More on Meth Lab Chemicals

Since AristaTek published a newsletter article on meth lab chemicals in March 2004, we have received requests to come up with a simplified list of starting chemicals and on hazards, such as explosions and inhalation associated with cooking of these chemicals. The illegal meth lab operations take place in a house, motel, pickup truck, trailer, or in an abandoned building. The final product is methamphetamine or methamphetamine hydrochloride ("ice") or Yaba (a mixture of methamphetamine and caffeine).

A Little History

Prior to the early 1980's, most clandestine manufacture of methamphetamine used phenyl-2-propanone (also called P2P) as the starting material. Other chemicals required were methylamine, mercuric chloride, aluminum foil or aluminum wire, isopropanol, sodium hydroxide, a suitable solvent, salt, and acid (e.g. hydrochloric acid). Other variations used some different chemicals. A typical recipe [from: Dallosta, K.L., "Clandestine Laboratory Manual", Sacramento CA, Western States Information Network, 1985] involved the following steps:

- First mix isopropanol and sodium hydroxide in a reaction vessel. Add mercuric chloride and aluminum foil. Then heat the mixture to boiling.
- Add P2P and methylamine and boil for four hours.
- Pass reaction mixture through filter paper to remove contaminants.
- Apply heat to filtered reaction product to remove excess methylamine
- Salt wash the product (to kill the mercury), followed by acidification, which forms crystals of methamphetamine hydrochloride. The methamphetamine is purified by re-dissolving in a solvent using a separator funnel and recrystallized .

Methamphetamine continues to be made in Mexico by this method or a variation thereof.

In 1980, P2P was classified as a Schedule II controlled substance making it more difficult to obtain. Some clandestine laboratories manufactured their own starting chemicals. Methylamine can be manufactured from methanol and anhydrous ammonia. P2P can be manufactured by distilling phenylacetic acid using lead acetate as a reagent, or alternatively from benzene and chloroacetone using aluminum chloride as a reagent. These processes often resulted in toxic contamination of the methamphetamine product with lead, mercury, or various harmful organic byproducts.

As state and federal governments controlled more meth chemical precursors, clandestine laboratories used recipes which involved chemicals that can be easily obtained. Instead of purchasing the chemicals and equipment outright from a chemical supplier which would attract attention, the clandestine laboratories resorted to commercial substitutes which can be purchased at retail stores. The materials purchased might include over-the-counter cold medication, any one of a number of solvents sold in paint stores, muriatic acid, battery acid, hydrogen peroxide, iodine disinfectant, veterinarian products, lithium batteries, matches or highway flares containing red phosphorous, ammonia, glass jars, beakers, funnels, gas cans, Pyrex and Corning ware, tubing, duct tape, aluminum foil, coffee filters, hot plates, pressure cookers, and various plastic containers. Some chemicals such as anhydrous ammonia may be stolen.

Meth Production Today

Over 90% of meth labs in the United States use one of two methods for methamphetamine production. There are hundreds maybe over 1000 different recipes for the two methods. Both methods use either ephedrine, pseudoephedrine or one of its derivatives, or ephedra as the starting material. Examples of derivatives of pseudoephredrine may be pseudoephedrine hydrochloride or d-pseudoephridine hydrochloride. Ephedrine and pseudoephedrine (or its derivatives) are ingredients in some sinus and cold remedies purchased over-the-counter. Ephedra is a plant material which can be purchased in bulk form from Asian export companies or in the form of tablets of capsules or powered plant material from some health food stores. The two methods used are either the (1) Red Phosphorous method or (2) Birch or Nazi Method.

