



**LACORS/HPA Co-ordinated Food Liaison Group Studies:
An Evaluation of Hygiene Practices in Mobile Food Vendors in the
United Kingdom**

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**On behalf of the Local Authorities Co-ordinators of Regulatory Services
(LACORS) and the Health Protection Agency**

Summary

Mobile food vendors use vehicles for the preparation and serving of food, and include temporary stalls or trailers. Previous studies have associated mobile food vendors with poor food hygiene practices. This study was therefore undertaken to assess the cleanliness of food preparation areas, cleaning and disinfection methods used, and the microbiological quality of potable and/or bottled water used by these traders. Between June and November 2006, 4607 environmental and water samples were collected from 1258 mobile food premises throughout the UK. Samples collected included water samples (1102), cleaning cloths (801), chopping boards (834), tap nozzles (569), food containers (508), water container bottle neck (463), work top surfaces (232), and serving counters (98). Cleaning cloths were more heavily contaminated with bacteria (Aerobic Colony Count, Enterobacteriaceae, *Escherichia coli*, and *Staphylococcus aureus*) compared to the surfaces sampled. Surfaces that were visually dirty, wet, and chopping boards that were plastic, scored or damaged were also found to have higher levels of these bacteria. Fifty four percent of potable water samples taken from mobile food vendors were of poor microbiological quality, i.e. contained action levels of coliforms, *E. coli* and/or enterococci. A documented food safety management system was only evident in 40.1% of vendors and cleaning schedules were only used by 43.6%. Deficiencies in the correct use of cleaning materials, such as dilution factors and the minimum contact time for disinfectants, were identified.

Introduction

Mobile food vendors include any food business that uses a vehicle for preparation and for serving food. These also include temporary premises such as stalls or trailers. Mobile food vendors can include, for example, fish and chip vans, ice cream vans, mobile fishmongers and butchers and street market stalls. The maintenance of a high standard of food hygiene in relation to temporary or mobile premises is particularly important given the nature of the structure and location. Outside caterers, for example, often work in cramped conditions, are very busy and do not have much storage space or ideal facilities. Such conditions lead to greater cross-contamination risks to the food that can be exacerbated if good personal hygiene practices are not followed. Strict supervision of staff is therefore also essential (Clayton and Griffith, 2004; NCASS, 2005).

The European Commission Regulation on the hygiene of foodstuffs (Regulation (EC) No. 853/2004) (EC, 2004) provides a risk-based approach to controlling food hygiene. The Regulation requires businesses to implement a written food safety management system based on hazard analysis and critical control point (HACCP) principles. Food business operators are also required to keep their premises clean, maintain them in good repair and condition, and ensure food handlers are trained or instructed in good hygiene practices. Effective cleaning and preventing cross-contamination are both essential in ensuring that ready-to-eat food served by mobile food vendors is safe to eat. In all food businesses, cleaning practices should be outlined in a cleaning schedule and cleaning records should be maintained (FSA, 2006). The Food Standards Agency has produced a guide to implementing a food safety management system within small catering and retail businesses, including mobile food vendors. The guide, Safer Food Better Business (SFBB), provides a standardised framework relating to food safety, i.e. the four C's: cooking, prevention of cross-contamination, cleaning, and chilling, and is designed to help small businesses comply with the food hygiene regulations and to minimise microbial food safety hazards in their food business operations (FSA, 2006).

The effectiveness of cleaning practices can be monitored and/or verified by environmental sampling. However, few standards or guidelines have been published on what is an acceptable level of microbiological contamination on surfaces. As a guideline, the US Public Health Service recommends that adequately cleaned and disinfected food service equipment have not more than 10 viable microorganisms per cm² (Favero et al., 1984). A previous LACORS/HPA study of cleaning standards and

practices in food premises used an aerobic colony count (ACC) of $\geq 10^3$ cfu/g for surfaces that had been recently cleaned as unsatisfactory (Sagoo et al., 2003).

There must be an adequate supply of potable (drinking) water to be used whenever necessary to ensure food is not contaminated (EC, 2004), this includes for washing food, cleaning food equipment and surfaces that come into contact with food, hand washing and in recipes where water is required. Requirements in legislation for the quality of both potable and bottled water specify microbiological criteria for indicator organisms at levels above which action should be taken to restore acceptable water quality (Anon, 2002; 2007). In potable water, *Escherichia coli*, coliforms and enterococci should be absent in a 100 ml sample (Anon, 2000), and in stored or bottled water these indicator organisms together with *Pseudomonas aeruginosa* should be absent in a 250 ml water sample (Anon, 2007). The detection of indicator organisms provides a rapid and sensitive method to monitor for the potential of waterborne pathogens as well as indicating the risk of contamination with human or animal faeces and/or deterioration of water quality (EA, 2002).

Many mobile food vendors are individual enterprises with varying levels of management experience (NCASS, 2008). Previous studies have associated mobile food vendors with poor food hygiene practices, e.g. low confidence in management and absence of a documented food safety management system (Article 5 of Regulation (EC) No. 852/2004) than other types of establishments serving foods (Elson et al. 2005; Little et al., 2003, Sagoo et al. 2003). Mobile food vendors were therefore surveyed in this study to assess the cleanliness of food preparation areas, cleaning and disinfection methods used, and the microbiological quality of potable and/or bottled water used by these traders.

Materials and Methods

Sample collection

A total of 3505 environmental samples and 1102 potable water samples were collected from 1258 mobile food vendors across the UK between 1 June and 30 November 2006. Samples were collected and transported to laboratories by staff from 144 local Environmental Health Departments, involving 52 Local Authority Food Liaison Groups (Annex 1). These were examined by 32 Official Control Laboratories (Health Protection Agency (HPA), HPA Collaborating Laboratories, National Public Health Service (NPHS)-Wales and Public Analysts).

Up to three environmental swab samples from surfaces used to prepare ready-to-eat foods were collected from each mobile food vendor. These could

include one sample from a chopping board, worktop or serving counter surface, one from the inside of an empty and clean food container, and one from the tap or outlet from the main source of water used i.e. the tap nozzle / bottle neck or opening of a water container. A cleaning cloth used for wiping surfaces in ready-to-eat food preparation areas was also collected. Chopping boards and worktop surfaces were sampled by the surface sponge swab technique using sterile 1.5 x3" foam sampling sponges (SpongeSicle swabs with 10ml neutralising buffer), in polythene envelopes or plastic containers and sterile 100 cm² square templates. The entire inside surface of food containers, tap nozzles or outlets were also sampled using SpongeSicle swabs. Whole cleaning cloths were placed into sterile plastic bags for transport to the laboratory. Environmental samples were collected and transported to laboratories in accordance with the FSA Food Law Code of Practice (FSA, 2008) and LACORS guidance on microbiological food sampling (LACORS, 2006).

Water samples (1000 ml) were taken either as the proprietor would use the water or as the customer would receive it i.e. without pre-flushing the tap, or removing any external fittings, and transported to laboratories in accordance with the Environment Agency guidance on practices and procedures for sampling (EA, 2002).

