



British Food Journal

Food safety practices in European TV cooking shows

Daniela Borda Miles R. Thomas Solveig Langsrud Kathrin Rychli Kieran Jordan Joop van der Roest Anca Ioana Nicolau

Article information:

To cite this document:

Daniela Borda Miles R. Thomas Solveig Langsrud Kathrin Rychli Kieran Jordan Joop van der Roest Anca Ioana Nicolau, (2014), "Food safety practices in European TV cooking shows", British Food Journal, Vol. 116 Iss 10 pp. 1652 - 1666

Permanent link to this document:

<http://dx.doi.org/10.1108/BFJ-12-2013-0367>

Downloaded on: 29 May 2016, At: 04:49 (PT)

References: this document contains references to 33 other documents.

The fulltext of this document has been downloaded 823 times since 2014*

Users who downloaded this article also downloaded:

(2012), "Food safety knowledge, attitude and food handling practices of students", British Food Journal, Vol. 114 Iss 4 pp. 469-480 <http://dx.doi.org/10.1108/00070701211219504>

(2014), "Are diets healthier when they contain branded foods?", British Food Journal, Vol. 116 Iss 10 pp. 1522-1532 <http://dx.doi.org/10.1108/BFJ-08-2013-0226>

(2014), "Implementation of ISO-22000 in Spain: obstacles and key benefits", British Food Journal, Vol. 116 Iss 10 pp. 1581-1599 <http://dx.doi.org/10.1108/BFJ-02-2013-0034>

Access to this document was granted through an Emerald subscription provided by All users group

For Authors

If you would like to write for this, or any other Emerald publication, then please use our Emerald for Authors service information about how to choose which publication to write for and submission guidelines are available for all. Please visit www.emeraldinsight.com/authors for more information.

About Emerald www.emeraldinsight.com

Emerald is a global publisher linking research and practice to the benefit of society. The company manages a portfolio of more than 290 journals and over 2,350 books and book series volumes, as well as providing an extensive range of online products and additional customer resources and services.

Emerald is both COUNTER 4 and TRANSFER compliant. The organization is a partner of the Committee on Publication Ethics (COPE) and also works with Portico and the LOCKSS initiative for digital archive preservation.

*Related content and download information correct at time of download.



BFJ
116,10

Food safety practices in European TV cooking shows

1652

Received 22 December 2013
Revised 27 June 2014
Accepted 17 July 2014

Daniela Borda

*Faculty of Food Science and Engineering, Dunarea de Jos University of Galati,
Galati, Romania*

Miles R. Thomas

*Department for Knowledge Management, The Food and Environment Research
Agency, Sand Huton, UK*

Solveig Langsrud

*Microbiology Group, The Norwegian Institute of Food,
Fisheries and Aquaculture Research, Osloveien, Norway*

Kathrin Rychli

*Institute for Milk Hygiene, University of Veterinary Medicine Vienna,
Vienna, Austria*

Kieran Jordan

Food Safety Department, Teagasc Food Research Centre, Fermoy, Ireland

Joop van der Roest

Institute of Food Safety, RIKILT, Wageningen, The Netherlands, and

Anca Ioana Nicolau

*Faculty of Food Science and Engineering, Dunarea de Jos University of Galati,
Galati, Romania*

Abstract

Purpose – The purpose of this paper is to determine how well cooking shows promote safe food handling via TV and to suggest their use for providing good hygiene and good cooking practices examples for consumers.

Design/methodology/approach – Principal component analysis was applied for the multivariate statistical analysis of the cooking shows, the components being: personal hygiene, cross-contamination, cooking and storing practices and risk communication. Data were collected via a questionnaire special designed for the purpose of the study. The positive attributes were converted into numbers using a nine-point Likert scale. This conversion enabled ranking of the cooking shows as a function of the total results obtained and considering the best show as the one with the maximum score attained.

Findings – Evaluation of cooking practices by food safety professionals highlighted the most frequent safety errors and poor practices that are disseminated by the TV shows.



© Daniela Borda, Miles Thomas, Solveig Langsrud, Kathrin Rychli, Kieran Jordan, Joop van der Roest and Anca Nicolau. Published by Emerald Group Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 3.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial & non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licenses/by/3.0/legalcode>

This work was supported by the European Union funded FOODSEG Project (Contract No. 266061) under the 7th RTD Framework.

Practical implications – While the repetition of good food handling and cooking practices risks antagonizing viewers, an increase in occasional emphasis of good hygiene would be of benefit to domestic viewers and potentially improve food safety practices among the public.

Originality/value – This is the first study that gives an European perspective on presentation of safety practices during food handling and preparation in a range of TV cooking shows as it examines 19 such shows broadcasted in six European countries over three months. Adherence to food safety standards and introduction of a star rating system for safety practices in TV cooking shows is proposed.

Keywords Education, Hygiene, Food safety, Consumer, Kitchen, TV cooking shows

Paper type Research paper

1. Introduction

Even though the contamination of food can occur at any stage of food production and major responsibility lies with the producers, a large proportion of foodborne diseases are caused by foods that are improperly cooked or mishandled either in domestic kitchens or in food service establishments (Fotannaz, 2011). Taking into consideration that home prepared food has been suggested to cause a proportion of 9-90 per cent of food borne illnesses, the proportion varying among countries (FSA, 2000; Redmond and Griffith, 2003), it becomes obvious that it is necessary to find means of improving consumer understanding of food safety; one approach could be TV cooking shows.

Cooking shows are part of a growing number of television programmes that challenge the traditional distinction between factual and entertainment programmes, the key ingredient being the cooking demonstration (De Solier, 2005). Most of the cooking shows are performed in a kitchen set in a studio, but there are also shows that are performed in real kitchens (restaurant or home) or outside (garden, beach, river banks or lake shorelines). In such shows, a celebrity chef is very often involved. He/she either does the cooking or acts just as host, coordinator or supervisor of the cooking, while guest professional chefs, celebrities from show-business or other invitees prepare one or more dishes over the show duration.

