SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION LIB00002

CHEMETALL FOOTE CORP.
348 HOLIDAY INN DRIVE
KINGS MOUNTAIN, NC 28086
704-739-2501 (8 AM–5 PM M–Th)
(8 AM- 12 PM F)

FOR EMERGENCY TRANSPORTATION INFORMATION, CALL CHEMTREC
1-800-424-9300

SUBSTANCE: LITHIUM BROMIDE BRINE SOLUTION with NITRATE INHIBITOR
TRADE NAMES/SYNONYMS: None.
CHEMICAL FAMILY: Aqueous Inorganic Salt Solution
PRODUCT USE: Used for a variety of industrial and research applications.
FORMULA: $LiBr/H_2O$ and $LiNO_3$
CREATION DATE: 10/19/96 REVISION DATE: 06/29/11 (see Section 16 for revision details)

SECTION 2 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: WARNING! CAUSES SKIN AND EYE IRRITATION. MAY BE HARMFUL IF SWALLOWED. MAY CAUSE AN ALLERGIC SKIN REACTION. CAN CAUSE CENTRAL NERVOUS SYSTEM EFFECTS AND KIDNEY DAMAGE. Clear, colorless, odorless solution. This solution poses a slight health hazard during typical emergency response situations. Lithium Bromide Brine Solution causes eye, skin and respiratory irritation. This solution is not flammable. This solution is not reactive under most circumstances. Emergency responders must wear personal protective equipment suitable for the situation to which they are responding.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most serious health consequences reported for lithium compounds, such as Lithium Bromide and Lithium Nitrate (components of this solution), are adverse effects on the central nervous system from overexposures via ingestion. In terms of anticipated occupational situations for employees, the main health effect from overexposure would be irritation or burns of contaminated skin and eyes.
INHALATION: Inhalation of mists or sprays may irritate the mouth, nose, and other tissues of the respiratory system. Inhalation of relatively large doses of this product may produce symptoms similar to those described for other lithium compounds (e.g., ringing in the ears, nausea, vomiting, diarrhea, drowsiness, twitching, and blurred vision). Prolonged or repeated inhalation of inorganic bromides (such as Lithium Bromide) can cause rashes, which resemble acne.
CONTACT WITH SKIN or EYES: Skin overexposure can cause severe irritation with itching, pain, and reddening. Prolonged or repeated skin exposures can cause dermatitis. Repeated skin contact may result in an allergic skin reaction. This solution can cause severe eye irritation; symptoms of such overexposure would be pain and reddening of the eyes. Prolonged eye contact may damage the eyes.
INGESTION: Ingestion is not anticipated to be a significant route of occupational exposure. Acute or chronic ingestion of this product may cause rash, ringing in the ears, nausea, vomiting, diarrhea, difficulty speaking, drowsiness, twitching, visual disturbances, and coma. Ingestion of relatively large quantities of this product can cause kidney and liver damage. This product may also irritate or burn the mouth, throat, esophagus, and other tissues of the gastrointestinal tract. Ingestion of lithium nitrate may cause headache, weakness, loss of coordination, cyanosis (bluish color of the skin and lips), seizures, coma, blood in the urine and may affect the kidneys and thyroid.
SKIN ABSORPTION: Severe skin absorption exposure may cause symptoms similar to those described in "Ingestion".
CHRONIC: Prolonged or repeated skin exposures can cause dermatitis. Long-term inhalation or ingestion overexposure may produce symptoms similar to those described for other lithium compounds (e.g., rash, ringing in the ears, nausea, vomiting, diarrhea, difficulty speaking, drowsiness, twitching, visual disturbances, kidney damage, thyroid effects and coma). Prolonged or repeated inhalation or ingestion of inorganic bromides (such as Lithium Bromide, a component of this solution) can cause rashes, which resemble acne.
TARGET ORGANS: ACUTE: Eyes, skin, mucous membranes. CHRONIC: Skin, central nervous system, thyroid, kidney.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory, skin, central nervous system, and kidney conditions can be aggravated by overexposure to this product. Persons with significant cardiovascular or renal disease, sodium and water imbalance, and pre-existing hypothyroidism may also be at increased risk. Alertness may be impaired.

SECTION 3 COMPOSITION, INFORMATION ON INGREDIENTS

Component	CAS #	% w/w
Lithium Bromide	7550-35-8	54-55
Lithium Nitrate	7790-69-4	0.04-0.06

SECTION 3	COMPOSITION, INFORMATION ON INGREDIENTS	
Water	7732-18-5	Balance

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-2004 format.

