# Food safety survey of retail doner kebabs in NSW

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Doner kebab outlets (237) across NSW were surveyed for compliance to food handling practices within the Australia New Zealand Food Standards Code and 236 doner kebab samples were assessed against microbiological guidelines for ready-to-eat products. While issues concerning temperature control and hygiene and sanitation of utensils and equipment were mainly resolved at the time of inspection, formal regulatory action was required for some businesses (16%), which subsequently showed full compliance upon reinspection. Of the 236 samples tested, 88.6% were microbiologically acceptable. One sample contained coagulase positive staphylococci at a level of potential concern ($10^4$ cfu/g); 11 samples contained elevated levels of *E. coli* (> 100 cfu/g) and two contained elevated levels of *C. perfringens* (> 100 cfu/g). *Salmonella* was not detected. There was no direct correlation between non-compliant food handling practices and microbiological results.

A doner kebab is a popular take-away roll consisting of thin slices of grilled seasoned meat (usually lamb, chicken or beef) served with salad and sauces wrapped in a piece of Lebanese bread. The meat mixture, prepared by mixing the meat, either sliced or minced, with spices, is formed into a cylinder shape on a vertical skewer and cooked using a vertical rotating grill.

From 2001 to 2004, OzFoodNet reported six incidents/outbreaks of foodborne illness affecting 59 people where kebabs were implicated as the vehicle of infection (Ashbolt & others 2002, OzFoodNet 2003, 2005). Of particular importance was an outbreak of salmonellosis affecting 49 people where *Salmonella* Montevideo was detected in imported tahini paste used in doner kebabs (OzFoodNet 2003).

A survey of kebab outlets in Victoria found issues associated with cooking temperatures, with 5.6% of chicken and 8.8% of lamb kebabs failing microbiological testing (Anon 2004a). A previous survey conducted by the Hunter Public Health Unit in New South Wales also identified issues including 11% of sampling failing guidelines for *E. coli* and problems with cross-contamination of raw and cooked foods (pers comm., Phillip Bird).

In late 2004, the NSW Food Authority undertook a survey of take-away kebab outlets in New South Wales with an aim to:

- Assess the microbiological status of kebabs in NSW;
- Assess compliance of businesses with Standard 3.2.2 and 3.2.3 of the Australian New Zealand Food Standards Code (FSC); and
- Provide businesses with advice on compliance with the FSC and assist them with information to enable them to prepare a microbiologically acceptable product.

## Methods and materials

A total of 237 kebab outlets across NSW, including businesses from metropolitan, regional and country areas, participated in the survey. Businesses were chosen randomly from the NSW Food Authority's Notification and Food Safety Information System (NAFSIS).

### Food handling practices

Inspections occurred during normal business hours to assess the food handling practices. Prior to the inspections, a common checklist was developed and information sessions held with officers involved in the survey. These information sessions aimed to provide information on doner kebabs and instructions for inspection to ensure a consistent approach when observing practices. The instructions included information to consider when assessing the food handling practices. For example assessment of personal hygiene included the presence/absence of a hand wash basin and its suitability for use and review of the food handler's hand washing technique as well as other factors impacting on personal hygiene.

The areas covered during the inspections included:

- cooking practices;
- time/temperature control of food;
- storage and handling of raw and prepared food;
- cleaning and sanitation of equipment and premises;
- personal hygiene; and
- food hygiene knowledge.

The duration of each visit varied depending upon the assessment but was a minimum of 45 min. After the inspections, food handlers were provided with copies of the NSW Food Authority fact sheet on doner kebabs written in English, Arabic and/or Turkish (*www.foodauthority.nsw.gov.au/industry/pdf/Doner%20kebabs.pdf*). Where necessary each food business was advised how to correct poor food handling practices. In situations where serious issues were identified, the outlet was revisited to assess compliance.