Red Phosphorous Method (or Red P Method).
Ephedrine (or pseudoephedrine or ephedra) is cooked for several hours with hydroiodic acid and red phosphorous to form methamphetamine. Hydroiodic acid (a controlled chemical) is not purchased direct but made from iodine crystals and acid which are added to the brew. Red phosphorous also is usually not purchased direct but is purchased in the form of strike matches or highway road flares, and the red phosphorous extracted from these products. The steps involved are typically as follows:

- If cold or sinus tablets are the starting material, the active ingredient is separated from the binders by crushing and dissolving in a suitable solvent (e.g. acetone, ether, mineral spirits, methanol, etc.). The material is filtered (usually a coffee filter). The filter containing a white sludge is discarded. The filtered liquid is evaporated (in a glass jar or coffee pot). The whitish residue contains the purified ephedrine or pseudoephedrine.
- If ephedra plant material is used, the active ingredient is extracted by dissolving in a suitable solvent (e.g. methanol, ether, etc.). The mixture is filtered. The solvent is evaporated leaving a greenish-brown tar-like substance.
- The extracted ephedrine, pseudoephedrine, or greenish-brown tar-like substance from ephedra plant material is cooked for several hours with red phosphorus, iodine crystals, and acid (usually hydrochloric acid) in a vessel fitted with a condenser.
- The reaction mixture is cooled, filtered, and made basic using sodium hydroxide (lye, e.g. Red Devil Lye). Salt may be added in some recipes.
- The methamphetamine is extracted from the mixture by mixing with a solvent (methanol; ether; acetone; etc). The solvent is evaporated leaving the methamphetamine.
- Methamphetamine hydrochloride (meth crystals, or “ice”) is created by bubbling hydrochloric acid gas into the container containing the solvent/methamphetamine solution. Eventually the solution turns to a white paste. The material is filtered to remove excess liquid. The meth crystals collected on the filter are allowed to dry.
- The hydrogen chloride gas might be created by mixing rock salt and battery acid or muratic acid and aluminum foil in a gas can connected to the methamphetamine container with a hose.

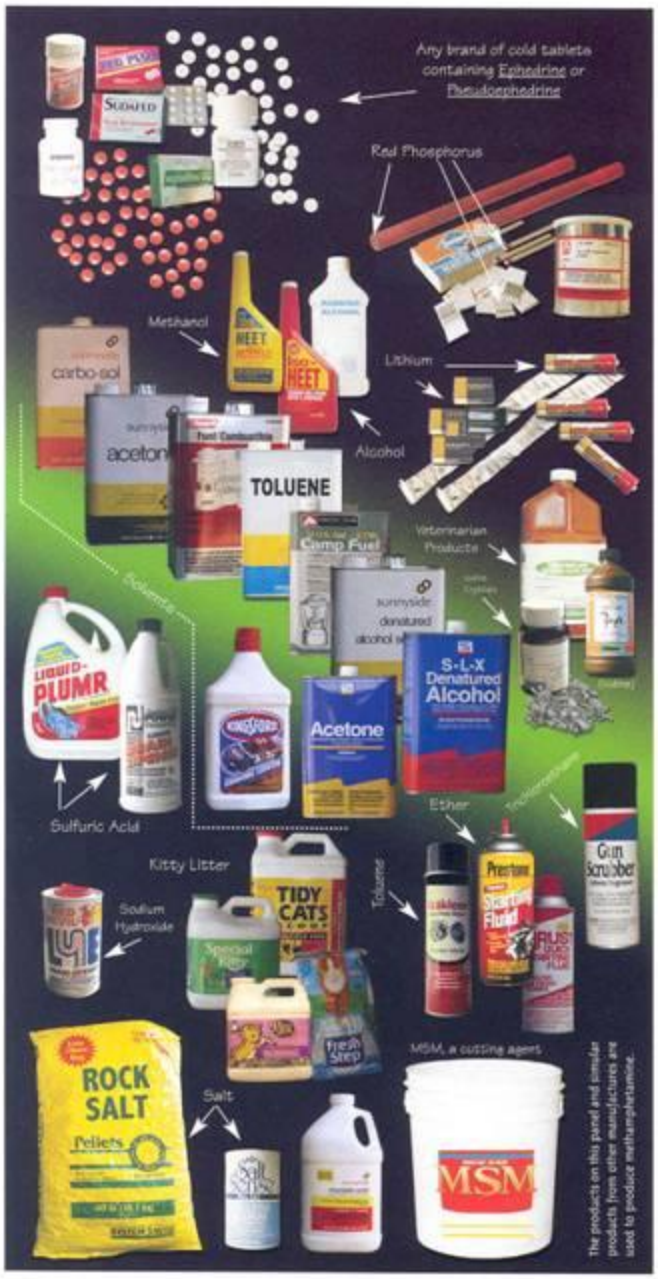
Birch or Nazi Method
(recipe from http://www.okienarc.org/nazilab.htm).