SECTION 4 FIRST-AID MEASURES

Victims of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention if necessary. Take copy of label and MSDS to physician or health professional with victim.
SKIN EXPOSURE: If this solution contaminates the skin, immediately begin decontamination with running water. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victims must seek immediate medical attention if adverse effect occurs.
EYE EXPOSURE: If this solution contaminates the eyes, immediately wash eyes. Open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 20 minutes. Victims must seek immediate medical attention if any adverse effect occurs.
INHALATION: If mists or sprays of this solution are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.
INGESTION: If this solution is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. DO NOT INDUCE VOMITING. If conscious, have victim rinse mouth with water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow.

SECTION 5 FIRE-FIGHTING MEASURES

FIRE EXTINGUISHING MATERIALS: This product is not flammable. Use fire extinguishing material appropriate for surrounding fires.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product presents a moderate contact hazard to firefighters. When involved in a fire, this product may decompose and produce irritating fumes and toxic gases (lithium and nitrate compounds, hydrogen bromide, bromine).

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. If possible, firefighters should control runoff water to prevent environmental contamination.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area and protect people. The minimum Personal Protective Equipment recommended for response to non-incidental releases should be **Level C: nitrile gloves, chemical resistant suit and boots, hard-hat, and air-purifying respirator with high-efficiency particulate filter. Self-Contained Breathing Apparatus would be worn in situations where the oxygen level is below 19.5 % or is unknown.** Absorb spilled liquid with polypads or other suitable absorbent. Decontaminate the area thoroughly. Place all spill residue in a suitable container and seal. Dispose of in accordance with U.S. Federal, State, and local or Canadian solid waste disposal regulations (see Section 13, Disposal Considerations).

SECTION 7 HANDLING AND STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this solution ON YOU or IN YOU. Wash thoroughly after handling this solution. Do not eat, drink, or smoke while handling this product. Remove contaminated clothing immediately. Use ventilation and other engineering controls to minimize potential exposure to this solution.
STORAGE AND HANDLING PRACTICES: All employees who handle this solution should be trained to handle it safely. Ensure containers of this solution are properly labeled. Open containers slowly on a stable surface. Store containers in a cool, dry location, away from direct sunlight or sources of intense heat. Keep container tightly closed after use. Store away from incompatible materials (see Section 10, Stability and Reactivity). Inspect containers of this solution for leaks or damage. Read instructions provided with the product prior to use. Empty containers may contain residual material; therefore, empty containers must be handled with care.
PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely, as applicable. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures. Note: When steel equipment containing a film of Lithium Bromide salt is heated red-hot (for example, when cutting the steel with an oxy-acetylene torch), a small amount of elemental bromine gas could be liberated. This gas, which is reddish in color, can be smelled at low concentrations (Odor Threshold = 0.00999 ppm) and has an irritating odor. Bromine can cause eyes to water uncontrollably. All pipelines, process lines, and other equipment that contained this solution must be

SECTION 7 HANDLING AND STORAGE

thoroughly decontaminated before maintenance begins.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

Component	Exposure Limits in Air				
	ACGIH-TLVs		OSHA-PELs		OTHER
	TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	mg/m^3
Lithium Bromide	NE	NE	15 (Total dust) 5 (Respirable fraction) as Particulates not otherwise classified	NE	NE
Lithium Nitrate	NE	NE	NE	NE	NE
Water	NE	NE	NE	NE	NE

NE = Not Established See Section 16 for Definition of other terms and acronyms used.

The information presented is based only on this product. The Exposure Controls and Personal Protection required will be dependent on the conditions present in the workplace, including the presence of other chemicals. PPE should be based on a Hazard Assessment as required in 29CFR1910.132.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation, to ensure exposure levels are minimized. Mechanical exhaust may be needed.

RESPIRATORY PROTECTION: If ventilation is inadequate, an approved dust respirator may be required. For higher exposures or in potentially oxygen deficient atmospheres, a supplied air respirator may be required. Respirator selection and use should be based on contaminant type, form and concentration. Follow OSHA 1910.134, ANSI Z88.2, CSA Standard Z94.4-02 and good Industrial Hygiene practice.

EYE PROTECTION: Splash goggles or safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133, and appropriate Canadian Standards.

HAND PROTECTION: Wear nitrile gloves for routine industrial use. If necessary, refer to U.S. OSHA 29 CFR 1910.138 and appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate for task (e.g., Apron or protective suit). If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, wear foot protection, as described in U.S. OSHA 29 CFR 1910.136.

Where there is any possibility that an employee's eyes may be exposed to this product, the employer should provide an eye wash fountain within the immediate work area for emergency use.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

VAPOR DENSITY (air = 1): Not established.

