

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Ammonium Perchlorate

OTHER/GENERIC NAMES: AP, ammonium salt of perchloric acid,

PRODUCT USE: Analytical chemistry, oxidizer in various propellant or explosive mixtures, various industrial uses involving need for oxidizing or ionization in aqueous solution properties.

MANUFACTURER: American Pacific Corporation, Western Electrochemical Co. 10622 West 6400 North, Cedar City, UT 84721

FOR MORE INFORMATION CALL: (435) 865-5000

IN CASE OF EMERGENCY CALL: (435) 865-5044

2. COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT NAME	CAS NUMBER	EINECS NUMBER	WEIGHT %
Ammonium Perchlorate	7790-98-9	232-235-1	~100

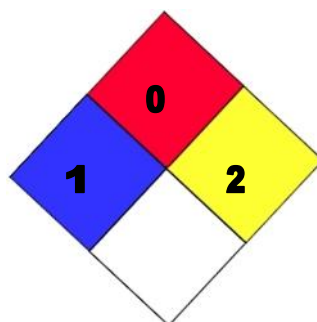
OSHA Hazard Communication Standard:

This product is considered hazardous under the OSHA Hazard Communication Standard. The stated hazards classifications are applicable to the ammonium perchlorate as manufactured by AMPAC and as delivered in the DOT/UN approved shipping containers. Any rework, modification, amending or additional processing of the ammonium perchlorate may change the hazards classification and may require further hazards classification testing to determine the appropriate classification. AMPAC will not be responsible for personnel or property damage caused by a failure to conduct or provide adequate safe measures needed due to any individual company's production activities.

3. HAZARDS IDENTIFICATION

HEALTH	1
FIRE	0
REACTIVITY	2
PPE	B

HMIS



NFPA

EMERGENCY OVERVIEW: An odorless white crystal material. Perchlorate is an Oxidizing Agent; there is a risk of explosion if heated under confinement. As with any toxicant, dose and exposure are critically important variables to understand any potential treatment.

Harmful if swallowed or inhaled in large doses.

Potential health effects:

Acute eye: irritation, redness, tearing

Acute skin: Irritating to mucous membranes and skin

Acute inhalation: may cause respiratory tract irritation; coughing, and shortness of breath; high concentrations may cause more significant respiratory effects

Acute ingestion: may cause gastrointestinal irritation; larger doses may cause nausea and vomiting.

Potential chronic effects

Perchlorates act to reversibly and competitively inhibit iodine uptake by the thyroid gland. Perchlorate is soluble in water, so exposure to ammonium perchlorate can be via water contaminated with ammonium perchlorate or inhalation in the workplace.

With chronic exposure given sufficient dose (see NRC, 2005) and duration, ammonium perchlorate can cause thyroidal stores of iodine to be reduced, which may lead to hypothyroidism. For those individuals that live in areas of the world where endemic iodine deficiency occurs, it is important that these people receive adequate iodine in the diet or are supplemented with iodine.

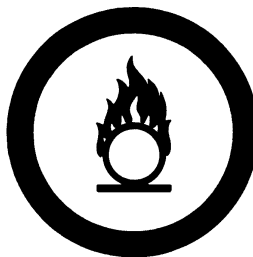
Information pertaining to particular dangers for man and environment

May be explosive when mixed with combustible material. Risk of explosion if heated under confinement.

Additional region specific information**European Union:**

EC Risk Phrase O; R 9, R 44

EC Safety Phrase S: (2-) 14-16-27-36/37

Canada:

Canadian WHMIS Class C, Oxidizing material

4. FIRST AID MEASURES

Routes of exposure	Signs and symptoms of exposure:	Emergency and first aid procedures:
SKIN:	May cause local irritation or stinging effect.	Wash exposed area immediately with plenty of water. Remove contaminated clothing and footwear.
INHALATION:	Airborne concentrations of ammonium perchlorate can aggravate pre-existing respiratory problems.	If experiencing breathing difficulties, move to fresh air. Administer oxygen if exposed person is unconscious. Never give anything by mouth to an unconscious person.
INGESTION:	Ingestion of large quantities has been reported to cause staggering in small mammals. Chronic ingestion of sufficient quantities may interfere with uptake of iodine by the thyroid.	Give water. Induce vomiting, keep airway clear. Seek medical attention.
EYES:	Irritation of the eyes will cause stinging effect.	Flush eyes with fresh water for at least 15 minutes and move exposed person to a non-contaminated area.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

FLASH POINT: Not flammable.