Information on samples and premises was obtained by observation and enquiry and recorded on a standard questionnaire. Sampling officers provided information on the premises and its compliance with food hygiene legislation, including: the type of premises, food hygiene inspection category rating, consumers at risk, confidence in management, level of food hygiene training and compliance with HACCP principles. These areas were assessed in accordance with Annex 5 of the FSA Food Law Code of Practice (FSA, 2008). Annex 5 of the Code of Practice includes the Food Hygiene Inspection Rating Scheme. This scheme categorises premises from A to E, with Category A premises receiving the highest minimum inspection frequency. The Confidence in Management score relates to how confident the last inspecting officer was in a food premises management. It is affected by the attitude and knowledge of the staff and management towards food hygiene and the presence of an adequate food safety management system. The Consumer at Risk score indicates the number of consumers likely to be at risk if there is a failure of food hygiene and procedures.

Sample examination

Sponge swabs and cloths were placed into sterile stomacher bags containing 100ml or 150ml of Maximum Recovery Diluent (MRD) respectively, and the contents thoroughly mixed. Sample eluents were serially diluted in MRD and appropriate

dilutions were used to enumerate Aerobic Colony Count (ACC), Enterobacteriaceae, *Escherichia coli* and *Staphylococcus aureus* (cloths only) in accordance with Health Protection Agency (HPA) Standard Microbiological Methods (HPA 2005a-e). Microbiological results were compared with criteria used by the US Public Health Service (Favero et al., 1984) and Sagoo et al. (2003) (Table 1).

Table 1 Microbiological criteria for environmental swabs and cleaning cloths

Sample	Microorganisms	Microbiological Quality	
		Satisfactory	Unsatisfactory
Swab from ready-to-eat food contact surfaces: Cleaned & ready to use	ACC	<10 cfu / cm ² or swab	≥10 cfu / cm ² or swab
	Enterobacteriaceae	<1 cfu / cm ² or swab	≥1 cfu / cm ² or swab
	<i>E. coli</i>	Not detected	Detected
Swabs from recently cleaned surfaces that are in use	ACC	<10 ³ cfu / cm ² or swab	≥10 ³ cfu / cm ² or swab
	Enterobacteriaceae	<10 ² cfu / cm ² or swab	≥10 ² cfu / cm ² or swab
	<i>E. coli</i>	Not detected	Detected
Cleaning cloth in use	ACC	<10 ⁵ cfu / cloth	≥10 ⁵ cfu / cloth
	Enterobacteriaceae	<10 ⁴ cfu / cloth	≥10 ⁴ cfu / cloth
	<i>E. coli</i>	Not detected	Detected
	<i>S. aureus</i>	Not detected	Detected

Potable water samples were examined for enterococci, *E. coli* and coliforms in accordance with HPA Standard Microbiological Methods (HPA 2005f; 2006; 2007a). Water samples from stored sources (i.e. tank, water container, or bottle) were also examined for these organisms, and *Pseudomonas aeruginosa* (HPA 2007b). Microbiological results of potable water samples were compared with published criteria (Tables 2 and 3) (Anon 2000; 2007).

Table 2 Microbiological criteria for potable mains water samples

Parameter	Acceptable Level	Action Level
Coliforms	0 / 100ml	>0 / 100ml
<i>E. coli</i>	0 / 100ml	>0 / 100ml
Enterococci	0 / 100ml	>0 / 100ml

Table 3 Microbiological criteria for stored potable water samples

Parameter	Acceptable Level	Action Level
Coliforms	0 / 250ml	>0 / 250ml
<i>E. coli</i>	0 / 250ml	>0 / 250ml
Enterococci	0 / 250ml	>0 / 250ml
<i>P. aeruginosa</i>	0 / 250ml	>0 / 250ml

Statistical Analysis

Descriptive and statistical analysis of the data was undertaken using Microsoft Excel and Epi Info version 6.04d. Relative proportions were compared using chi-squared (χ^2) and Fisher's exact tests. A probability value of less than 5% was deemed to be significant

Results

Environmental swabs were taken from 834 chopping boards, 569 water tap nozzles, 508 food containers, 463 water container bottle necks, 232 worktop surfaces, and 98 serving counter surfaces. A total of 801 cleaning cloths and 1102 potable water samples were also examined.

Microorganisms isolated from food equipment surfaces

The levels of microorganisms obtained from food equipment surfaces are shown in Table 4. Serving counter surfaces sampled had the least amount of contamination from *E. coli* (faecal indicator organism) (6.1%) compared to all other surfaces' samples (work tops, 12.1%, chopping boards, 12.2%, water container/bottle neck, 16.8%, food container, 19.7%, tap nozzle, 21.1%). This finding was statistically significant when comparing serving counter surfaces to tap nozzle, food container and water container/bottle neck surfaces ($p=0.0004$).

Microorganisms isolated from cleaning cloths

Of the 801 cleaning cloths sampled, 65% had an ACC at $\geq 10^5$ /cloth. Enterobacteriaceae at $\geq 10^4$ /cloth was present in 50% of cloths, and *E. coli* and *S. aureus* were present in 29% and 15% of samples respectively. These results indicate a reservoir of bacteria and an increased risk of cross-contamination (Table 4).

Table 4 Microbiological results for environmental swabs and cleaning cloths

Sample type	<10	10- <10 ²	10 ² - <10 ³	10 ³ - <10 ⁴	10 ⁴ - <10 ⁵	10 ⁵ - <10 ⁶	10 ⁶ - <10 ⁷	≥10 ⁷	NE*	Total examined
Chopping/cutting board (n=834)										
Aerobic colony count	138	157	198	150	112	46	25	8	-	834
Enterobacteriaceae	580	91	72	43	29	9	5	2	3	831
<i>E. coli</i>	732	85	10	2	2	-	-	-	3	831
Food container (n=508)										
Aerobic colony count	62	105	114	89	60	43	22	13	-	508
Enterobacteriaceae	348	69	38	27	12	10	3	-	1	507
<i>E. coli</i>	408	83	11	4	-	-	-	-	2	506
Serving counter (n=98)										
Aerobic colony count	36	34	11	9	5	2	1	-	-	98
Enterobacteriaceae	84	11	-	-	-	-	-	-	3	95
<i>E. coli</i>	91	6	-	-	-	-	-	-	1	97
Tap nozzle (n=569)										
Aerobic colony count	44	61	99	74	97	98	78	18	-	569
Enterobacteriaceae	350	103	55	44	9	6	2	-	-	569
<i>E. coli</i>	449	95	14	7	1	1	-	-	2	567
Water container or bottle neck (n=463)										
Aerobic colony count	26	28	33	44	96	125	83	28	-	463
Enterobacteriaceae	274	75	53	32	20	3	1	-	5	458
<i>E. coli</i>	385	68	6	3	-	-	-	-	1	462
Work top surface (n=232)										
Aerobic colony count	74	76	36	23	10	7	5	1	-	232
Enterobacteriaceae	190	18	10	6	3	3	-	-	2	230
<i>E. coli</i>	204	22	3	1	1	-	-	-	1	231
Cleaning cloth (n=801)										
	<10 ²	10 ² - <10 ³	10 ³ - <10 ⁴	10 ⁴ - <10 ⁵	10 ⁵ - <10 ⁶	10 ⁶ - <10 ⁷	10 ⁷ - <10 ⁸	10 ⁸ - <10 ⁹	≥10 ⁹	Total examined
Aerobic colony count	43	57	87	97	118	124	151	45	79	801
Enterobacteriaceae	212	98	91	99	84	79	77	30	31	801
<i>E. coli</i>	569	101	44	32	23	16	8	4	4	801
<i>S. aureus</i>	680	69	21	12	2	-	-	-	17	801