Although cooking programmes and food demonstrations are perceived as entertainment sources, they are partly educational, so they are excellent vehicles for delivering food safety information to young people (Diehl *et al.*, 2010) and other groups. Indeed, television was cited as one of three main sources of food safety information by Irish teenagers (Tobin *et al.*, 2005).

Warburton (2001) noted that, while cookery programmes were becoming increasingly popular in the UK, it was perceived that they devoted little or no attention to health and safety aspects of food preparation and storage. Subsequently, research carried out at the University of Guelph, Canada (Mathiasen *et al.*, 2004), revealed that chefs on popular television cooking programmes make food safety errors 13 times as often as they handle food correctly. The study showed that an average of seven food-handling mistakes was made during a typical 30-minute show. About 30 per cent of the shows analysed were produced in Canada, while the remainder were from the USA and the UK. The most frequent error was poor hand washing, which occurred in 75 per cent of the segments from 2002 and 96 per cent of those from 2003. Another prevalent mistake was not separating raw from cooked foods, which was noticed in 72 per cent of the shows in 2002 and 86 per cent of those in 2003.

A content analysis of a total of 49 episodes from *30 m Meals*, *The Essence of Emeril*, *Everyday Italian*, *Paula's Home Cooking* and *Semi Homemade Cooking with Sandra Lee* revealed a total of 460 poor food handling incidents, compared to 118 positive food safety references. Most commonly, these shows did not demonstrate washing fruits,

vegetables and herbs properly. A lack of hand washing was also frequently observed (Irlbeck *et al.*, 2009).

TV-cooking shows may be an important way to reach the groups of consumers and demonstrate good practices, but, on the contrary, may also show risky behaviour in the kitchen. In this context, the study aimed to determine how well cooking shows promote safe food handling via a powerful mass-media in six European countries and to determine the need to use of TV cooking shows as tool to support food safety education.

2. Materials and methods

In all, 19 TV cooking shows (Table I), which were broadcast during November 2012 to January 2013 in six European countries (Austria, Ireland, the Netherlands, Norway, Romania and UK) were analysed regarding the hygiene and food safety practices they promoted. The shows were randomly chosen, but covered all the days of a week and different hourly segments.

A group of academics and scientists (authors) covering all the six countries designed the questionnaire and analysed the shows. All the experts involved have a

| Original name/translated name | Country where it was watched | TV-channel | Duration (min) | Type of recording |
|---|------------------------------|--------------|----------------|--|
| <i>Hellstrøms Mesterkokk/Hellstrøms Masterchief</i> | Norway | TV3 | 45 | Precast show, inside (studio), cruise boat kitchen, restaurants, outside (harbour) |
| <i>Barnas Restaurant/Children Restaurant</i> | Norway | NRK | 30 | Precast show, inside (studio), kitchen |
| <i>Hellstrøms Inviterer/Hellstrøm Invitees</i> | Norway | TV3 | 30 | Precast show, inside (studio) |
| <i>Kitchen Hero</i> | Ireland | RTE1 | 30 | Precast show, partly in partly out |
| <i>Jamie's 15 m Meals</i> | Great Britain | Channel 4 | 30 | Precast show, inside (studio) |
| <i>Masterchef Ireland</i> | Netherlands | 24 Kitchen | 30 | Precast show, inside (studio) |
| <i>Neven Maguire – Home Chef</i> | Ireland | RTE1 | 30 | Precast show, inside (studio) |
| <i>Martin Still Loves Fish</i> | Ireland | RTE1 | 30 | Precast show, inside (studio), outside (e.g. garden, at sea); each partially |
| <i>Frisch gekocht mit Andi und Alex/ Rapid Cooking with Andi and Alex</i> | Austria | ORF | 25 | Precast show |
| <i>Silent Cooking</i> | Austria | ORF | 30 | Precast show |
| <i>Koch mit Oliver/Cook with Oliver</i> | Austria | PULS 4 | 25 | Inside (studio) |
| <i>Rudolph's Bakery</i> | Netherlands | 24 Kitchen | 30 | Precast show, inside (studio), |
| <i>Easy Meals</i> | Netherlands | 24 Kitchen | 30 | Precast show, inside (studio) |
| <i>Saturday Kitchen Live</i> | Great Britain | BBC1 | 90 | Live show, inside (studio) |
| <i>Rick Stein's Taste of the Sea</i> | Great Britain | Good Food HD | 30 | Pre-cast show, inside (studio) |
| <i>Top Chef Romania</i> | Romania | Antena 1 | 120 | Precast show, half inside, half outside |
| <i>3Flavours, 3 bucatari/3Flavours, 3 Cooks</i> | Romania | Prima TV | 30 | Precast show, real kitchen |
| <i>Cireasa de pe tort/The Cherry on Top of the Cake</i> | Romania | Prima TV | 60 | Precast show, real kitchen |
| <i>Reteta de acasa/The Recipe of Home</i> | Romania | Acasa TV | 15 | Precast show, studio |

Table I.
The TV cooking shows submitted to food safety evaluation

general expertise is in the food safety domain, while their specific expertise covers food microbiology, hygiene in kitchens and in other food business units, food safety management, and consumer behaviour in relation to food safety. In addition, they act occasionally as external auditors of food safety systems implemented in food business units.

A draft questionnaire was made by three of the experts, then discussed and revised by all involved scientists. Important criteria for designing the questionnaire were that risky handling practices that are frequently reported from domestic studies had to be covered (Shapiro *et al.*, 2011). However, due to the format of the cooking shows, some practices (e.g. left-over handling) could not be included as they are not elements of the processes included in TV shows.

The questionnaire had two parts. The first allowed the researchers to collect information on show duration, frequency of broadcasting, show type from the point of view of its aim (competition, instructive, product placement) and the type of broadcasting (live or pre-cast), TV channel, place (real kitchen, studio kitchen, outside) and persons who did the cooking (chefs, celebrities or lay public – males or females). The second part of the questionnaire was designed to evaluate: personal hygiene, cross-contamination, cooking and storing conditions, risk communication. These topics were considered by the World Health Organisation (WHO) to cover the five keys to safer food (WHO, 2006).

