

Methyl Bromide

- What
 - Bromomethane, monobromomethane, isobrome, Brom-o-Gas, Bromomethane, Celume, Embafume, Haltox, MB, MeBr, Profume, Terr-o-Gas, Zytox, and methyl fume
 - Oder less and colorless gas, up to 2% chloropicrin used to provide warning of exposure
 - Liquid at temperatures less than 38.5F
 - Three times heavier than air, accumulates in poorly ventilated and low-lying areas
- Uses
 - Pesticide to fumigate soil, spaces, structures, and commodities
 - 87% used prior to planting to eradicate fungus, nematodes, microorganisms, and weeds
 - Mostly for tomato, strawberry and bell pepper crops
 - 8% post harvest for grain fruits and vegetables during transport or when arrival to the United states to prevent contamination from outside insects
 - 5% for structural spraying to protect from insect infestation
 - 70% of methyl bromide produced in the U.S. goes into pesticidal formulations (as of 1996)
 - Total use of 711,175 lb in 2009, 78% on imported and 22% on exported material under Plant Protection and Quarantine oversight with the Plant Protection Act of 2000
 - The value of imports requiring fumigation in 2005-2009 \$2.36 billion/year
 - These included grapes, chestnuts, watermelons, tomatoes, cut flowers, plywood, and machinery.
 - The value of exports requiring MB fumigation in 2005-2009 \$2.2 billion/year
 - Methylating solvent, low-boiling solvent, and oil extractant in chemical syntheses
 - Was previously used as a refrigerant and fire-extinguishing agent
- Sources and Sinks
 - Budget is out of balance in that the sinks are greater than the sources with fumigation accounting for 20-40% of all sources
 - Sources 113×10^6 kg.yr, sinks 146×10^6 kg/yr
 - Natural sources, mostly oceans, some from wetlands and salt marches 64×10^6 kg/year
 - Fumigations 19×10^6 kg/yr
 - Automobile emissions $5-6 \times 10^6$ kg/yr
 - Biomass burning, biofuel production, rapeseed cultivation 24×10^6 kg/yr
 - Total decline of emissions at 30 kt/yr or 60%, accounts for 25% of overall decline in ozone-depleting substances
 - Atmospheric abundance has declined with the decline in production and the North-South hemisphere emission difference has diminished by 50%, shows anthropogenic sources
 - Stratospheric Br has reached a plateau
- Regulations
 - Considered a Class I Ozone-depleting Substance
 - Vienna Convention for the Protection of the Ozone Layer (1985), precursor to the Montreal Protocol
 - Montreal Protocol (1987) Methyl Bromide regulations added at their Fourth Meeting.

- Phase out of methyl bromide produced and imported in the U.S. was phased out in January 1, 2005. Except for allowed exemptions.
 - “The critical uses of methyl bromide are adjusted every year based on decisions of the Parties to the Montreal Protocol and rulemakings by EPA.” Current critical uses include pre-plant uses, food processing, commodities, dry cured pork products.
 - Exemptions for laboratory and analytical uses allowed by the EPA for use in equipment calibration, use as extraction solvents, diluents or carriers for chemical analysis, biochemical research, inert solvents for chemical reactions, as a carrier or laboratory chemical and other critical analytical and laboratory purposes.
- Human Toxicity
 - NIOSH IDLH = 250 ppm, AIHA ERPG-2 = 50 ppm, 30 mg/L exposure lethal at 1.5
 - Sub-lethal poisoning has a latency period of 2 to 48 hours
 - Dermal contact stinging pain, redness of the skin, and blisters characteristic of second-degree burns.
- Atmospheric Toxicity
 - Ozone Depletion Potential = 0.51, atmospheric lifetime 0.7 yr
 - 9.2 ppt in 1999, 1.3 ppt decrease by 2004,
 - Ice core samples show 1700-1900 mixing ratio 5-6 ppt
 - From independent measurements 5.5 ppt in 1930s
- Ecological/Environmental
 - Half life in soil of 30-60 days, rate of degradation 6-14% per day at 20C
 - Water run off is rare, but breakdown half life ranges from 6.6 hours to 20 days depending on the study. Toxic to freshwater fish at 11 mg/L and saltwater fish at about 12 mg/L
 - Plants grown in fumigated soil uptake bromide ions. High-protein plants have higher levels of bromide.
 - Typically not toxic to birds unless they are in the fumigation area. Not toxic to bees.
- Alternatives
 - Capture During Fumigation
 - Tissue paper containing ammonium thiosulfate sandwiched between layers of plastic tarp, placed over fumigated soil captured all but 0.15% of the fumigant. 50% of the fumigant usually escapes to the atmosphere after application. Research published 2011.
 - Ammonium Thiosulfate is very soluble in water and is a strong reducing agent. MSDS information is largely incomplete.
 - Other Pesticides
 - Telone, manufactured by Dow AgroSciences, a known carcinogen harmful to humans and animals but kills only nematodes, not fungus or weeds
 - Conserve, manufactured by Dow AgroSciences, kills insects considered a “Hazardous Chemical”
 - Champon’s 100% Natural Soil Treatment, Dazitol, non-toxic to humans, kills nematodes, fungus, microorganisms, and weeds
 - According to the Champon website, a 2005 cost-comparison shows Dazitol’s product cost one-half to one-fourth methyl bromide.

- Also according to the website it meets the “requirements of the EPA, the Food Quality Protection Act of 1996, the Clean Air Act, and the EPA Office of Children Safety Protection.”
 - However, used specifically for pre-planting fumigation.
- Methyl Bromide in the news
 - (November 2008) Bush administration received approval for use of 5900 tons of methyl bromide for agricultural uses.
 - “The Bush administration also maintains that their stockpiles existed before the 2005 [ban](#), and therefore do not count toward the treaty rule that only allows new production of methyl bromide if current supplies are insufficient.”
 - (January 2011) California approves use of methyl iodide to as a pesticide for strawberries. Methyl iodide known to cause cancer, brain, DNA, and reproductive damage. Toxins will also likely end up in the groundwater.
 - (June 2010) “Currently, California strawberry growers use millions of pounds a year of a chemical called methyl bromide. Methyl bromide is banned in many parts of the world and is being phased out because it damages the ozone layer. Like every chemical pesticide, methyl bromide comes with health risks. Respiratory, nervous system, and neurological problems are common with the chemical - and it's especially dangerous to people working on or living near the farms. Now, we're getting this dangerous chemical out of strawberry fields, but it'll be replaced with another chemical that can damage our DNA, as well as cause miscarriages, cancer and brain damage. The new chemical, methyl iodide, is actually considered more toxic than the chemical it's replacing.”
 - (September 2010) “By virtually every major indicator, these [scientists](#) found the organic fields and fruit were equal to or better than their conventional counterparts.”