

## History of Agent Orange and Dioxin in Vietnam

**About Agent Orange:** Agent Orange was one of a class of color-coded herbicides that U.S. forces sprayed over the rural landscape in Vietnam from 1961 to 1971 to defoliate trees and shrubs and kill food crops that were providing cover and food to opposition forces. It was a 50/50 mixture of two herbicides: 2,4-D and 2,4,5-T. It remained toxic for only days or weeks and then degraded,<sup>1</sup> but it had a toxic contaminant, dioxin, that did not degrade as readily and is still causing health problems in Vietnam.

**About Dioxin:** Its chemical name is 2,3,7,8-tetrachloro-dibenzo-para-dioxin, or TCDD. It is a persistent organic pollutant that contaminated Agent Orange and some of the other color-coded herbicides when the production of one of their components (2,4,5-T) was accelerated during wartime.<sup>2</sup> TCDD is the most toxic of about 419 types of similar toxic compounds, which include PCBs (polychlorinated biphenyls). The chemical companies that produced the Vietnam-era herbicides say they were unaware how toxic the dioxin contaminant was.

**Agent Orange/Dioxin Use in Vietnam:** About 60 percent of the herbicides used in Vietnam was Agent Orange. More than 43 million litres (11.4 million gallons) of it were used from 1962-1970. More than 30 million litres (about 8 million gallons) of Agent White, Blue, Purple, Pink and Green were also sprayed.<sup>3</sup> The concentrations were 20 to 55 times normal agricultural use for killing plants. Estimates as to the amount of dioxin in the herbicides vary because each manufacturer and each batch of 2,4,5-T had different levels of the dioxin contaminant.<sup>4</sup>

The first test spraying occurred August 10, 1961. The U.S. Air Force aerial spraying program, Operation Hades (later renamed Operation Ranch Hand), took place from January 1962 until February 1971, largely from C-123 cargo planes. That accounted for 95 percent of the herbicides sprayed. The U.S. Chemical Corps and other allied forces sprayed the remaining 5 percent from helicopters, trucks and by hand, mostly to clear brush around military base perimeters.<sup>5</sup>

The herbicides were sprayed over about 24 percent of southern Vietnam, destroying 5 million acres of upland and mangrove forests and about 500,000 acres of crops (a total area the size of Massachusetts). Of these areas, 34 percent were sprayed more than once; some of the upland forests were sprayed more than four times.<sup>6</sup> One study found that 3,181 villages were sprayed as well.<sup>7</sup> Areas of Laos and Cambodia near the Vietnam border were also sprayed.

The U.S. government stopped the spraying of all herbicides in October 1971, but the South Vietnamese military continued spraying various chemicals until 1972.<sup>8</sup> The production of Agent Orange was halted in the 1970s. Existing stocks were collected and destroyed by incineration, and it is no longer used.

(more)

***The Lifespan of Dioxin:*** The half-life of dioxin depends on its location. In human bodies the half-life is 11–15 years, though it can be as high as 20 years. In the environment, the half-life varies depending on the type of soil and the depth of penetration. Sun will break down dioxin, so on leaf and soil surfaces it will last 1–3 years, depending on conditions. Dioxin buried or leached under the surface or deep in the sediment of rivers and other bodies of water can have a half-life of more than 100 years.<sup>9</sup>

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<sup>1</sup> For toxicity information on 2,4, 5-T see [http://www.pesticideinfo.org/Detail\\_Chemical.jsp:Rec\\_Id=PC34514](http://www.pesticideinfo.org/Detail_Chemical.jsp:Rec_Id=PC34514). For information on 2,4-D, see [http://www.pesticideinfo.org/Detail\\_Chemical.jsp](http://www.pesticideinfo.org/Detail_Chemical.jsp).

<sup>2</sup> Dwernychuk, Wayne and Bailey, Charles, "Clarity on Two Terms," July 7, 2009. Agents Pink, Purple and Green also contained 2,4,5-T and therefore dioxin. <http://www.warlegacies.org/Agent%20Orange/Clarity.pdf>.

<sup>3</sup> Young, Al, *The History, Use and Disposition and Environmental Fate of Agent Orange* (New York, NY: Springer, Science and Business Media, 2009), p 67 and 5. Also Stellman, J. et al, "The Extent and Pattern of Usage of Agent Orange and other Herbicides in Viet Nam," *Nature*, Vol. 422, April 17, 2003, p. 682.

<sup>4</sup> Samples from barrels of Agent Orange stored at Gulfport, Miss., and Johnston Island, tested by the US military in 1977, had a range of <3-50 ppm. Researchers used these levels to estimate dioxin in herbicides sprayed in Vietnam. Stellman estimated 221-366 kg, Gough 167kg, Young 130-144 kg and Westing 170kg.

<sup>5</sup> Stellman, pp. 681-2.

<sup>6</sup> Vo Quy, "Statement to the House Subcommittee on Asia, the Pacific and Global Environment," June 4, 2009. <http://www.internationalrelations.house.gov/111/quy060409.pdf>.

<sup>7</sup> Stellman, p. 685.

<sup>8</sup> Young, *The History...*, p. 4.

<sup>9</sup> Wayne Dwernychuk, Hatfield Consultants, e-mail exchange Aug. 5, 2009 with Susan Hammond, War Legacies Project.