Topics taken into consideration in Sections 1, 2 and 3 are similar to those present in the questionnaires that food safety officers use when evaluating the food business operators (Bolton *et al.*, 2005; Queensland Health, 2010; Wright *et al.*, 2012). Section 4 was specially introduced to investigate if cooking shows are used as communication channels for food risk. The questions of the survey are presented in Table II.

The answers to these questions were recorded as frequency attributes (never, infrequent and frequent) representing the number of the safety practices corresponding to the show's length. Furthermore, the positive attributes were converted into numbers using a nine-point Likert scale, where never was rated with one point, infrequent with five points and frequent with nine points, and the negative attributes were rated

| Category | Question | Abbreviation |
|----------|---|---------------|
| A | Were the hands been washed before start cooking? | Hands_A |
| | Was a chef uniform or any similar protection equipment worn? | Dress_A |
| | Did she/he wear jewellery and/or a watch? | Jewellery_A |
| | Did she/he have long or polished nails? | Nails_A |
| B | Were the hands been washed after contact with raw meat/fish? | Hands_B |
| | Was the chopping board changed after contact with raw meat/fish? | Chopp_B |
| | Were the knives changed or washed after contact with raw meat/fish? | Knives_B |
| | Were the spoons changed or washed properly after tasting the cold meal? | Spoons_B |
| C | Was there an assessment that the meat/fish was cooked properly (using thermometer)? | Cooking_C |
| | Were any instructions about appropriate cooking given (minimum time/temperature)? | Training_C |
| D | Were any instructions about the cooling temperature and time given? | Cooling_C |
| | Was food safety information provided? | Safety_info_D |
| | Was any information contradictory to food safety recommendations? | Bad info_D |
| | Were any cleaning procedures mentioned? | Cleaning_D |

Table II. Questions and associated acronyms applied to assess the food safety practices in TV shows

with -1 point for never, infrequent with -5 points and frequent with -9 points. This convention enabled ranking of the cooking shows as a function of the total results obtained and to consider the best show with the maximum score attained. For multiple evaluation of the same cooking show, an average value was further taken into account in the statistical analysis.

In addition to filling out the questionnaire, the experts made notes on risky food handling observed in the show that was not covered in the questionnaire.

3. Data analysis

The reliability of the data regarding food safety practices collected by the evaluators of the above mentioned TV cooking shows was checked using the Cronbach's α coefficient for multiple items (Clayton and Griffith, 2008; Saba and Messina, 2002). Cronbach's α assessed how reliable the results of the TV evaluation reports were to measure the same construct (food safety practices). This coefficient was calculated using the MINITAB 16 software for the data set after standardization (the mean values for each variable were subtracted from each variable value and the result was divided by the standard deviation of the values for each variable). Cronbach's α values approaching 1 suggest high internal consistency, while a benchmark value of 0.7 is commonly used to indicate that the items measure the same construct (Saba and Messina, 2002).

A principal component analysis (PCA) that transforms the original measured variables into new variables, called principal components (Berrueta *et al.*, 2007; Çam *et al.*, 2009; Patras *et al.*, 2011), was performed using the Unscrambler software (Version 9.7; CAMO, Norway). PCA is a mathematical tool which performs a reduction in data dimensionality and a transformation into a new co-ordinate system. This allows visualization of the underlying structure of the experimental data and relationships between data and variables, together with a significant decrease in noise. PCA gives the possibility to analyse the data collected in a multivariate way (Fernandéz-Ruiz *et al.*, 2013), thus considering both the overall performance of the cooking shows (which allows their classification) and the reciprocal relationship between the food handling practices (Demattè *et al.*, 2013).

The PCA was applied on a data matrix with 19 rows corresponding to each evaluated cooking show, and 14 columns corresponding to questions from the categories A, B, C and D (Table I). The answer to the questions was introduced in each of the 14 columns as an average score per show. The data were mean-centred, not standardized and full cross-validated (Johansen *et al.*, 2011).

Based on the maximum decrease of the residual variance and according to the parsimony principle, four principal components were selected in the PCA.

Comments made within the Results and Discussions section referring to frequency of events described by PCA were made using the following terms: very rarely for <10 per cent of the situations, rarely/infrequent/occasionally for 10-25 per cent, often for 60-80 per cent and very often for more than 80 per cent.

4. Results and discussions

4.1 Descriptive data

Most of the cooking shows taken into consideration in this study happen to be instructive (74 per cent), had professional chefs as performers (63 per cent) and were of 30 minutes or less duration (79 per cent).

The value obtained for the Cronbach's α coefficient (0.821) proved that evaluators were consistent when assessing the TV cooking shows and provided a reliable

judgement of the safety practices, even if they did not watch the same TV shows. This result also suggests that the questionnaire was a reliable tool for evaluating the cooking practices in different TV shows, when applied by evaluators with a similar background.

Many commonly recurring errors were reported in most of the cooking shows evaluated for safety practices, either from the point of view of personal hygiene, cross-contamination or cooking and storage practices. The results demonstrated significant differences across the investigated safety practices, taken into account by the four categories of questions presented in Table II (A-D). In the evaluated TV shows, the performers had a very low score ($M = -0.04$; $SD = 0.02$) for personal hygiene (category A), obtained better results for the measures applied to assess cooking and storage safety (category C) ($M = 2.70$; $SD = 1.66$, $p < 0.02$), and even better results for the hygienic handling practices ($M = 3.01$; $SD = 2.56$, $p < 0.01$) (category B). A similar type of finding was reported in a study made for the home cooking environment by Shapiro *et al.* (2011) in which respondents demonstrated more positive attitudes towards proper hygienic food handling than towards using food thermometers.

Risk communication (category D) registered scores ($M = 1.05$; $SD = 0.74$) situated between those obtained for personal hygiene and cooking and storage. Comments on the recurring errors identified in the TV cooking shows are presented below.

4.2 Personal hygiene

Personal hygiene includes several issues, such as protecting the food from contamination from the preparer (avoid contamination via feces, body fluids and hair) or clothes. It was not possible to include all factors associated with personal hygiene in the questionnaire, but the expert viewers noted risky behaviour beyond the questionnaire when observing this. Several other poor practices not included in the questionnaire were observed, including scratching the head and nose whilst cooking, and sniffing the food by getting the nose very close to it. These practices could be associated with contamination of food with *Staphylococcus aureus*, and represent a risk if the food is not stored properly after preparation allowing the pathogen to multiply and produce toxin.