* Not Examined

Microorganisms isolated from potable water samples

Of the 1102 potable water samples examined, 55.3% (610) were from a mains piped supply and 44.7% (492) were bottled or stored sources. The proportion of mains piped supply samples containing action levels of coliforms, *E. coli* and enterococci (≥ 1 cfu/100ml) are shown in Table 5. Fifty seven percent (347/610) of samples tested positive for at least one of these three indicator organisms and 12.1% (74/610) contained one or more faecal indicators (*E. coli* and/or enterococci). Coliform, *E. coli* and enterococci counts ranged from 1.0 to 3.0x10³, 1.0 to 2.7x10³ and 1.0 to 1.6x10⁴ cfu/100ml, respectively.

The proportion of bottled or stored water samples containing action levels of coliforms, *E. coli* and enterococci (≥ 1 cfu/250ml) are also shown in Table 5. Forty nine percent (242/492) of samples tested positive for at least one of these three indicator organisms and 14.4% (71/492) contained one or more faecal indicators (*E. coli* and/or enterococci). Coliform, *E. coli* and enterococci counts in non-mains water ranged from 1 to 6x10⁵, 1 to 4.4x10⁴ and 1 to 5.2x10⁴ cfu/250ml, respectively.

Twenty-five percent (123) of non-mains water samples contained *P. aeruginosa* at action levels ($\geq 1/250\text{ml}$) with counts ranging from 1 to 1.0×10^5 cfu/250 ml (Table 5).

Table 5 Microbiological results of potable water samples (n=1102)

Parameters	Mains piped water cfu / 100ml (n=610)			Water from a stored source cfu / 250ml (n= 492)			Total Examined
	0	≥ 1	NE	0	≥ 1	NE	
Coliforms	330	273	7	249	171	72	1023
<i>E. coli</i>	565	26	19	444	31	17	1066
Enterococci	526	48	36	428	40	24	1042
<i>P. aeruginosa</i> *	-	-	-	355	123	14	478

* samples taken from a stored source i.e. tank, container, bottle

Assessment of cleanliness

Cutting/Chopping Board Surface

- Cutting/chopping board surfaces were sampled from 66.3% (834/1258) of mobile food premises. Of these, 54.2% (452/834) were classified as being of unsatisfactory microbiological quality (Table 6).
- Of the cutting/chopping boards sampled, 71.5% were recently cleaned and in use. A significantly higher proportion of boards that had been previously cleaned and were ready for use were of unsatisfactory quality (76.7%) when compared with those recently cleaned and in use (47.5%) ($p < 0.0001$) and those that were not cleaned (59.6%; $p = 0.0203$; Table 6).
- Sixty eight percent of cutting/chopping boards sampled were plastic. Significantly more plastic boards (58.1%) were of unsatisfactory quality when compared wooden boards (42.0%, $p = 0.0142$) or other types (43.4%) ($p = 0.0010$) (Table 6).
- Seventy one percent 70.8% of boards (were visibly clean as judged by the sampling officer. Significantly more boards that were visually dirty (60.2%) were of unsatisfactory microbiological quality than those that were visually clean (49.1%) ($p = 0.0479$) (Table 6).
- Fifty percent of boards sampled had a good surface condition. Significantly less boards with a good surface condition were of unsatisfactory microbiological quality (49.1%) compared with poor surface conditions (60.2 - 72.2%) ($p = 0.0068$) (Table 6).
- Forty eight percent of boards were dry when sampled. A higher proportion of boards that had a wet surface were of unsatisfactory microbiological quality

(70.3%) compared to those that had either a damp (52.6%) or dry (54.3%) surface, although this finding was not statistically significant ($p>0.05$) (Table 6).

Table 6 Microbiological status of cutting/chopping board (n=834)

Cutting/chopping board	No. environmental swabs (%)		No. environmental swabs of unsatisfactory microbiological quality (%)	
Surface				
Cleaned and ready-to-use	159	(19.1)	122	(76.7)
Recently cleaned and in use	596	(71.5)	283	(47.5)
Not cleaned	52	(6.2)	31	(59.6)
Not recorded	27	(3.2)	16	(59.2)
Type				
Plastic	568	(68.1)	330	(58.1)
Wood	69	(8.3)	29	(42.0)
Other (e.g. glass, stainless steel)	166	(19.9)	72	(43.4)
Not recorded	31	(3.7)	21	(67.7)
Surface appearance				
Visually clean	590	(70.8)	309	(52.4)
Visually dirty	198	(23.7)	120	(60.6)
Not recorded	46	(5.5)	23	(50.0)
Surface condition				
Good	417	(50.0)	205	(49.1)
Scored	176	(21.1)	106	(60.2)
Scratched	73	(8.8)	37	(50.7)
Scuffed	54	(6.5)	39	(72.2)
Other (e.g. combination of scored, scratched, chipped and/or scuffed)	76	(9.1)	41	(53.9)
Not Recorded	38	(4.5)	24	(63.2)
Presence of moisture				
Wet	37	(4.5)	26	(70.3)
Damp	152	(18.2)	80	(52.6)
Dry	398	(47.7)	216	(54.3)
Not recorded	247	(29.6)	130	(52.6)

Food Container

- Food container surfaces were sampled from 40.4% (508/1258) of mobile food premises. Of these, 64.9% (330/508) were classified as being of unsatisfactory microbiological quality (Table 7).
- Fifty five percent of food containers sampled had been recently cleaned and were in use. A higher proportion (85.4%) of food containers that were cleaned and ready-to-use were of unsatisfactory quality compared to containers that were recently cleaned and in use (57.1%, $p<0.0001$) or not cleaned (46.4%, $p<0.0001$) (Table 7).
- Sixty five percent of containers sampled were plastic. A significantly higher proportion of containers that were plastic (70.7%) or ceramic (75.0%) were of unsatisfactory quality compared to other types (51.8%) ($p<0.0001$) (Table 7).

- Seventy nine percent of food containers were visually clean as judged by the sampling officer. There was no significant difference in the microbiological quality of the surface of the containers in relation to whether the surface was visually clean or not ($p>0.05$) (Table 7).
- Sixty-two percent of containers were dry when sampled. Containers that were wet were more likely to be of unsatisfactory microbiological quality (72.5%) compared with those that were dry (64.6%) or damp (69.0%), although this finding was not statistically significant ($p>0.05$) (Table 7).