FLASH POINT METHOD: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable. Ammonium perchlorate decomposes spontaneously at 300° C in its pure state. Contaminants may cause decomposition at lower temperatures typically down to 270°C but decomposition temperature has been listed as low as 240°C in one case

UPPER FLAMMABILITY LIMIT (volume % in air): Not applicable.

LOWER FLAMMABILITY LIMIT (volume % in air): Not applicable.

EXTINGUISHING MEDIA: Water - other extinguishing materials are ineffective

UNUSUAL FIRE AND EXPLOSION HAZARDS: Ammonium perchlorate is an oxidizing agent and may cause rapid combustion or explosions if mixed with fuels, including organic materials or powdered metals. This does not include DOT shipping containers if intimate mixtures are not present and the shipping container is not inordinately contaminated. Plastic containers have been observed to burn and leave standing cylinders of ammonium perchlorate. Molten metal from aluminum containers may contribute fuel in an instance hot enough to melt aluminum.

SPECIAL FIRE FIGHTING PRECAUTIONS/INSTRUCTIONS: Do not fight fires involving mixtures of ammonium perchlorate and fuels. Ammonium perchlorate is an oxidizing agent and may cause rapid combustion or explosions if mixed with fuels. Burning ammonium perchlorate may produce chlorine, chlorine dioxide, hydrogen chloride, and oxides of nitrogen as well as mixtures with any other compounds involved in the combustion. These are common by-products of combustion and are likely to be serious health concern; thus, keep upwind or wear self-contained breathing apparatus when attempting to rescue.

6. ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE: (See section 8 for recommended personal protective equipment.) Sweep up material and containerize. Clean contaminated floor surface with water. Ammonium perchlorate is water soluble; thus, manage water to avoid release into the environment. Dispose of in accordance with local, state, and federal regulations.

Spills and releases may have to be reported to Federal or other Governmental Authorities and/or local authorities. See Section 15 regarding reporting requirements.

7. HANDLING AND STORAGE

NORMAL HANDLING: (See section 8 for recommended personal protective equipment.) Avoid contact with skin, eyes and clothing. Avoid breathing dust. Wash thoroughly after handling and follow good personal hygiene and good housekeeping practices. Keep containers closed. Handle in a manner to minimize dusting. Use of containers that meet the requirements to be DOT approved shipping containers which are managed in a manner to inhibit intimate mixtures of the container material with the product is recommended. Materials such as plastic drums, steel drums, flexible intermediate bulk containers, and fiberboard containers approved or constructed to the same specifications as DOT requirements are normally safe. FIBC are normally constructed of plastic materials in which intimate contamination soaked into the plastic is difficult to achieve. If in doubt wet and wash the FIBC and manage the water used to wash in accordance with good environmental principles to avoid contaminating drinking water sources or organic materials more subject to intimate mixtures.

STORAGE RECOMMENDATIONS: Store away from combustibles and flammables. Keep container closed when not in use. Control static electricity and other ignition sources. Store in dry areas away from sources of extreme heat.

SPECIAL MIXING AND HANDLING INSTRUCTIONS: Ground and bond process equipment. Mixing ammonium perchlorate with fuels of any type may result in rapid combustion or explosions. When handling materials contaminated with ammonium perchlorate such as dust collector bags or any other combustible material, thoroughly wet the bags with water before handling, keep the bags wet while handling, and use non-sparking tools or tools coated with non-sparking material if non-sparking tools are not available. AVOID friction, impact, or static electricity ignition sources when organic materials are contaminated with ammonium perchlorate. Fire resistant fabrics do not reduce the hazard. Finely powdered metals are frequently as combustible with ammonium perchlorate as are organics.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Ventilate as necessary to minimize dust exposures. Inspect and clean ventilation systems regularly.

