

Case Study

Thermo Scientific TSQ Quantum GC-MS/MS Ensures the Safety of Food through Accurate, Selective and Efficient Analysis

Food and Environmental
Research Agency Case Study



The Food and Environment
Research Agency

The Food and Environment Research Agency (Fera) was founded in April 2009 with the fundamental purpose of supporting and developing a sustainable food chain, a healthy natural environment, and protecting the global community from biological and chemical risks. Fera is an executive agency of the UK Government's Department for Environment, Food and Rural Affairs (Defra).

Fera required a gas chromatography-mass spectrometry (GC-MS) system with the ability to run targeted screening methods for the detection of low concentrations of pesticides in foodstuffs. The Thermo Scientific TSQ Quantum GC-MS/MS system was evaluated for the sensitive, accurate and time-efficient analysis of pesticides in a range of matrices.

Background

As issues such as food security, climate change and environmental sustainability present countries with significant, complex and often interrelated challenges, Fera plays a vital role in anticipating global issues, assessing the risks and gathering the evidence to aid policy makers. It is therefore important that advice to government, international organizations and private sector companies is supported by robust evidence and rigorous analysis.

Fera manages over 600 research projects, analyzing more than 50,000 plant and food samples a year and is the National Reference Laboratory for chemicals in food, pesticides, veterinary drugs and dioxins and polychlorinated biphenyls (PCBs) in feed. Fera's main laboratory facility is located on a 32 hectare site at Sand Hutton near York in the United Kingdom, where approximately 550 scientists are employed. The agency has more than 7,500 customers and 1,000 collaboration partners in over 100 countries.

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Mike Hetmanski,
Analytical Chemist, Fera

The use of pesticides to protect crops and maintain efficiency of production is commonplace in agriculture. Governments, food producers and food retailers have a public responsibility to ensure that any residues occurring in foods for human consumption are at or below Statutory Maximum Residue Levels (MRLs). Regulation EC 396/2005, adopted in the European Union, sets MRLs for more than 500 different pesticides in over 300 different food commodities. The majority of these MRLs are set at a default value of 0.01 mg/kg. Thus, there is a requirement for residue testing laboratories to test a wide array of foods for a large number of pesticides at concentrations at or below 0.01 mg/kg in an accurate, rapid and economical manner.

Fera's pesticides methods team is primarily focused on the development of new and improved methods for the analysis of pesticides in food, with some work on pesticides in the environment. Working to support UK monitoring programs for pesticide and veterinary drug residues, Fera's work routinely requires the ability to conduct both multi-residue screening and analysis for specific residues.

Thermo Scientific
TSQ Quantum GC



Instrumentation

Fera implemented the TSQ Quantum™ GC-MS/MS system in 2009 to analyze approximately 200 different pesticide residues in food, feed, water and air samples.

Benefits

Since the implementation of the TSQ Quantum GC-MS/MS with PTV and backflush, the Fera Pesticides team has been able to minimize problems associated with the use of GC/MS for the analysis of pesticides in acetonitrile extracts prepared using the QuEChERS procedure. These include: degradation of the column phase; poor focusing of chromatography peaks due to high polarity; and vapor overload of the insert liner due to the high expansion coefficient. The high sensitivity of the system enables analyses to be carried out on QuEChERS extracts diluted with ethyl acetate. Evaporation of the extract in the PTV facilitates an almost complete solvent exchange, with the remaining small volume of solvent consisting almost entirely of ethyl acetate, transferred onto the column. Contamination of the system by sample matrix co-extractives is also reduced by dilution of extracts.

“...ensure a sustainable food chain and protect the global community from chemical contamination in food”



Mr. Mike Hetmanski, an analytical chemist comments: “The sensitivity and selectivity of the Thermo Scientific TSQ Quantum GC-MS/MS instrument means we can easily achieve 0.01 mg/kg target reporting limits even with relatively low amounts of sample extracts injected onto the system. The instrument reliably and consistently produces precise and accurate results first time, with almost no repeat analyses required. In combination with the use of Thermo Scientific Xcalibur software for data processing the overall throughput of analyses has increased.”

Thermo Fisher provided comprehensive training at the initial installation of the instrument and additional follow-up support after it was implemented.

Conclusion

The TSQ Quantum GC-MS/MS is one of a range of specialized instruments used by Fera to support governments and food producers worldwide through the development of rapid and comprehensive methods for the detection of chemical residues in food, feed, air and water. Since implementation, the instrument has proved robust and provided accurate and consistently reliable results.

Mr. Richard Fussell, also from the pesticides team, concludes: “The TSQ Quantum is now an essential instrument in our laboratory and is supporting Fera’s efforts to ensure a sustainable food chain and protect the global community from chemical contamination in food.”

For more information on the work of Fera visit <http://www.fera.defra.gov.uk>.

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