EVAPORATION RATE (nBuAc=1): Not established.

SPECIFIC GRAVITY (water = 1): 1.6

FREEZING/MELTING POINT: Not established.

SOLUBILITY IN WATER @ 28°C: Soluble.

BOILING POINT: Not established.

VAPOR PRESSURE, mm Hg @ 20°C: Not established.

pH: Not established.

ODOR THRESHOLD: Not applicable.

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume): Not applicable

COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not available.

APPEARANCE AND COLOR: Clear, colorless odorless solution.

HOW TO DETECT THIS SUBSTANCE (warning properties): The color of this product may act as a unique warning property.

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition of this product can produce hydrogen bromide, bromine and lithium and nitrogen compounds.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product is not compatible with strong acids, strong oxidizers, water reactive materials, flammable materials, and reducing agents.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid mixing this solution with incompatible chemicals.

SECTION 11 TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicology data for components of this product present in greater than 1% concentration are provided below:

LITHIUM BROMIDE:

LD_{50} (Oral-Rat) 1800 mg/kg

LD_{50} (Oral-Mouse) 1840 mg/kg

LITHIUM NITRATE:

LD50 oral rat 1426 mg/kg.

CARCINOGENICITY STATUS: Lithium Bromide and Lithium Nitrate are not listed as carcinogens or suspected carcinogens by IARC, NTP, OSHA or ACGIH. Ingested nitrate under conditions that result in endogenous nitrosation is probably carcinogenic to humans (Group 2A). Nitrate can be converted to nitrite in the body. Nitrite in food is associated with an increased incidence of stomach cancer.

IRRITANCY OF PRODUCT: This solution can irritate the skin and eyes.

SENSITIZATION TO THE PRODUCT: Lithium Bromide may cause skin sensitization

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system. Lithium chloride and Lithium carbonate have led to reproductive effects in laboratory experiments; Reproductive effects were also observed with humans, as well as effects on the infants through breast feeding. The validity of animal test and its significance for humans cannot be concluded with certainty.

Mutagenicity: This product is not reported to produce mutagenic effects in humans.

Embryotoxicity: This product is not reported to produce embryotoxic effects in humans.

Teratogenicity: This product is not reported to produce teratogenic effects in humans.

Reproductive Toxicity: This product is not reported to produce adverse reproductive effects in humans.

ACGIH BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, there are no ACGIH Biological Exposure Indices (BEIs) determined for the components of this product.

SECTION 12 ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: This solution is stable in the environment.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: The effects on exposed animals would be primarily irritation of contaminated tissue. The main effect on plants would be the increase in salinity of contaminated soils if large volumes of this solution are released.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Releases of large quantities of this solution can be detrimental to an aquatic environment by altering the salinity of a body of water.

ACUTE AQUATIC TOXICITY:

Lithium Bromide: EC50 daphnia 364 mg/L/48 hr.

Lithium Ion: Growth inhibition LC50 pimephales promelas 1.4 mg/L/96 hr; NOEC 0.2 mg/L/96 hr. (OECD 210).

DEGRADABILITY: The methods for determining biodegradability are not applicable to inorganic substances.

LOG BIOCONCENTRATION FACTOR (BCF): No data currently available.

LOG OCTANOL/WATER PARTITION COEFFICIENT: No data currently available.

SECTION 13 DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations or with regulations of Canada and its Provinces. This solution, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local solid waste regulatory authority.

U.S. EPA WASTE NUMBER: Not applicable.

SECTION 14 TRANSPORT INFORMATION

THIS MATERIAL IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Not Applicable
HAZARD CLASS NUMBER and DESCRIPTION:	Not Applicable
UN IDENTIFICATION NUMBER:	Not Applicable
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Not Applicable

NORTH AMERICAN EMERGENCY RESPONSE GUIDE NUMBER (2008): Not applicable.

MARINE POLLUTANT: No component of this product is designated as a Marine Pollutant by the DOT (per 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This product is not considered as Dangerous Goods, per regulations of Transport Canada.

EMERGENCY RESPONSE CONTACT FOR AN INCIDENT DURING TRANSPORTATION:
CHEMTREC 1-800-424-9300 or 1-703-527-3887

SECTION 15 REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this solution are subject to the reporting requirements of the Comprehensive Environmental Response, Compensation, and Liability Act and Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act as follows:

CERCLA SECTION 103 (40 CFR 302.4) Listed CERCLA Extremely Hazardous Substance:	No
SARA SECTION 302 (40 CFR 355.30) Extremely Hazardous Substance:	No
SARA SECTION 304 (40 CFR 355.40) RQ-CERCLA or SARA 302:	No
SARA SECTION 313 (40 CFR 372.65) Toxic Chemical Release Inventory (TRI/Form R):	Yes (Nitrate Compound Category, water dissociable)

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

U.S. TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory.