- If cold or sinus tablets are the starting material, the active ingredient is separated from the binders by crushing and dissolving in a suitable solvent (e.g. acetone, ether, mineral spirits, methanol, etc.). The material is filtered (usually a coffee filter). The filter containing a white sludge is discarded. The filtered liquid is evaporated (in a glass jar or coffee pot) leaving a white powder. The whitish residue powder contains the purified ephedrine or pseudoephedrine.

- Small pieces of lithium or sodium metal are mixed in with the whitish powder in the container. The most likely source is small lithium batteries that have been torn apart using pliers.
- Anhydrous ammonia is then slowly dripped into the container containing the lithium (or sodium) pieces and ephedrine or pseudoephedrine. Usually, the anhydrous ammonia is stolen from agricultural supply companies or from ammonia storage containers in the field. The ammonia is placed in five or 20 gallon propane storage tanks for use at the meth lab.
- As anhydrous ammonia is added, the mixture turns blue to blackish purple in color. Once the lithium or sodium pieces have dissolved, water is slowly added to quench the reaction.
- The material is evaporated at room temperature leaving a white paste called "meth oil".
- The "meth oil" is dissolved in a suitable solvent, usually ether obtained from cans of starting fluid. The ether (solvent) layer contains the dissolved meth. Any bottom solids and water are discarded.
- Methamphetamine hydrochloride (meth crystals, or "ice") is created by bubbling hydrochloric acid gas into the container containing the ether/methamphetamine solution. Eventually the solution turns to a white paste. The material is filtered using a coffee filter to remove excess liquid. The meth crystals collected on the filter are allowed to dry.

Congress has passed the Methamphetamine Control Act of 1996 restricting the sale of key chemicals such as iodine and red phosphorus, including reporting requirements of large purchases. About 40 states have passed laws restricting the amount of cold remedy tablets which can be purchased by individuals. Laws have been passed restricting the sale of anhydrous ammonia and the storage of anhydrous ammonia in non-authorized containers. Target, Wal-Mart, Rite Aide, and other retailers have recently moved nonprescription cold pills to behind the pharmacy counter. As of November 2005, a move is underway to make products containing pseudoephedrine available by prescription only. Some retailers restrict the amount of solvents that can be purchased. Much of the psueodoephedrine today used by meth labs comes in bulk shipments from Mexico or Asia [see Newsweek, August 8, 2005, page 47].

As of November 2005, the plant material ephedra is being marketed over the Internet as a diet control or weight loss aid. For more details on the manufacture of methamphetamine, see Andrews, K.M., "Ephedra's Role as a Precursor in the Clandestine Manufacture of Methamphetamine", Journal of Forensic Sciences 40 551-560 (1995), abstract at http://journalsip.astm.org/jofs/PAGES/2242.htm .