Table 7 Microbiological quality of food containers (n=508)

Food Container	No. environmental swabs (%)		No. environmental swabs of unsatisfactory microbiological quality (%)	
Surface				
Cleaned and ready-to-use	151	(29.7)	129	(85.4)
Recently cleaned and in use	280	(55.1)	160	(57.1)
Not cleaned	28	(5.5)	13	(46.4)
Not recorded	49	(9.7)	28	(57.1)
Type				
Plastic	328	(64.6)	232	(70.7)
Ceramic	16	(3.1)	12	(75.0)
Other (e.g. glass, steel, cardboard)	137	(27.0)	71	(51.8)
Not recorded	27	(5.3)	15	(55.6)
Surface appearance				
Visually clean	399	(78.5)	262	(65.7)
Visually dirty	47	(9.3)	31	(66.0)
Not recorded	62	(12.2)	37	(60.0)
Presence of moisture				
Wet	40	(7.9)	29	(72.5)
Damp	87	(17.1)	60	(69.0)
Dry	316	(62.2)	204	(64.6)
Not recorded	65	(12.8)	37	(56.9)

Serving counter surface

- Serving counter surfaces were sampled from 7.8% (98/1258) of mobile food premises. Of these, 25.5% (25/98) were classified as being of unsatisfactory microbiological quality (Table 8).
- Sixty seven percent of serving counter surfaces sampled were cleaned and ready-to-use. Significantly more serving counters surfaces recently cleaned and in use were of unsatisfactory microbiological quality (66.7%) compared to those cleaned and ready-to-use (15.1%) ($p=0.0002$) (Table 8).
- Seventy nine percent of surfaces were visually clean (as judged by the sampling officer). No significant difference was observed in surfaces that were clean or not with surfaces that were of satisfactory or unsatisfactory quality (Table 8).

- Seventy nine percent of the surfaces sampled were in good condition. There was no significant difference in the microbiological quality of the surface of the serving counters in relation to whether the surface was in good condition or not ($p>0.05$) (Table 8).
- Fifty eight percent of the surfaces were dry when sampled. Surfaces that were damp were more likely to be of unsatisfactory microbiological quality (62.5%) compared with those that were dry (28.1%), although this finding was not statistically significant ($p>0.05$) (Table 8).

Table 8 Microbiological quality of serving counters (n=98)

Serving counter	No. environmental swabs (%)		No. environmental swabs of unsatisfactory microbiological quality (%)	
Surface				
Cleaned and ready-to-use	66	(67.4)	10	(15.1)
Recently cleaned and in use	15	(15.3)	10	(66.7)
Not cleaned	3	(3.1)	1	(33.3)
Not recorded	14	(14.2)	4	(28.6)
Surface appearance				
Visually clean	77	(78.6)	21	(27.3)
Visually dirty	9	(9.2)	2	(22.2)
Not recorded	12	(12.2)	2	(16.7)
Surface condition				
Good	77	(78.6)	20	(26.0)
Scored	1	(1.0)	1	(100.0)
Scratched	1	(1.0)	0	
Scuffed	1	(1.0)	0	
Other (e.g. combination of scored, scratched, chipped and/or scuffed)	4	(4.1)	2	(50.0)
Not recorded	14	(14.3)	2	(14.3)
Presence of moisture				
Wet	0			
Damp	8	(8.2)	5	(62.5)
Dry	57	(58.2)	16	(28.1)
Not recorded	33	(33.6)	4	(12.1)

Worktop surfaces

- Worktop surfaces were sampled from 18.4% (232/1258) of mobile food premises. Of these, 38.7% (90/232) were classified as being of unsatisfactory microbiological quality (Table 9).
- Sixty seven percent of surfaces sampled were recently cleaned and in use. Significantly, more worktop surfaces that were cleaned and ready-to-use (75.0%) were of unsatisfactory quality compared to surfaces that had been recently cleaned and in use (25.0%) ($p< 0.0001$) (Table 9).
- Eighty five percent of surfaces were visually clean as judged by the sampling officer. More surfaces that were visually dirty were likely to be of unsatisfactory microbiological quality (50.0%) compared to those that were

deemed clean (34.2%), although this finding was not statistically significant ($p>0.05$) (Table 9).

- Seventy three percent of surfaces sampled were in good condition. Surfaces that were scored (83.3%), scratched (50.0%) or a combination of different poor conditions (62.5%) were more likely to be of unsatisfactory microbiological quality compared with those that were of good condition (34.1%), although this finding was not statistically significant ($p>0.05$) (Table 9).
- Forty seven percent of the surfaces were dry when sampled. Surfaces that were damp (43.3%) or wet (37.5%) were more likely to be of unsatisfactory microbiological quality compared with those that were dry (23.0%), although this finding was not statistically significant ($p>0.05$) (Table 9).

Table 9 Microbiological status of worktop surfaces (n=232)

Worktop surface	No. environmental swabs (%)		No. environmental swabs of unsatisfactory microbiological quality (%)	
Surface				
Cleaned and ready-to-use	68	(29.3)	51	(75.0)
Recently cleaned and in use	156	(67.2)	39	(25.0)
Not cleaned	0			
Not recorded	8	(3.5)	0	
Surface appearance				
Visually clean	196	(84.5)	67	(34.2)
Visually dirty	22	(9.5)	11	(50.0)
Not recorded	14	(6.0)	12	(85.7)
Surface condition				
Good	170	(73.3)	58	(34.1)
Scored	6	(2.5)	5	(83.3)
Scratched	8	(3.5)	4	(50.0)
Chipped	1	(0.4)	0	
Scuffed	2	(0.9)	0	
Other (e.g. combination of scored, scratched, chipped and/or scuffed)	8	(3.5)	5	(62.5)
Not recorded	37	(15.9)	18	(48.7)
Presence of moisture				
Wet	8	(3.5)	3	(37.5)
Damp	30	(12.9)	13	(43.3)
Dry	109	(47.0)	36	(23.0)
Not recorded	85	(36.6)	38	(44.7)

Tap Nozzle and Water Container/Bottle opening

- Tap nozzles were sampled from 45.2% (569/1258) of mobile food premises. Of these, 68.7% (391/569) were classified as being of unsatisfactory microbiological quality (Table 10).
- Water container or bottle neck openings were sampled from 36.8% (463/1258) of mobile food premises, and of these 83.8% (388/463) were classified as being of unsatisfactory microbiological quality (Table 10).

- Forty nine percent of tap nozzles sampled were made of stainless steel. There was no significant difference in the microbiological quality of the surface of the tap nozzle in relation to the tap nozzle material ($p>0.05$) (Table 10).
- Eighty five percent of water container or bottle neck openings sampled were made of plastic. Significantly, more water container/bottle neck openings made of plastic were of unsatisfactory quality (87.3%) compared to those made from other materials, such as stainless steel (62.5% ($p= 0.0137$)) (Table 10).

