

## CHAPTER 9

### INCENDIARY AGENTS

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#### 9-1. General

Incendiary agents are used to burn supplies, equipment, and structures. The main agents in this group are thermite (TH), magnesium (MG), WP, and combustible hydrocarbons (including oils and thickened gasoline). Chemical fire extinguishers containing carbon dioxide should not be used in confined spaces to extinguish thermite or magnesium incendiaries. When carbon tetrachloride is in contact with flame or hot metal, it produces a mixture of CG, chlorine, CO, and hydrochloric acid. The field protective mask does not protect against some agents such as CO.

#### 9-2. Thermite

Thermite incendiaries are a mixture of powdered iron oxide, powdered aluminum, and other materials. Thermite incendiaries are used for attacks on armored fighting vehicles. Thermite incendiaries burn at about 3600°F (2000°C) and scatter molten iron. Explosive charges are frequently added, which make control hazardous. Particles of iron that lodge in the skin produce multiple small deep burns. The particles should be cooled immediately with water and removed. Afterwards, the treatment is that used for other thermal burns.

#### 9-3. Magnesium and Its Alloys

Magnesium burns at about 3600°F (2000°C) with a scattering effect similar to that of TH. Its particles produce deep burns. Healing is slow unless these particles are removed quickly. Removal is usually possible under local anesthesia. When explosive charges have been added to a magnesium bomb, the fragments may be embedded deep in the tissues, causing the localized formation of hydrogen gas and tissue necrosis.

#### 9-4. White Phosphorus

Incandescent particles of WP may produce extensive burns. The burns usually are multiple, deep, and variable in size. The particles continue to burn unless deprived of atmospheric oxygen. The smoke irritates the eyes and the nose in moderate concentrations. Figure 9-1 shows a casualty with WP burns of the face.

##### a. Self-Aid.

(1) If burning particles of WP strike and stick

to the clothing, take off the contaminated clothing quickly before the WP burns through to the skin.

(2) If burning WP strikes the skin, smother the flame with water, a wet cloth, or mud. Keep the WP covered with the wet material to exclude air until the particles can be removed.

(3) Try to remove the WP particles with a knife, bayonet, stick, or other available object. It may be possible to remove some particles by rubbing with a wet cloth.

(4) Report for treatment as soon as the combat situation permits.

##### b. Treatment.

(1) Since WP will ignite spontaneously and continue to burn when exposed to air, oxygen must be excluded until the agent is removed from the burn or the wound.

(2) At the earliest opportunity, all WP particles must be removed from the skin.

(a) Initially, the affected area is bathed in a bicarbonate solution to neutralize phosphoric acid, which will then allow removal of visible WP. Particles often can be located by their emission of smoke when air strikes them, or by their phosphorescence in the dark. In dark surroundings, fragments are seen as luminescent spots.

(b) Promptly debride the burn if the patient's condition will permit removal of bits of WP which might be absorbed later and possibly produce systemic poisoning. DO NOT apply oily-based ointments until it is certain that all WP has been removed. Following complete removal of the particles, treat the lesions as thermal burns.

(3) Once the particles have been removed, they must be placed in a container to prevent injury to others in the surrounding area.

(4) If the eyes are affected, treatment must be initiated immediately. The most effective treatment is to neutralize any phosphoric acid present by irrigating with 5 percent bicarbonate solution (5/6 cup (7 ounces) of bicarbonate dissolved in a gallon of water). Continue irrigation for 10 to 15 minutes using copious amounts of normal saline or room temperature water. Upon completion of irrigation, a wet dressing/cloth or mud should be applied to stop the WP burning by depriving it of oxygen. All WP particles that are readily accessible must be removed promptly. Since WP is readily soluble in oil and certain other solutions,

oily dressings or eye ointments must not be used. White phosphorus fumes are also irritating to the eyes and the respiratory tract. The lids must be separated and a local anesthetic instilled to aid in the removal of all embedded particles. Once all particles have been removed from eyes, atropine ophthalmic ointment should be instilled. Transfer the patient to the care of an ophthalmologist as soon as possible.

