

Appendix B

A05 Food Irradiation Research Review: Project Details for the Review Period

1995 – December 2002

Project Code	Title	Contractor	Start Date	End Date	Cost £	Summary and scope of work and use of results
A05004/ FS1925	A preliminary investigation on the impact of blending on luminescence detection of irradiated herbs and spices	SUERC (Scottish Universities Environmental Research Centre)	7/98	12/98	£27,092	Blended samples were prepared by mixing irradiated material with non-irradiated material to produce a series of samples with known dilutions of irradiated components. Overall it could be seen that standard methods are able to detect a significant proportion of irradiated blends at concentrations above 1-10%. Below these concentrations there is a significant probability of non-detection.
A05002 / FS1923	Production and publication of the DEFT/APC method to aid the detection of irradiated foods, as a MAFF validated method	Campden & Chorleywood Food Research Association	4/98	12/98	£5,386	The DEFT/APC method was fully detailed and written in the format of a MAFF Validated Method.
A05001/F S1922	A European collaborative blind trial using 2-alkylcyclobutanones to detect irradiated fat-containing food	Food Science Division, Department of Agriculture for Northern Ireland	4/98	12/99	£8,500	An inter-laboratory trial was carried out in order to evaluate the application of the 2-alkylcyclobutanone (2-CB) method for the detection of irradiated Camembert cheese, salmon meat, mango and papaya. Overall, 98% of the cheese and salmon were correctly identified. The method gave 90% correct identification on the mango samples. The papaya samples presented considerable difficulty with a correct identification of only 52% being achieved.
FS1921	Development of Validated Luminescence Methods for Detecting Irradiated Foods	Scottish Universities Environmental Research Centre	9/97	6/98	£37,261	To complete the luminescence project by producing MAFF Validated Methods for four luminescence methods and writing up the results of collaborative trials for publishing in peer reviewed journals. A method for photostimulated luminescence (PSL) was developed that was used by the CEN Working Group on Food Irradiation to produce a European Standard. All papers were written up to a satisfactory level.

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FS1920	Development of an ELISA to detect irradiated food	North East Wales Institute	10/97	03/98	£19,255	A standard operating procedure was written for the ELISA (Enzyme-Linked Immunosorbent Assay) which was considered ready for further validation by use in an inter-laboratory trial. The limit of detection was improved (0.5 kGy) and good reliability routinely obtained (percentage coefficient of variation typically 5%).
FS1919	Detection of irradiated food via determination of Hydrogen	Dr C Hitchcock	03/97	02/98	£5,686	The determination of hydrogen from thawed samples of frozen foods (chicken and prawns) and eggshells was investigated as a possible method for the detection of prior irradiation. Samples of frozen chicken irradiated at 1 kGy and above can be confidently identified after several months storage at -18°C. The method was also used successfully to identify irradiated eggshells, inorganic salts (e.g. sodium chloride) and organic compounds (e.g. sugar). Before this method can be recommended, a collaborative test is necessary.
FS1918	Development of an ELISA to detect irradiated food based on DNA base changes	North East Wales Institute	09/96	03/97	£36,187	The aim of the work was to optimise the ELISA. An indirect competitive ELISA was developed using single monoclonal anti-dihydrothymidine (DiHT) antibody. Further assessment of the performance of other monoclonal antibodies generated during the project was required. It was also necessary to prove that DNA from irradiated whole prawns was responsible for the successful response to the ELISA and not other components of the whole prawns. If successful the aim was to apply the test to other foods. However, this was not done. The sensitivity of the ELISA was improved but a further improvement allowing detection at 1 kGy is required for prawns.

