# The Lethality Characteristic

## A Minnesota-specific hazardous-waste characteristic

Minnesota Pollution Control Agency

Waste/Hazardous Waste #2.05 • May 2009

**Contents**

Table 1 ..... 2
Further evaluation ..... 3
Calculating LD50 ..... 3
Applying knowledge .. 3
Sufficient knowledge unavailable ..... 3
Published information 4
Table 2 ..... 4
More information ..... 4

Lethality, a hazardous waste characteristic specific to Minnesota, considers the toxicological, or poisonous, effect of a waste. Minnesota waste generators must ensure that wastes are evaluated for the Lethality characteristic as well as for the federal characteristics of Ignitability, Oxidizers, Corrosivity, Reactivity, and Toxicity. While the more familiar characteristic of Toxicity also contains the root 'toxic,' that characteristic refers to the presence and concentration of specific toxic contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). The Lethality characteristic is concerned with the overall toxicological effect of the waste as determined by biological testing. In this document, wastes displaying the Lethality characteristic are termed 'Lethal.'

Seek ways to reduce the total amount of waste you generate and the toxicity of the products you use to reduce the amount of potentially lethal hazardous wastes you generate. For free assistance, contact the Minnesota Technical Assistance Program (MnTAP). Contact information on page 4.

For more information on the federal characteristics, see MPCA hazardous waste fact sheet #2.04, *Characteristic Wastes*, available at www.pca.state.mn.us/publications/w-hw2-04.pdf

### Lethality thresholds

The toxicological effect of a material is often measured in terms of the median lethal dose ($LD_{50}$), which is the amount of a material which will kill half of a test population of a specific animal, presented as a ratio with the body weight of the animal. Median lethal dose information is determined for a specific exposure method and test animal. The Lethality characteristic considers the oral, dermal, and inhalation exposure methods. The median lethal dose for the inhalation exposure is commonly referred to as the median lethal concentration (LC50).

Under Minnesota Rules, a waste is hazardous for the Lethality characteristic when a representative sample of the waste exhibits any of the following:

- an oral $LD_{50}$ (rat) less than 500 milligrams per kilogram (mg/kg)
- a dermal $LD_{50}$ (rabbit) less than 1000mg/kg
- an inhalation LC50 (rat) less than 2000 milligrams per cubic meter (mg/m3) for dusts and mists
- an inhalation LC50 (rat) less than 1000 parts per million (ppm) for gases and vapors

### Evaluating for lethality

To help you evaluate waste for the Lethality characteristic, the Minnesota Pollution Control Agency (MPCA) has compiled a list of attributes that indicate a waste may be Lethal. See Table 1.

You may consider a waste does *not* meet the Lethality characteristic when you can document that the product from which the waste is generated does not display any of the Table 1 attributes. Maintain documentation at the generation site.

If a product *does* display any of the attributes, the waste *may* be Lethal; you must evaluate it further. Manage waste that



Minnesota Pollution Control Agency • 520 Lafayette Rd. N., St. Paul, MN 55155-4194 • www.pca.state.mn.us
651-296-6300 • 800-657-3864 • TTY 651-282-5332 or 800-657-3864 • Available in alternative formats

displays any of the attributes as a Lethality characteristic hazardous waste unless and until you evaluate further under Minn. R. 7045.0131, Subp. 6 and demonstrate that the waste does not display the Lethality characteristic.

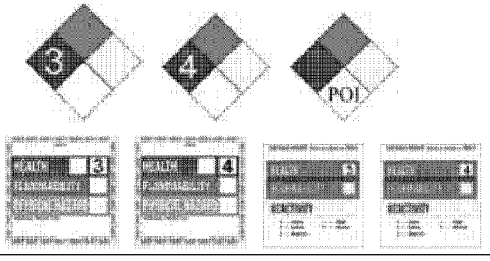
Instead of performing a full evaluation, you may choose to assume a waste is lethal and manage it as fully regulated hazardous waste

**Table 1: Attributes of potential lethality**

- A **drug*** regulated by the Minnesota Board of Pharmacy
- A **pesticide** regulated by the Minnesota Department of Agriculture
- A **poisonous material** regulated for transport by the U.S. Department of Transportation
- A material bearing any of the descriptive or signal terms **"Poison"**, "**Poisonous**", "**Toxic**", **"Lethal"**, **"Fatal"** or **"Deadly"** on the product shipping container, product label, or in product documentation
- A material bearing the '**skull and crossbones**' graphic on the product shipping container, product label, or in product documentation

