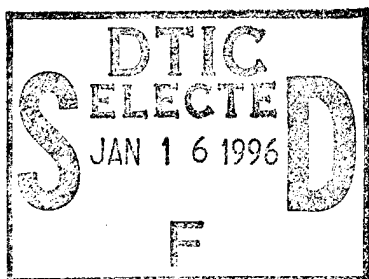
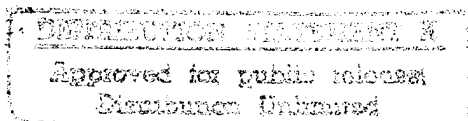


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1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 11/05/78	3. REPORT TYPE AND DATES COVERED	
4. TITLE AND SUBTITLE STUDIES OF ENVIRONMENTAL FATES OF DIMP AND DCPD, MONTHLY PROGRESS REPORT 4			5. FUNDING NUMBERS	
6. AUTHOR(S) SPANGGORD, R.; CHOU, T.; MABEY, W.			DAMD 17 78 C 8053	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) SRI INTERNATIONAL MENLO PARK, CA			8. PERFORMING ORGANIZATION REPORT NUMBER 81340R09	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND FORT DETRICK, FREDERICK			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) THE OBJECTIVES OF THIS RESEARCH ARE TO CONDUCT LABORATORY EXPERIMENTS THAT WILL PREDICT THE PHOTOCHEMICAL AND BIOLOGICAL TRANSFORMATIONS OF DCPD AND DIMP IN THE SOILS AND WATERS OF ROCKY MOUNTAIN ARSENAL AND WILL PROVIDE A SEMIQUANTITATIVE EVALUATION OF DECOMPOSITION RATES OF AND PRODUCTS RESULTING FROM DCPD AND DIMP. DURING OCTOBER, ANALYTICAL METHODS WERE DEVELOPED TO DETERMINE CONCURRENTLY METHYLPHOSPHONATE (MP) AND ISOPROPYLMETHYLPHOSPHONATE (IMP) IN THE PRESENCE OF DIMP. THE PHOTOCHEMISTRY OF DCPD IN NATURAL WATERS WAS INVESTIGATED, AND MICROBIAL STUDIES OF 14C-LABELED DCPD AND DIMP WERE INITIATED.				
14. SUBJECT TERMS CONTAMINANTS, FAUNA, FLORA, SOIL, GROUNDWATER, CHEMICALS, BIODEGRADATION			15. NUMBER OF PAGES	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT	

STUDIES OF ENVIRONMENTAL FATES OF DIMP AND DCPD

Monthly Progress Report 4

5 November 1978

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Contract No. DAMD 17-78-C-8053
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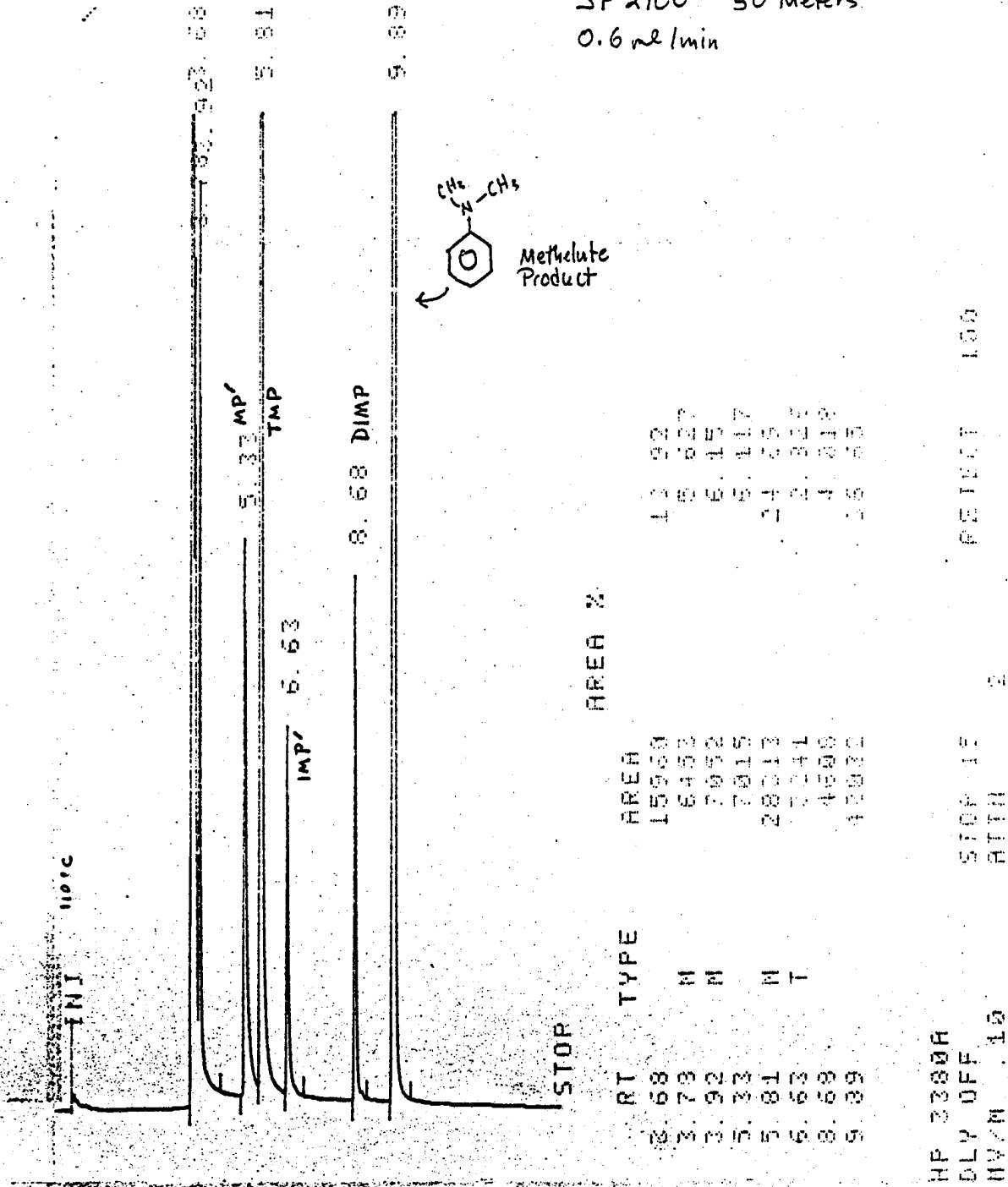