Hands are an important source for several food associated pathogens (Montville *et al.*, 2002). Washing hands before handling food was performed only occasionally by some of the cooks instead of being promoted as common practice. Although one children's cooking programme (*The Children's Restaurant*) did emphasize the need for washing hands, no instruction regarding how this action should be performed was provided. As many studies have demonstrated that the practice of washing hands, although it is one of the basics rules, represents one of the most difficult practices to implement (Larson *et al.*, 2000; Pittet, 2000; Clayton and Griffith, 2003). TV cooking shows could offer a good support for visual demonstrations of hand washing, if their producers understand the show's impact on creating appropriate behaviours regarding hygiene practices. Watches, bracelets and occasionally rings, which may protect bacteria during the hand washing procedure, were often worn by professional chefs (seen in 68 per cent of the evaluated TV shows).

Using hygienic clothing, such as wearing aprons and covering the hair was included in the questionnaire although these measures to avoid contamination may be of less importance than hand washing regarding direct risk, and may be more regarded as signals for hygiene. Even when the shows involved professional chefs 33 per cent of them did not wear hats, whites or aprons. As discussed below, using the clothes as cloths for hand cleaning was observed.

4.3 Cross-contamination

Cross-contamination occurrences are difficult to determine, however many experts agree that cross-contamination plays an important role and is responsible for the sporadic outbreaks associated with home cooking (Humphrey, 2001; Clayton and Griffith, 2003). If only this argument is to be considered, it would be highly advisable for all TV cooking shows to display correct food handling practices that will induce the viewer to use correct cooking practices. Practices associated with the risk of cross-contamination from raw products to ready-to-eat products were observed in several shows. Important vehicles for transfer of pathogens are hands and equipment with direct food contact with such as knives, spoons and chopping boards. The practice of washing hands after handling raw meat or fish was infrequently observed (16 per cent of the evaluated TV shows) and on occasion the host chef had to prompt the guest chef to carry this out. In other shows (e.g. *Top Chef Romania*, *Hellstroms Masterchef*, *Saturday Kitchen Live*) chefs seemed to prefer to wipe their hands on a dry cloth, such as a tea towel or an apron (sometimes blood-stained), between any operation, and this was inevitably the same cloth used throughout the cooking operation, with obvious cross-contamination risks. It is not appropriate to use the same cloth to clean hands and to clean cutting boards and plates, even if it is wet, especially after handling raw meat.

One practice regularly adhered to in the UK was that of presenting and preparing meat, fish and vegetables on different chopping boards, with red and blue plastic boards regularly used for meat and fish, respectively, while wooden chopping boards were almost always used for vegetables, fruit and bread. Unfortunately, this was not the case for the shows evaluated in the other EU countries. TV viewers need to know that cross-contamination also occurs when cutting boards are just wiped using paper tissue (common practice in *3 Flavours*, *3 Cooks*).

The practice of regularly tasting food during preparation using a spoon was often suggested or even shown (seen in 71 per cent of the evaluated TV shows), but what happens with the spoon afterwards was very rarely demonstrated (happened in 4 per cent of the evaluated TV shows), so it was assumed that the spoon was washed to avoid the risk of contamination from using it repeatedly without washing between operations. This action should, however, be mentioned, if not shown. Using the same unwashed spoon was seen on several occasions. Furthermore, using fingers to taste food was observed. Sometimes this happened several times with the same food. Besides the risk of transferring microorganisms to food, the habit of tasting food by fingers or repeatedly using the same spoon without washing it is perceived by TV cooking shows fans as a disgusting habit. For example, the *Points of View* page on the BBC web site contains complains on the bad hygiene practices presented in Master Chef show (Littlejohn, 2013).

4.4 Cooking and storage conditions

Heat treatment is among the most important measures in the kitchen to eliminate vegetative bacteria in raw materials and similarly cooling for inhibition of bacterial growth and toxin production. A recent consumer study showed that temperature violations (cooking, cooling and storage) was rated among the most risky food handling behaviours in the home (Røssvoll *et al.*, 2012).

Advice on cooking times was difficult to assess across or between TV programmes or even within a programme, as several different dishes were prepared, using specific raw ingredients requiring a wide range of cooking techniques, times and temperatures.

Precise heat treatment times were rarely given (happened in 25 per cent of the evaluated TV shows) though mentioning an appropriate cooking temperature where ovens were used was a normal practice. Assessments of whether food was thoroughly cooked were very often based on visual appearance (seen in 96 per cent of the evaluated TV shows). Although judging visual appearance is a common method to evaluate doneness of red meat, it may not be a safe method to measure proper heat treatment (Kennedy *et al.*, 2011; Røssvoll *et al.*, 2014).

For items such as large fish, easy removal of skin or inserting a knife into the deepest part of the flesh then testing for warmth on the lip were advised. Such advice is not only bad, but it is also dangerous, leaving the consumer at risk of being burned. In none of the programmes assessed were any recommendations given on appropriate cooling and subsequent storage conditions if food was not to be consumed immediately.

Data reported in the literature show that cooks are more prone to the practice of hand washing than to that of using food thermometers and proper temperature control (Redmond and Griffith, 2003; Shapiro *et al.*, 2011). Similarly, in the present study, people showed a more positive attitude towards hand washing if prompted than usage of food thermometers to check meat temperature when cooking.

4.5 Risk communication

TV cooking shows should adhere to food safety standards and should use the opportunity to introduce simple but important food safety messages. There is a real challenge for the programme production team to balance between the education and entertainment message of the cooking shows. However, only the success of achieving this balance could considerably contribute to improve food safety practices. While good hygiene practices were often indirectly suggested, the reasons behind following such practices, like the risk of microbiological contamination from raw to cooked food, was rarely, if ever mentioned.