### Microbiological sampling

From each outlet, a whole prepared doner kebab was taken, placed on ice within an insulated container and transported to the laboratory for testing, which usually commenced within four hours of receipt. The kebabs were tested for:

- Standard Plate Count using Australian Standard (AS) 1766.2.1
- *Escherichia coli* using AS 1766.2.3
- Coagulase positive staphylococci using AS 1766.2.4
- *Clostridium perfringens* using AS 1766.2.8
- *Salmonella* species using AS 1766.2.5

The mean, medium, minimum and maximum values were calculated using Microsoft® Office Excel and Access 2003. Frequency distributions were also calculated and constructed using Microsoft® Office Excel 2003.

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### *Assessment of overall microbiological quality*

Doner kebabs fall into a large category of ready-to-eat foods for which there are no microbiological standards. To assist government and industry interpret microbiological results for these foods, Food Standards Australia New Zealand published microbiological guidelines (FSANZ 2001). These guidelines, as shown in Table 1, were used to assess the quality of the doner kebabs tested in this survey. The FSANZ guidelines also include criteria for Standard Plate Count, but these were not applicable because of the presence of dairy foods and raw fruits or vegetables in doner kebabs.

**Table 1. Microbiological criteria for ready-to-eat foods (FSANZ 2001).**

| Organism | Microbiological quality | | | |
|---|---|---|---|---|
| | Satisfactory | Marginal | Unsatisfactory | Hazardous |
| *E. coli* (MPN/g) | <3 | 3 – <100 | ⩾100 | * |
| Coagulase positive staphylococci (cfu/g) | <100 | 100 – $<10^3$ | $\geqslant 10^3$ – $<10^4$ | $\geqslant 10^4$ |
| *C. perfringens* (cfu/g) | <100 | 100 – $<10^3$ | $\geqslant 10^3$ – $<10^4$ | $\geqslant 10^4$ |

MPN - Most Probable Number, cfu - colony forming units
* Testing for pathogenic *E. coli* is required to determine if the product may be classified as hazardous due to *E. coli*.

**Table 2. Critical food handling practices for doner kebab preparation and the rate of compliance at 237 outlets in New South Wales.**

| Food handling practice | Unsatisfactory |
|---|---|
| Ready to eat, potentially hazardous ingredients refrigerated at or below 5°C | 70% |
| Effective sanitisation of food contact surfaces | 37% |
| Effective sanitisation of knives and meat shavers | 36% |
| Unused kebab meat under refrigeration (5°C) | 36% |
| Frozen kebabs thawed under refrigeration | 33% |
| Hand washing facility properly used and installed | 24% |
| Left-over doner kebab meat properly cooled/refrigerated | 13% |
| Cooked meat not contaminated with raw meat juices | 14% |
| Effective second-cook step prior to serving | 8% |
| No likely cross contamination between raw and prepared foods | 8% |
| Doner kebab meat immediately cooked after removal from storage | 6% |
| Separate utensils for raw and prepared foods | 3% |

**Table 3. Summary of microbiological results for whole doner kebabs.**

| Test | Mean | Median | Minimum | Maximum |
|---|---|---|---|---|
| Standard Plate Count (log cfu/g) | 7.5 | 6.8 | 2.4 | 9.0 |
| *E. coli* (log MPN/g) | 2.4 | 0.5 | 0.5 | 4.0 |
| Coagulase positive staphylococci (log cfu/g) | 2.2 | 2.0 | 2.0 | 4.0 |
| *C. perfringens* (log cfu/g) | 2.1 | 2.0 | 2.0 | 3.7 |

## Results

### *Food handling practices*

Doner kebab outlets were assessed against 15 food handling practice criteria identified during previous visits to outlets. Of the 15, 12 were identified as critical in the preparation of doner kebabs and rates of unsatisfactory compliance with these are shown in Table 2. The remaining three criteria related to:

- The reusing of non-reuseable containers
- The refrigeration of seasoned slices of raw meat while binding to form one cylinder shape
- The use of seperate utensils for raw and prepared foods.

The most common issues identified related to temperature control and the cleaning and sanitation of equipment.

For each kebab outlet, the total number of non-compliant food handling practices (both critical and non-critical) was totalled and a frequency distribution of the overall level of compliance was calculated (Figure 1). Over half the outlets surveyed had three or less unsatisfactory food handling practices, with over 70% of outlets with four or less.

