care must be taken to avoid the most common problem associated with chemical waste; lack of knowledge. It is all too common that wastes are generated haphazardly with little regard given to documentation of the exact components of the waste. The following guidelines are designed to avoid hazardous accumulation and lack of knowledge of chemical waste:

1. Waste is only to be stored in an appropriate location. Any waste that is not deemed safe for long term storage must be removed from the building by an appropriate service annually. Waste that does not pose a particular hazard may be stored longer than one year, although this practice is discouraged.
2. All waste containers are to be appropriately labeled with the date, the name of the individual accumulating the waste, a log entry number and the contents of the waste container with special care taken to denote any known heavy metal, flammable, organic, corrosive, explosive, health and/or other particular hazards associated with the waste.
3. The LM will maintain a logbook of waste containers accumulated. The log books are minimally to contain a log entry number for each waste container, the dates in which waste was added to the container, the name of the person(s) adding the waste, the contents of the waste and any known hazards.
4. Organic and/or water waste may have its volume reduced by evaporation provided that no heat is applied whatsoever during the process as heat can lead to the formation of side products with unpredictable properties. All evaporation processes of chemical waste must be performed within a functioning fume hood.
5. The PO is responsible for hiring a company for its removal. This work may be delegated as necessary.

All chemical waste must be handled with extreme care and special attention must be paid to remain vigilant in its correct identification.

4.2 Minimum Laboratory Requirements

Any laboratory by nature has special risks associated with it. For this reason, special care must be made to ensure that appropriate equipment and design goes into the laboratories to ensure that these risks, while impossible to remove, are at the very least minimized. Such items include safety equipment, appropriate space, continual ventilation and security measures to prevent usage by non-approved individuals. The following guidelines must be met in the laboratory environments:

1. All laboratories will have a minimum of two fire escape routes.
2. All laboratories will have a minimum of two fire extinguishers located on opposite sides of the laboratory (or, more specifically, one near each emergency exit) designed for use on all types of fires.
3. All laboratories utilizing reagents will have a minimum of two eye wash stations located on separate sides of the laboratory. Eye wash stations may be permanent or portable.
4. All laboratories will have a minimum of two fire blankets located on opposite sides of the laboratory. Exceptions include laboratories in which a permanent emergency shower has been installed which can be used for extinguishing fires on individuals.
5. Chemistry laboratories and areas which regularly utilize large quantities of corrosive reagents will have at least one emergency shower.
6. Laboratories that utilize reagents with known fume hazards will be equipped with appropriate ventilation for the entire room and fully functional fume hoods for use with the reagents by individuals.
7. All laboratories will have at least one first aid kit, containing no less than adhesive elastic and stretch bandages, adhesive tape, antiseptic wipe, bandage compresses, scissors, tweezers, at least one pair of latex gloves and disposable one-way CPR micro shields.

8. Every laboratory will have a minimum of 30 square feet of working space per LP within the laboratory.
9. Laboratories with specific and unique hazards other than those typically associated with chemical reagents will be appropriately equipped to handle the hazards.
10. Pathways to laboratory safety equipment (fire extinguishers, eye wash stations, etc) must *never* be blocked by any object, even temporarily, including by chairs or stools.
11. All working benches must be kept clear of clutter, and aisles are never to be obscured or blocked.
12. All laboratory safety equipment will be kept in good working condition and inspected minimally twice annually. The check sheet included in Appendix E of this document can be used to log these inspections.

Laboratory regulations are designed to prevent accidents, but accidents can always occur. Only by properly equipping a laboratory for every possible contingency will anybody be able to truly claim that the hazards of their laboratories have been minimized.

4.3 Employee Training

Employee safety training consists of two parts, initial training and refresher training, and is the responsibility of the CHO. Initial training is typically assumed for those who enter a position with degrees that would have included such safety instruction (such as a degree in biology, chemistry, or physics). However, all other personnel must be given proper safety training before being allowed to handle or to be exposed to hazardous chemicals.

To avoid the hazards associated with forgetfulness of safety procedures due to lack of practice, all employees must receive refresher training at least annually. Training of new employees can be included in this training as their initial safety instruction. Such training must

minimally include handling hazardous materials, procedures for purchasing and disposing of reagents, record keeping procedures, safety equipment and attire, and reading MSDS's and the information contained therein. A written record of the employees receiving such training and the date of the training is to be kept by the CHO.