U.S. TSCA 12(b) EXPORT NOTIFICATION: TSCA 12(b) Notification is not required, per 40 CFR 707, for the components of this product.

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

U.S. STATE REGULATORY INFORMATION: The components of this product are covered under specific State regulations, as denoted below

Massachusetts - Substance List: No.
Michigan - Critical Materials Register: Lithium Compounds.
New Jersey - Right to Know Hazardous Substance List: Lithium Nitrate.
Pennsylvania - Hazardous Substance List: No.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this product is on the California Proposition 65 lists.

ANSI STANDARD LABELING (Precautionary Statements): **WARNING!** CAUSES SKIN AND EYE IRRITATION. MAY BE HARMFUL IF SWALLOWED. MAY CAUSE AN ALLERGIC SKIN REACTION. CAN CAUSE CENTRAL NERVOUS SYSTEM EFFECTS AND KIDNEY DAMAGE.. Avoid contact with skin, eyes, and clothing. Wash thoroughly after handling. Use in well-ventilated area. Do not take internally. Wear gloves, safety glasses or goggles, and appropriate body protection. FIRST-AID: In case of skin or eye contact, immediately flush with water for 20 minutes. Remove contaminated clothing and shoes. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If ingested, do not induce vomiting. Seek immediate medical attention. IN CASE OF FIRE: Use any media suitable for the fire situation. IN CASE OF SPILL: Absorb spilled material with polypads or other suitable absorbent. Place in a suitable container. Consult Material Safety Data Sheet before use.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are on the DSL Inventory.

CANADIAN WHMIS SYMBOLS: **Class D2B** Other Toxic Effects, Skin Irritation, Eye Irritation ; (see final page of this document).

SECTION 16 OTHER INFORMATION

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM RATING: Health Hazard = 2; Fire Hazard = 0; Physical Hazard = 0

NFPA 704 RATING: Health Hazard = 2; Fire Hazard = 0; Instability Hazard = 0

4 = Severe Hazard 3 = Serious Hazard 2 = Moderate Hazard 1 = Slight Hazard 0 = Minimal Hazard

The information in this Material Safety Data Sheet is based on data that Chemetall Foote Corporation believes to be reliable as of the MSDSs date of revision. Chemetall Foote Corporation makes no warranty or representation of any kind that the MSDS does not contain errors. The data in this MSDS relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process. It is intended for use by persons having technical skill and at their own discretion and risk. Since conditions of use are outside the control of Chemetall Foote Corporation, there are no warranties, expressed or implied, and Chemetall Foote Corporation assumes no liability in connection with the use of this information. Nothing herein is to be taken as a license to operate under or a recommendation to infringe on any patents. Any use of these data and information must be determined by the user to be in accordance with Federal, State and local laws and regulations.

REVISIONS MADE IN 2011:
Section 2: Emergency Overview, Skin Contact and Ingestion, Section 3: Percentage, Section 6: Gloves, Section, Section 10: Decomposition,

SECTION 16 OTHER INFORMATION

Section 11: Toxicity Data, Section 12: Ecotoxicity data, Section 15 Label

DEFINITIONS OF EXPOSURE LIMIT TERMS AND ABBREVIATIONS

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association that establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance that represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration. **PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based on the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.

IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**REL**s). When no exposure guidelines are established, an entry of **NE** is made for reference.

GRAPHICAL REPRESENTATION OF HAZARDS

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM RATING

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

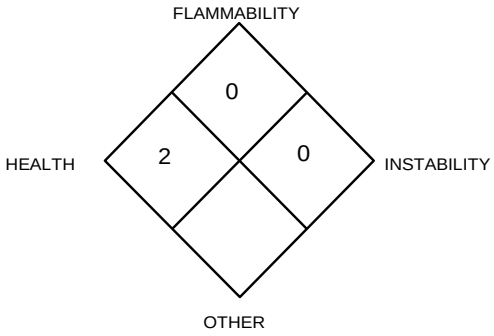
HEALTH HAZARD	(BLUE)	2
FLAMMABILITY HAZARD	(RED)	0
PHYSICAL HAZARD	(YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		

For Routine Industrial Use and Handling Applications

NATIONAL FIRE PROTECTION SYSTEM RATING



WHMIS SYMBOL

Class D2B: Materials Causing Other Toxic Effects