### *Microbiological results*

Of the 237 samples obtained, 236 were examined; one sample was not examined because of temperature abuse during transport. A statistical summary of the results for Standard Plate Count, *E. coli*, coagulase positive staphylococci and *C. perfringens* is presented in Table 3. *Salmonella* was not detected in any of the samples tested.

Frequency distributions were calculated for Standard Plate Count, *E. coli*, coagulase positive staphylococci and *C. perfringens* (see Figure 2). The kebabs showed an overall medium to

**Table 4. Assessment of results using the microbiological criteria for ready-to-eat foods (FSANZ 2001).**

| Organism | Satisfactory | | Marginal | | Unsatisfactory | |
|---|---|---|---|---|---|---|
| | Number | % | Number | % | Number | % |
| *E. coli* | 162 | 68.6 | 50 | 21.2 | 24 | 10.2 |
| Coagulase positive staphylococci | 228 | 96.6 | 7 | 3.0 | 1 | 0.4 |
| *C. perfringens* | 231 | 97.9 | 3 | 1.3 | 2 | 0.8 |

high microbial load with a mean count of 7.5 log cfu/g and a maximum count of 9 log cfu/g. While the majority of samples (over 200) contained little or no *E. coli*, 11 samples were found to contain greater than 3 log cfu/g of *E. coli*. Most samples contained little or no *C. perfringens* or coagulase positive staphylococci, with the exception of two samples containing 3 log cfu/g of *C. perfringens* and one sample containing 4 log cfu/g of coagulase positive staphylococci.

## Discussion

Doner kebabs are a multi-component food comprised of both raw and cooked ingredients. During the preparation of kebabs there is opportunity for both cross contamination of raw and cooked ingredients and subsequent growth of pathogenic microorganisms if critical food handling practices are not within compliance. Some areas where problems were encountered previously include improper cooking of meat, contamination of cooked meat with raw meat juices, poor hygiene and sanitation and poor personal hygiene.

### *Food handling practices*

At most of the kebab outlets, non-compliance issues concerning food handling practices were identified, but most of these were resolved at the time of the inspection. Only 16% (37) of businesses required formal regulatory action, which was resolved on reinspection. The majority of issues related to inadequate temperature control of ready-to-eat foods such as tabouli and sauces and ineffective cleaning and sanitation of food contact equipment such as knives used to shave meat from the kebab cylinders prior to serving. The distribution of fact sheets during the inspection provided an opportunity to educate the food handlers on these matters. Issues associated with hand washing facilities included no hot water, no paper hand towels or soap and, at one outlet, no dedicated hand washing facility.

A similar survey undertaken by Victorian food authorities noted that 23% of premises carved meat while it was still pink or raw and that 65% of businesses did not use a second cooking step (Anon 2004a). A higher level of compliance to these issues was observed in the NSW survey with only 14% of outlets carving meat while raw and 4% of outlets not performing a second cook step. The differences in these observations suggest that awareness has increased over time and businesses are increasingly adopting good food handling practices. For example, the concept of performing a second cook on doner kebab meat is recommended in a New Zealand food safety newsletter published in 2000 (Auckland Healthcare 2000) and is a requirement for businesses preparing doner kebabs in Victoria (Anon 2004b).

### *Microbiological status*

The high Standard Plate Counts were expected because of the presence of either fermented dairy products (eg cheese and yoghurt) or raw salad vegetables in the doner kebabs. When the microbiological results were compared to the FSANZ microbiological guidelines for ready-to-eat foods, 88.6% of samples (209) were either satisfactory or marginal (Table 4). Where samples failed against the FSANZ guidelines, the major reason was presence of unacceptable levels of *E. coli* (24 samples), coagulase positive staphylococci (one sample) or *C. perfringens* (two samples). No sample failed due to unsatisfactory levels of more than one of the test organisms.


