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<p>Fact Sheet</p>	
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Methyl Methacrylate (MMA)

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Health Hazard Summary: *The most common effect of overexposure to methyl methacrylate (MMA) is irritation of the skin, eyes, nose, throat, or lungs. MMA can affect the nervous system, causing symptoms similar to drunkenness, but most people will experience irritation first.*

HOW TO FIND OUT IF YOU ARE WORKING WITH METHYL METHACRYLATE

Odor and Appearance: Methyl methacrylate is a clear liquid with a distinctive, sharp, fruity odor. Most people can smell MMA when the level in the air is considerably below the level which is hazardous to health. MMA is also called methacrylic acid methyl ester or methyl methacrylate.

MMA is widely used because single molecules of methyl methacrylate *monomer* link together to form a very strong, hard *polymer* (chain of molecules) that bonds tightly to a variety of other substances. The main hazard to your health comes from breathing the *vapors* of the *monomer liquid*.

Jobs Where MMA Is Used: MMA is used in the manufacture of acrylic plastics with numerous trade names such as Diakon,^R Osteobond,^R Lucite,^R Plexiglass^R, and many others. Some common uses are:

glues	polyester resins
adhesives	synthetic fibers
orthopedic cement	dental prostheses

MMA is sometimes used to make artificial fingernails, even though this use is now illegal because so many people develop allergic reactions to MMA.

Under California's Hazard Communication Standard (Cal-OSHA regulation *GISO 5194*), your employer must tell you if you are working with any hazardous substances, including methyl methacrylate, and must train you to use them safely.

If you think you may be exposed to hazardous chemicals at work, ask to see the Material Safety Data Sheets (MSDSs) for the products you are using. An MSDS lists the hazardous chemical contents of a product, describes its health and safety hazards, and gives methods for its safe use, storage, and disposal. An MSDS should also include information on fire and explosion hazards, reactivity, first aid, and procedures for handling leaks and spills. Your employer must have an MSDS for any workplace product that contains a hazardous substance, and must make the MSDS available to employees on request.

This Fact Sheet is an aid for worker training programs. It does not take the place of a Material Safety Data Sheet.

HOW METHYL METHACRYLATE ENTERS AND AFFECTS YOUR BODY

MMA enters your body when you breathe in the vapor or get the liquid on your skin. The most common effect of overexposure is irritation of your skin, eyes, nose, throat, or lungs. MMA can affect your nervous system (causing symptoms similar to drunkenness), but most people will not experience this without first experiencing irritation.

Eyes, Nose, and Throat: MMA vapor in the air at a level of 125 ppm (just above Cal-OSHA's Permissible Exposure Limit - see "Legal Exposure Limits" on page 3) may cause teary eyes, sore throat, coughing, and irritation of your nose. In animal studies, prolonged exposure to 400 ppm damaged the surface of the trachea (windpipe). It is not known whether this occurs in humans.

Skin: Direct contact with liquid MMA can cause itching, burning, redness, swelling, and cracking of the skin. Repeated skin contact can cause dermatitis (skin rash). In some people, an allergic skin reaction can occur. There are reports that prolonged skin contact may cause tingling, numbness, and whitening of the fingers. MMA easily penetrates most ordinary clothing and can also penetrate surgical gloves (see "Reducing Your Exposure" on page 3).

Nervous System: Overexposure to MMA can affect your brain the way drinking alcohol does. Symptoms may include headache, drowsiness, nausea, weakness, fatigue, irritability, dizziness, and loss of appetite. Overexposure to MMA may also cause sleeplessness.

Cancer: In a recent test, MMA did *not* cause cancer in animals. Whether MMA can cause cancer in humans is not known.

Reproductive System: Experiments with animals to find out whether MMA can affect a developing

fetus have given uncertain results. Some studies have suggested that MMA can cause birth defects when pregnant animals are exposed to extremely high levels. It is not known whether MMA can affect pregnancy in humans. However, MMA inhaled by a pregnant woman can reach a developing fetus. Women who may be pregnant should avoid overexposure to MMA.

