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TECHNOLOGY EVALUATION

Demonstration Bulletin

PCP Immunoassay Technologies

Penta RISc by Ensys Inc., Penta RaPID by Ohmicron Corp., EnviroGard by Millipore

Technological Description: The objectives of this demonstration were to test these field screening technologies for accuracy and precision in detecting Pentachlorophenol (PCP) levels in soil and water by comparing their results with those of a confirmatory laboratory. The three immunoassay technologies were:

- EnviroGard,
- Penta RaPID Assay, and
- Penta RISc Test System.

The demonstration took place in Morrisville, NC where NERL-CRD and National Risk Management Research Laboratory (NRMRL) combined logistical and support efforts. The demonstration plan called for 98 soil samples, 53 samples from the Kippers Company in Morrisville, NC, and 45 soil samples from the Winona Post in Winona, MO.

An immunoassay test kit uses enzyme-linked immunosorbent assays (ELISA) to create a color change. A portable spectrophotometer measures the color intensity, which is inversely proportional to PCP concentrations in the sample.

The Penta RISc and Envirogard Tests can both analyze for PCP in soil and water samples. They both use the walls of test tubes as the substrate for the polyclonal antibodies that are the basis for the test. When target analytes are introduced to the antibody coated test tube they occupy antibody binding sites in proportion to their concentration. An enzyme conjugate is introduced to compete with the target analyte for binding sites, and a chromogen which reacts with the enzyme to produce color complete the ELISA test.

The Penta RaPID Assay, also uses an ELISA conjugate to compete with PCP in an environmental sample. The antibody binding substrate is magnetic particles attached inside the test tube. In addition to soil and water this assay is applicable to crop and food samples.

Waste Applicability: ELISA systems are most applicable to sites where PCP is a known contaminant and where large concentrations of other chemicals are not present in the samples. The potential limitation of ELISA systems is that their results may not always agree with results from the analysis of the same sample by EPA approved methodologies. The principal advantage of the ELISA technology, which all three technologies used, is that it is very specific to PCP. The technology was found to be easy to operate by individuals with some prior analytical laboratory experience.

Demonstration Results: Examination of the Penta RISc Test System revealed 83 correct results and 31 incorrect results. The majority of the incorrect results were false positives. This technology does not produce quantitative data. Overall, the technology was found not to be accurate when compared to Level 3 data, but it can produce Level 2 or Level 1 data.

Examination the Penta RaPID Assay revealed that the technology did not meet the criteria for Level 3 accuracy, but it can produce Level 2 or Level 1 data. This technology can produce quantitative data.

The EnviroGard PCP Test Kit produced false negative results when concentrations of PCP were greater than 1,000 ppm. The developer has modified the technology. In a letter to EPA, the developer said: "We believe that, based on the knowledge gained from the demonstration, we have been able to make significant improvements in our product." The SITE Program has not yet reevaluated the kit since the modifications.

An Innovative Technology Evaluation Report (ITER) describing the complete demonstration will be available in late 1995.

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