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**Description Notes** Contents of folder labeled: "Form Letter for Herbicide Orange Technical Reports."

DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS AEROSPACE MEDICAL DIVISION (AFSC)  
BROOKS AIR FORCE BASE, TEXAS 78235



REPLY TO  
ATTN OF: EC

SUBJECT: Literature Request

TO:

1. Per your request for literature, the following documents on Air Force studies of the environmental fate of 2,4-D, 2,4,5-T and TCDD are attached.

2. The first three Technical Reports are pertinent studies on the fate of 2,4,5-T and its trace contaminant TCDD in an ecosystem treated with massive quantities of phenoxy herbicides. Technical Reports AFATL-TR-74-12 (Atch 1), AFATL-TR-75-49 (Atch 2) and AFATL-TR-75-142 (Atch 3) detail ecological studies conducted on a unique 3.0 km<sup>2</sup> military test area (Test Area C-52A, Eglin AFB FL) that received approximately 73,000 kg 2,4,5-T and 77,000 kg 2,4-D during the period 1962-70. Significant results included:

a. At the termination of spray equipment testing programs in 1970, significant levels (ppm) of 2,4,5-T soil residues were found throughout the test area. However, no residues of 2,4,5-T were detected (detection limit of 10 ppb) in any soil samples collected during 1971-1972.

b. Fifty-four (54) soil samples were collected to a depth of 15 cm from throughout the test area and analyzed for TCDD. TCDD levels ranged from <10 to 1,500 parts per trillion (ppt). The median concentration was 30 ppt while the mean was 165 ppt.

c. An ecological survey extending over a five-year period documented the presence of more than a 123 different plant species, 77 bird species, 71 insect families, 20 species of fish, 18 species of reptiles, 18 species of mammals, 12 species of amphibians and 2 species of molluscs. At least 170 biological samples were analyzed for TCDD, including 30 species of animals. No TCDD was found in any of the plant species examined. However, TCDD was found in nine species of animals including two rodent species: beachmouse (300-1,500 ppt, liver) and hispid cotton rat (<10-210 ppt, liver); three species of birds: meadowlark (100-1,020 ppt, liver), mourning dove (50 ppt, liver), and Savannah sparrows (69 ppt, liver); three species of fish: spotted sunfish (85 ppt, liver) mosquitofish (12 ppt, whole body) and sailfin shiner (12 ppt, whole body), and one reptile, the six-lined racerunner (360-430 ppt, muscle). A composite sample of insects (whole bodies) contained 40 ppt TCDD.

d. Gross pathology was done on all species collected for TCDD residue analyses. Histopathological examinations were performed on over 300 beachmice or hispid cotton rats from the test area and a control field site. Examinations were performed on the heart, lungs, trachea, salivary glands, thymus, liver, kidneys, stomach, pancreas, adrenals, large and small intestine, spleen, genital organs, bone, bone marrow, skin and brain. Initially, the tissues were examined on a random basis without the knowledge of whether the animal was from a control or test area. All microscopic changes were recorded including those interpreted as minor or insignificant. The tissues were then reexamined on a control and test basis, which demonstrated that the test and control mice could not be distinguished histopathologically. Similar histopathological studies were conducted on the fish and racerunners with no significant abnormalities being found.

3. Technical Report USAFA-TR-76-18 (Atch 4) is a summary of Air Force ecological research on TCDD. It also presents analytical data on the soil degradation of TCDD when in the presence of 2,4,5-T and 2,4-D. Significant results included:

a. The half-life of TCDD in soils containing 2,4-D and 2,4,5-T appeared to be between 225 and 275 days.

b. Studies of bacteria, actinomycetes and fungi from soil plots treated with massive quantities of 2,4-D and 2,4,5-T (5,000 - 40,000 ppm) confirm that these microorganisms proliferate to such an extent that they were probably using the herbicides and TCDD as metabolic carbon sources and, as such, were contributing to their degradation.

c. Movement of TCDD in the abiotic portions of the environment occurred by wind or water erosion of soil particles, but leaching by water alone did not occur.

4. Technical Report USAF OEHL-TR-78-92 (Atch 5) contains, in addition to the above environmental data on 2,4,5-T and TCDD (Chapter III), other significant data including:

a. Data on the analysis of 492 samples of Herbicide Orange (a 50:50 mix of the n-butyl esters of 2,4-D and 2,4,5-T) for TCDD (See Chapter I). The levels of TCDD ranged from <0.02 to 15 ppm in herbicide produced during the 1965-1968 time period. The weighted mean concentrations of TCDD in Herbicide Orange was 1.98 ppm. The samples were taken from surplus Herbicide Orange.

b. Industrial hygiene and ambient air sampling data from all landbased dedrumming/transfer operations of Project PACER HO, the 1977 USAF project to dispose of 2.22 million gallons of Herbicide Orange (see Chapter II). Results of these sampling programs revealed that under the worst case noted, the levels of 2,4,5-T (and 2,4-D) vapors were well below the time-weighted Threshold Limit Value (TLV) for each of these materials. The detected levels were at least two and, in most cases, three orders of magnitude below the TLVs. TCDD was not detected in any air samples. Approximately 200 personnel carried out the dedrumming/transfer

operations. Comparisons of available pre- and post-operational medical examinations of military personnel involved have revealed no apparent physical effects as a result of these activities.

c. An assessment of the world's scientific literature on the toxicity of 2,4,5-T, 2,4-D and TCDD in selected laboratory and domestic animal species (see Chapter IV). Each chemical was critically reviewed for:

1. Acute and short-term toxicity potentials.
2. Subacute and chronic toxicity potentials.
3. Absorption, distribution, and excretion potentials.
4. Embryotoxic, fetotoxic, and teratogenic potentials.
5. Carcinogenic and tumorigenic potentials.
6. Mutagenic and cytogenic potentials.


d. A review of available scientific data on numerous incidents involving suspected 2,4,5-T/TCDD poisoning of humans or livestock (see Chapter V). Extensive efforts in translating over 30 major foreign documents permitted for the first time detailed accounts of 23 industrial episodes that involved exposure of over 1,100 people to TCDD. An assessment of the medical data from these industrial episodes and other episodes was made in Chapter VI. Some of the significant medical conclusions were:

1. Adverse effects of 2,4,5-T herbicide should manifest themselves shortly after exposure. Symptoms arising for the first time months to years after the last exposure are probably due to an etiology other than the herbicide.

2. The hallmark of TCDD exposure is chloracne and its absence makes it unlikely that systemic disorders present are related to TCDD. Asthenic and vegetative symptoms are often present in overexposure but are difficult to interpret. They would normally be expected to clear with time.

3. There is no conclusive evidence at this time that either 2,4,5-T herbicide or TCDD is mutagenic, teratogenic, or carcinogenic in man.

5. If I can provide additional copies of these documents or further elaborate on the data, please contact me.

  
ALVIN L. YOUNG, Captain, USAF, Ph.D.  
Environmental Sciences Consultant  
USAF Herbicide Specialist

5 Atchs

1. AFATL-TR-74-12
2. AFATL-TR-75-49
3. AFATL-TR-75-142
4. USAFA-TR-76-18
5. USAF OEHL-TR-78-92