- A material bearing a U.S. Department of Transportation "**Hazard Class 6.1**" label or placard on the product shipping container, product label, or in product documentation


- A material bearing a National Fire Rating (NFR), Hazardous Materials Identification System (HMIS), or Hazardous Material Identification/Information Guide (HMIG) rating **Health Division ≥3** or **Special Hazard Division "POI"** (NFR only) label on the product shipping container, product label, or in product documentation




- A material bearing **$LD_{50}$ data** on a Material Safety Data Sheet (MSDS) which you have, or which you are required by OSHA regulations to have, which states that the $LD_{50}$ of any of the ingredients is less than the lethality thresholds on page 1 of this fact sheet
- A material having **specific information known to you** that the waste may reasonably be Lethal, including but not limited to information that your processes may alter a product or other material which does not exhibit any of the above attributes in such a way that the waste generated may reasonably be Lethal
- A material having **specific information published by the MPCA** in Table 2 of this fact sheet that the waste may reasonably be Lethal

Wastes which display no attributes may be considered non-Lethal.
Wastes which display one or more attributes may be Lethal and must be evaluated further.

*A 'drug' as specified in Table 1 above is considered by the MPCA to be a 'pharmaceutical' eligible for further evaluation for lethality under an approved Petition for the "*Alternate Method to Evaluate Pharmaceutical Waste for the Lethality Characteristic*" if you have such an approved Petition. For more information on the Alternate Method, see MPCA hazardous waste fact sheet **#4.45b**, *Alternate Method to Evaluate Pharmaceutical Waste for the Lethality Characteristic*, available at www.pca.state.mn.us/publications/w-hw4-45b.pdf

## Further evaluation for lethality

Further evaluation of a waste for the Lethality characteristic may include calculating the estimated $LD_{50}$ of the waste or applying specific and documented knowledge of materials and processes used in the generation of the waste. If you evaluate the waste further and can demonstrate that it does not meet the Lethality characteristic as identified in Minn. R. 7045.0131, Subp. 6, you may manage the waste as non-Lethality characteristic without further action on your part.

Note: A waste that is not hazardous due to the Lethality characteristic may be hazardous for other reasons. Always perform a complete evaluation.

## Calculating the estimated $LD_{50}$ of a waste

To calculate the estimated $LD_{50}$ of a waste, you must have the appropriate $LD_{50}$ data for all of the waste components that reasonably may produce a toxic effect. The $LD_{50}$ data you use must be for the correct exposure method and test animal. You may exclude ingredients that reasonably will not produce a harmful toxicological effect. If your reference material gives a range for the % concentration of an ingredient, you must use the maximum range value in your calculation.

Note: Ingredients identified as 'inert' on product labels, such as propellants, solvents, and carriers, may *not* be assumed to produce no harmful toxicological effect. Many product labels identify these ingredients as 'inert' only because they do not perform the main function of the product. However, many of these 'inert' ingredients, such as petroleum-based solvents, may have significant harmful toxicological effects and must be included in your $LD_{50}$ calculation.

To calculate the estimated $LD_{50}$ of the waste, use the following formula:

$$\frac{1}{T_W} = \frac{1}{100} \times \left( \frac{C_A}{T_A} + \frac{C_B}{T_B} + \frac{C_C}{T_C} \right)$$

$T_W$ = $LD_{50}$ of the waste

$T_{A,B,...Z}$ = $LD_{50}$ of ingredient A, B, ...Z in the waste

$C_{A,B,...Z}$ = % concentration of ingredient A, B, ...Z in the waste

Note: The total % concentrations of ingredients A, B, ...Z you use in your calculation may be less than 100% if the remainder of the waste will not produce a harmful toxicological effect.

## Applying specific knowledge to determine the lethality of a waste

As an alternative to calculating the estimated $LD_{50}$ of a waste, you may apply specific and documented knowledge of the materials and processes used in generating the waste. If the waste is an unaltered discarded product, you must determine whether the product would reasonably meet the Lethality characteristic when disposed of. Certifications or informed statements by a product manufacturer that a waste is "non-toxic" or "practically non-toxic" to humans or mammals may constitute knowledge that the waste is reasonably non-Lethal.

