Environmental Fate of TCDD and Agent Orange and Bioavailability to Troops in Vietnam

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Introduction

This paper reviews the environmental fate of Agent Orange and the contaminant, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), and discusses how this affects the bioavailability of TCDD for ground troops in Vietnam.

Methods and Materials

From 1962 to 1971, herbicides were sprayed in Vietnam to defoliate the jungle canopy and to destroy crops, exposing the enemy and denying them food, and to clear tall grasses and bushes from the perimeters of US base camps and outlying fire-support bases. The most widely used herbicides were phenoxyacetic acids – 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), picloram and cacodylic acid. Only the herbicides containing 2,4,5-T were contaminated with TCDD – Agents Orange, Green, Pink and Purple.

Dispersion of Agent Orange: The US Air Force was responsible for training aircrews, developing aerial tactics for herbicide missions and the developing, testing and evaluating spray equipment. These programs were conducted mainly at Eglin Air Force Base, Florida and to a lesser degree at Pran Buri Calibration Grid in Thailand. Responsibility for the defoliant rested with the US Army at Fort Detrick, Maryland with the cooperation of the US Department of Agriculture.[1, 2]

Extensive field tests with herbicide determined optimum conditions and deposition rate for Vietnam. Dispersal of herbicide droplets by air turbulence could be minimized by scheduling missions in favorable weather conditions and by controlling droplet size. Agent Orange was found to be most effective in defoliating when applied to the target vegetation: while wind was calm (i.e., less than 8 knots), in the absence of precipitation, and early morning.[1, 3]

RANCH HAND missions achieved optimum defoliation by flying at 140 knots and an altitude of 50 meters above the ground level (just above tree tops). These parameters allowed the aircraft to be on target for 3.5-4 minutes and resulted in a particle size where 98% of the particles were greater then 100 microns, meaning they have a rapid settling velocity.[4] Tests showed that 87% of the