**Figure 1. Unsatisfactory food handling practices observed in 237 doner kebab outlets in New South Wales**

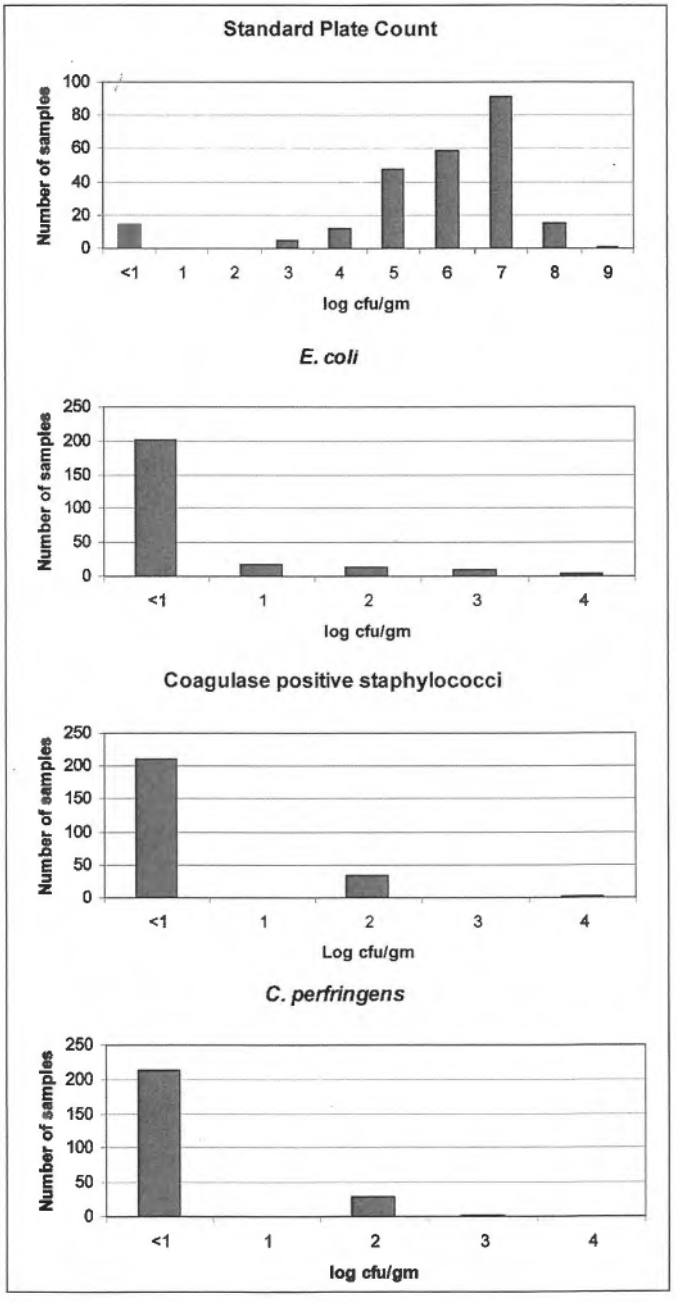


**Figure 2. Frequency distribution of Standard Plate Count, *E. coli*, coagulase positive staphylococci and *C. perfringens* for doner kebabs collected at 237 doner kebabs outlets.**

In assessing the microbiological results, no direct correlation was made between non-compliant food handling practice and unacceptable results. For example, *E. coli* is generally considered a good indicator of fecal contamination (Hocking & others 2003), which may be due to inadequate, infrequent or no hand washing. Where unacceptable *E. coli* levels were detected, some premises were deemed unsatisfactory for hygiene and sanitation issues and hand washing facilities, although just as many satisfactory microbiological results were obtained from businesses where similar non-compliance issues were identified. A similar situation exists for both the coagulase positive staphylococci and *C. perfringens* results, although where samples were unacceptable for these two organisms, poor temperature control was observed. As the Victorian survey tested only cooked meat samples, direct comparison of the results is not possible because of other ingredients in the kebabs tested in NSW.

## Conclusion

The survey highlighted some areas for doner kebab outlet managers to focus on during the preparation of doner kebabs. In particular, good hygiene practices and temperature control are essential as are the requisite food safety skills and knowledge workers. Many of the failures may have been due to poor knowledge. The distribution of fact sheets combined with visits to premises assisted in improving the skills and knowledge of food handlers as demonstrated by compliance to the Food Standards Code on repeat visits. Overall, the microbiological results for doner kebabs were good with only three samples failing due to unsatisfactory levels of the pathogens coagulase positive staphylococci and *C. perfringens*.