If you are able to locate some toxicological information but are unable to calculate the estimated $LD_{50}$ of the waste, you may still be able to use the available data to evaluate the waste for the Lethality characteristic. As an example, if the only $LD_{50}$ data you are able to locate is for an exposure method other than the one you are considering, or if the test animal is different than the required animal for the exposure method you are considering, you may apply accepted principles of biochemistry, toxicology, and physiology to the $LD_{50}$ data you do have to determine whether the waste would reasonably be Lethal.

Note: You may not use information that a product is certified for a specific use by a governmental agency, such as the U.S. Food and Drug Administration (FDA), U.S. Environmental Protection Agency (EPA) or other similar Federal or state agency, as evidence that the product is non-Lethal when disposed of unless the certified use by its nature and lack of limitation shows that the product would reasonably be non-Lethal. As an example, you may not use approval for limited medical use of a pharmaceutical by the FDA as evidence that the waste pharmaceutical is non-Lethal; however, the approval for unlimited food use of an additive would reasonably indicate the additive waste is non-Lethal.

## When sufficient information and knowledge are not available to determine lethality

When, after exercising due diligence, you are unable to locate sufficient information and knowledge to determine whether a waste displays the Lethality characteristic, you may either simply manage the waste as a Lethal hazardous waste or notify the MPCA in writing. The MPCA may require specific additional evaluation to reasonably determine whether the waste may be managed as non-Lethal.

## Specific published lethality information

Table 2 lists specific lethality information currently known to the MPCA for wastes which may not exhibit any of the other attributes from Table 1, with the approximate lethality threshold concentrations for the oral exposure method for each waste. This table does not list all known or potentially Lethal wastes, only those which the MPCA believes may otherwise not be identified and of which it has specific knowledge.

**Table 2: Specific known lethality information**

| Waste name | CAS registry number | Approximate lethality threshold concentration |
|---|---|---|
| Beryllium | 7440-41-7 | 2% |
| Formaldehyde | 50-00-0 | 20% |
| Glutaraldehyde | 111-30-8 | 27% |
| Perfluorobutanesulfonate (PFBS) | 29420-49-3 | 86% |
| Perfluorodecanoic acid (PFDA) | 335-76-2 | 11% |
| Perfluorooctanesulfonate (PFOS) | 1763-23-1 | 50% |
| Perfluorooctanesulfonylamide (FOSA or PFOSA) | 754-91-6 | 34% |
| Perfluorooctanoic acid (PFOA) | 3825-26-1 | 50% |

## More information

The MPCA, in cooperation with metropolitan county hazardous waste staff, Minnesota Technical Assistance Program (MnTAP) staff and other partners have developed guidance materials about the hazardous waste regulations available on MPCA's Web site at www.pca.state.mn.us/waste/pubs/business.html

The MPCA and your metropolitan county hazardous waste offices have staff that can help you. Contact your metropolitan county or the MPCA office nearest your facility at the numbers below. MnTAP staff can provide information and resources to help you reduce waste.

### Metro County Hazardous Waste Offices

Anoka County ..... 763-422-7093
Carver County ..... 952-361-1800
Dakota County ..... 952-891-7557
Hennepin County ..... 612-348-3777
Ramsey County ..... 651-266-1199
Scott County ..... 952-496-8475
Washington County ..... 651-430-6655
Web sites ..... www.co.[county].mn.us

### Minnesota Pollution Control Agency

Toll free (all offices) ..... 1-800-657-3864
Brainerd ..... 218-828-2492
Detroit Lakes ..... 218-847-1519
Duluth ..... 218-723-4660
Mankato ..... 507-389-5977
Marshall ..... 507-537-7146
Rochester ..... 507-285-7343
St. Paul ..... 651-296-6300
Willmar ..... 320-214-3786
Web site ..... www.pca.state.mn.us

### Minnesota Technical Assistance Program

Toll-free ..... 1-800-247-0015
Minneapolis ..... 612-624-1300
Web site ..... www.mntap.umn.edu