

## History: Agent Orange/Dioxin in Vietnam

**What is Agent Orange?** Agent Orange was one of a class of color-coded herbicides that US 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>i</sup> but it had a toxic contaminant, dioxin, that did not degrade as readily and is still causing health problems in Vietnam.

**What is 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>ii</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.

**How much Agent Orange/dioxin was sprayed over 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>iii</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>iv</sup>

**How was the spraying conducted?** The first test spraying occurred August 10, 1961. The US 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 US 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>v</sup>

**What areas of Vietnam were sprayed?** 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>vi</sup> One study found that 3,181 villages were sprayed as well.<sup>vii</sup> Areas of Laos and Cambodia near the Vietnam border were also sprayed. [See map.] The US government stopped the spraying of all herbicides in October 1971, but the South Vietnamese military continued spraying various chemicals until 1972.<sup>viii</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.

**What is 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>ix</sup>

## CHRONOLOGY

- 1010** – The Ly dynasty founds the city of Hanoi as its capital
- 1858** – The French navy attacks Da Nang, starting 25 years of struggle between France and Vietnam
- 1867** – Cochinchina (South Vietnam) becomes a French colony
- 1883** – Tonkin (North Vietnam) and Annam (central Vietnam) become part of French Indochina
- 1940** – Japan invades Indochina
- 1941** – Ho Chi Minh starts the Viet Minh, declaring Leninism an ideological weapon against colonialism
- 1945** – The Viet Minh ousts Emperor Bao Dai; Ho Chi Minh declares the country's independence
- 1954** – Vietnam defeats the French at the battle of Dien Bien Phu. At the Geneva peace conference, Vietnam is partitioned at the 17<sup>th</sup> parallel into North and South Vietnam.
- 1961** – U.S President John F. Kennedy sends the first military advisers to South Vietnam. Testing of Agent Orange and other herbicides begins in August
- 1962** – Operation Hades, later renamed Operation Ranch Hand, begins aerial spraying of herbicides
- 1965** – US troops arrive in Da Nang; aerial raids begin. Agent Orange spraying continues nationwide
- 1968** – The Viet Cong's Tet offensive is a military failure but stuns the West and sparks US anti-war feeling, including protests against the use of Agent Orange
- 1971** – US ends use of Agent Orange after spraying 11.4 million gallons. Remaining stocks are collected at Da Nang, Bien Hoa and Tuy Hoa airbases, re-barreled and shipped to the South Pacific for incineration
- 1973** – After the Paris Accords are ratified, the US military withdraws from Vietnam
- 1975** – North Vietnamese forces enter Saigon; the Socialist Republic of Vietnam is proclaimed in 1976
- 1979** – US veterans file class action lawsuit against chemical companies that produced Agent Orange
- 1984** – Veterans' lawsuit is settled out of court for \$180 million
- 1987** – Vietnam begins liberalizing economy with new foreign investment law. First US tourists arrive
- 1991** – US Congress approves Agent Orange Act, creating a list of "presumptive illnesses" for which government compensation and medical care will be provided to US Vietnam veterans
- 1994** – US ends trade embargo against Vietnam
- 1995** – US and Vietnam establish diplomatic relations
- 2002** – US and Vietnam hold joint scientific conference, sign a research memorandum of understanding
- 2004** – Vietnamese citizens file suit in US courts against Agent Orange-producing chemical companies
- 2005** – US District and Appeals courts dismiss Vietnamese case. US Supreme Court later refuses a review
- 2006** – US and Vietnamese presidents meet and agree that cooperation in addressing Agent Orange residues in Vietnam would strengthen the bilateral relationship
- 2007** – The US Congress appropriates \$3 million to address remediation of dioxin hotspots in Vietnam and to support public health programs in the surrounding communities
- 2009 and 2010** – Congress appropriates an additional \$3 million each year for the same purposes.

---

<sup>i</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>ii</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>iii</sup> Young, AI, *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>iv</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>v</sup> Stellman, pp. 681-2.

<sup>vi</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>vii</sup> Stellman, p. 685.

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

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