**NOTE**

Cupric (copper) sulfate has been used by U.S. personnel in the past and is still being used by some nations. However, copper sulfate is toxic and its use will be discontinued. Copper sulfate may produce kidney and cerebral toxicity as well as intravascular hemolysis.

[Click here for Figure 9-1.](#)

**9-5. Combustible Hydrocarbon Incendiaries**

*a. General.* Burns may be produced by flame weapons, oil incendiary bombs (which may also contain phosphorus and sodium), and firebombs containing thickened gasoline. Lung damage from heat and irritating gases may be a complication added to the injuries from incendiaries, especially in confined places. Morphine should be given cautiously to

patients with pulmonary complications. The treatment of burns caused by those agents is similar to that for other thermal burns.

*b. Flame Weapon Attack.* As flame and burning fuel fills an enclosed area, the oxygen content of the air is reduced. A hot toxic atmosphere containing large amounts of CO, unburned hydrocarbons, and smoke is produced. The coolest and least contaminated air is found at floor level.

(1) *Casualties.* Deaths may occur during or shortly after a flame attack due to the heat, the toxic atmosphere, or suffocation caused by laryngeal or glottic edema. Survivors may have thermal burns of the skin and upper respiratory tract and pulmonary damage from the hot flames.

(2) *Protection.* The floor level is the safest area during a flame attack. Any kind of cover affords some protection from heat. A wool blanket is excellent. The protective mask may give partial protection against smoke, but none against CO.

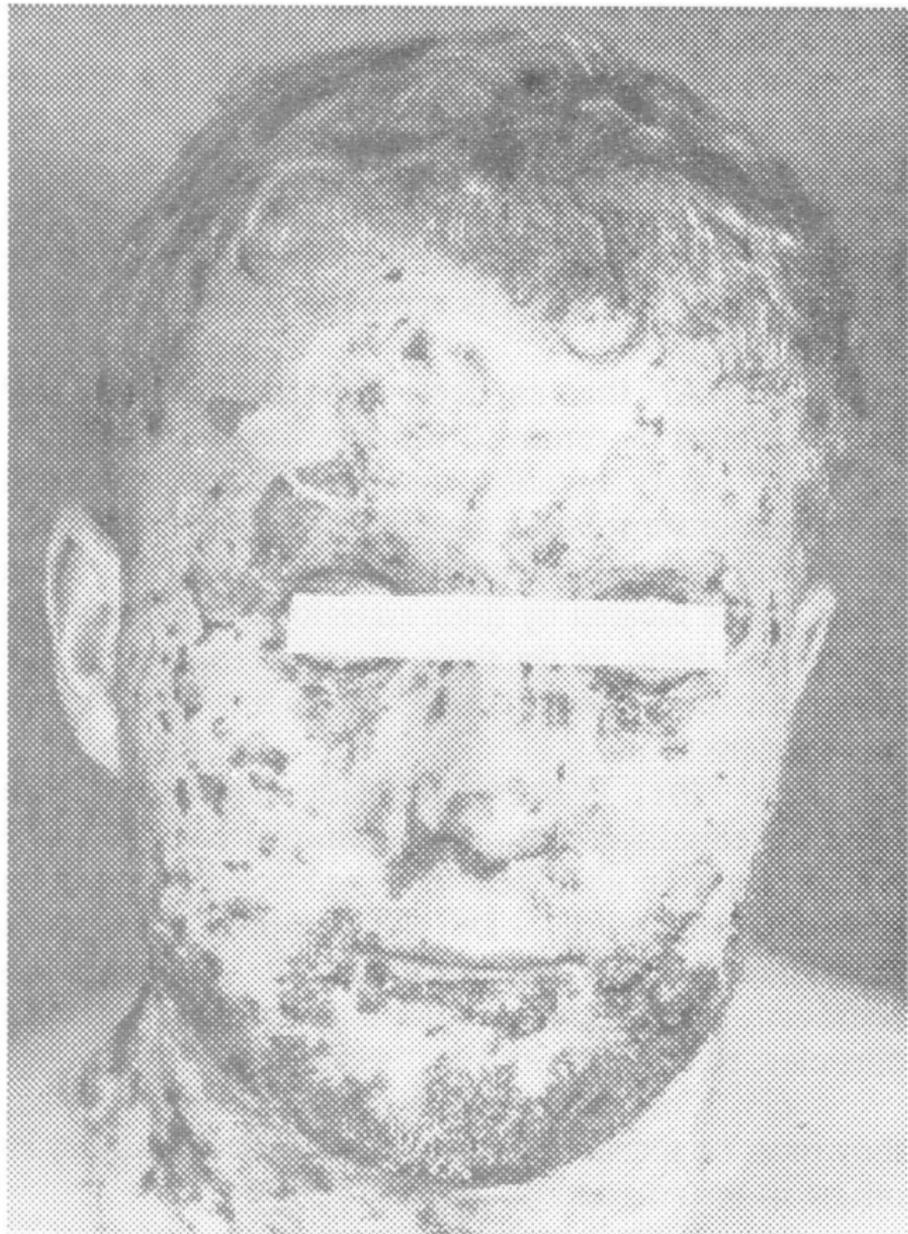
(3) *Treatment.* Remove casualties to fresh air as soon as possible. Assisted ventilation (using oxygen, if available) should be administered if breathing has ceased. Treat skin burns as thermal burns. If there are burns about the face, laryngeal burning with subsequent edema-producing respiratory obstruction may occur. Incubation, tracheotomy, or cricothyroid cannulation may be required. The general treatment of the casualty produced by flame attack does not differ from the treatment of one with extensive thermal burns from other sources.