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## References

Anon. 2004a. Kebabs need a kill step. Victorian Food Safety News 1: 7. Downloaded from www.health.vic.gov.au/foodsafety/downloads/kebab_report.pdf on 15/11/2006.

Anon. 2004b. Food Safety Program Template for Food Service and Retail Businesses (edition 1.1): Supplement A. Kebabs. Downloaded from www.health.vic.gov.au/foodsafety/downloads/fsp_supp_kebabs.pdf on 30/08/2007.

Auckland Healthcare. 2000. Food Safety Advice: Auckland Healthcare Food Safety Quart Rep Dec 2000. Downloaded from www.arphs.govt.nz/publications/Advice_Publications/FS/2000/FS_Dec00.pdf on 15/11/2006.

Ashbolt, R & others. 2002. Enhancing foodborne disease surveillance across Australia in 2001: the OZFoodNet Working Group. Communicable Disease Intelligence 29 (3): 375-406.

FSANZ. 2001. Guidelines for microbiological examination of ready-to-eat foods. Food Standards Australia New Zealand. Downloaded from www.foodstandards.gov.au/_srcfiles/Guidelines%20for%20Micro%20exam.pdf on 15/11/2006.

Hocking, A & others (eds). 2003. Foodborne Microorganisms of Public Health Significance. 6th ed. AIFST Inc, Waterloo NSW.

OzFoodNet. 2003. Foodborne disease in Australia: incidence, notification and outbreak. Ann. Report OzFoodNet Working Group 2002. Communicable Disease Intelligence 27 (2): 209-243.

OzFoodNet. 2005. Reported foodborne illness and gastroenteritis in Australia: Ann. Report OzFoodNet working Group 2004. Communicable Disease Intelligence 29 (2): 164-190. □

# food service

## Skills shortage impacts foodservice

Celebrity chefs have helped to raise the profile of the profession, but finding a way to help combat the crippling skills shortage is going to take more according to The William Blue School of Hospitality, Tourism and Leisure Management in North Sydney, NSW.

"The enthusiasm and success of high profile chefs such as Jamie Oliver helped to inspire young people to take on a career as a cook or a chef. But more than 3500 new commercial cooks, chefs, pastry chefs and bakers are needed each year in addition to those currently in training. Further action needs to be taken to attract people to the industry and retain existing staff.

"In the past chefs had advocated literally learning over the hot plate and resisted formalised training. It is now recognised that Advanced Diploma courses are the fastest way to deliver well-trained cooks to the kitchen," said **Jenny Jenkins**, William Blue Head of School.

A National Industry Skills Initiative report *Recipe for Change* shows that employers in commercial cookery now strongly value training, with over 90% stating that it increases productivity and retention, and more than 75% saying it increases profitability.

"With demand for training increasing, there are now multiple study paths available to those interested in pursuing a career in the kitchen. Private colleges and training institutes offer fast-tracked options to gain qualifications in commercial cookery, helping graduates to become job-ready faster," explained Ms Jenkins.

William Blue students are trained in all aspects of kitchen operations, food and beverage service, hygiene, nutrition, supervisory and management skills. These skills are particularly beneficial for graduates looking to work their way to head chef or into a managing position. Whilst some may be turned off working in the industry due to 'unsociable' hours, there are many career options and rewards.

"Ultimately, there is a vast array of career opportunities available ... Students who receive quality education and practical experience will be able to become a productive contributor to the business faster, and employees that are mentored and supported are more likely to stay in the industry," she concluded.

William Blue School of Hospitality, Tourism & Leisure Management offers an Advanced Diploma of Hospitality Management – Commercial Cookery; Advanced Diploma of Hospitality Management, which includes Diploma in Hospitality (Management) and International Diploma in Hospitality Management (awarded by the Educational Institute of the American Hotel & Lodging Association and recognised in over 160 countries); Associate Degree in Hospitality Management and Bachelor of Business (Tourism and Hospitality) awarded by La Trobe University.

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