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## Product Safety Assessment

### 2,4 Dichlorophenoxyacetic acid (2,4-D)

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#### Names

- CAS No. 2008-39-1
- 2,4-dichlorophenoxyacetic acid
- 2,4-D
- DMA-4 IVM Herbicide

Although much of the information in this document supports the registration and sale of 2,4-dichlorophenoxyacetic acid in the United States of America, a number of other countries around the world, many of which are also member nations of the OECD (Organization for Economic Co-Operation and Development) have registered 2,4-dichlorophenoxyacetic acid products. For further details, consult the country specific [Product Label](#), [Safety Data Sheet](#), or [Contact Us](#).

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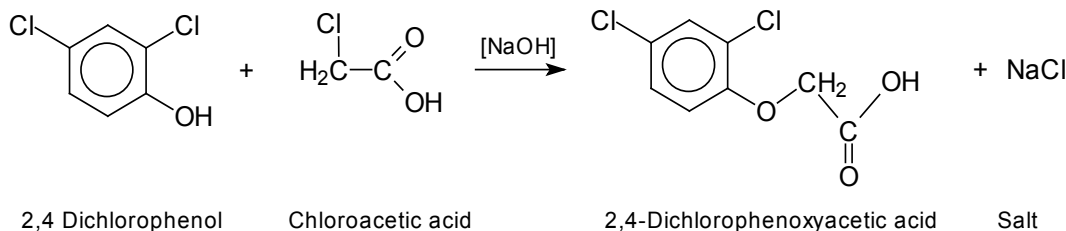
#### Product Overview

- 2,4-D is the common name for 2,4-dichlorophenoxyacetic acid, an active ingredient in several herbicides manufactured by Dow AgroSciences, a wholly owned subsidiary of The Dow Chemical Company. For further details, see [Product Description](#).
- 2,4-D is used to control established broadleaf weeds. It is registered by the U.S. Environmental Protection Agency (EPA) for use on a variety of field, fruit, and vegetable crops. 2,4-D is also registered for use on turf, rights-of-way, aquatic sites, forestry applications, and as a plant growth regulator on citrus crops. 2,4-D may also be used on residential lawns.<sup>1</sup> For further details, see the relevant [Product Label](#) and [Product Uses](#).
- Eye contact with concentrated 2,4-D may result in severe irritation with corneal injury, possibly resulting in permanent impairment of vision. Brief skin contact is essentially nonirritating. Prolonged or widespread skin contact may result in absorption of harmful amounts. No adverse effects are anticipated from a single vapor inhalation.<sup>2</sup> For further details, see [Health Information](#) or [Safety Data Sheet](#).
- Consumers could be exposed to 2,4-D when using lawn-care products containing it or following applications at golf courses, parks, or other grassy areas. Recreational swimmers could be exposed to 2,4-D while swimming in waters treated for aquatic weeds. The public could also be exposed to low-level residues by eating crops treated with 2,4-D or through drinking water. Workers could be exposed to 2,4-D during manufacturing, formulating operations, or during herbicide application in the field.<sup>3</sup> For further details, see [Exposure Potential](#).
- Herbicides containing 2,4-D are stable under normal storage conditions. Avoid excessive temperatures. This product is incompatible with acids and oxidizing materials, and contact should be avoided.<sup>4</sup> For further details, see [Physical Hazard Information](#).

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## Manufacture of Product<sup>5,6</sup>

- **Manufacture** – Dow AgroSciences manufactures and formulates 2,4-D at facilities in Midland, Michigan.
- **Process** – 2,4-D is manufactured by reacting 2,4-dichlorophenol with chloroacetic acid in the presence of sodium hydroxide. The chemical reaction is shown below.



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## Product Description<sup>7</sup>

2,4-D is the common name for 2,4-dichlorophenoxyacetic acid, the active ingredient in several herbicides manufactured by Dow AgroSciences, a wholly owned subsidiary of The Dow Chemical Company. It is readily absorbed through plant leaves and roots. 2,4-D is a systemic herbicide that disrupts the internal growth processes of established weeds, resulting in death one to four weeks after application.