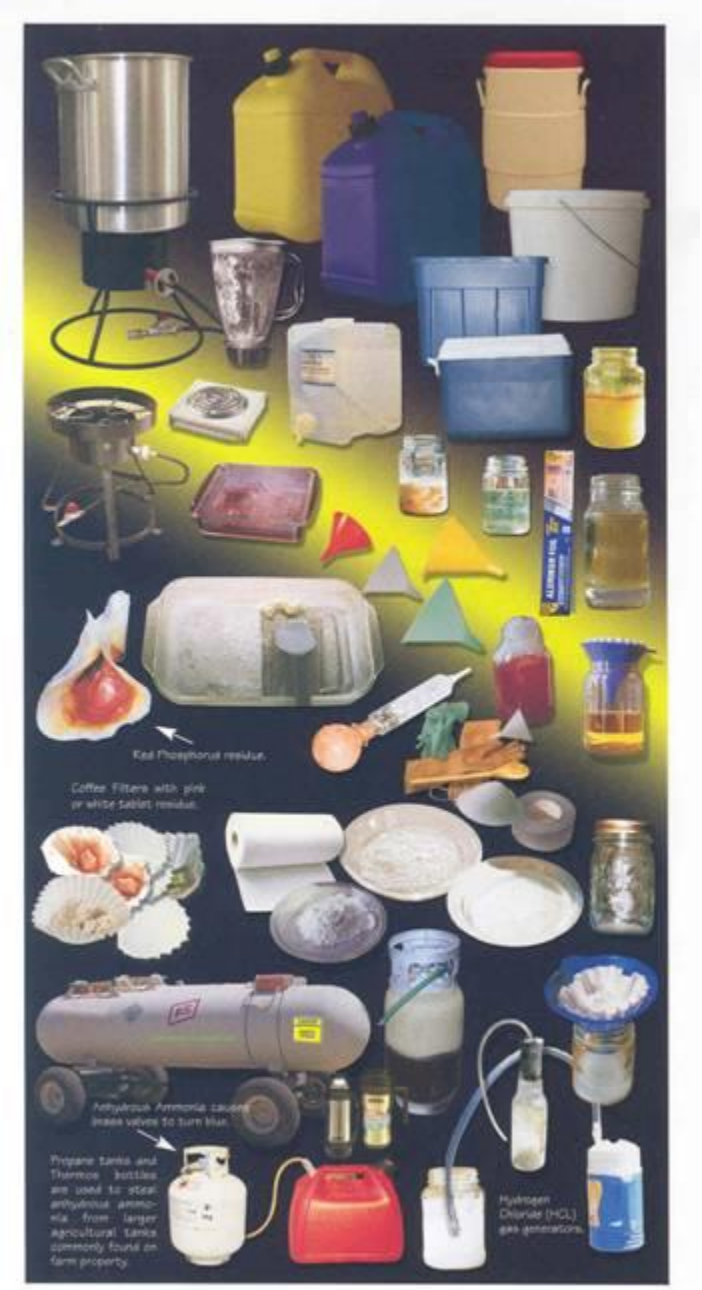
Illustrated at left are chemicals that are commonly used at a Meth lab. Included are cold tablets (pseudoephedrine), matches or road flares (red phosphorus), a variety of solvents (acetone, rubbing alcohol, methanol, toluene, denatured alcohol, Coleman fuel, etc.), muriatic acid, salt, lye (Red Devil lye, Drano), batteries (source of lithium metal), starter fluid (ether), iodine crystals (sold as a disinfectant).

Many of these products might also be found in ordinary households and used for legitimate purposes unrelated to meth production.

Illustration from http://www.cityofsalem.net/~police/Meth%20Lab%20Signs.htm .

Illustrated at left are some equipment used by meth labs. The items are obviously not to scale as a very large anhydrous ammonia tank is shown along smaller items. The anhydrous ammonia is typically stolen from large storage tanks at farm facilities. Also shown are cookers, a hot plate, aluminum foil, coffee filters with residues, paper towels, various jugs and bottles and

plastic containers, tubing, a gas can setup rigged with hoses for hydrogen chloride production connected to a mason jar containing a white paste (meth crystals or “ice”), red phosphorus residue, paper towels, measuring cups, funnels, and blenders.



Some of the items are also commonly found in ordinary households.

Illustration

from http://www.cityofsalem.net/~police/Meth%20Lab%20Signs.htm .

Photo of Meth Lab from http://www.stopdrugs.ord/equip2.html

Close-up of meth crystals (Methamphetamine hydrochloride).

Can a simplified list be developed for meth chemical precursors?

