R E Biagini, D L Sammons, J P Smith C.A.F. Striley, B.A. MacKenzie, J.E. Snawder, S.A. Robertson. Use of liquid suspension array technology to measure environmental, bioterrorism and immunodiagnostic analytes. Picogram 71:120, 2006.

AGRO

207. Technologies to reduce pollution of the air with pesticides

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Pesticides can find their way into the air in many ways. One that is most frequent is drift of pesticide particles away from the application site during and/or after the application of pesticides. Some recent studies indicate that once mixed in the air, pesticides can move hundreds, and sometimes thousands of miles before depositing on the surface. For example, some pesticides that were used only in southern United States, and later banned in late 70's were found in the 90's at the arctic circle. Drift is influenced by many factors. They usually fall into one of the following four categories: (1) Spray characteristics; (2) Equipment/application techniques; (3) Weather; (4) Operator skill and care. This paper discusses equipment and technologies recently discovered that have the highest potential to reduce spray drift and pollution of air with pesticides.

208. Use of liquid suspension array technology to measure environmental, bioterrorism and immunodiagnostic analytes

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Luminex® multianalyte liquid suspension array profiling (Xmap®) technology can be used to develop fluorescent covalent microsphere immunoassays (FCMIAs) for numerous types of analytes using indirect, competitive, capture/sandwich as well as other assay formats. We have described FCMIAs for serologic markers to 5 CDC select agents (*Bacillus anthracis, Yersinia pestis, Francisella tularensis*, ricin toxin, and staphylococcal enterotoxin B; *Analytical and Bioanalytical Chemistry* 382:1027-34, 2005), IgG antibodies to anthrax toxins (*Clin Diag Lab Immunol* 11:50-55, 2004), IgG antibodies to 23 pneumococcal polysacchrides (*Clin Diag Lab Immunol*, 10:744-750, 2003), 3 pesticides/metabolites (*Analytical and Bioanalytical Chemistry*, 379:368-374, 2004), genetically-modified-organism pesticidal proteins (Cry1Ab and Cry3B) and 25 cytokines (IL-1β, IL-1ra, IL-2, IL-2R, IL-4, IL-5, IL-6, IL-7, IL-8, IL-10, IL-12p40, IL-13, IL-15, IL-17, TNF-α, IFN-α, IFN-γ, GM-CSF, MIP-1-α, MIP-1-β, IP-10, MIG, Eotaxin, RANTES, and MCP-1). In general, FCMIAs are faster, more sensitive, use less sample, are more precise, and have higher throughput than any competing assay technology. In this presentation, we describe the performance of these analyses and their usefulness as diagnostic and environmental methods, comparing them to traditional enzyme-linked, immunosorbant assays (ELISAs) and classical instrumental methods, such as gas- and high performance liquid chromatography. The findings and conclusions in this abstract have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.

209. New microarray developments: On-chip microfluidics and electrasense detection technology

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Microarray-based bioassays have become a key, enabling technology in molecular biology with broad applicability in a variety of settings, including infectious disease surveillance, clinical diagnostics, environmental toxicology, and homeland security. Microarrays may contain DNA, oligonucleotides, proteins, peptides, carbohydrates, or organic compounds. Traditionally, they are manufactured using "spotting techniques". CombiMatrix has developed 12,000 feature semiconductor microarrays, which have the potential to detect hundreds of different viruses and bacteria simultaneously. These microarrays are manufactured using *in situ* synthesis of over 12,000 unique DNA sequences. In addition, we have developed a unique electrochemical detection (ECD) based ElectraSense™ microarray platform, which eliminates the need for an expensive optical system and fluorescent reagents. We have also investigated different approaches for integrating microfluidics and automated sample processing. DNA-based microarray assays involve multi-stage sample processing and fluidic handling which are generally labor-intensive and time-consuming. Using microfluidic technology to integrate and to automate all these steps in a single device is highly desirable.

210. Multiplex immunochemical detection of food contaminants and adulterants

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In monitoring programs in which different compounds need to be tested, the general comment about immunoassays is that they are too specific. For each compound, a different immunoassay has to be performed and, where multiple drug residue detection is necessary, a shift is shown towards multi-residue LC-MS screening methods. To overcome the disadvantage of specificity, different approaches for multiplex detection were investigated, such as the application of group-specific antibodies (with sulfonamides as model compounds) and multi-channel biosensor assays (four flow channel Biacore for proteins and aminoglycosides). However, this has resulted in limited multiplex assays only, with a maximum of four different (groups of) compounds. A relatively new system for multiplex detection is based on the Luminex xMAP™ technology (Luminex Corporation, Texas, USA). In theory, this flow cytometry-based system allows the simultaneous measurement of up to 100 different residues in one well using antibody- or antigen-coated microspheres labeled with 100 different distinguishable fluorophores. Results will be shown with respect to the development of multiplex assays for the detection of plant proteins (soy, pea, and soluble wheat proteins) in milk powder and residues of allergenic proteins and veterinary drugs in food.

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