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## Product Use and Regulatory Information<sup>8,9</sup>

2,4-D is used to control established broadleaf weeds on land and in water. It is an ingredient in many agricultural and residential-use products. 2,4-D is registered for the following applications:

- Pasture and rangeland
- Agricultural
  - Wheat, filberts, sugarcane, barley, corn, seed crops, apples, cherries, oats, millet, soybeans, pears, pistachios
  - Citrus (growth regulator)
  - Aquatic food crops – rice, commercial fishery water systems
- Nonagricultural
  - Forestry – conifer, forest plantings (reforestation program), tree management
  - Golf course turf, sod farms
  - Recreational areas
  - Tree farms and plantations
  - Rights-of-way
  - Lakes, ponds, reservoirs, streams, swamps, marshlands, wetlands
  - Commercial, industrial, and residential lawns

Additional registered uses can be found in the U.S. EPA's 2,4-D Reregistration Eligibility Decision (RED) report. 2,4-D products are registered for use in almost all of the member nations of the OECD and many other countries around the world. Some of these countries include the United States, Canada, the European Union, Australia, New Zealand, Brazil, and Argentina.

Regulations also exist that govern the manufacture, sale, transportation and/or disposal of 2,4-D. These regulations may vary by city, state, country or geographic region. For further details, consult the country specific [Product Label](#), [Safety Data Sheet](#), or [Contact Us](#).

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## Exposure Potential

2,4-D is used in the formulation of commercial and residential herbicides. Based on the uses for 2,4-D, the public could be exposed through:

- **Workplace exposure**<sup>10,11</sup> – Exposure can occur in a 2,4-D manufacturing facility or in facilities that formulate it into herbicides. Those working with 2,4-D in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Each facility should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit unnecessary exposure. Agricultural workers, forest-service employees, roadside-maintenance workers, greens keepers, and others using this product could be exposed while applying herbicide in the field. Applicators are expected to follow label precautions, including wearing personal protective equipment appropriate to application method. Please consult the country-specific [Safety Data Sheet](#) or [Product Label](#), or [Contact Us](#) for more information about protective equipment and procedures. See [Health Information](#) and [Product Label](#).
- **Consumer exposure to products containing 2,4-D**<sup>12</sup> – Consumers could be exposed to 2,4-D when using lawn-care products containing it or following applications at golf courses, parks, or other grassy areas. Recreational swimmers could be exposed to 2,4-D while swimming in waters being treated for aquatic weeds. The public could also be exposed to low-levels of 2,4-D residues by eating crops treated with it or through drinking water. The EPA has assessed the aggregated risks associated with combined dietary, drinking water and residential exposures and concluded that the acute, short-term and chronic (non-cancer) risks from these potential exposures are all below EPA's level of concern. See [Health Information](#).
- **Environmental releases**<sup>13</sup> – In the event of a spill, the focus is on containment to prevent contamination of soil, ditches, sewers, waterways, or groundwater. Absorb small spills in an absorbent material such as sawdust, sand, or clay. Consult the relevant [Safety Data Sheet](#) or [Product Label](#) for more detailed information about protective equipment and procedures. See [Environmental](#), [Health](#), and [Physical Hazard Information](#).
- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, dike the area to contain the spill and contact Dow AgroSciences at **800-992-5994**. Consult the country-specific [Safety Data Sheet](#) or [Product Label](#) for more detailed information about protective equipment and procedures.
- **In case of fire** – Wear positive-pressure, self-contained breathing apparatus (SCBA) and protective fire-fighting clothing. Use water fog or fine spray to fight the fire. Noxious fumes may be formed. Contain water from fire fighting to prevent entry into surface and ground water. Follow emergency procedures carefully. Consult the country-specific [Safety Data Sheet](#) or [Product Label](#) for specific firefighting measures. See [Environmental](#), [Health](#), and [Physical Hazard Information](#).
- **Emergency Response Information** – In case of an emergency such as poisoning, product spillage or fire associated with a Dow AgroSciences product in the United States, call **800-992-5994** (additional information is available on the [Product Label](#) or at the region-specific [Contact Us](#)).