Answer: Look for indicators. As governments restrict the sale of chemicals which might be used in meth production and mandate reporting requirements, meth labs seek out materials which can be easily purchased without attracting attention. There are probably over 1000 different recipes for making meth using various commercially available products. Rather than list the many different solvents and acids which might be purchased at a paint or hardware store (and used by ordinary households, e.g. wood finishing, restorations, automotive purposes, scale removal), look for certain key indicators, e.g., (1) large amounts of cold remedy tablets, (2) large amounts of lithium batteries, especially mangled batteries, (3) ammonia or other chemical odors, (4) ammonia stored in unauthorized vessels such as a portable propane tank, (5) bulk ephedra plant material or powder or tablets, sometimes sold as diet aids, (6) red-stained coffee filters, (7) large amounts of iodine crystals in a household, and (8) books or recipes on methamphetamine manufacture [an example of a book which can be purchased openly is Uncle Fester's "Secrets of Methamphetamine Manufacture", at amazon.com]. Remember, some

items can be stolen. There may be solvents and acids from a variety of commercial products used in combination with these other indicators.

Some Indicators of a Possible Meth Lab Operating in a Neighborhood.
[abstracted from several Internet sources]

- Unusual chemical odors (ammonia, solvents)
- Residences with windows blacked out or shades always drawn
- Large amounts of traffic, especially people coming in and out at night; people frequently leaving the place to smoke.
- Unusual trash, including large amounts of various solvent containers or lantern fuel containers, red-stained coffee filters or red-stained bed sheets, drain-cleaning containers, mangled batteries, mangled match sticks, excessive duct tape, numerous bottles.
- Evidence of chemical dumping (e.g. yard stains, dead spots, burn pits)
- Renters who pay cash
- Excessive security; occupants watch cars suspiciously when they pass by; occupants unfriendly and appear secretive about their activities.

Any single activity is not proof that meth manufacturing is taking place, but they may be reasons for concern.

To avoid the problem with odors, clandestine laboratories may be set up in rural areas away from people possibly inside a trailer or van [more details, see http://www.jointogether.org/sa/news/summaries/reader/0,1854,566455,00.html]. The laboratory may package its wastes in black garbage bags and dispose someplace else. Wastes may be poured down drains or into the storm sewer. For every pound of methamphetamine manufactured, six pounds of toxic wastes are produced poisoning the nation's land and waters.

It is not unusual for drug chemicals to be stored in mislabeled food or soda pop containers and placed in the refrigerator. The possibility of accidental poisoning, especially of children, is very real.

Dangers of Meth Use

The August 8, 2005 issue of Newsweek carried an excellent article on the dangers of meth use. The article can be viewed at http://www.msnbc.msn.com/id/8770112/site/newsweek/ Long term losses include brain tissue destruction in the regions responsible for memory and emotion, resulting in depression, anxiety, and memory loss similar to Alzheimer's disease. Repeated use of methamphetamine causes brain cells to lose receptors for dopamine. Dopamine is the chemical internally produced in the body that produces pleasurable sensations; methamphetamine, at least initially, causes the brain to produce more dopamine. When the brain cells lose receptors for dopamine, meth user can no longer feel any enjoyment when not using the drug. Other long-term risks include stroke, liver damage, extreme weight loss, plus increased risk of exposure to hepatitis and liver damage.

Imagine life without pleasure. The person is not able to experience natural joy, such as that which comes from helping other, a beautiful sunset, listening to good music, a job well done, a

caring spouse, good friends, the “high” from exercise, or other things that make up the human experience.

Other long-term risks of using meth include stroke, liver damage, extreme weight los, plaus an increased risk of exposure to hepatitis and liver damage.

Depending upon how the meth is manufactured, there could be toxic contaminants mixed in with the meth crystals. With meth cooks using more and more products from the commercial market, unwanted toxic chemicals can be produced during cooking. These toxic contaminants could include a number of organic compounds inadvertently produced as byproducts, including some that can produce permanent tremors similar to Parkinson’s disease. Some meth may be contaminated with lead and other toxic metals (see http://www.health.state.mn.us/divs/eh/meth/lab/tburton.pdf).

Hazards of Meth Production

Probably only 10% or less of meth cooks have any formal training in chemistry. The possibility of fires, explosions, generation of poisonous vapors and fumes is very real. Meth cooks have been killed or severely maimed as the result of explosions or exposure to toxic chemicals during the cooking process or solvent evaporation process. Increasingly, responders investigating a meth lab have become injured because of explosions or chemical exposure. Even common household products when mixed in meth production can damage the central nervous system, damage the liver and kidneys, and can burn or irritate the skin, eyes, and throat. Some are known to cause cancer (e.g. benzene, chloroform) and can cause permanent respiratory problems.