PERSONAL PROTECTIVE EQUIPMENT

SKIN PROTECTION: Wear impervious aprons or rain gear to reduce contamination of cotton or other fiber clothing. Plastic, rubber or latex gloves are recommended. Leather or cotton gloves should not be used unless a management program is implemented to ensure detection of contamination and immediate cleaning and change in case of contamination. Cotton clothing may be used if chance of contact is minimal or if clothing is monitored for contamination and changed if contamination occurs. In any case where combustible protection is used, a strong management system must be in place to monitor contamination and ensure appropriate removal and cleaning or severe risk of fire and personal injury or death exists. There are no known cloth materials that will not combust vigorously with perchlorates including nomex, Kevlar based materials, or clothing that is normally considered fire retardant or resistive. Observation and management of contamination is the only practicable safety measure. See additional recommendations below.

EYE PROTECTION: Under normal conditions, wear safety glasses. Under dusty conditions, wear chemical safety goggles.

RESPIRATORY PROTECTION: Under normal conditions, not required. Where dusty conditions develop, use a NIOSH-approved respirator for dusts.

ADDITIONAL RECOMMENDATIONS: Avoid contamination of cotton or other absorbent material. As in any industrial working environment, workers should routinely wear clean clothes to work. Do not wear any work clothing that has become contaminated with ammonium perchlorate. Remove contaminated clothing immediately and keep wet until thoroughly washed. Keeping contaminated clothing wet minimizes hazards until the laundering is completed. Showering is recommended after handling any industrial chemical. Smoking of tobacco should not be permitted while wearing contaminated clothing. Leather boots may become contaminated and could be a source of combustion damaging feet. Rubber boots are recommended unless a very strict management program to detect contaminated leather boots is in place much as listed on the glove section above.

EXPOSURE GUIDELINES

<u>INGREDIENT NAME</u>	<u>ACGIH TWA</u>	<u>OSHA PEL TWA</u>
Ammonium Perchlorate	10 mg/m3 (Nuisance Dust)	15 mg/m3 (Nuisance Dust)

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: White crystal	PHYSICAL STATE: Solid	MOLECULAR WEIGHT: 117.50	CHEMICAL FORMULA: NH ₄ ClO ₄	ODOR: No odor
SPECIFIC GRAVITY (water = 1.0): 1.95	SOLUBILITY IN WATER (weight %): 20.8 g/100 ml at 20°C	pH: materials is a solid however, dissolved in water the pH is slightly acidic	BOILING POINT: Not applicable, Decomposes	MELTING POINT: Decomposes at 300°C in its pure state, impurities may lower the decomposition temperature significantly.
VAPOR PRESSURE: Solid, Not applicable	VAPOR DENSITY (air = 1.0): at 20 ° C Not applicable ³	EVAPORATION RATE: Not Applicable		
FLASH POINT: Not flammable (Flash point method and additional flammability data are found in Section 5.)				

10. STABILITY AND REACTIVITY

NORMALLY STABLE (CONDITIONS TO AVOID):

Stable under normal conditions. Do not mix with organic materials, reducing agents, metal powders or powdered carbon. Avoid elevated temperatures over 270°C, which can cause spontaneous exothermic decomposition. Cloth fabric of any type including dust collector bags intimately contaminated with ammonium perchlorate is subject to ignition through friction or impact. High-energy static electricity may also serve as an ignition source when contamination or combustibles are intermixed.

INCOMPATIBILITIES: Sulfuric acid, powdered metals, and intimate mixtures with organics.

HAZARDOUS DECOMPOSITION PRODUCTS: Chlorine, chlorine dioxide, oxygen, nitrogen oxides, hydrogen chloride.

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION

As with any toxicant, dose and exposure are critically important variables to understand any potential toxicity. It is always advisable to minimize dusting and use respiratory protection for environments where substantial dust is generated or where there may be exposure to water with high concentrations of perchlorate.

Ammonium perchlorate acts to reversibly and competitively inhibit iodine uptake by the thyroid gland. The half-life of ammonium perchlorate ranges from 8 to 12 hours. Ammonium perchlorate does not bioaccumulate. Perchlorate is not metabolized and is excreted from the kidneys.