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## Health Information<sup>14</sup>

**Laboratory testing** – 2,4-D has been evaluated by comprehensive regulatory procedures used to register products in many geographies, including the U.S. and EU (i.e., U.S. Federal Insecticides, Fungicides, Rodenticides Act and EU Directives for Plant Protection, respectively). These schemes require laboratory testing for potential short-term (acute) and long-term (chronic) health effects. These tests help scientists determine how chemicals might affect humans, domestic animals, or wildlife in cases of overexposure. Pesticide products used according to label directions are unlikely to cause toxic effects. The amount of pesticide that people and pets may be exposed to is low compared to concentrations used in laboratory testing. Health information

for 2,4-D products is summarized on country-specific [Safety Data Sheets](#). For further details, also consult country-specific [Product Labels](#).

**Eye and Skin Contact** – Eye contact with concentrated 2,4-D may result in severe irritation with corneal injury, possibly resulting in permanent impairment of vision. Chemical burns may occur. Brief skin contact with 2,4-D herbicide formulations is essentially nonirritating. Prolonged or widespread skin contact may result in absorption of harmful amounts.

**Inhalation** – No adverse effects are anticipated from a single exposure to vapor.

**Ingestion** – Low toxicity if swallowed. Swallowing small amounts incidental to normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.

**Cancer and Birth Defect Information** – Various animal cancer tests have not shown an association between 2,4-D exposure and cancer. 2,4-D did not cause birth defects in laboratory animals.

For more information, see the country-specific [Product Label](#), [Safety Data Sheet](#), or [Contact Us](#).

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### **Environmental Information**<sup>15,16</sup>

2,4-D degrades rapidly in soils and aerobic aquatic environments. It degrades more slowly in anaerobic (limited oxygen) aquatic environments. 2,4-D is considered to be moderately to practically nontoxic to birds and honey bees on an acute basis and slightly toxic to small mammals. 2,4-D acid has been found to be practically nontoxic to freshwater or marine fish.

For more information, see the country-specific [Product Label](#), [Safety Data Sheet](#), or [Contact Us](#).

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### **Physical Hazard Information**<sup>17</sup>

2,4-D is stable under normal storage conditions and should be stored in a cool, dry place in the original container with the lid tightly closed. Avoid excessive temperatures. This product is incompatible with acids and oxidizing materials, and contact should be avoided. Hydrogen chloride and nitrogen oxides may be formed if the material is burned.

Consult the [Product Label](#) for specific use and storage information. For more information, see the [Safety Data Sheet](#), or [Contact Us](#).

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### **Additional Information**

- Safety Data Sheet (<http://www.dowagro.com/products/>)
- Contact Us (<http://www.dowagro.com/company/contact/index.htm>)
- *2,4-Dichlorophenol Safe Handling Guide*, Dow AgroSciences LLC, Form No. Y44-135-001 (9/00) ET (<http://www.cdms.net/ldat/ld6M3000.pdf>)
- *DMA™ 4 IVM Herbicide Specimen Label*, Dow AgroSciences LLC, Label Code: D02-141-001, February 26, 2001 (<http://www.cdms.net/ldat/ld4JS000.pdf>)
- *R.E.D. FACTS: 2,4-D* (Pesticide Reregistration Summary), United States Environmental Protection Agency, Form No. EPA-738-F-05-002, June 30, 2005 ([http://www.epa.gov/oppsrrd1/REDS/factsheets/24d\\_fs.htm](http://www.epa.gov/oppsrrd1/REDS/factsheets/24d_fs.htm))

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- *Reregistration Eligibility Decision (RED) for 2,4-D*, United States Environmental Protection Agency, Office of Pesticide Programs, Form No. EPA 738-R05-002, June 2005 ([http://www.epa.gov/oppsrrd1/REDs/24d\\_red.pdf](http://www.epa.gov/oppsrrd1/REDs/24d_red.pdf))

For more business information about 2,4-D, visit the Dow AgroSciences website at [www.dowagro.com](http://www.dowagro.com).