The risk of consuming unwashed fruits and vegetables was not communicated and only 17 per cent of the evaluated TV shows demonstrated the practice of washing fruits and vegetables before cooking. An exception to this was *Cook with Oliver* and *Jamie's 15 m Meals*, where the practice of washing vegetables before preparation was quite common. Although washing with water may not completely eliminate pathogens, it can potentially reduce their numbers, and this fact should be announced to consumers as a measure to fight against the food outbreaks related to raw vegetables, fruits and berries, which are increasing (Verhoeff-Bakkenes *et al.*, 2011).

Good refrigerator practice was also something that was very rarely mentioned (in 5 per cent of the evaluated TV shows) and simple steps like allowing food to cool thoroughly before refrigeration and appropriate refrigeration temperatures could easily be, but were almost never, included in such programmes. The likelihood of antagonizing the viewer through patronizing repetition of good food handling and cooking practices is high, but programmes often show bad practices, which is also rarely pointed out, or if corrected, the reasons for correction are not explained. An increase in emphasis of good practices would therefore clearly be of benefit to domestic food safety practice.

It is also feasible to introduce a star rating system for safety practices in TV cooking shows similar to the one used for restaurants. Table III suggests a star rating scheme for TV cooking shows. The number of stars given to a show would indicate how reliable the show is from the point of view of safety practices. Such a measure

Table III.
Proposal for hygiene ratings of TV cooking shows

| Number of stars | Significance | Explanatory notes |
|-----------------|-----------------------------|---|
| 0 | Major improvements required | Infringements of food hygiene rules are noticed. No comments on hygiene rules and food risks are made |
| 1 | Poor standards | Food hygiene rules are inconsistently applied, bad practices being often noticed. No comments on hygiene rules and food risks are made |
| 2 | Fair standards | Food hygiene rules are applied. Comments on hygiene rules and on food risks are not made |
| 3 | Good standards | Food hygiene rules are respected. Comments on hygiene rules and on food risks are made occasionally |
| 4 | Very good standards | Food hygiene rules are respected. Comments on hygiene rules are made on regular basis, while on food risks are made occasionally |
| 5 | Excellent standards | Personal hygiene rules are respected. Practices regarding food handling and temperature control are well demonstrated. Comments on hygiene rules and food risks are made on regular basis |

could be seen equally as a stimulant for broadcasters to improve the hygiene practice they promote via TV cooking shows and an intervention strategy tailored for the needs of individual consumers to obtain improvements in public health. If such a measure is implemented, the person giving the star rating would need to be qualified in food safety.

4.6 PCA

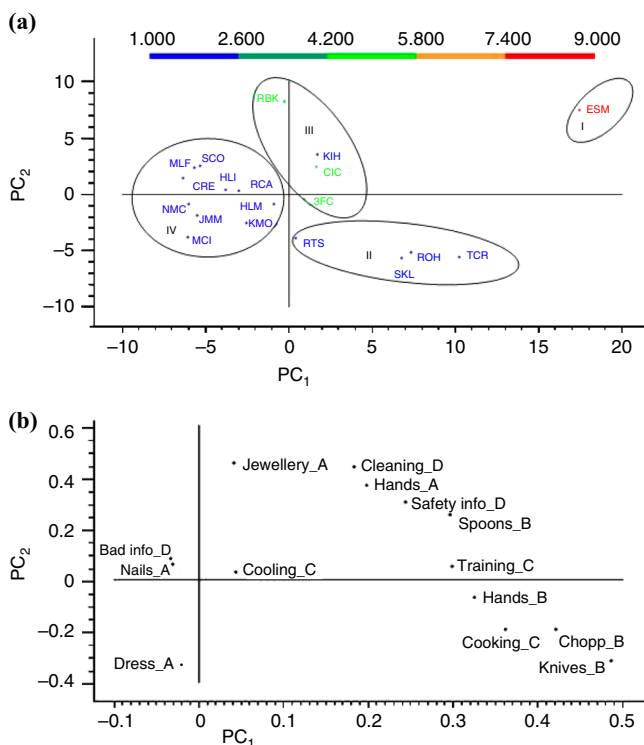
PCA was applied for the multivariate statistical analysis of the cooking shows. The analysis was performed using four principal components based on their ability to explain over 84 per cent of the total variance.

The score and the loadings for PC₁-PC₄ are indicated in Figures 1 and 2.

The loading plot of the first two principal components PC₁ and PC₂ explaining 64 per cent of the total variance provided a projection view of the inter-variable relationships and showed how much the questions contributed to each principal component. As the results from Figure 1 show, PC₁ which has the highest contribution to the total variation (47 per cent) is strongly influenced by the questions from the cross-contamination category (B). The strongest influence on PC₁ is given by the chopping boards and knives, indicating that the practice of using the same boards and/or knives for raw fish or meat and then for cooked foods or for ready to eat salads, without washing them and the good practices of washing the utensils and the chopping boards were noticed, suggesting a strong variation of these practices among the evaluated shows.

Another important contribution to the variation in PC₁ is the assessment of the appropriateness of cooking regime, a question that was included in category C. The practice of wiping hands with the same cloth when handling raw and cooked foods from category B also highly contributed to the total variation (Figure 1(b)) measured by the principal component (PC₁).

When analysing the score plot (Figure 1(a)), it can be easily seen that *Easy meals* is the TV show ranked first from the perspective of the food safety practices applied, having the highest average score for the B category of questions (nine points). This illustrates that during this show most of the good practices that prevent cross-contamination were explicitly demonstrated. *Easy Meals* had very good average scores for categories A and C also, and it was included in a separate cluster apart from all the rest of the TV shows, in cluster I.