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FS1917	Studies to develop a rapid screening test for irradiated food using lipid degradation products (ELISA)	Department of Food Science Division, The Queen's University of Belfast	10/96	04/99	£85,600	The aim of the work was to develop a dip stick immunoassay for the detection of 2-alkylcyclobutanones (2-CBs) as a rapid and easy screening method. The dipstick immunoassay was developed with a detection limit of 0.5 kGy. Some attempts to increase sensitivity of this method showed promise. An ELISA was successfully developed for whole liquid egg. The project also investigated other methods of sample preparation, to maximise the speed of analysing for 2-CBs. The method developed was Supercritical Fluid Extraction.
FS1916	Method for the detection of irradiated meat and plant material – using microgel electrophoresis	Campden & Chorleywood Food Research Association	04/96	12/97	£4,075	The method assessed the degree of irradiation induced damage which is used as a marker of the irradiation process. The method is applicable to materials of both plant and animal origin and was tested for meats (chicken and pork) and plant material (almond, lentil, sesame seed, linseed, sunflower seed, rose pepper, figs and soya beans). Several collaborative trials were carried out. Trial 1: six laboratories, chicken legs, 95% success. Trial 2: nine laboratories, chicken bone marrow, chicken muscle and pork muscle, 93.2% success. Trial 3: four laboratories, fruit and seeds, 92.5% success. Trial 4: five laboratories, trout, salmon and chicken, 94% success. The method was also shown to be applicable to strawberries, carioca and macacar beans. The method is not readily applicable to nuts (Brazil nut, pistachio nut, pine nut and hazelnut), certain seeds (chickpea, kiwi seeds) and spices (anise, coriander).

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FS1915	Detection of irradiated proteinaceous food such as liquid egg white	Campden & Chorleywood Food Research Association	09/96	07/97	£6,580	This project addressed the lack of methods to detect irradiation of proteinaceous foods, such as liquid egg white. The objective of this work was to determine if capillary electrophoresis, a technique suited to the separation of proteins and peptides, could be used to detect changes in liquid egg white following irradiation. The complexity of peptide maps for whole liquid egg was so great that differences due to irradiation would be unlikely to be detected. Purification of single proteins would be required but would not be suitable where the egg white had been used in food products.
FS1914	The DEFT/APC screening method for the detection of irradiated frozen stored foods: a collaborative trial	Campden & Chorleywood Food Research Association	03/95	07/96	£30,839	The Direct Epifluorescent Filter Technique/ Aerobic Plate Count (DEFT/APC) method is a recognised technique for the screening of irradiated foods. Irradiation is suspected if the difference between the two microbiological counts is at least 2 log units. Five laboratories tested five food types each (prawns, cod, chicken, beefsteak, mince beef) irradiated at 0, 5 and 10 kGy. The project concluded that the DEFT/APC screening technique could be used reliably.
FS1913	Immunological detection of irradiated food	North East Wales Institute of Higher Education	04/96	09/95	£24,000	The aim of the project was to produce a test for irradiated food based on specific DNA base changes. A competitive ELISA was developed that is suitable for detecting DiHT. Further work was suggested to improve the sensitivity of the method.
FS1912	The use of two-substituted cyclobutanones in the development of an ELISA for the detection of irradiated lipid-containing foods	Department of Food Science, The Queen's University of Belfast	10/96	07/97 extended to 03/98	£41,433 extended by £15,007	This work substantially improved the speed of sample preparation which can be used to the advantage of the ELISA. The overall time taken to extract lipid was reduced from 8 to 2 hours. This assay was shown to be capable of detecting 2-alkylcyclobutanones (2-CBs) in chicken meat irradiated at doses normally applied to this foodstuff.

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FS1911	Detection of irradiated low fat-containing foods using 2-alkylcyclobutanones and ESR spectroscopy	Department of Food Science, The Queen's University of Belfast	09/94	10/97	£48,932	The inter-laboratory blind trial using ESR spectroscopy to detect irradiated crustacea confirmed previous findings that the reliability and reproducibility of the method is species dependent. This project has demonstrated that the 2-alkylcyclobutanone (2-CB) method can be used for the detection of irradiated exotic fruits. However, storage of samples will have a significant effect on the probability of detecting irradiated avocados and papayas. The results indicated that ESR spectroscopy could be used to detect irradiated exotic fruits when the seeds or skin is analysed.
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