The linear dynamic range was 0.05 to 100 mg/L, with a limit of detection of approximately 0.05 to 15 mg/L for CDA and HDA respectively. The IC_{50} s were 2 and 15 mg/L respectively. Cross reactivity to alachlor was 6.7% and less than 0.1% for the chloroacetanilides acetochlor, butachlor, metolachlor and propachlor. The CDA/HDA cELISA provides a sensitive, fast, and inexpensive means of measuring the incidence of these mutagens in environmental matrices, and whether operational factors(formulation type or soil management practices) mitigate or enhance their formation.

047. USE OF IMMUNOASSAYS FOR BIOMONITORING OF HERBICIDES IN URINE. J.P. Mastin, C.A.F. Striley, R.E. Biagini, C.J. Hines*, R.D. Hull, B.A. MacKenzie, S.K. Robertson, and D.A. Shoemaker, Div.of Biomedical & Behavioral Science and * Div.of Surveillance, Hazard Evaluation, and Field Studies, NIOSH, Cincinnati, Ohio, 45226.

Our laboratory has been experimenting with using commercially available ground water immunoassays to analyze urine samples from workers exposed to the herbicides alachlor (ALA), metolachlor (MET), atrazine (ATZ), cyanazine, and 2,4-D. Several issues related to using these kits for urinary biomonitoring have been addressed in this study, including matrix effects and cross reactivities of the kit antibodies with metabolites of the herbicides and with other chemically-related herbicides. In general, dilution of the urine has proven satisfactory in removing matrix effects for all the kits except 2,4-D. The ALA and ATZ kits showed cross-reactivities with their respective mercapturate derivatives, whereas the MET kit showed cross-reactivities with other acetanilides, but no reactivity with MET- mercapturate. These issues, along with considerations involved in determining LOD and linearity range, will be discussed. In addition, results from experiments involving direct-reading field immunoassay kits will be discussed.

048. DEVELOPMENT OF MONOCLONAL ANTIBODY-BASED ENZYME IMMUNOASSAY FOR THIOBENCARB. S. Miyake, S. Ito, Y. Yamaguchi, Y. Beppu, S. Takewaki and Y. Yuasa, Environmental Immuno-chemical Technology Co., LTD., Katori-gun, Chiba 289-22, Japan

Four monoclonal antibodies for the herbicide thiobencarb, S-(4-chlorobenzyl)-N,N-diethylthiocarbamate, were prepared from the hybridomas of mouse myeloma cells and the splenocites of Balb/c mice immunized with a hapten, 4-[N-(4-chlorobenzylthiocarbonyl)-N-ethylamino]butyric acid, conjugated to keyhole limpet hemocyanin. The reactivities of the monoclonal antibodies with thiobencarb and the related compounds were examined by using an indirect competitive enzyme-linked immunosorbent assay (indirect C-ELISA). TBC 7-2 was selected as a promising antibody. Direct C-ELISA for thibencarb was developed by the combination of TBC 7-2 and the hapten-horseradish peroxidase conjugate. The assay detected thiobencarb in the range of 5-50 ng/ml. Pond water samples and a few kinds of crop samples spiked with thiobencarb were analyzed by the assay. The results showed good correlation to spiked amounts.

049. 4,4'-DINITROCARBANILIDE – HAPTEN DEVELOPMENT UTILIZING MOLECULAR MODELS. Ross C. Beier and Larry H. Stanker, *USDA, Agricultural Research Service, 2881, F & B Road, College Station, TX 77845--4998.*

Nicarbazin is a feed additive used to prevent outbreaks of cecal and intestinal coccidiosis in poultry, and is composed of equimolar amounts of 4,4'-dinitrocarbanilide (DNC) and 2-hydroxy-4,6-dimethylpyrimidine (HDP). The drug also is used to increase the rate of weight gain. DNC is the active component in nicarbazin and analysis of DNC is used to determine nicarbazin residues in tissue. Currently, detection of tissue residues and feed levels is limited to laboratory-based liquid chromatographic techniques. The present methods of analysis for DNC are time consuming and relatively expensive. Development of an immunoassay for DNC requires that the DNC molecule be modified (the hapten) in order to be linked to an appropriate carrier molecule to produce an effective immunogen. Results of molecular modeling studies demonstrated that conversion of DNC to a usable hapten by different chemistries targeted toward the central region of the molecule, i.e., the carbonyl or NH groups, changed the configuration of the hapten from that observed for DNC. Therefore, a mimic was proposed that closely resembles DNC, and it has been synthesized. These details will be presented as well as results from on going efforts to produce MAbs to DNC.