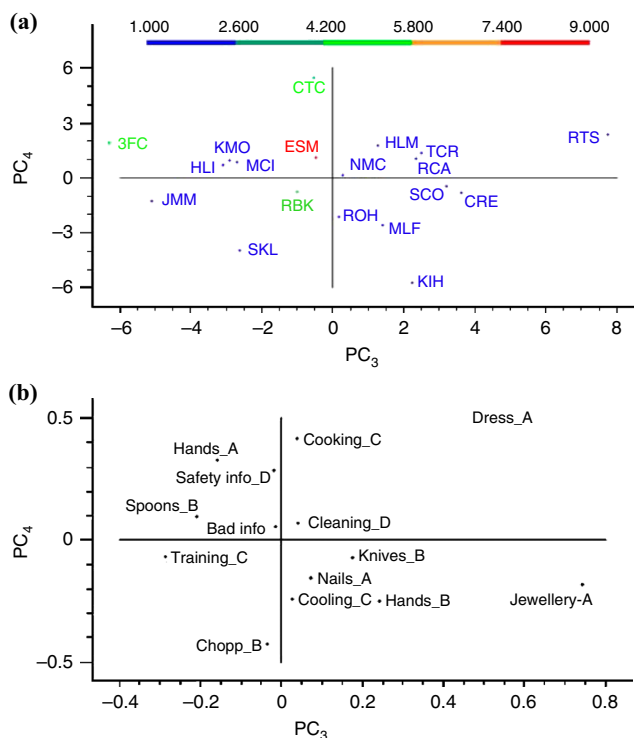


Notes: Hellstroms Masterchief, HLM; Children Restaurant, CRE; Hellström Invitees, HLI; Kitchen Hero, KIH; Jamie's 15 Minute Meals, JMM; Masterchef Ireland, MCI; Neven Maguire Home Chef, NMC; Martin Still Loves Fish, MLF; Rapid Cooking with Andi and Alex, RCA; Silent Cooking, SCO; Cook with Oliver, KMO; Rudolph's Bakery, RBK; Easy Meals, ESM; Saturday Kitchen Live, SKL; Rick Stein's Taste of the Sea, RTS; Top Chef Romania, TCR; 3 Flavours, 3 Cooks, 3FC; The Cherry on Top of the Cake, CTC; The Recipe of Home, ROH

Figure 1. PCA analysis of cooking shows, scores (a) (I, II, III, IV-clusters) and loadings (b) plots for PC₁ (47 per cent) and PC₂ (17 per cent)

The second centroid cluster (II) in PC₁ gathered TV shows with very good average scores for the B category of questions such as: *Top Chef Romania*, *The Recipe of Home* and *Saturday Kitchen Live*. *Rick Stein's Taste of the Sea*, (Figure 1(a)), can be considered as being safe for some hygiene aspects (cleaning the knives or using different knives for cutting raw foods and cooked foods, wearing aprons and adequate uniform, hand washing during preparing food). However, some of the practices demonstrated were not very good (i.e. the repeated use of the same spoon to taste raw and cooked food without any washing step, the habits of wearing wrist watches and other jewellery while cooking).

It should be taken into account that the shows *Rick Stein's Taste of the Sea*, *Top Chef Romania* and *Saturday Kitchen Live* were performed by professionals, while the *The Recipe of Home* show was presented by a celebrity, which could explain its lower



Notes: *Hellstroms Masterchief*, HLM; *Children Restaurant*, CRE; *Hellström Invitees*, HLI; *Kitchen Hero*, KIH; *Jamie's 15 Minute Meals*, JMM; *Masterchef Ireland*, MCI; *Neven Maguire Home Chef*, NMC; *Martin Still Loves Fish*, MLF; *Rapid Cooking with Andi and Alex*, RCA; *Silent Cooking*, SCO; *Cook with Oliver*, KMO; *Rudolph's Bakery*, RBK; *Easy Meals*, ESM; *Saturday Kitchen Live*, SKL; *Rick Stein's Taste of the Sea*, RTS; *Top Chef Romania*, TCR; *3 Flavours, 3 Cooks*, 3FC; *The Cherry on Top of the Cake*, CTC; *The Recipe of Home*, ROH

Figure 2. PCA analysis of cooking shows, scores (a) and loadings (b) plots for PC₃ (13 per cent) and PC₄ (7 per cent)

score compared with *Top Chef Romania* on PC₁. Moreover, *Rick Stein's Taste of the Sea*, *Saturday Kitchen Live* and *The Recipe of Home* are instructive shows while *Top Chef Romania* is a competition between professional chefs and the stress of competition could increase the number of mistakes compared to the regular shows.

The third centroid cluster (III) in PC₁ was placed at a significant distance from the first one and it included shows such as *Rudolphs Bakery*, *The Cherry on Top of the Cake* and the show *3 Flavours, 3 Cooks*. This cluster had variations given by the jewellery wearing habit, by the cleaning practices and hand washing before cooking and it was influenced mainly by variables from category A questions.

The fourth cluster (IV) included shows with a low average score and multiple inconsistencies for the food safety practices applied. When considering both PC₁ and PC₂ it was noticed that the fourth cluster was separated by the horizontal axis PC₁ in two parts (Figure 1(a)): on the positive scale of PC₂ is situated *Barnas Restaurant* and

Rapid Cooking with Andi and Alex and on the negative scale of PC₂ is situated *Hellstroms Masterchef* and *Cook with Oliver*. The results of the evaluation showed that *Hellstroms Masterchef* and *Cook with Oliver* had low average scores for the A category of questions, while *Barnas Restaurant* and *Rapid Cooking with Andi and Alex* had positive values for the same category of questions. These findings are connected with the personal hygiene measures, namely the presence of wristwatches and other jewellery, that were observed in *Hellstroms Masterchef*, *3 Flavours*, *3 Cooks* and *Cook with Oliver* shows and were seen less frequently in cooking shows like *Barnas Restaurant* and *Rapid Cooking with Andi and Alex*.

The principal component two (PC₂) contributed 17 per cent to the total variation and it was influenced by the practice of wearing jewellery, cleaning and hand washing on the positive scale of the axis (Figure 1(b)) where *Rudolph's Bakery* is the show that had the maximum score (Figure 1(a)). On the negative scale of PC₂, the variation was influenced by the wearing of protective equipment, aprons or special dresses (Figure 1(b)) and *The Recipe of Home* together with *Saturday Kitchen Live* registered low average scores (Figure 1(a)).

Principal component three (PC₃) contributed 13 per cent at the total variation. It was strongly influenced by the practice of hat and apron wearing, jewellery wearing and also by hand washing, food cooling on the positive side of the axis designated by PC₃.