Harmful if swallowed or inhaled in large doses. In the early 1960s another salt of perchlorate, potassium perchlorate, given in very high doses for weeks of exposure as an oral therapeutic agent to treat hyperthyroidism was reported to be associated with a few cases of aplastic anemia and agranulocytosis (National Research Council, 2005). Since that time, there have been no known reports of aplastic anemia. There have been no reports of ammonium perchlorate associated with aplastic anemia or agranulocytosis.

IMMEDIATE (ACUTE) EFFECTS:

Oral LD50: rat; 4200 mg/kg Rat-par-LDLo = 3500 mg/kg
Oral LD50: rabbit; 1900 mg/kg Rabbit-par-LDLo = 750 mg/kg
Inhalation LC50: No references found.
Skin sensitization: not reported to be a skin sensitizer

DELAYED (SUBCHRONIC AND CHRONIC) EFFECTS:

Thyroid

No long-term health effects have been reported with exposure to ammonium perchlorate. Perchlorate is water soluble, so exposure to ammonium perchlorate can be via water contaminated with ammonium perchlorate or inhalation in the workplace. With chronic exposure, sufficient dose, and duration, ammonium perchlorate may cause thyroidal stores of iodine to be reduced, which may lead to goiter (enlarged thyroid gland) and hypothyroidism. Occupational studies indicated no adverse health effects on workers exposed for 3 years or more to perchlorate. These studies also demonstrate that blood chemistry and hormone values are not altered with occupational exposures as high as 0.48 mg per kilogram body weight (Braverman et al., 2005; Lamm et al., 1999). In 2005, a National Academies of Science Committee reviewed the literature and oral exposures to perchlorate and identified a no-observable-adverse-effect-level 0.4 mg/kg/day in humans. That dose is inhibits iodide uptake by nearly 70 percent without effecting thyroid hormones or thyroid stimulating hormone. The NAS also identified a no-observed-effect-level of 0.007 mg/kg/day in humans, based on Greer, et. al. 2002, which is a dose that does not cause inhibition of iodide uptake. For those individuals that live in areas of the world where endemic iodine deficiency occurs, it is important that these people receive adequate iodine in the diet or are supplemented with iodine.

Carcinogen: IARC: NO NTP: NO OSHA: NO

Reproductive

In 2005, the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) Developmental and Reproductive Toxicology Identification (DART) Committee concluded that available scientific information on perchlorate was not sufficient for placing the substance on a list (Prop 65) list of chemicals known to the State of California to cause birth defects or other reproductive harm.

Immunology

Extensive immunotoxicity studies in mice revealed no changes in immunologic function in response to perchlorate exposure (Keil et al. 1998, 1999)

Other Medical conditions aggravated by exposure: Excessive dust inhalation can aggravate respiratory conditions

12. ECOLOGICAL INFORMATION

Limited data available – perchlorate ion is persistent but can be decomposed by naturally occurring bacteria in anoxic conditions in the presence of a suitable electron donor. Some additional data appears above in the Toxicity data section 11.

Toxicity Data: Daphnia Magna Acute 48-hour LC₅₀ 490 mg/l water with sodium perchlorate
Pimephales Promelas Acute 96 hour LC₅₀ 1655 mg/l water with sodium perchlorate
Ceriodaphnia dubia Chronic 6 day LC₅₀ 77.8 mg/l water with ammonium perchlorate
Pimephales promelas Subchronic 7 day LC₅₀ 270 mg/l water with ammonium perchlorate
Lатуca Sativa Subchronic 7 day LC₅₀ 614 mg/kg soil
Eisenia Foetida Acute 7 day LC₅₀ 4450 mg/kg soil

13. DISPOSAL CONSIDERATIONS

RCRA

Is the unused product a RCRA hazardous waste if discarded? Yes –if discarded as a solid and not in solution. If discarded as a solution carefully evaluate before any determination of waste status to avoid misinterpretation. Caution: Intentionally placing solid material into solution to dispose of it may violate several regulations if not managed carefully thereafter. Various states have local regulations that are applicable and are changing. Evaluate carefully all applicable regulations for your location before determining status and method of disposal!