Employee training shall incorporate at least the following:

1. Information on their rights as delineated by the Occupational Safety and Health Administration (OSHA).
2. The contents of this CHP.
3. The concept of permissible exposure limits (PEL) and OSHA regulations of such limits, including but not limited to definition, where to find PEL's, and signs and symptoms of overexposure to hazardous chemicals.
4. The location and availability of safety reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory.
5. Methods and observations that may be used to detect the presence of hazardous chemicals.
6. The physical and health hazards associated with working in a laboratory and means of protection from such hazards.
7. The right of all employees to seek medical attention free of charge and without fear of retaliation should symptoms appear of toxic exposure or when exposed to chemicals.

BL will develop a safety exam that must be taken and passed with a minimal score of 90% by all BL employees no less frequently than once a year.

5. Emergency Procedures

The best plans of safety cannot prevent injury from occurring due to either accident or unforeseen circumstances. It is assumed that, should an injury occur, there will be an appropriate expert nearby (such as the LM) who will know how to handle the incident immediately. BL is concerned with both the safety of any injured personnel as well as with follow-up procedures to ensure that the situation is not repeated.

5.1 Bodily Injury

There is, naturally, a distinct difference between minor and serious bodily injury. Injuries that are deemed minor by the LM (scrapes, cuts, or minor burns for example) can be handled immediately. Such injuries should be noted by the LM, who can then make a judgment as to whether or not to forward the injured to appropriate health services (HS). The primary reason for reporting such incidences is to inform the HS that a given individual may develop symptoms because of the injury sustained. Any person developing symptoms which may be the result of exposure to chemicals or who are known to have been exposed to a chemical at concentrations above the permissible exposure limit (PEL) will be assumed to have received a bodily injury and as such will receive a free examination and treatment if necessary at an appropriate HS.

Handling of more severe accident depends on the extent of the injury. Any of these injuries must be reported to an appropriate HS. Injured personnel are never to go to any HS alone; if they are well enough that ambulatory services are not necessary, a second individual from BL will be given the assignment of getting the injured party to an appropriate HS. Otherwise, 911 is to be called and the HS is to be apprised of the situation.

All injuries resulting in the need for a physical examination and/or medical treatment must be reported to the CEO. The CEO will maintain a record of all persons injured, including the nature of the injury, any chemical(s) involved in the incident if applicable, the date, and

response to the injury including but not limited to medical procedures incurred. The form included in Appendix F of this document should be filled out and filed for each injury that occurs.

Should any person need to be examined by a medical professional, the medical professional must be provided with the identity of the hazardous chemical(s) to which the person was exposed, a description of the conditions under which the exposure occurred including quantitative exposure data if available, and a description of the signs and symptoms of exposure that the person is experiencing if any. The form included in Appendix G of this document can be used to transmit this information to the attending physician. In return, the physician is requested to offer a written opinion based on the examination which includes any recommendations for medical follow-up, the results of the examination including any tests that were performed, any medical condition which may be revealed in the course of the examination which may place the person at increased risk as a result of exposure to hazardous chemicals, and a statement that the individual has been informed of the results. This written opinion is to be kept on file by the CEO.

5.2 Physical Damage to Facilities

It is assumed here that the incident resulting in the damage, either fire, explosion or spillage, has been contained and eliminated. Should major physical damage occur to a laboratory or laboratory equipment, the first priority will always be to the safety of BL employees and treating the injured. Assuming the injured have been attended to, the LM is to make a decision as to whether or not the laboratory is in suitable condition for use. If it is not, laboratories will be moved or cancelled until reparations can be made. All work will be cancelled if the laboratory is deemed unsafe because of the incident or if LP are deemed overly

distressed to be able to continue by the LM. Before the laboratory can be used again, the damage must be repaired at least to a state where there is no physical danger in using the laboratory and the safety standards are met.