Whether MMA can affect male reproductive function has not been studied in animals or in humans.

TESTS FOR EXPOSURE AND MEDICAL EFFECTS

Methyl methacrylate does not remain in your body for long. There is no medical or laboratory test that can accurately measure the amount of MMA in your body, or identify any damage that MMA exposure might cause. Thus, no specific routine testing is recommended or required. Patch testing can be performed to diagnose allergic dermatitis.

It is generally recommended that workers who are frequently exposed to MMA or other hazardous substances receive a complete physical examination, including an occupational and medical history, at the beginning of their employment. Periodic follow-up examinations are also recommended.

LEGAL EXPOSURE LIMITS

California's Division of Occupational Safety and Health (Cal-OSHA) sets and enforces workplace chemical exposure limits. Cal-OSHA has adopted a Permissible Exposure Limit (PEL) for the amount of methyl methacrylate in your breathing zone. The PEL for MMA is 100 parts of MMA per million parts of air (100 "parts per million," or 100 ppm). This is equal to 410 milligrams of MMA per cubic meter of air (410 mg/m³).

Your exposure may legally be above 100 ppm at times, but only if it is *below* 100 ppm at other times, so that your *average* exposure for any 8-hour workshift is 100 ppm or less.

Most people can smell methyl methacrylate when the concentration in the air is well below the PEL of 100 ppm. Thus, smelling a strong odor of MMA does not tell you whether you are being overexposed to it. Measuring the amount of a substance in the air is the only reliable way to determine the exposure level.

If you have any of the symptoms described on page 2 while you are working with MMA, you may be exposed at more than the legal limit. Talk to your supervisor and/or your union. If any worker might be exposed to a substance at more than the legal exposure limit, the employer must measure the amount of the chemical in the air in the work area (*GISO 5155*). You have the right to see the results of such monitoring relevant to your work (*GISO 3204*).

You also have the right to see and copy your own medical records and records of your exposure to toxic substances. These records are important in determining whether your health has been affected by your work. Employers who have such records must keep them and make them available to you for at least 30 years after the end of your employment.

REDUCING YOUR EXPOSURE

Your employer is required to protect you from being exposed to chemicals at levels that are above the

PELs. For information about how Cal-OSHA and Cal-OSHA Consultation Service can help you and your employer, see the "Resources" section on page 4.

Substitution: The most effective way to reduce hazardous chemical exposures is to use a safer chemical, if one is available. However, the health and safety hazards of substitutes must also be carefully considered to ensure that they are actually safer.

Engineering Controls: When possible, employers must use engineering controls rather than personal protective equipment to prevent overexposure. Engineering control methods include installing ventilation, changing the work process, and changing work practices. Containers should be tightly covered to prevent evaporation. Some work processes can be isolated, enclosed, or automated to reduce exposures.

Local exhaust ventilation systems ("hoods") are the most effective type of ventilation control. These systems capture contaminated air at its source before it can spread into the air in your breathing zone. In hospitals or other settings where MMA is mixed, a local exhaust system with laminar flow should be used. Vapor scavengers must be installed in operating rooms where MMA is used.

Personal Protective Equipment: When engineering controls cannot sufficiently reduce exposures, a respirator must be worn and a respiratory protection program must be developed, as outlined by Cal-OSHA regulations (*GISO 5144*). An industrial hygienist or other knowledgeable person should be consulted to ensure that the equipment is appropriate and is used correctly.

If frequent or prolonged skin contact with liquid MMA is necessary, or if splashing may occur, other protective equipment such as gloves, goggles, or a faceshield should be worn. Protective clothing should be made of a material which is resistant to MMA, such as polyvinyl alcohol. Even the most resistant materials will be penetrated quickly, so gloves should be replaced often.