adequate as an oncogenicity study in a third species because of the limited duration of the study and the limited histopathology apparently conducted. *Comment*. With regard to the

Comment. With regard to the dichlorvos dog feeding study (2–year), the registrant stated that "[t]he study showed no suggestion of carcinogenic effects of DDVP in dogs."

Agency Response. The Agency does not believe that a 2–year feeding study in the dog is of long enough duration to conclude that there are no carcinogenic effects of dichlorvos.

Comment. With regard to the mutagenicity of dichlorvos, the registrant states that "dichlorvos has not been shown to present a significant risk of mutagenic effects to animals or humans."

Agency Response. The comment did not include a discussion of results of mutagenicity studies conducted by the NTP in conjunction with conducting the bioassays on dichlorvos. Dichlorvos was found to be positive in two mammalian systems, for point mutations in the mouse L5178 lymphoma cell assay without metabolic activation (assay with activation was not done) and for sister chromatid exchanges in Chinese hamster ovary cells both with and without metabolic activation.

Comment. Amvac has supplied the Agency with additional information on the chronic rat inhalation study indicating that the test animals may have been exposed to substantially more dichlorvos than was measured in the inhalation chambers. The registrant estimated that the high-dose animals may have been exposed to 10 mg/rat/ day, equivalent to 25 mg/kg/day in males and 34 mg/kg/day in females.

Agency Response. The Agency believes that the additional information provided by Amvac does not provide sufficient evidence to support adjusting the doses administered to the test animals.

Comment. Amvac stated that the dog study, which formed EPA's initial concern about liver toxicity, did not satisfy Subdivision F guidelines.

Agency Response. EPA has invalidated this study and liver effects are no longer of concern.

Comment. Pest Control Services, Inc. commented that the Agency overestimated the exposure for the No-Pest strip for use in museums.

Agency Response. First, EPA's exposure estimate was based on residential use where individuals are constantly exposed to dichlorvos. Because there are so many uses of dichlorvos, it is difficult to anticipate every possible exposure scenario. To protect the public health, the Agency

focused on the high exposure scenario in the home. Use in museums (i.e., enclosed spaces such as display cabinets, display drawers, etc.) would be similar to that of grain silos, in that individuals would not be constantly exposed to the No-Pest Strip. Therefore, this preliminary determination does not propose any risk mitigation for use of No-Pest Strips in enclosed spaces in museums. In addition, an error in the Agency's 1987 exposure estimate has been corrected, reducing the residential exposure estimate from 9.6 mg/kg/yr to 0.93 mg/kg/yr. Even with this reduction in estimated exposure, the short-term and long-term MOEs for residential use are still far below 100.

III. Benefits Assessment

A. Summary of Benefits Assessment

EPA conducted a benefits assessment which concludes that the overall annual economic impact of a dichlorvos cancellation to users and consumers is not expected to be significant for most sites (Ref. 56). EPA knows of no major benefits from retaining most uses of dichlorvos with the probable exception of packaged or bagged nonperishable raw and processed food; poultry and livestock premises; feedlots; and possibly mushroom houses. Furthermore, for most of the individual dichlorvos use sites, a number of alternatives are registered and available. Any economic impacts are expected to diminish over time as users adjust to the alternative control measures. The major benefits of dichlorvos relate to its chemical properties: knockdown action and vapor activity. Its quick knockdown ability makes dichlorvos desirable for fly control, although it has little residual activity. In addition, dichlorvos is said to have vapor action which gives it penetration characteristics similar to a fumigant. Because of this characteristic, some users claim that there are no equivalent alternatives for certain uses.

B. Background

Dichlorvos, an organophosphate insecticide, kills insects on contact. Products containing dichlorvos are registered for use in controlling various invertebrate pests (insects, mites, spiders, scorpions, and sowbugs) in diverse situations. Dichlorvos is formulated alone and in combination with other active ingredients as emulsifiable concentrates, soluble concentrate liquids, granulars, pressurized liquids and dusts, smoke generators, impregnated materials, pellets/tablets, liquids (ready to use), total release aerosols, and wettable powders. Although dichlorvos has little residual activity, the knockdown action and vapor activity of the chemical are said to make it a versatile and effective chemical for pest control. Applications are made with aerosol and fogging equipment, smoke generators, handheld sprayers, other ground spray equipment, and through slow release from impregnated materials, such as resin strips and pet collars. Amvac Chemical Corporation is the sole producer of technical grade dichlorvos in the United States. Dichlorvos is registered for use on a number of diverse indoor and outdoor sites.

C. Usage Information

Total annual usage of dichlorvos is estimated to range from about 250,000 to 500,000 pounds of active ingredient. The Agency believes that most of the dichlorvos is used for animal, livestock and premise treatments, and on bulk, packaged or bagged raw or processed food. EPA estimates that these sites account for between 45 and 83 percent of the dichlorvos used in the United States annually. Most of the remaining dichlorvos is used in greenhouses, homes, and mushroom houses.

D. Method

The approach of the benefits analysis was to evaluate, on the basis of available information, the potential economic impacts associated with the switch to alternative pest control technologies caused by the possible cancellation of certain dichlorvos uses. Future Agency action could change the availability and use of the alternatives. However, this analysis does not anticipate or speculate on the possible effects due to specific regulatory actions on the other chemical alternatives identified.

The following analysis is qualitative in scope. The information presented in the specific site assessments identifies the major pests controlled by dichlorvos for these sites, identifies the major registered alternatives and their availability, estimates the change in pest control costs associated with the use of the alternatives, and, where possible, evaluates impacts to users.

Usage estimates for the major dichlorvos use sites were based on various proprietary and non-proprietary usage data. Prices for dichlorvos and alternative products were based on pesticide product catalogues, quotes from pesticide distributors, and market surveys of consumer products. Determination of primary pests and major alternatives was based upon previous site-specific assessments prepared by a USDA/National Agricultural Pesticide Impact Assessment Program (NAPIAP)