5.3 Uncontrollable Situations

Here we assume that the incident which has occurred cannot be eliminated and is still occurring, such as, for example, fires or chemical spillage producing toxic fumes. In such a situation, both the laboratory and the building is to be evacuated immediately and the correct emergency agency, fire department or HAZMAT team, is to be notified. Any injured persons are to be taken to safety and treated immediately for their injuries. The LP present when the situation arose must remain available to explain the situation to the appropriate emergency response professionals.

6. Special Safety Procedures

Special safety procedures include the handling of radioactive, infectious materials or other hazards that may arise for specialty procedures. Currently, BL does not anticipate working with or storing such materials, so procedures for handling these types of material are not currently necessary. Should we begin utilizing this type of material, appropriate modifications will be made to this CHP and local authorities will be made aware.

7. Conclusion

This document began with the statement that safety is the responsibility of everybody. Throughout the document, we have delineated the responsibilities of many people, and hopefully gave the impression that there is enough responsibility to share. Only through vigilant effort can we ensure that our college is as safe as possible. We are all in this together; we all have to do our part to see that we stay well.

Appendix A: Types of Hazards and Hazardous Materials[2]

Aerosol, Flammable: An aerosol that yields a flame protection exceeding 18 inches at full valve opening or a flashback at any degree of valve opening.

Carcinogen: Regulated by OSHA as a carcinogen, listed under the category "known to be carcinogens" in the Annual Report on Carcinogens by the National Toxicology Program (NTP), listed under Group 1 ("carcinogenic to humans") in the latest editions by the International Agency for Research on Cancer Monographs (IARC), or listed in either Group 2A or Group 2B by the IARC or under the category "reasonably anticipated to be carcinogens" by the NTP.

Combustible Liquid: Any liquid having a flashpoint at or above 100 ^{o}F (37.8 ^{o}C) but below 200 ^{o}F (93.3 ^{o}C).

Compressed Gas: A gas or mixture of gases having, in a container, pressure exceeding 40 psi at 70 ^{o}F (21.1^{o}C) or exceeding 104 psi at 130 ^{o}F (54.4 ^{o}F).

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

Gas, Flammable: a gas that forms a flammable mixture with air at a concentration of 13% by volume or less, or a gas that forms a range of flammable mixtures with air wider than 12% by volume.

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

Liquid, Flammable: Any liquid having a flashpoint below 100 ^{o}F (37.8 ^{o}C).

Organic Peroxide: An organic compound that contains the bivalent –O-O- structure.

Oxidizer: A chemical other than a blasting agent or explosive 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 CEOientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

Reproductive Toxins: Chemicals which affect the reproductive capabilities including chromosomal damage (mutagens) and effects on fetuses (teratogensis).

Solid, Flammable: A solid other than a blasting agent or explosive that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard.

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.

Appendix B: Terms and Definitions

Chemical Hazard: Any known hazard of a reagent that could cause harm to an individuals health, including but not limited to respiratory aiCEOents, burn hazards, or damage to mucous membranes.

Chemical Hygiene Plan: The plan which is approved by the faculty, staff and administration of the BL on appropriate procedures and policies concerned with safety in laboratories.

Corrosive: Any chemical that causes erosion of skin and/or matter such as containers or surfaces.

Experiment: Any procedure in which the outcome is either not known in advance, or in which the outcome is to drive those performing the procedure to a given conclusion through experience.

Explosive: Any chemical known to react violently creating excessive force and/or heat.

Fumes: Toxic and/or corrosive airborne chemicals from reagents that are typically in liquid or solid state in the form of either gases or small particles (mist).

Flammable: Chemicals with a flash point below $200^{o}F$ ($93.3^{o}C$).[1]

Flashback: flame extending back to the source of the flammable material

Flash Point: That temperature at which a liquid or solid will begin to burn when exposed to a source of ignition (spark or flame).

Hazardous: Any reagent or situation that exposes an individual or group to chemical or physical hazards.

HAZMAT Team: Professionals specifically trained to deal with spillage of hazardous materials.

Heavy Metal: A heavy metal (such as lead, Pb or mercury, Hg, for example) with special hazards including lifetime cumulative effects.

Laboratory: Any room or physical space so designated for experiments for the express purpose of either education or professional research.

Laboratory Procedures: Guidelines for behavior in laboratories designed to minimize risk of injury.