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## References

- <sup>1</sup> *R.E.D. Facts: 2,4-D* (Pesticide Reregistration Summary), United States Environmental Protection Agency, Form No. EPA-738-F-05-002, June 30, 2005, page 1.
- <sup>2</sup> *DMA™ 4 IVM Herbicide Material Safety Data Sheet*, Dow AgroSciences LLC, Product Code: 84631, June 27, 2007, pages 1–3.
- <sup>3</sup> *R.E.D. Facts: 2,4-D* (Pesticide Reregistration Summary), United States Environmental Protection Agency, Form No. EPA-738-F-05-002, June 30, 2005, pages 4–6.
- <sup>4</sup> *DMA 4 IVM Herbicide Material Safety Data Sheet*, Dow AgroSciences LLC, Product Code: 84631, June 27, 2007, page 2.
- <sup>5</sup> *Reregistration Eligibility Decision (RED) for 2,4-D*, United States Environmental Protection Agency, Office of Pesticide Programs, Form No. EPA 738-R05-002, June 2005, page 9.
- <sup>6</sup> *2,4-Dichlorophenol Safe Handling Guide*, Dow AgroSciences LLC, Form No. Y44-135-001 (9/00) ET, page 2.
- <sup>7</sup> *DMA 4 IVM Herbicide Material Safety Data Sheet*, Dow AgroSciences LLC, Product Code: 84631, June 27, 2007, pages 1–2.
- <sup>8</sup> *DMA 4 IVM Herbicide Specimen Label*, Dow AgroSciences LLC, Label Code: D02-141-001, February 26, 2001, page 1.
- <sup>9</sup> *Reregistration Eligibility Decision (RED) for 2,4-D*, United States Environmental Protection Agency, Office of Pesticide Programs, Form No. EPA 738-R05-002, June 2005, pages 8–10.
- <sup>10</sup> *R.E.D. Facts: 2,4-D* (Pesticide Reregistration Summary), United States Environmental Protection Agency, Form No. EPA-738-F-05-002, June 30, 2005, page 6.
- <sup>11</sup> *DMA™ 4 IVM Herbicide Specimen Label*, Dow AgroSciences LLC, Label Code: D02-141-001, February 26, 2001, page 1.
- <sup>12</sup> *R.E.D. Facts: 2,4-D* (Pesticide Reregistration Summary), United States Environmental Protection Agency, Form No. EPA-738-F-05-002, June 30, 2005, pages 5–6.
- <sup>13</sup> *DMA 4 IVM Herbicide Material Safety Data Sheet*, Dow AgroSciences LLC, Product Code: 84631, June 27, 2007, page 1.
- <sup>14</sup> *DMA 4 IVM Herbicide Material Safety Data Sheet*, Dow AgroSciences LLC, Product Code: 84631, June 27, 2007, pages 2–3.
- <sup>15</sup> *R.E.D. Facts: 2,4-D* (Pesticide Reregistration Summary), United States Environmental Protection Agency, Form No. EPA-738-F-05-002, June 30, 2005, page 8.
- <sup>16</sup> *DMA 4 IVM Herbicide Material Safety Data Sheet*, Dow AgroSciences LLC, Product Code: 84631, June 27, 2007, page 3.
- <sup>17</sup> *DMA 4 IVM Herbicide Material Safety Data Sheet*, Dow AgroSciences LLC, Product Code: 84631, June 27, 2007, pages 1–2.

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