PC₃ was influenced by cooking instruction, the presence of food safety information and the habit of using the same spoons to taste raw and cooked foods on the negative side of the axis (Figure 2(b)). From this perspective shows such as *Rick Stein's Taste of the Sea* obtained a high score for the personal hygiene and *3 Flavours*, *3 Cooks* a low score for the same criterion. The fourth principal component – PC₄ – had a smaller contribution to the total variation (7 per cent) compared with the other three analysed. A positive contribution was given by the cooking practices but also by questions regarding risk communication from category D, where *Hellstroms Masterchef* show registered a high average score. The strong influence of variables such as cooling but also chopping boards placed the show *Saturday Kitchen Live* on the negative side of PC₄ axis. Furthermore, it can be noticed that *The Cherry on Top of the Cake* is a show in which food safety risk communication was well undertaken as opposed to *The Recipe of Home*, which was placed on the negative side (Figure 2(a, b)) of PC₄ axis.

Overall, when analysing the distribution of the shows according to PC₁ and PC₂, four main clusters were noticed that allowed classification of the shows. PCA indicated that 47 per cent of the evaluated TV shows are included in three clusters (I-III) that have relative high average scores, but need improvements of certain safety aspects mostly related to cross-contamination and personal hygiene, while the rest of the shows (53 per cent) had relatively low average scores and presented many poor hygiene practices that could negatively influence the viewers.

The best safety practices were observed for the show *Easy Meals* presented by the 24 Kitchen TV programme.

5. Conclusions

Evaluation of the cooking shows by food safety professionals, using questionnaires combined with PCA analysis, enabled identification of similarities and differences in the cooking practices in TV shows.

The investigation revealed that unsafe handling of food or lack of preventive measures to reduce the likelihood of food poisoning is frequent in European TV cooking shows,

either instructive or competitive. Time pressure, which is high in cooking competitions, should not be an excuse for mistakes regarding hygiene rules and food safety practices.

Associating risk communication with endorsement gestures of the safe handling practices would increase the educational role of the TV cooking shows. To let the public know how reliable a cooking show is for food safety practices and risk communication, a star rating scheme was proposed. The effect of such shows, alone and in combination with other measures to improve safety should be subject for further research.

References

- Berrueta, L.A., Alonso-Salces, R.M. and Héberger, K. (2007), "Supervised pattern recognition in food analysis", *Journal of Chromatography A*, Vol. 1158 Nos 1/2, pp. 196-214.
- Bolton, D.J., Meally, A., Trimble, J., Blair, I. and Cowan, C. (2005), "Food safety knowledge, microbiology and refrigeration temperatures in restaurant kitchens on the Island of Ireland", available at: www.safefood.eu/SafeFood/media/SafeFoodLibrary/Documents/Professional/Ref-01-RESR109AStudyOfFoodSafetyKnowledgeMicrobiologyAndRefrigerationTemperaturesInRestaurantKitchensOnTheIslandOfIreland.pdf (accessed 19 February 2013).
- Çam, M., Yaşar, H. and Durmaz, G. (2009), "Classification of eight pomegranate juices based on antioxidant activity measured by four methods", *Food Chemistry*, Vol. 112 No. 3, pp. 721-726.
- Clayton, D.A. and Griffith, C.J. (2008), "Efficacy of an extended theory of planned behaviour model for predicting caterers' hand hygiene practices", *International Journal of Environmental Health Research*, Vol. 18 No. 2, pp. 83-98.
- Clayton, D.A., Griffith, C.J. and Price, P. (2003), "An investigation of the factors underlying consumers' implementation of specific food safety practices", *British Food Journal*, Vol. 105 No. 7, pp. 434-453.
- Demattè, M.L., Endrizzi, I., Biasioli, F., Corollaro, M.L., Pojer, N., Zampini, M., Aprea, E. and Gasperi, F. (2013), "Food neophobia and its relation with olfactory ability in common odour identification", *Appetite*, Vol. 68 No. 1, pp. 112-117.
- De Solier, I. (2005), "TV dinners: culinary television, education and distinction", *Continuum: Journal of Media and Cultural Studies*, Vol. 19 No. 4, pp. 465-481.
- Diehl, D.C., Pracht, D.W., Forthun, L.F. and Simonne, A.H. (2010), "Food safety for 4-h youth: a survey of interests and educational methods", *The Journal of Extension*, Vol. 48 No. 4, pp. 1-11.
- Fernandéz-Ruiz, V., Claret, A. and Chaya, C. (2013), "Testing a Spanish-version of the food neophobia scale", *Food Quality and Preference*, Vol. 28 No. 1, pp. 222-225.
- Fotannaz, F. (2011), "31 August. Françoise Fontannaz explains the work of WHO in empowering consumers to prevent foodborne diseases, and the role and responsibilities of consumers to improve food safety", available at: www.research-europe.com/index.php/2011/08/francoise-fontannaz-technical-officer-world-health-organization-food-safety/ (accessed 10 March 2013).
- FSA (2000), "Foodborne disease: developing a strategy to deliver the agencies targets", Paper No. FSA 00/05/02, Agenda item 4, Food Standards Agency, London, 12 October.
- Humphrey, T. (2001), "The spread and persistence of *Campylobacter* and *Salmonella* in the domestic kitchen", *Journal of Infection*, Vol. 43 No. 1, pp. 50-53.
- Irlbeck, E.G., Akers, C. and Brashears, M.A. (2009), "Content analysis of food safety measures on television's food network", *Food Protection Trends*, Vol. 29 No. 1, pp. 16-20.
- Johansen, S.B., Næs, T. and Hersleth, M. (2011), "Motivation for choice and healthiness perception of calorie-reduced dairy products: a cross-cultural study", *Appetite*, Vol. 56 No. 1, pp. 15-24.