Table 10 Microbiological quality of tap nozzles and water container / bottle neck opening (n=1032)

	No. environmental swabs (%)		No. environmental swabs of unsatisfactory microbiological quality (%)	
Tap nozzle & type (n=569)				
Plastic	197	(34.6)	129	(65.5)
Stainless steel	280	(49.2)	188	(67.1)
Other (e.g. aluminium)	39	(6.9)	25	(64.1)
Not recorded	53	(9.3)	49	(92.5)
Water container / bottle neck opening (n=463)				
Plastic	392	(84.6)	342	(87.3)
Other (e.g. stainless steel, metal)	16	(3.5)	10	(62.5)
Not recorded	55	(11.9)	36	(65.5)

Cleaning Cloth

- Cleaning cloths were sampled from 64% (801/1258) of mobile food premises. Disposable cloths were sampled from 22.7% (286/1258) of premises, and reusable cloths from 40.9% (515/1258) of premises. Of these, 85.3% (244/286) of disposable cloths and 88.1% (454/515) of re-useable cloths were classified as being of unsatisfactory microbiological quality (Table 11).
- Eighty one percent of disposable cloths were reported to be replaced within either 12 hours (47.2%) or between 12 and 24 hours (33.9%). There was no significant difference in the microbiological quality of the disposable cloths in relation to the frequency that the cloths were replaced ($p>0.05$) (Table 11).
- The time between cleaning of re-useable cloths varied between <1 hour to >24hrs: the most common frequency (27.2%) being between 10 and 24 hours. There was no significant difference in the microbiological quality of the re-useable cloths in relation to the frequency that the cloths were cleaned ($p>0.05$) (Table 11).

- Most re-usable cloths were reported to be cleaned using a washing machine (44.5%). There was no significant difference in the microbiological quality of the re-useable cloths in relation to the method of cleaning ($p>0.05$) (Table 11).
- Forty three percent of cleaning cloths collected were used for separate areas, whereas 46.3% were not (Table 11). There was no significant difference in the microbiological quality of the cloths in relation to the area where the cloths were used ($p>0.05$) (Table 11).

Table 11 Microbiological status of cleaning cloths (n=801)

Cleaning cloth	No. of cleaning cloths (%)		No. cleaning cloths of unsatisfactory microbiological quality (%)	
<i>Frequency disposable cloths replaced (n=286)</i>				
<12 hrs	135	(47.2)	114	(84.4)
12 - <24 hrs	97	(33.9)	85	(87.6)
24 - <46 hrs	0			
Not known	54	(18.9)	45	(83.3)
<i>Frequency re-useable cloths cleaned (n=515)</i>				
<1 hrs	69	(13.4)	58	(84.1)
1 - <3 hrs	76	(14.7)	68	(89.5)
3 - < 6 hrs	40	(7.8)	38	(95.0)
6 - <10 hrs	30	(5.8)	27	(90.0)
10 - <24 hrs	140	(27.2)	120	(85.7)
≥24 hrs	74	(14.4)	62	(83.7)
Not known	86	(16.7)	81	(94.2)
<i>Method used for cleaning re-useable cloths (n=515)</i>				
Sanitiser-rinse	59	(11.5)	48	(81.3)
Boiling	63	(12.2)	57	(90.5)
Washing machine	229	(44.5)	206	(90.0)
Other (e.g. hand washing, bleach or combination of sanitiser, boiling and washing machine)	110	(21.4)	92	(83.6)
Not known	54	(10.4)	51	(94.4)
<i>Separate cleaning cloths used for separate areas (n=801)</i>				
Yes	344	(42.9)	303	(88.1)
No	371	(46.3)	321	(86.5)
Not recorded	86	(10.8)	74	(86.0)

Water Supply

- Water samples were collected from 87.6% (1102/1258) of mobile food premises. Of these, 84.6% (932/1102) were classified as requiring action (Table 12).
- Fifty five percent of the water samples collected were from a mains piped supply or from water containers or bottles (40.7%) (Table 12). There was no significant difference in the microbiological quality of the water samples and the source of the water ($p>0.05$) (Table 12).

- Fifty one percent of water samples were collected from water containers. No significant difference was observed in the microbiological quality of samples and where they were sampled from ($p>0.05$) (Table 12).
- Where water containers were used, 61.1% were emptied and refilled between 12- 24 hours. There was no significant difference in the microbiological quality of the water samples and the frequency in which the water containers were emptied and refilled ($p>0.05$) (Table 12). Eighty three percent of supplies in water containers were distinguishable from the waste water supply.
- Thirty three percent of water hoses/containers were cleaned and disinfected weekly. There was no significant difference in the microbiological quality of the water hoses or containers and the frequency of cleaning and disinfecting ($p>0.05$) (Table 12).
- Sixty two percent of water hoses and containers were not included on the cleaning schedule. There was no significant difference in the microbiological quality of the water hoses and containers and being included on the cleaning schedule or not ($p>0.05$) (Table 12).
- Thirty eight percent of water on board mobile food vendors was untreated, 48.6% were treated, and for 13.7% of samples, this information was not recorded (Table 12). No significant difference was found between the microbiological quality of the water and the treatment received ($p>0.05$) (Table 12).
- Sixty five percent of water samples were from the same water supply or point used for drinking, washing and cleaning (721/1102). Eighty six percent of the sampled water was used for a combination of drinking, washing, and cleaning (Table 12). No significant difference was found between the microbiological quality water and the intended use of the water ($p>0.05$) (Table 12).

Table 12 Microbiological status of potable water (n=1102)

Water	No. of samples	(%)	No. of samples exceeding the action level	(%)
Water Source				
Mains pipe supply	610	(55.4)	327	(53.6)
Water containers/bottles	448	(40.7)	265	(59.2)
Private water supply	6	(0.5)	2	(33.3)
Bowser	2	(0.2)	1	(50.0)
Other (e.g. combination of mains, bottled, private water supplies)	33	(2.9)	20	(60.6)
Not recorded	3	(0.3)	2	(66.7)
Water sample taken from				
Mains tap	306	(27.8)	166	(54.2)
Standpipe	19	(1.7)	10	(52.6)
Tap from bottled supply	184	(16.7)	122	(66.3)
Water container	558	(50.6)	298	(53.4)
Hose	9	(0.8)	7	(77.8)
Other (e.g. jug, bucket)	13	(1.2)	6	(46.1)
Not recorded	13	(1.2)	6	(46.1)
How often is water in containers emptied & refilled (n=558)				
< 12 hrs	146	(26.2)	74	(50.7)
12 - <24 hrs	341	(61.1)	179	(52.3)
24 - <48 hrs	44	(7.8)	30	(68.2)
≥48 hrs	17	(3.1)	8	(47.1)
Not recorded	10	(1.8)	7	(70.0)
How often water hose/container cleaned & disinfected (n=567)				
Daily	152	(26.8)	37	(24.3)
Weekly	189	(33.3)	52	(27.5)
Other (e.g. monthly, twice or 3 times a year, yearly)	175	(30.9)	59	(33.7)
Not recorded	51	(9.0)	22	(43.1)
Are hoses/containers included on cleaning schedule (n=567)				
Yes	144	(25.4)	40	(27.8)
No	352	(62.1)	100	(28.4)
Not recorded	71	(12.5)	30	(42.2)
How was water treated				
Chlorinated	326	(29.6)	99	(30.3)
Chlorine tables/ Milton	146	(13.2)	37	(25.3)
Filtered	2	(0.2)	2	(100.0)
UV Filter	1	(0.1)	1	(100.0)
Untreated	416	(37.7)	123	(29.6)
Other (e.g. Combination of milton, filter systems).	60	(5.5)	13	(21.7)
Not recorded	151	(13.7)	23	(15.2)
Use of water				
Cleaning/ washing hands	67	(6.1)	15	(22.4)
Cleaning food	3	(0.3)	2	(66.7)
Cleaning surfaces in contact with food	5	(0.5)	0	
Washing up	17	(1.5)	4	(23.5)
Drinking	33	(2.9)	9	(27.3)
Included in foods or drinks served	12	(1.1)	2	(16.7)
Other (e.g. combination of washing up, drinking, cleaning)	952	(86.4)	263	(27.6)
Not recorded	13	(1.2)	3	(23.1)

Mobile Food Vendor Information

Cleaning methods and schedules

- Forty four percent of mobile food vendors did use cleaning schedules, 45.2% did not, and for 11.2%, this information was not recorded (Table 13).