Material Safety Data Sheet: Obtained from the reagent's manufacturer, the Material Safety Data Sheet is a listing of all known hazards and appropriate safety responses.

Organic: Any chemical or mixture containing one or more compounds with carbon and hydrogen. Organics tend to have safety hazards associated with health risks and flammability.

Permissible Exposure Limit: A limit of exposure as a function of concentration and time as set by OSHA and reported on a chemical's MSDS.

Physical Hazards: Any hazard associated with a reagent that could cause physical harm, including but not limited to corrosive properties, flammability, or explosion hazards.

Procedure: Any task or series of tasks performed in the laboratory either for clients or for internal use.

Reagents: Any chemical or mixture of chemicals ordered for the express purpose of use in a laboratory setting.

Appendix C: Index of Abbreviations

ANSI:	American National Standards Institute
CHO:	Chemical Hygiene Officer
CHP:	Chemical Hygiene Plan
LM:	Department Chair or Acting Chair
CEO:	Chief Executive Officer
BL:	Bleil Laboratories, Inc.
HS:	Health Services
IARC:	International Agency for Research on Cancer
LP:	Laboratory Personnel
MSDS:	Material Safety Data Sheet
NTP:	National Toxicology Program
OSHA:	Occupational Safety and Health Administration
PEL:	Permissible Exposure Limit
PO:	Procurement Officer

Appendix D: List of Key Personnel

Title	Name	Office Phone	Email
CEO	Richard Bleil		
CHO			
PO			
LM			

Appendix E: Laboratory Safety Equipment Check Sheet

Date: Room Number: Name of Inspector:

Fire Blankets:

Two fire blankets on opposite sides of lab: ___ yes ___ no
If no, is there a safety shower present? ___ yes ___ no
Rips or Tears in blanket(s): ___ yes ___ no

Safety Showers:

Adequate flow? ___ yes ___ no ___ emergency shower not present in this room

Eyewash Stations:

Two stations on opposite sides of the lab? ___ yes ___ no
Station 1:
___ permanent ___ disposable
if permanent, adequate water flow? ___ yes ___ no
if disposable, has the bottle been compromised? ___ yes ___ no
Station 2:
___ permanent ___ disposable
if permanent, adequate water flow? ___ yes ___ no
if disposable, has the bottle been compromised? ___ yes ___ no

First Aid Kits:

Still sealed from the previous inspection? ___ yes ___ no
If no, are the following items present?
adhesive bandages : ___ yes ___ no
elastic bandages : ___ yes ___ no
stretch bandages : ___ yes ___ no
triangular bandage: ___ yes ___ no
adhesive tape : ___ yes ___ no
bandage compresses : ___ yes ___ no
first aid cream: ___ yes ___ no
burn cream: ___ yes ___ no
antiseptic wipes : ___ yes ___ no
instant cold pack: ___ yes ___ no
scissors : ___ yes ___ no
tweezers : ___ yes ___ no
latex gloves : ___ yes ___ no
disposable one-way valve CPR micro shield : ___ yes ___ no

Fume Hoods:

Adequate flow? ___ yes ___ no

Appendix F: Injury Report Form

Date: Room Number:

Name of LM: Name of injured:

Briefly describe the nature of the injury:

Were safety procedures properly followed? ___ yes ___ no
If not, explain:

Are there safety procedure or equipment modifications that could have prevented this injury?
___ yes___ no
If yes, explain:

Provide a complete list of chemical reagents in use during the time of the injury:

Briefly describe the action taken at BL:

Was the injured taken to an appropriate HS for further treatment? ___ yes ___ no
If yes, attach doctor's report

Appendix G: Injury Fact Sheet for Physicians

Date: Room Number:

Name of LM: Name of injured:

Briefly describe the nature of the injury:

Provide a complete list of chemical reagents in use during the time of the injury:

Is this a ___ complete list or ___ partial list of the most hazardous chemicals?

Briefly describe the action taken at BL:

Bibliography

1. Jay A. Young, Warren K. Kingsley, and George H. Wahl, Jr., Developing a Chemical Hygiene Plan (American Chemical Society, USA, 1990).

2. Federal Registry 55, number 21, Jan. 31, 1990 as reproduced in reference (1).