If yes, the RCRA ID number is: D001

California has imposed a best management practice standard for reporting, handling, storage and disposal and requires the following on container labels or on MSDS:


California: Requirements for labeling: "Perchlorate Material – special handling may apply, See www.dtsc.ca.gov/hazardouswaste/perchlorate

European Union and Canada – check national and local regulations for disposal of both oxidizers and for the specific substance before disposal – follow all regulatory requirements.

OTHER DISPOSAL CONSIDERATIONS: The information offered in section 13 is for the product as shipped. Use and/or

alterations to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classification and the proper disposal method.

14. TRANSPORT INFORMATION

US DOT HAZARD CLASS, PACK GROUP: Oxidizer 5.1, PG II	UN NUMBER: 1442	CAS number: 7790-98-9	PROPER SHIPPING NAME: Ammonium Perchlorate
EC (EINECS/ELINCS) 232-235-1	EC Index Number 017-009-00-0	EC Class Oxidizing; Risk of explosion if heated under confinement	
EC Risk Phrase O; R 9 R 44	EC Safety Phrase S: (2-) 14-16-27-36/37	ENCS (MITI) 1-220	
Canadian WHMIS: Class C oxidizing material	Canadian WHMIS SYMBOL: 		
RTECS SC7520000	RTECS class Drug (D)	Merck 12,574	
<p>For additional information on shipping regulations affecting this material, contact the information number found in Section 1. Note: AMPAC, the parent of Western Electrochemical Co. Division has performed tests as required and applied to DOT and received approvals listed at the right for various grades of AP as 5.1 oxidizer as shown to the right. Other AP does not automatically meet this classification and would require testing and DOT approval to achieve a 5.1 oxidizer class as covered in 49CFR172 Hazardous materials Table with special provision 107 for ammonium perchlorate and subsequent information covered in note 107 at 49 CFR172.102. This requirement is supplemented by 49 CFR173.57 and 173.58 as described in note 107. These exemptions are specific to the facility located at 10622 West 6400 North, Cedar City, Utah 84720 Ammonium perchlorate Propellant grade 170 micron and greater has received classification as a 5.1 oxidizer under EX 2003110036.</p> <p>Ammonium perchlorate propellant grade with average particle size of 70 microns and larger; Ammonium perchlorate wetted with not less than 5% water, and Ammonium perchlorate, non-propellant grade, with average particle size 70 microns and larger has received classification as a 5.1 oxidizer under EX2004020234</p> <p>Both exemptions have container and weight restrictions and are not directly transferable to any other parties without application to and approval of DOT through the RSPA office or its successor office.</p>			

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA)

TSCA INVENTORY STATUS: Listed on the TSCA Inventory.

OTHER TSCA ISSUES: None

SARA TITLE III/CERCLA "Reportable Quantities" (RQs) and/or "Threshold Planning Quantities" (TPQs) exist for the following ingredients.

INGREDIENT NAME	SARA/CERCLA RQ (lb)	SARA EHS TPQ (lb)
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No ingredients listed in this section. No listing on the EPA list of lists.

Spills or releases resulting in the loss of any ingredient at or above its RQ requires immediate notification to the National Response Center [(800) 424-8802] and to your Local Emergency Planning Committee.

SARA 313 TOXIC CHEMICALS: The following ingredients are SARA 313 "Toxic Chemicals" and may be subject to annual reporting requirements. CAS numbers and weight percents are found in Section 2.

INGREDIENT NAME	SARA/CERCLA RQ (lb)	SARA EHS TPQ (lb)
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No ingredients listed in this section.

STATE RIGHT-TO-KNOW In addition to the ingredients found in Section 2, the following are listed for state right-to-know purposes.

INGREDIENT NAME	SARA/CERCLA RQ (lb)	SARA EHS TPQ (lb)
Ammonium Perchlorate	Examine local regulations to determine	Examine local regulations to determine

Due to the rapidly changing regulatory environment in individual states, it is very difficult to maintain up to date information for each state in a material safety data sheet. The user must examine the local regulations in force and comply with all requirements.

California: Requirements for labeling: "Perchlorate Material – special handling may apply, See www.dtsc.ca.gov/hazardouswaste/perchlorate."

