Since spills of liquid emulsifiable concentrate pesticides on concrete surfaces, such as loading docks and warehouse floors, are potential sources for contamination of foodstuff or other items set on such surfaces, it was of interest to study the decay of two typical highly toxic organophosphorus pesticides. Earlier work at this laboratory had indicated that there are difficulties in accomplishing adequate cleanup or decontamination of certain surfaces following spillage of concentrated liquid parathion (WOLFE et al. 1976). Cleanup of contaminated wood flooring was found to be almost impossible, with removal and replacement of flooring the best approach to safety. Decontamination tests on concrete surfaces gave less than satisfactory results. In view of the fact that, in many cases, it is almost impossible to remove and replace contaminated concrete, additional research was felt necessary to assess the contamination potential following spillage on such surfaces.

Methyl parathion (O,O-dimethyl O-β-nitrophenyl phosphorothioate) and ethyl parathion (O,O-diethyl O-β-nitrophenyl phosphorothioate) were applied to concrete and the potential contamination hazard at various periods of time following the simulated spillage was determined. The first experiment was to determine the persistence of methyl parathion spilled on concrete followed by no cleanup. Indoor and outdoor conditions were employed and the potential for contamination of foodstuff in contact with such spills was also determined. In the second experiment the persistence of both methyl and ethyl parathion were determined. These simulated spills were outdoors on concrete and were followed by a minimal decontamination effort similar to the haphazard cleanup procedure occasionally employed in actual spill situations.

MATERIALS AND METHODS

Concrete test blocks (20.3 x 20.3 x 7.6 cm) were especially made with surfaces finished to simulate the floor of a warehouse, a loading dock, or a worn highway (smooth-surfaced blocks) and to simulate the surface of a new highway (rough-surfaced blocks). The blocks were kiln dried and were allowed to cure for several weeks before being used.
Outdoor and Indoor Persistence of Methyl Parathion

Sets of smooth blocks (six replicate blocks per set) were placed inside of a well-ventilated building, which would simulate warehouse floor conditions, and outside exposed to the elements, which would correspond to loading dock or highway conditions. Rainfall in our area of the Pacific Northwest averages approximately 25 cm per year with sunshine on over 275 days per year. Relatively high maximum temperatures are attained (over 32°C for an average of 14 days each summer) and the blocks were covered with snow for approximately 2 months.

Vinyl caulking material was applied in a narrow strip around the upper edge of each test block to provide an area on which the pesticide application would be confined without run-off. Methyl parathion (5 ml of 51% emulsifiable concentrate) was applied evenly over the surface of each block and was allowed to soak in for a period of 24 hours before the initial samples were taken. The applied methyl parathion was approximately 7 mg/cm².

Swab samples were taken periodically for one year. A metal template containing an open area of 96.5 cm² was placed over half of a block and the exposed surface was swabbed with 4 alcohol-soaked gauze pads using 25 strokes with both sides of each swab (50 strokes/swab). The swabs from each block were shaken for 20 minutes with 100 ml of ethanol, were well drained, and were re-extracted by shaking for 20 minutes with an additional 50 ml of ethanol.

After each of the swab testings, flour-filled muslin sacks, containing 60 g of flour, were placed in contact with the unswabbed half of the blocks and were held in place for 24 hours with a brick weighing approximately 2.1 kg. The contact surface area of each test sack was 30.6 cm². The flour sacks were used in order to obtain recoveries for a food item having maximum absorption. Similar sacks were also placed on the unswabbed half of the blocks, but inside of paper "boats" constructed from paper flour sack material, in order to determine the penetrability of that material. All flour sack samples were extracted with benzene in Soxhlet extractors.

Outdoor Persistence of Methyl and Ethyl Parathion

A second series of outside tests employed both rough and smooth-surfaced blocks to which methyl or ethyl parathion was applied. The application was followed by minimal cleanup, as described below, with 4 replicates used for each test.

Methyl parathion (12 ml of 51% emulsifiable concentrate) or ethyl parathion (12 ml of 45% emulsifiable concentrate) was applied to each block, prepared as described previously, and was allowed to stand for one hour. The vinyl dam was removed and