As a starter, even the common household solvents and automobile additives (e.g. acetone, methanol, ether, toluene, petroleum distillates, Coleman® lighter fluid) which might be used during the solvent extraction steps have lower explosive limits (meaning that a vapor cloud explosion can occur if the vapors reach certain concentrations in the air). All are flammable. The vapors are also toxic. Often concentrations of solvents vaporized into the air can exceed Immediately Dangerous to Life and Health (IDLH) values. Severe exposure can lead to coma and death.

Hydrochloric acid can cause skin burns, irritate the respiratory track, and cause liver damage if inhaled.

Ammonia can cause blistering lung damage.

Iodine crystals if heated can evaporate resulting in kidney damage and thyroid damage if inhaled. When mixed with acid (sulfuric, hydrochloric, etc.) hydroiodic acid is formed which causes burns on contact and can do permanent organ damage. Inhalation of iodine and hydroiodic acid can lead to pulmonary edema (fluid in the lungs) and pneumonitis (inflammation of the lungs). Chronic exposure to low levels can lead to thyroid gland problems.

Red phosphorus is unstable and is flammable. The chemical can do serious damage if the fumes are inhaled.

Lithium metal can produce burns and if the powder is inhaled cause pulmonary edema. Lithium or sodium metal reacts violently with water.

Methamphetamine produced during the cooling, purification, and salting process can be adsorbed through the skin. Symptoms of exposure include jerky movements, tremors, irritability, pupil dilation, dizziness, sweating, confusion, and convulsions.

Phosphine is a toxic gas produced during the cooking step using the red phosphorous process. Phosphine gas production is especially likely if the brew is overcooked. Phosphine is a severe pulmonary irritant which can result in death; fatalities have been reported from phosphine linked to meth production. The onset of pulmonary edema may be delayed.

Sometimes things go wrong during the cooking process producing the deadly phosgene gas killing all present.

Under controlled tests run by the Colorado Springs Police Department and funded in part by the U.S. Department of Justice, air quality samples were taken during the manufacture of methamphetamine by the red phosphorous process. The meth production was done under "controlled" conditions and not under overheated conditions which would generate considerable phosphine and other toxic air contaminants.. Even under the test conditions, air quality samples for phosphine, iodine, and hydrogen chloride often exceeded worker short term exposure limits and are sometimes immediately dangerous to life and health conditions in the area near the cook. The results are available in a document titled "Chemical Exposures Associated with Clandestine Methamphetamine Laboratories", which can be downloaded from the Internet at http://www.njc.org/pdf/chemical_exposures.pdf .

Certain combinations of chemicals can create explosive mixtures even if not heated. Ether if contaminated with rust or other trace metals can partly decompose over time forming peroxides, which can detonate by a simple activity as removing the container cap. The combination of acetone, sulfuric acid, and hydrogen peroxide results in an explosive mixture. The possibility of an explosion exists anytime a chemical classified as an oxidant is mixed with a solvent. Metallic lithium or sodium mixed with water generates explosive hydrogen gas.

Additional Reading

General article: http://www.iir.com/centf/guide.htm#What%20is%20the%20Nazi%20method .

Meth Lab Cleanup (various states)
: See http://www.dhfs.state.wi.us/eh/ChemFS/fs/MethClnUp.htm .
http://www.health.state.mn.us/divs/eh/meth/lab/labcleanup.html .
http://www.metrokc.gov/health/methlabs/ .
http://www.kci.org/meth_info/meth_cleanup.htm .
http://www.cdphe.state.co.us/hm/methlabfaq.pdf .
http://www.idph.state.ia.us/eh/common/pdf/hseess/meth_lab_cleanup.pdf .

Mandatory Federal Minimum Sentences

The mandatory minimum sentences for methamphetamine trafficking under federal law is 5 years in prison for possession of 10 grams (pure basis) or 10 years in prison for 100 grams (pure basis) of methamphetamine.