- Sixty nine percent of cleaning schedules specified how surfaces should be cleaned and 69.2% specified the use of cleaning and chemical products. However, 48.2% did not include the method required for dilution of stock chemicals frequency (Table 13).
- Information on whether vendors used some form of cleaning product was collected for 85.5% (1075/1258) premises. All vendors for whom this information was collected used some form of cleaning products.
 - ❖ Of these, 43.0% (462) used sanitisers, 18.0% (194) used antibacterial products, 9.6% (103) used detergents, and 29.4% (316) used a combination of the above and other products such as bleach.
- Twenty five percent of staff in mobile food vendors were aware of dilution factors for the cleaning products used (Table 13). Only 20% of staff were aware of the contact times to be used for the cleaning products (Table 13).

Table 13 Details of cleaning methods and schedules used by mobile food vendors (n=1258)

Premises	Yes	(%)	No	(%)	Not recorded	(%)
Cleaning schedule used	548	(43.6)	569	(45.2)	141	(11.2)
Cleaning schedules include:						
How surfaces are cleaned	376	(68.6)	144	(26.2)	28	(5.1)
Use of cleaning/chemical products	379	(69.2)	142	(25.9)	27	(4.9)
Method required for dilutions of stock chemical frequency	184	(33.6)	264	(48.2)	100	(18.2)
Staff aware of dilution factors of cleaning products	318	(25.3)	138	(11.0)	802	(63.7)
Staff aware of contact time of cleaning products	251	(20.0)	546	(43.4)	461	(36.6)

Type of Vendor

- Most mobile food vendors visited operated from a van (63.5%; 799/1258) or 'other' type of premises, e.g. a trailer (27.4%) (Table 14). Most mobile food vendors visited traded as caterers (91.7%) (Table 14).
- Ninety four percent of mobile vendors had a regular pitch to trade (Table 14) and street vendors were the main type (67.6%) of mobile food vendors visited (Table 14).
- Sixty-eight percent (854/1258) of mobile food vendors handled both ready-to-eat and raw foods, 20.2% (253) handled only ready-to-eat foods and for 12.0% (151), this information was not recorded (Table 14).
- There was no significant difference with regard to numbers of samples (environmental swabs, cleaning cloths and water) of unsatisfactory

microbiological quality was found between the type and trade of the mobile food vendors (Table 14).

Mobile food vendors and compliance with food hygiene legislation

- Most vendors were categorised as Inspection Rating Category C (65.6%; 828/1258) or B (11.3% (142) (Table 14). Category C and B premises accounted for 76.9% of all premises visited. Premises rated as Category C have a minimum inspection frequency of 18 months; Category B premises have a minimum inspection frequency of 12 months.
- Sixty nine percent of vendors had a consumer at risk score of 5 (businesses, most of whose customers are likely to be living, staying or working in the local area) and 5.8% had a score of 10 (businesses serving a substantial number of customers, including a significant proportion from outside the local area) (Table 14). These premises accounted for three quarters (74.9%) of all vendors visited.
- Forty nine percent of vendors had a Confidence in Management score of either 10 (satisfactory record of compliance) or 5 (reasonable record of compliance, 15%) (Table 14).
- Forty percent of vendors complied with the principles of HACCP (Article 5, Regulation (EC) No. 852/2004), whereas 40.0% did not. This information was not recorded for 20.0% of vendors (Table 14).
- Eighty four percent of vendors had received food hygiene training, and 8.2% had not. This information was not recorded for 8.1% of vendors (Table 14).
- There was no significant difference between the food hygiene inspection categories, compliance with HACCP principles, and food hygiene training received and the number of samples of unsatisfactory quality (Table 14) ($p>0.05$).

Table 14 Microbiological quality of environmental & water samples in relation to mobile food vendor details

Premises Details		Total No. of samples		No. of microbiologically unsatisfactory samples	
n=1258		n=4607	(%)	n=3305	(%)
Type of Mobile Vendor					
Market stall (n=41)		140	(3.0)	94	(67.1)
Hand Cart (n=5)		14	(0.3)	14	(100.0)
Van (n=799)		2919	(63.4)	2120	(72.6)
Other (e.g. trailers) (n=341)		1263	(27.4)	895	(70.9)
Not Recorded (n=72)		271	(5.9)	183	(67.5)
Type of Trade					
Caterer (n=1154)		4244	(92.1)	3066	(72.2)
Butcher (n=15)		45	(1.0)	36	(80.0)
Fish monger (n=9)		29	(0.6)	16	(55.2)
Ice-cream vendor (n=32)		110	(2.4)	73	(66.4)
Candy floss/doughnut maker (n=3)		11	(0.2)	8	(72.7)
Other (e.g. cheese vendors, fruit & vegetable) (n=45)		168	(3.6)	107	(63.7)
Type of Venue/ Event					
Street Vendor (n= 850)		3091	(67.0)	2250	(72.8)
Sports Event (n= 14)		43	(1.0)	31	(72.1)
Concert (n=25)		85	(1.8)	76	(89.4)
Markets (Local, Farmers & Continental) (n=67)		249	(5.4)	167	(67.0)
Other (n=190)		717	(15.6)	514	(71.7)
Not Recorded (n=112)		422	(9.2)	268	(63.5)
Type of food Handled					
Ready-to-eat only (n= 253)		888	(19.3)	636	(71.6)
Ready-to-eat & Raw (n=854)		3181	(69.0)	2296	(72.1)
Not recorded (n=151)		538	(11.7)	374	(69.5)
Regular Pitch					
Yes (n=1176)		4324	(93.8)	3094	(71.6)
No (n=60)		212	(4.6)	160	(75.5)
Not Recorded (n=22)		71	(1.5)	52	(73.2)
Inspection Rating					
Category	Minimum frequency of inspection				
A	At least every 6 months (n= 17)	71	(1.5)	49	(69.0)
B	At least every 12 months (n=142)	512	(11.1)	374	(73.0)
C	At least every 18 months (n=828)	3048	(66.2)	2172	(71.3)
D	At least every 2 years (n=14)	37	(0.8)	21	(56.8)
E	Alternative enforcement strategy (n=9)	30	(0.7)	25	(83.3)
Not Recorded (n=250)		909	(19.7)	665	(73.2)
Consumer at risk Score					
0	(very few) (n= 13)	51	(1.1)	38	(74.5)
5	(few) (n=870)	3205	(69.6)	2296	(71.6)
10	(Intermediate) (n=74)	248	(5.4)	189	(76.2)
15	(Substantial) (n=1)	5	(0.1)	3	(60.0)
Not Recorded (n= 300)		1098	(23.8)	780	(71.0)
Confidence in Management Score					
0	(Good) (n= 7)	29	(0.6)	21	(72.4)
5	(Reasonable) (n=189)	705	(15.3)	499	(70.8)
10	(Satisfactory) (n=617)	2258	(49.1)	1606	(71.1)
20	(Varying) (n=22)	576	(12.5)	432	(75.0)
30	(Poor) (n=6)	20	(0.4)	13	(65.0)
Not Recorded (n= 277)		1019	(22.1)	735	(72.1)
Compliant with principles of HACCP* (Article 5, Regulation (EC) No. 852/2004)					
Yes (n=507)		1850	(40.1)	1348	(72.9)
No (n= 503)		1870	(40.6)	1319	(70.5)
Not recorded (n=248)		887	(19.3)	639	(72.0)
Managers Food Hygiene Training					
Received trained & attended (n=1053)		3871	(84.0)	2773	(71.6)
❖ <i>Foundation</i>		3404	(87.9)	2451	(72.0)
❖ <i>Intermeidate</i>		144	(3.7)	98	(68.0)
❖ <i>Advanced</i>		49	(1.3)	35	(71.4)
❖ <i>Other (company training, MLC, HACCP, C&G)</i>		86	(2.2)	56	(65.1)
❖ <i>Not Recorded</i>		188	(4.9)	133	(70.7)
Not Trained (n=103)		382	(8.3)	278	(72.8)
Not Recorded (n=102)		354	(7.7)	255	(72.0)

