COLORADO DEPARTMENT OF AGRICULTURE

Inside Ag

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Pesticides Analysis Programs

The Colorado Department of Agriculture's Biochemistry Laboratory provides analytical testing services to the Divisions of Inspection & Consumer Services, Plant Industry, and Conservation Services. Analyses are performed on a wide variety of samples including pesticides, animal feeds, fertilizers, soils, sediments, vegetation, and water. The Biochemistry Laboratory is organized into six Sections: Pesticides, Groundwater, Fertilizer, Feeds, Microbiology, and Drugs & Vitamins.

The Pesticides and Groundwater Sections analyze a variety of pesticides, herbicides, insecticides, rodenticides, and fungicides. Pesticides, insecticides, and rodenticides are agents of chemical or biological origin used to control pests and insects that cause damage to crops in the field and in storage. Herbicides and fungicides are chemicals designed specifically for killing weeds and harmful fungal species. Correctly used and applied, pesticides are very beneficial for agricultural production through increased crop yields, efficient weed control, and reduced spoilage.

Like any class of chemical or biological agents, misuse, excess application, and improper handling or storage can result in harmful human exposure and/or environmental contamination. The Colorado Department of Agriculture regulates the use of pesticides in the State through product registration and applicator licensing, and monitors levels of pesticide residues in ground waters. The Biochemistry Laboratory supports these programs through sample testing. Samples tested include: product formulations, soil or vegetation affected by alleged applicator misuse or over-application, and groundwater from private wells across the State.

The Pesticide Section also participates in the US Department of Agriculture's Pesticide Data Program (PDP) grant. For the PDP program, the Pesticides Section performs testing for pesticide residues on food commodities. Currently, potatoes and spinach from eight states are being tested.

Pesticide Section Laboratory

The Pesticide Section Laboratory is staffed with 1 full time Chemist, 1 full time Laboratory Technician, 1 PDP grant funded Chemist, and 1 part-time Laboratory Technician. The Pesticide laboratory facility is fully equipped with the latest generation of analytical instrumentation and equipment to support all the pesticide-related testing needs of the Department.

An example of work related to pesticide enforcement would be the regulation of commercial or private pesticide applicators. The Laboratory receives samples obtained by inspectors from the Plants Division. These inspectors are located throughout the State. Samples collected are related to investigations of alleged pesticide misuse and can consist of a variety of materials such as soil, water, clothing, vegetation

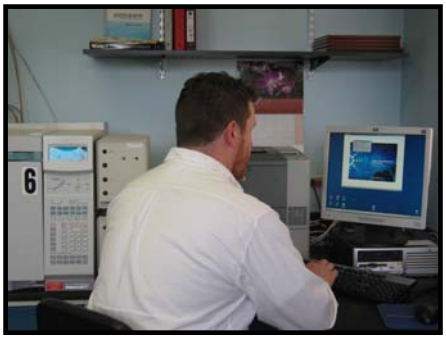
or animal tissue. Generally, the levels of pesticides detected are in the sub parts per million (ppm) levels. As an example of this level of detection, 1% is equivalent to 10,000 ppm. The testing results help support the investigations in combination with interviews of individuals involved and photographs of the investigation site.

In support of the Pesticide Registration Program, the Laboratory tests pesticide products or devices for compliance with label claims related to amount and identity of active ingredients. Annually, the Laboratory coordinates with the Registration Program to focus on a particular product of class of products for analysis. For example, during the height of the West Nile Virus season several years ago the Department focused on the DEET content claims of various mosquito wipes and spray products.

The Pesticide Section Laboratory has been a member of the USDA's PDP program since 2001 and is one of only 10 state laboratories in the nation asked to participate in this important program. The other participating state laboratories are located in California, Florida, Texas, Michigan, Minnesota, Montana, New York, Ohio, and Washington. The data collected from this program is primarily used by the US Environmental Protection Agency to prepare realistic dietary exposures and continue pesticide re-registration activities. Currently, the Laboratory is working on a 1-year project testing for the presence of 12 herbicides on fresh commodities. We are receiving approximately 200 samples per month which have been statistically-sampled to be representative of the U.S. food supply.

The Pesticide Section Laboratory continues to advance in its scientific and technical capabilities. An example is the testing of animal feeds containing the antibiotic monensin. The Laboratory uses advanced liquid chromatography/mass spectrometry techniques for accurate and precise determinations of monensin levels in feeds. This analysis approach replaced an outdated procedure and has produced more reliable and better quantitative results.

Groundwater Section Laboratory



The Groundwater Section Laboratory performs testing of groundwater samples for the presence of over 100 different pesticide compounds, and to determine Nitrate/Nitrite levels. The Department collects groundwater samples from nearly 500 wells across the State. Wells are grouped geographically and sampled on a rotating basis. Each year, the Groundwater Section Laboratory tests nearly 300 samples.

Considerable progress on improving sampling techniques and sample preservation has occurred in the past 10 years. The Groundwater Section Laboratory will be assisting the Groundwater Program in reviewing, assessing, and updating sampling methods and preservatives. A current project involves comparing sampling techniques and associated preservatives used for well sampling to optimize the process.

The Groundwater Section Laboratory uses several types of instrumentation systems to test groundwater samples. Samples are analyzed for Nitrate/Nitrite levels using ion chromatography. The turnaround time for Nitrate/Nitrite analyses is 48 hours. After this time, the Nitrate/Nitrite levels may begin to degrade, so the samples must be prepared and analyzed quickly after collection. Any levels found that exceed the safe drinking water limits are reported to the well owner(s).

Gas chromatography/mass spectrometry systems are used to identify individual pesticide compounds that may be present in groundwater samples. This instrumentation is able to separate, isolate, and accurately identify nearly 50 different pesticides. In 2007, the Department received funding to upgrade this

instrumentation through a lease/purchase procurement. Upgrading this system will enable even the most challenging compound separations to be performed more easily and efficiently. The upgraded instrument is on order and will be brought on-line this summer.

Gas chromatography with a photometric detector is used for detecting over 25 pesticide compounds. This system is used for identifying the organophosphate class of pesticides. The remaining pesticide list includes the carbamate class and other hard to detect compounds. These pesticides analyses utilize a liquid chromatography/mass spectrometry system. This system is very sensitive and capable of detecting and identifying even the most elusive pesticide compounds.

Pesticide testing is challenging chemistry for a number of reasons. Many of the compounds partially degrade or breakdown in the environment. Several classes of pesticides are notoriously difficult to separate and isolate. Sophisticated sample preparation processes and expert spectroscopy techniques are required to deliver accurate and usable results.

The Biochemistry Laboratory is fortunate to have a team of highly-skilled, experienced, and knowledgeable scientists with expert spectroscopy techniques to perform pesticides testing for the Department.