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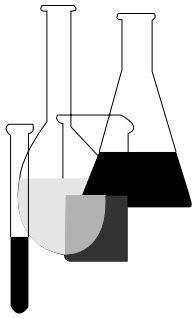
Occupational and Residential Exposure Test Guidelines

OPPTS 875.1500
Biological Monitoring



INTRODUCTION

This guideline is one of a series of test guidelines that have been developed by the Office of Prevention, Pesticides and Toxic Substances, United States Environmental Protection Agency for use in the testing of pesticides and toxic substances, and the development of test data that must be submitted to the Agency for review under Federal regulations.

The Office of Prevention, Pesticides and Toxic Substances (OPPTS) has developed this guideline through a process of harmonization that blended the testing guidance and requirements that existed in the Office of Pollution Prevention and Toxics (OPPT) and appeared in Title 40, Chapter I, Subchapter R of the Code of Federal Regulations (CFR), the Office of Pesticide Programs (OPP) which appeared in publications of the National Technical Information Service (NTIS) and the guidelines published by the Organization for Economic Cooperation and Development (OECD).

The purpose of harmonizing these guidelines into a single set of OPPTS guidelines is to minimize variations among the testing procedures that must be performed to meet the data requirements of the U. S. Environmental Protection Agency under the Toxic Substances Control Act (15 U.S.C. 2601) and the Federal Insecticide, Fungicide and Rodenticide Act (7 U.S.C. 136, *et seq.*).

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OPPTS 875.1500 Biological monitoring.

(a) **Scope**—(1) **Applicability.** This guideline is intended to meet testing requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. 136, *et seq.*).

(2) **Background.** The source material used in developing this harmonized OPPTS test guideline are OPP guidelines 230 and 235. This guideline should be used with OPPTS 875.1000.

(b) **Estimation of exposure by biological monitoring.** The feasibility of implementing a biological monitoring study is determined by information available on the absorption, distribution, metabolism, and excretion profiles of the chemical of interest. A review of all available data in these areas will serve to identify data gaps and to design studies to generate the requisite data. At the current stage of development, biological monitoring should be considered a chemical-specific method. Consequently, only general guidance can be provided to assist in the selection of analytical methods, sampling collection schedule, and sample storage. Some references which provide guidance are to be found under paragraphs (d)(1), (d)(2), (d)(3), (d)(4), (d)(5), and (d)(6) of this guideline. As is the case with passive dosimetry studies, the design of a biological monitoring study should not subject participants to potentially higher exposure than that normally found during routine operations.

(1) **Studies necessary before field studies are initiated.** (i) The pharmokinetic properties of the chemical being studied should be determined in vivo in an appropriate species.

(ii) The studies should include protocols for both dermal and oral administration of the test substance. The dermal studies should be designed to allow an estimation of the rate of absorption of the substrate. Protocols for the studies should be submitted for evaluation and approval by the Agency, and they should be identified as components of a biological monitoring study. To the extent possible, the protocols should follow procedures in OPPTS series 870—Health Effects Test Guidelines. The necessary experiments should be conducted to determine the potential for adsorption of the test substance or its urinary metabolites to the collection bottles, stability and recovery from the sampling medium, and possible breakdown during storage.

(2) **Field studies—**(i) **Urine sample collection.** The recommended procedure involves the collection of 24–h urine samples. The collection regimen is as follows:

(A) At least one baseline preexposure 24–h urine sample must be collected.

(B) Samples should be collected for day 1 (application), and postapplication days 2, 3, ...n, as determined by the excretion profile of the pesticide.

(C) A 24–h urine sample starts with the first void after initiation of the first work activity and is completed with the last void of the 24–h period. The time and volume of the complete urine void should be reported, along with the age, sex, and weight of the study participants.

(ii) **Analytical procedure.** The selection of analytical procedures will depend on the particular chemical being studied. Consequently, this decision is left to the discretion of the investigator. The selected procedure should conform to appropriate Agency good laboratory practice standards (40 CFR part 160). The amount of test substance should be reported as a cumulative total for each collection period. The investigator should consider determining creatinine levels as a way of monitoring completeness of urine collection samples.

(c) **Number of replicates.** For the purposes of biological monitoring, in these guidelines, a replicate is defined as measuring total exposure to an individual which occurs over the course of a work day or portion thereof.

(1) **Aircraft pilots and other workers.** In the event that available study participants may be limited, a minimum of three replicates each at a minimum of three sites shall be employed. It is recommended that as many different individuals as practicable be monitored.

(2) **All other workers involved in each work cycle of pesticide application.** A minimum of five replicates each at a minimum of three sites shall be employed. It is recommended that as many different individuals as practicable be monitored.

(d) **References.** The following references should be consulted for additional background material on this test guideline.

(1) Franklin, C.A. et al., Correlation of urinary pesticide metabolite excretion with estimated dermal contact in the course of occupational exposure to guthion. *Journal of Toxicology and Environmental Health* 7:715–731 (1981).

(2) Franklin, C.A. et al., Correlation of urinary dialkyl phosphate metabolite levels with dermal exposure to azinphos-methyl. Pp. 221–226 in Human Welfare and the Environment. J. Miyamoto, ed. IUPAC Pesticide Chemistry, Pergamon, NY (1983).

(3) Franklin, C.A. et al., The use of biological monitoring in the estimation of exposure during the application of pesticides. Presented at the seventh Workshop ‘‘Biological Monitoring of Workers Manufacturing, Formulating and Applying Pesticides.’’ Szeged, Hungary (1986).

(4) Kolmodin-Hedman B. et al., Studies on phenoxy acid herbicides. I. Field Study on occupational exposure to phenoxy acid herbicides (MCPA, dichloroprop, mecoprop, and 2,4–D) in agriculture. *Archives of Toxicology* 54:257–265 (1983).

(5) Lavy, T.L. et al., Exposure measurements of applicators spraying (2,4,5-Trichlorophenoxy) acetic acid in the forest. *Journal of Agricultural and Food Chemistry* 28:626–630 (1980).

(6) Lavy, T.L. et al., (2,4-Dichlorophenoxy) acetic acid exposure received by aerial application crews during forest spray operations. *Journal of Agricultural and Food Chemistry* 30:375–381 (1982).