- Kennedy, J., Gibney, S., Nolan, A., O'Brien, S., McMahon, M.A.S., McDowell, D., Fanning, S. and Wall, P.G. (2011), "Identification of critical points during domestic food preparation: an observational study", *British Food Journal*, Vol. 113 Nos 6-7, pp. 766-783.
- Larson, E.L., Early, E., Cloonan, P., Sugrue, S. and Parides, M. (2000), "An organizational climate intervention associated with increased handwashing and decreased nosocomial infections", *Behavioral Medicine*, Vol. 6 No. 1, pp. 14-22.
- Littlejohn, G. (2013), "Masterchef accused of bad hygiene standards after viewers complain", available at: www.entertainmentwise.com/news/112787/Masterchef-Accused-Of-Bad-Hygiene-Standards-After-Viewers-Complain (accessed 1 June 2014).
- Mathiasen, L.A., Chapman, B.J., Lacroix, B.J. and Powell, D.A. (2004), "Spot the mistake: television cooking shows as a source of food safety information", *Food Protection Trends*, Vol. 24 No. 5, pp. 328-334.
- Montville, R., Chen, Y. and Schaffner, D.W. (2002), "Risk assessment of hand washing efficacy using literature and experimental data", *International Journal of Food Microbiology*, Vol. 73 Nos 2/3, pp. 305-313.
- Patras, A., Brunton, N.P., Downey, G., Rawson, A., Warriner, K. and Gernigon, G. (2011), "Application of principal component and hierarchical cluster analysis to classify fruits and vegetables commonly consumed in Ireland based on in vitro antioxidant activity", *Journal of Food Composition and Analysis*, Vol. 24 No. 2, pp. 250-256.
- Pittet, D. (2000), "Improving compliance with hand hygiene in hospitals", *Infections Control and Hospital Epidemiology*, Vol. 21 No. 6, pp. 381-386.
- Queensland Health (2010), "Know your food business – a self-assessment guide to the food safety standards", The State of Queensland, available at: www.health.qld.gov.au/ph/Documents/ehu/21883.pdf (accessed 1 June 2014).
- Redmond, E.C. and Griffith, C.J. (2003), "Consumer food handling in the home: a review of food safety studies", *Journal of Food Protection*, Vol. 66 No. 1, pp. 130-161.
- Røssvoll, E.H., Rønning, H.T., Granum, P.E., Møretro, T., Hjerpekjøn, M.R. and Langsrud, S. (2014), "Toxin production and growth of pathogens subjected to temperature fluctuations simulating consumer handling of cold cuts", *International Journal of Food Microbiology*, Vol. 185, August, pp. 82-92.
- Røssvoll, E.H., Ueland, Ø., Hagtvedt, T., Jacobsen, E., Lavik, R. and Langsrud, S. (2012), "Application of hazard analysis and critical control point methodology and risk-based grading to consumer food safety surveys", *Journal of Food Protection*, Vol. 75 No. 9, pp. 1673-1690.
- Saba, A. and Messina, F. (2002), "Attitudes towards organic foods and risk/benefit perception associated with pesticides", *Food Quality and Preference*, Vol. 14 No. 8, pp. 637-645.
- Shapiro, M.A., Porticella, N.L., Jiang, C. and Gravani, B.R. (2011), "Predicting intentions to adopt safe home food handling practices. Applying the theory of planned behavior", *Appetite*, Vol. 56 No. 1, pp. 96-103.
- Tobin, J., Henehan, G. and Moran, F. (2005), "Food safety knowledge, attitudes and behavior of Irish teenagers", *Food Protection Trends*, Vol. 25 No. 11, pp. 832-837.
- Verhoeff-Bakkenes, L., Jansen, H.A.P.M., in 't Veld, P.H., Beumer, R.R., Zwietering, M.H. and van Leusden, F.M. (2011), "Consumption of raw vegetables and fruits: a risk factor for Campylobacter infections", *International Journal of Food Microbiology*, Vol. 144 No. 3, pp. 406-412.
- Warburton, N. (2001), "An opportunity lost", *Environmental Health Journal*, Vol. 109 No. 4, pp. 113-115.
- WHO (2006), *Five Keys to Safer Food Manual*, World Health Organisation, Geneva, available at: www.who.int/foodsafety/publications/consumer/manual_keys.pdf (accessed 19 February 2013).

Wright, M., Leach, P. and Gill, P. (2012), "A tool to diagnose culture in food business operators report from Greenstreet Berman Ltd for the FSA", available at: www.foodbase.org.uk/admin/tools/reportdocuments/803-1-1430_FS245020.pdf (accessed 20 May 2014).

Further reading

Fischer, A.R.H., De Jong, A.E.I., Van Asselt, E.D., De Jonge, R., Frewer, L.J. and Nauta, M.J. (2007), "Food safety in the domestic environment: an interdisciplinary investigation of microbial hazards during food preparation", *Risk Analysis*, Vol. 27 No. 4, pp. 1065-1082.

About the authors

Daniela Borda is a Professor of Food Safety and Dairy Technology. She is licensed to perform audits on food safety systems.

Miles R. Thomas is an Expert in Web-Based Applications for delivery of information on food safety and quality. He is the Head of Knowledge Management.

Dr Solveig Langsrud is a Research Scientist and a Member of the Microbiology-Group at NOFIMA.

Dr Kathrin Rychli is a Doctor of Veterinary Medicine. She is the Leader of the working group Adaptation of Food Associated Pathogens.

Kieran Jordan is a Principal Research Officer responsible for the Co-ordination of Food Safety projects.

Joop van der Roest is a Researcher and an expert in Food Quality and Safety.

Anca Ioana Nicolau is a Professor of Food Microbiology, Hygiene in Food Processing Units and Public Food. Anca Ioana Nicolau is the corresponding author and can be contacted at: anca.nicolau@ugal.ro

This article has been cited by:

1. Pei Yee Woh, Kwai Lin Thong, Jerzy Marian Behnke, John Watkin Lewis, Siti Nursheena Mohd Zain. 2016. Evaluation of basic knowledge on food safety and food handling practices amongst migrant food handlers in Peninsular Malaysia. *Food Control* **70**, 64-73. [[CrossRef](#)]
2. Curtis Maughan, Edgar Chambers, Sandria Godwin. 2016. Food safety behaviors observed in celebrity chefs across a variety of programs. *Journal of Public Health* fdw026. [[CrossRef](#)]
3. Sharon Friel, Laura Ford. 2015. Systems, food security and human health. *Food Security* **7:2**, 437-451. [[CrossRef](#)]