ADDITIONAL REGULATORY INFORMATION:

Hazard symbols: O Oxidizing

Risk phrases: 9 Explosive when mixed with combustible material.
44 Risk of explosion if heated under confinement.

Safety phrases:

14 Keep away from flammable organic substances
16 Keep away from sources of ignition - No smoking.
27 Take off immediately all contaminated clothing.
36/37 Wear suitable protective clothing and gloves.

Regulations

Listed on the Toxic Substances Control Act (TSCA).
Listed in US RTECS and in US EPA IRIS database

Listed under EINECS

Listed on Canadian Domestic Substances List (DSL).

Listed on Australian Inventory of Chemical Substances (AICS).

Information about limitation of use: For use only by technically qualified individuals. **Export is controlled by the US government and may be restricted in other nations. No use in conflict with a granted export license is permitted.**

United States OSHA: Ammonium perchlorate is on the list of process safety management chemicals with a threshold quantity of 7500 pounds 29 CFR 1910.119

Canadian WHMIS: Ammonium Perchlorate is a Class C oxidizer under WHMIS and requires the warning symbol:



16. OTHER INFORMATION

CURRENT ISSUE DATE: January 2, 2013

PREVIOUS ISSUE DATE: May 25, 2010

CHANGES TO MSDS FROM PREVIOUS ISSUE DATE ARE DUE TO THE FOLLOWING: Three year review. Reviewed and found no changes which are required at this time.

OTHER INFORMATION: Not for Food or Drug Use. The user is responsible to evaluate the safety and environmental consequences of any intended uses. The manufacturer assumes no liability for any usages that result in adverse consequences.

IMPORTANT: The information presented herein, while not guaranteed, was prepared by competent technical personnel and is true and accurate to the best of our knowledge. NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, IS MADE REGARDING PERFORMANCE, STABILITY OR

OTHERWISE. This information is not intended to be all-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. While our technical personnel will be happy to respond to questions regarding safe handling and use procedures, safe handling and use remains the responsibility of the customer. No suggestions for use are intended as, and nothing herein shall be construed as a recommendation to infringe any existing patents or violate any Federal, Other National Governmental Entity, State, Provincial, or local laws.

References

Keil, D., A. Warren, M. Jenny, J. EuDaly, and R. Dillard. 1998. Effects of Ammonium Perchlorate on Immunotoxicological, Hematological, and Thyroid Parameters in B6C3F1 Female Mice. DSWA01-97-0008. Medical University of South Carolina, Charleston, SC. September 30, 1998. [Online]. Available: <http://www.epa.gov/ncea/perchlorate/references2/documents/44966.pdf> [accessed Feb, 6, 2006.]

Keil, D., A. Warren, M. Jenny, J. EuDaly, and R. Dillard. 1999. Effects of Ammonium Perchlorate on Immunotoxicological, Hematological, and Thyroid Parameters in B6C3F1 Female Mice, Final Report. DSWA01-97-0008. Medical University of South Carolina, Charleston, SC. June 19, 1999. [Online]. Available: <http://www.epa.gov/ncea/perchlorate/references2/documents/99555.pdf> [accessed Feb 6, 2006].

Greer, M.A., G. Goodman, R.C. Pleus, and S.E. Greer. 2002. Health effects assessment for environmental perchlorate contamination: The dose response for inhibition of thyroidal radioiodine uptake in humans. *Environ. Health Perspect.* 110(9):927-937.

Lamm, S.H., L.E. Braverman, F.X. Li, K. Richman, S. Pino, and G. Howearth. 1999. Thyroid health status of ammonium perchlorate workers:

Gibbs, J.P., R. Ahmad, K.S. Crump, D.P. Houck, T.S. Leveille, J.E. Findlay, and M. Francis. 1998. Evaluation of a population with occupational exposure to airborne ammonium perchlorate for possible acute or chronic effects in thyroid function. *J. Occup. Environ. Med.* 40(12):1072-1082.

National Research Council, 2005. Health Implications of Perchlorate Ingestion, National Academy of Sciences, The National Academies Press, Washington, DC., January.