Tests for gluten and residues

For the thousands of Australians who suffer from coeliac disease, ordering a meal in a restaurant — or, for that matter, shopping for food in a supermarket — can be a nerve-wracking experience. They must think about everything they eat or drink (even, if they're ill, what kinds of pills they can take) and choose only those items that do not contain gluten proteins found in wheat, rye and barley.

Gluten occurs naturally in flour, and is also used as a thickener in soups and some desserts, beer, breakfast cereals and sweets and as a binding agent in pharmaceutical pills. Coeliac disease prevents absorption of food by the small intestine; ingesting gluten can cause symptoms that range from fatigue and weight loss to diarrhoea, vomiting, cramps, loss of fertility, anaemia... even starvation and an early death if the disease is undiagnosed or untreated.

The problem is that even foods labelled 'gluten-free' may contain small amounts of the protein, so coeliac sufferers can endure long periods of ill health simply because they are unwittingly ingesting minute quantities.

Dr John Skerritt and Ms Amanda Hill of CSIRO's Wheat Research Unit have developed test kits for detecting heat-stable gluten proteins in foodstuffs; as these proteins are not denatured by cooking they can be measured in finished foods. The kits use monoclonal antibodies that will bind only to gluten molecules; an enzyme reaction after the antibodies have bound to the gluten causes a colour change that indicates not only the presence of gluten in a sample, but also the amount present.

The laboratory gluten test kit, manufactured under licence by Medical Innovations, was released late last year. Recently, Dr Skerritt and his colleagues extended the same technology to provide a portable, accurate test that individual coeliacs can use at home.

The scientists have also developed test kits to analyse pesticide residues in stored grain. Australian grain producers face a conflict, in that the market tolerance for pesticide residues is decreasing while stored grain provides a perfect environment for insects and other pests... which are controlled through pesticides. To reconcile those conflicting needs, grain-handlers use only safe, short-lived pesticides, but they must monitor their stocks before the grain reaches the food industry, which in turn must ensure its products do not contain unacceptable levels of residues.

While other scientists are working to reduce the use of pesticides in stored grain, Dr Skerritt, Ms Hill, and colleagues Dr David McAdam, Ms Helen Beasley and Ms Simone Edward have applied antibody technology to the problem of identifying residues — to ensure the food we eat in Australia is not contaminated, protect the export industry and help growers and producers avoid over-use of agricultural chemicals.

Following initial research and development work by CSIRO, a commercial partner, Millipore Australia, is working in collaboration with the American firm Immunosystems on marketing and technology development of grain test kits, some of which are expected to reach the market within the next 12 months.

The first — a small field kit — provides grain-handlers and government or industry analysts with a rapid, quantitative measure of which pesticides are present and at what levels. The second, more complex, kit is designed for use in laboratories, so that analysts (especially in the food industry) can test several batches of samples at once.

Both employ the same ELISA (enzyme-linked immunosorbent assay) technique that is used in the gluten test kit, although the grain test kits can identify and quantify 10 pesticides (primarily organophosphates) occurring singly or in combination. They can also identify residues from other sources — whether, for example, the chemicals were used as grain protectants, in horticulture or for control of soil insects — as a further means of alerting growers and grain-handlers to the over-use of particular agricultural chemicals.

Dr Skerritt's team is now looking beyond grain and gluten to measuring the environmental toxicity and persistence of pesticide residues in soil and water in cotton, citrus, grape, rice and sugar-cane farming systems.

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