*c. Firebomb Attack.* A firebomb is a large tank containing 100 or more gallons of thickened gasoline that is air dropped. When it strikes the ground, the fuel is ignited by phosphorus igniters and a large fireball of intense heat is produced, lasting about 4 to 6 seconds. A wide area of ground covered with burning thickened gasoline may continue to burn for 10 to 12 minutes.

(1) *Casualties.* Deaths may be caused by the intense heat or by suffocation from edema of the larynx or glottis. Thermal burns of the skin and upper respiratory tract may occur in the survivors. Danger from a toxic atmosphere is small in firebomb attacks in an open or in a well-ventilated enclosure.

(2) *Treatment.* Rapidly remove burning clothing and brush off burning fuel with a gloved hand. In general, treatment is similar to that used after flame weapon attacks.

*d. Oral Replacement of Body Fluids in a Contaminated Atmosphere.* In severe burns, lost body fluid must be replaced quickly to prevent shock. In a contaminated atmosphere, fluids that are being replaced orally must be administered to the patients without disrupting their MOPP. Oral fluid replacement may be accomplished by using the protective mask drinking tube and observing the following



*Figure 9-1. Casualty with white phosphorus burns.*

procedures:

(1) Do not remove the patient's protective clothing or mask.

(2) If the patient's protective clothing has burned away, replace it with a dry uncontaminated dressing or an improvised dressing, a sheet, a blanket, a mattress cover, or similar article.

(3) Remove the patient's canteen from its carrier. Check the canteen for contamination. If contaminated, decontaminate it before using.

(4) If the patient is conscious, is not vomiting, and does not have a stomach wound, open the valve on the mask, to position the drinking tube.

(5) Insert the protruding end of the drinking tube into the protective canteen cap. Be sure the seal

is tight.

(6) Gradually give the water to the patient, a few sips every few minutes. If the patient does not become nauseated, gradually increase the fluid intake. At the first sign of nausea, stop giving the water until the nausea subsides. (Administration of IV fluids, however, is the preferred method of replacing body fluids and should be accomplished when possible.) To start an IV, cut the sleeve of the protective jacket to expose the forearm. Start the IV as usual, pull the protective jacket over the IV needle and tube assembly and tape the sleeve to return the protective posture to the arm.

(7) Arrange evacuation of the casualty to an uncontaminated area as rapidly as possible.