* Hazard Analysis and Critical Control Points

Discussion

The risk of foodborne infection associated with cross-contamination depends on two factors: the level of contamination on the surfaces and the probability of its transfer to the foods being consumed (Bloomfield and Scott, 1997). Those involved in food preparation and service have a vital role in prevention of foodborne disease and their actions can be critical in preventing an outbreak of infection (Sagoo et al., 2003). The importance of effective cleaning and disinfection of food surfaces for reducing the potential of cross-contamination is well recognised and is an important component of food safety management systems (Sagoo et al., 2003). Nevertheless, just 40.3% of mobile food vendors in this study were fully compliant with the principles of HACCP (EC, 2004). Although 84.0% of mobile vendors had received food hygiene training, only 43.6% used a cleaning schedule. In addition, only 25.3% and 20.0% of staff were aware of dilution factors and contact times of the cleaning products used. This is lower than that reported in a previous study of cleaning standards and practices in food premises in the UK (55% had cleaning schedules, 61% had staff that were aware of dilution and contact times of cleaning chemicals) (Sagoo et al., 2003). These are matters of concern that need to be addressed.

This study found that cleaning cloths used for wiping surfaces in ready-to-eat food preparation areas were more heavily contaminated with bacteria (*ACC*, *Enterobacteriaceae*, *E. coli*, and *S. aureus*) than surfaces sampled (chopping boards, worktops, serving counters, food containers). Cleaning cloths in previous studies of food premises were also found to be heavily contaminated with bacteria (Sagoo et al. 2003; Scott and Bloomfield 1990; 1993; Tebbutt 1984, 1986). Cloths contaminated with *Salmonella* spp. have been associated with outbreaks of infection (Holtby et al. 1997, S Surman-Lee, HPA, personal communication). This underscores the key role that cleaning cloths have in the transfer of bacteria in commercial catering settings. Cleaning cloth hygiene could be improved by ensuring that only freshly disinfected cloths are used for each operation or by single use cloths. Sagoo et al. (2003), Scott and Bloomfield (1990, 1993), and Tebbutt (1984, 1986), have all emphasised the hazards associated with cleaning cloths that may act both as reservoirs of bacteria as well as disseminators of microbial contamination if not handled correctly. There is little point in providing separate surfaces for different preparations if all surfaces are cleaned with the same contaminated cloth. This is also supported by the findings of the present study.

Chopping boards are used extensively in food premises for preparing foods. In this study, 68.1% of mobile food vendors used plastic chopping boards, and these were more heavily contaminated with bacteria than those made from wood or other

materials. Chopping board surfaces that were visually dirty, wet, and/or scored or damaged, were shown to have higher levels of bacteria. Scott and Bloomfield (1990) have shown that microbial survival is enhanced if the surface is wet. There is evidence that multiplication of some bacteria can take place on these contaminated surfaces and that sufficient numbers can be transferred onto food, to represent a potential hazard to food safety (Scott and Bloomfield, 1990). Cutting boards contaminated with *Salmonella* spp. have been shown to be associated with outbreaks of *Salmonella* infection (Sanbom, 1963, S Surman-Lee, HPA, personal communication). It is suggested that boards should be cleaned more frequently within a 24-hour period, preferably before and after each use, with a non-residual disinfectant. Separate chopping/cutting boards should be used for ready-to-eat foods, and scored or damaged boards should be replaced as these are more difficult to clean.

The surfaces of clean empty food containers were also found to have high levels of bacteria. These containers would be used to hold ready-to-eat food. Furthermore, these food containers surfaces had higher levels of *E. coli* (faecal indicator organism) present (19.7%) compared to other surfaces sampled (e.g. chopping/cutting boards (12.2%), work tops (12.1%, and serving counters (6.1%)). This finding is comparable to that reported in a previous study of cleaning standards and practices in UK food premises by Sagoo et al. (2003). Food containers should be thoroughly cleaned between each use and stored in a clean dry place.

A high proportion of potable water samples taken from mobile food vendors were of poor microbiological quality (53.8%), i.e. contained action levels of coliforms, *E. coli* and/or enterococci. Action levels of 53.8% are unacceptably high for potable water to be used in food preparation and for drinking, and are slightly higher than that previously reported in a study of drinking water from mobile vendors in North West England (50%) (McDerment et al., 2002). The presence of coliforms in potable water samples may not be directly related to faecal contamination or a direct risk to public health. However, they do indicate that there has been post process contamination; re-growth or local contamination within the distribution system (EA, 2002). The presence of *E. coli* and enterococci in drinking water indicates contamination with human or animal faeces, are likely to be of greater risk for the presence of enteric pathogens (EA, 2002). This contamination may have arisen from the source water or during loading into containers, storage or use. In this study, 41.1% of tap nozzle and 40.2% of water container neck openings were heavily contaminated with Enterobacteriaceae, including *E. coli*. Where microbial counts are high, it is probably due to the formation of biofilms on the surfaces of containers and pipes. Once a

biofilm has been established it is very difficult to remove, and they protect bacteria from the effects of cleaning and disinfection (Gibson et al., 1999; Ganesh Kumar and Anand, 1998).