Figure 1 GAS CHROMATOGRAPHIC SEPARATION OF DIMP, TMP, and THE METHYL DERIVATIVES OF IMP AND MP

mercury light merry-go-round reactor. DCPD concentrations changed less than 2.0% relative to controls during that time.

The photolysis of DCPD (2 ppm) was also investigated in deep natural water obtained from Rocky Mountain Arsenal. After 94 hours of photolysis, an average loss of $32.2 \pm 2.2\%$ (0.34%/hr) was observed compared with controls. We are conducting another experiment to obtain a more detailed kinetic profile of this photolysis. Table 1 presents the data obtained to date.

Table 1

PHOTOLYSIS OF DCPD IN NATURAL RMA WATER

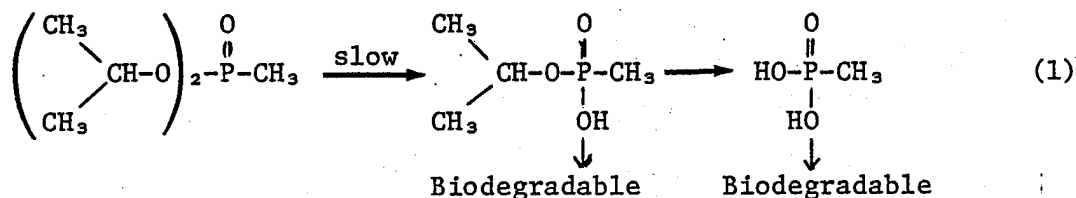
<u>Time, ΔT</u>	<u>Loss of DCPD (%)</u>	<u>Rate (% hr⁻¹)</u>
24	17.1	0.71
48	26.4	0.55
101	35.3	0.35
48 control	0	

These results indicate that naturally occurring organics (such as humic acids) may be participating in the phototransformation of DCPD, acting either as singlet oxygen ¹O₂ sensitizers or free radical oxidation initiators. These mechanisms are currently under investigation.

Biodegradation

The acclimation of DCPD- and DIMP-biodegrading organisms from RMA North Bog water and Palo Alto sewage plant effluent is continuing. However, after 7 weeks of acclimation, no transformation of either compound has been detected.

In phosphate-deficient medium, microbes from both RMA and Palo Alto sewage effluent were found to utilize MP, IMP, and trimethyl-phosphate readily. This indicates that the rate-limiting step is the initial transformation of DIMP, assuming that transformation occurs by a "hydrolysis" type of mechanism (Eq. 1).



IMP and MP were added as co-metabolic substrates to assist DIMP transformation, but no co-metabolism has been observed to date.

Our preliminary studies of DIMP biodegradation in soil have been initiated. ^{14}C -DIMP was added to RMA and local soils (moistened with water), and the generated $^{14}\text{CO}_2$ was trapped in KOH solution. After 1 week, indications of radioactivity appeared in the KOH trap. However, when the CO_2 was precipitated with barium ion and the BaCO_3 was washed with water and ethanol, most of the activity was found in the supernatants. We are investigating whether this activity results from ^{14}C -DIMP contamination or from volatile metabolites generated by the soil organisms.

The same phenomenon has been observed with ^{14}C -DCPD in soil studies. Radioactivity is observed in KOH traps but, barium precipitation of CO_2 incorporates little activity in barium carbonate. Because of its volatility, DCPD and possibly its volatile metabolites may accumulate in these traps. These possibilities are currently under investigation.

FUTURE WORK

Our future plans are to continue investigating DCPD and DIMP biotransformation using labeled compounds both in soil and liquid media. We also will investigate local eutrophic water samples for the development of DCPD- and DIMP-degrading organisms.

The photochemical studies will continue with the investigation of the photolysis of DCPD in natural waters as well as the initiation of solar photolysis studies in deep and shallow RMA waters.

Exhibit A is the performance schedule for project tasks, and Exhibit B is a graph of expenditures to date.

EXHIBIT A PERFORMANCE SCHEDULE FOR PROJECT TASKS

