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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 30 1984

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Aluminum Phosphide 40285-1, -2, -4. EAB Deferral.
Caswell # 31.

TO: William Miller, PM-16
Registration Division (TS-767C)

FROM: Stanley Gross, Toxicologist
Toxicology Branch
Hazard Evaluation Division (TS-769C)

THRU: Christine Chaisson, Section Head
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*McGraw
12/28/83*

*R. G. For. F. C.
1-17-84*

WAB

This action is in response to an Environmental Assessment Branch deferral to Toxicology Branch discussed in a memorandum from L.A. Richardson to Wm. Miller, 10/11/83. An August 19, 1983 letter to William Miller from Donald G. Shaheen of Degesch America contained an research article on the use of detector tubes for the analysis of phosphine and a request that the Short Term Exposure Limit (STEL) of 1 ppm for phosphine be permitted as the allowable post-fumigation reentry level. This information was submitted in response to the Agency's request for reentry data as discussed in the Aluminum Phosphide Pesticide Registration Standard, October 1981.

Recommendations

1) The STEL of 1.0 ppm cannot be approved as a reentry level nor can the use of the current occupational exposure limit of 0.3 ppm. The TLV of 0.3 ppm does not provide an adequate margin of safety for such hazards as teratogenicity or reproductive effects. Teratology and reproduction studies using phosphine are still current data gaps.

2) Toxicology Branch had previously indicated that it would waive the requirements for the additional testing (teratology, reproduction, mutagenicity) if it could be shown that post-fumigation levels of phosphine were readily reduced to levels below detectability by field methods (less than 0.1 ppm using the low level detector tubes for phosphine.) These post-fumigation studies were to be carried out using methods with reliable accuracy and specificity.

Detector tubes are known to have problems of accuracy (as shown by the article submitted by Degesch), of shelf life instability, and are dependent on the technical skills of the analyst.

Background Information

Aluminum phosphide formulations release highly toxic phosphine gas during the fumigation process. This gas must be removed by aeration before humans are allowed safe entry into the fumigation site. Various aeration times have been set for different fumigation sites, however, documentation to support these time periods has not been available. Fumigation and post-fumigation data discussed in the Environmental Fate section of the Registration Standard for Aluminum Phosphide indicated varying levels of phosphine during post-fumigation ventilation.

Allowable reentry levels have also not been established. The occupational Permissible Exposure Level (PEL) or Threshold Limit Value (TLV) is set at 0.3 ppm or 0.4 mg/cu.m. This was based on animal studies by Klimmer who found a no observed effect level in animals during long term exposure to be 2.5 ppm phosphine (see the August 26, 1981 Toxicology Branch report to SPRD, "Registration Standard for Aluminum Phosphide Pesticides. Toxicology", by this reviewer). The 0.3 ppm level currently accepted as the allowable occupational level provides a safety factor of approximately 10 and is therefore theoretically too small for protection against possible teratogenic or reproduction effects. Teratology or reproduction studies involving phosphine which could be used to evaluate a margin of safety are not available. The Branch however was willing to waive the requirements for these studies if it could be shown that phosphine levels were rapidly reduced to low levels during post fumigation aeration.

The literature on the use of detector tubes cautions the user about several problems with their use. Detector tubes are known to have limited shelf lives and need to be replaced with new tubes when the shelf life is exceeded. For some applications, they do not provide adequate sensitivity or specificity. This has been born out by the article provided by Shaheen with his letter: J.G. Leesch, "Accuracy of Different Sampling Pumps and Detector Tube Combinations to Determine Phosphine Concentrations", J. Econ. Entom. 75: 899-905, 1982. In a recent conversation with this reviewer (12/14/83), Dr. Floyd Madsen, Director of the OSHA laboratory at Salt Lake City, indicated that his laboratory recommends that detector tubes be used as screens only and that as a general rule, they are used to detect levels at 1/2 the TLV in order to allow for an approximate accuracy of 50%. Thus, the fumigation site studies discussed above need to be carried out using reliable analytical methods. The Branch assumed that if it could be shown using reliable methods that the phosphine levels are readily reduced by aeration, reentry might be allowed when the phosphine levels were below detectability (less than 0.1 ppm) using the low level detector tubes as a field method of analysis.