Clayton et al. (2003) have shown that food handlers believe the pressure of time may prevent them from carrying out food safety actions, such as washing hands and cleaning surfaces and equipment. Micro-organisms can survive for considerable periods of time on surfaces in food businesses (Kusumaningrum et al. 2003) which highlights the risk posed by ineffective cleaning. In the ready-to-eat food production environment, cleaning cloths, surfaces and equipment should be free from pathogens and faecal indicators. This study has shown the potential for cross-contamination via items used during food preparation and service by mobile food vendors. Current food hygiene training of mobile food vendors does not appear to have been effective in the ensuring implementation of food safety management systems (based on HACCP principles) and cleaning schedules. Training strategies need also to focus on changing the behaviour and attitude of mobile food vendors at work and so minimise the risk of contamination and food poisoning.

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Annex 1: Participating Laboratories and Local Authority Food Liaison Groups

Table I: Participating HPA and HPA Collaborating Laboratories and number of samples

HPA Region	Laboratory Name	Number of Samples							
		Tap Nozzle	Water container/ bottle neck	Chopping Board	Food Container	Serving counter	Work top	Cleaning Cloth	Water
East	Chelmsford	9	32	42	15	1	4	36	46
	Norwich	23	5	29	16	-	3	26	23
London	London FWEM ¹	28	20	39	26	3	13	43	40
South East	Ashford	14	13	25	14	4	6	20	35
	Brighton	70	37	87	41	16	20	72	114
	WEMS ²	54	40	81	45	8	30	77	114
West Midlands	Birmingham	9	3	9	3	1	2	7	11
	Coventry	34	22	48	23	3	12	49	59
	Shrewsbury & Telford	25	20	33	16	2	7	29	47
	Stoke	9	27	27	26	4	6	25	30
	Hereford	4	14	12	3	2	4	9	19
North West	Chester	29	24	52	29	2	6	41	63
	Preston	58	37	66	67	4	31	83	99
	Carlisle	9	14	13	8	4	5	9	21
North East, Yorkshire & the Humber	Hull	24	16	24	8	7	6	34	35
	Leeds	4	6	12	7	2	4	14	18
	Newcastle	13	22	23	14	1	12	25	36
	Sheffield	15	11	23	19	-	5	14	24
South West	Bristol	21	16	30	18	4	3	26	37
	Exeter	15	11	28	13	-	4	18	26
	Plymouth	-	3	3	-	3	1	5	7
	Truro	9	2	13	4	-	4	14	18
East Midlands	Leicester	6	5	8	4	-	4	5	11

	Lincoln	33	38	48	42	16	18	55	87
Total		515	438	775	461	87	210	736	1020

1, London Food, Water & Environmental Microbiology Laboratory

2, Wessex Environmental Microbiological Services

Table II: Participating Other Laboratories and number of samples

Nation	Laboratory	Number of Samples							
		Tap Nozzle	Water container/ bottle neck	Chopping Board	Food Container	Serving counter	Work Top	Cleaning Cloth	Water
England	Kings Lynn & West Norfolk	3	-	3	2	-	1	4	4
Northern Ireland	Belfast City Hospital	15	7	14	19	3	9	20	18
Scotland	Aberdeen City Council Public Analysts	3	4	3	1	1	1	6	6
	Dundee Scientific Services	9	3	7	4	3	2	9	12
	Glasgow Scientific Services	9	5	18	15	2	3	13	20
	Edinburgh	3	-	1	2	1	1	1	3
Wales	Bangor	2	2	3	1	-	2	3	5
	Cardiff	10	4	10	3	1	3	9	14
Total		54	25	59	47	11	22	65	82

Table III: Participating Food Safety Liaison Groups and number of samples

Local Authority Food Liaison Group	Number of Samples							
	Tap Nozzle	Water container/ bottle neck	Chopping Board	Food Container	Serving counter	Work Top	Cleaning Cloth	Water
Berkshire	8	4	14	11	1	1	10	15
Bedfordshire	-	5	4	-	-	1	4	5
Buckinghamshire	7	1	5	-	-	4	8	9
Cambridgeshire	11	3	12	5	-	1	8	11
Cheshire	16	11	29	17	1	4	27	37
Cleveland	3	3	3	2	1	3	4	7
Cornwall	9	2	13	4	-	4	14	18
Cumbria	15	18	18	14	5	9	17	31
Derbyshire	15	15	25	21	1	3	16	29
Devon	5	9	16	4	3	3	8	17
Dorset	9	6	14	3	-	2	10	12
Durham	2	2	2	2	-	2	1	4
East Sussex	31	10	27	10	13	9	27	46
Essex	4	20	25	11	1	2	21	26
LFCG ¹ Greater London NE Sector	-	2	2	-	-	-	2	1
LFCG Greater London NW Sector	6	-	5	4	1	-	6	5
LFCG Greater London SE Sector	10	-	8	5	-	1	8	6
LFCG Greater London SW Sector	2	9	9	13	-	6	7	6
Greater Manchester	28	16	29	33	2	17	38	48
Hampshire & Isle Of Wight	25	21	35	21	5	22	39	63
Hereford & Worcester	8	16	16	5	3	4	13	24
Hertfordshire & Bedfordshire	3	3	6	4	2	1	8	8
Humberside	24	16	24	8	7	6	34	35
Kent	14	13	25	14	4	6	20	35
Lancashire	24	17	32	28	1	10	37	41
Leicestershire	5	3	7	3	-	3	5	9
Lincolnshire	18	12	20	16	6	8	21	38
Merseyside	11	10	18	11	1	2	13	21
North Yorkshire	2	1	6	5	2	2	5	10

Northamptonshire	19	14	25	13	1	9	29	27
Northumberland	2	1	1	1	-	2	1	3
Northern Ireland Food Group ²	15	7	14	19	3	9	20	18
Norfolk	17	5	20	11	-	3	22	21
Nottinghamshire	7	19	19	16	9	8	28	35
Oxfordshire	8	8	13	5	2	4	15	19
Scottish Food Enforcement Liaison Committee ³	24	12	29	22	7	7	29	41
Shropshire	14	10	18	10	1	4	21	29
Somerset	10	5	15	9	-	2	15	16
South West Yorkshire	8	3	8	9	-	4	5	10
Staffordshire	16	31	35	29	4	8	28	39
Suffolk	3	9	13	3	-	1	12	14
Surrey	23	17	39	20	3	7	29	42
Tees Valley	-	-	-	-	-	-	-	-
Tyne & Wear	4	15	14	8	-	5	17	19
Wales North Group	4	5	8	2	-	2	4	10
Wales South West Group	10	4	10	3	1	3	9	14
Warwickshire	12	5	20	7	-	4	16	23
West Midlands	12	10	18	9	3	3	14	24
West of England	14	10	18	8	3	2	19	24
West Sussex	17	10	22	13	-	5	18	27
West Yorkshire	4	6	9	3	-	2	11	11
Wiltshire	10	7	16	13	1	1	8	17
Not Recorded	1	2	1	1	-	1	-	2
Total	569	463	834	508	98	232	801	1102

1, London Food Co-ordinating Group

2, Northern Ireland Food Group comprises of the Eastern, Northern, Southern and Western Groups

3, SFELG comprises of Central Scotland, Fife & Tayside, Lothian & Scottish Borders, North Scotland, and West of Scotland