

# Microbiological Survey of Supermarket Surfaces and Sanitation Procedures.

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## Introduction:

- New Zealand has the highest incidence of campylobacteriosis in the developed world (300 per 100,000).
- Studies have reported the presence of *Campylobacter*, *Salmonella* and *E. coli* on retail chicken meat<sup>2, 3, 4, 5, 6</sup> and the external surfaces of retail packaged poultry meat<sup>3, 4</sup>.
- The presence of pathogens on meat packaging is a potential risk of cross-contamination from raw meat to "ready-to-eat" foods in the retail environment.
- There is public concern regarding the sanitary state of supermarket trolleys, baskets and checkout conveyor belts and their possible role in indirect contamination of food and hands through grocery items.
- This study investigated sanitation procedures and the presence of food borne pathogens on supermarket trolleys, baskets and checkouts and checkout sanitation procedures.



Fig. 1 Trolley



Fig. 2 Basket



Fig. 3 Checkout

## Materials and methods:

The two major NZ supermarket companies were invited to take part in the survey, however only one company accepted the offer. Five supermarkets in the Hamilton area were selected for the study.

- Sanitation procedures:** Surveyed by means of a questionnaire.
- The efficacy of sanitation procedures on checkouts was verified by Aerobic Plate counts and ATP analysis.
- E. coli*, *Salmonella* and *Campylobacter* detection:** At each supermarket 12 trolley interiors (including the child seat), 12 basket interiors, and 12 checkout surfaces were swabbed and analysed using standard detection methods for *E. coli*, *Salmonella* and *Campylobacter*.
- Swabbing was performed over several days and was timed such that the checkouts had been operating for at least 3 h prior to swabbing.

## Results and Discussion

### Checkout Sanitation Procedures:

- There was little variation in checkout cleaning procedures between supermarkets. All checkouts were cleaned daily with detergent and sanitiser. Additional cleaning was carried out when needed.
- ATP analysis showed very high levels of biological material on conveyor belt surfaces. Microorganisms may contribute to ATP levels, but direct count analysis suggests the contribution from microorganisms in this case was small.
- ATP levels were reduced by cleaning methods to varying degrees (6-73%). There appeared to be high residual levels on conveyor belt material after cleaning. These high levels are of concern as organic residue may lead to the development of biofilms (if sufficient moisture is present) and also cause inactivation of sanitisers through interference.
- Swab sampling (APC) of smooth stainless steel surfaces and conveyor belts showed significant reduction in microbial numbers after cleaning.

### Basket cleaning procedures:

- Basket cleaning procedures varied from as infrequently as 3-monthly to daily cleaning.

### Trolley cleaning procedures:

- All five supermarkets employed an external contractor to clean trolleys every three months. The contractor used cold water at high pressure.

### Pathogen testing:

- Neither *Salmonella* nor *Campylobacter* were detected on any of the surfaces tested. *E. coli* was detected in a small number of samples (Table 1). Given the high potential for human hand contact with the surfaces under investigation, the presence of *E. coli* was not surprising.
- It was noted that for all supermarkets investigated, fresh chicken meat arrived at the store already processed and packaged. There was no processing of fresh chicken meat in store. All fresh chicken meat was packaged using 'leak-proof' packaging which may reduce the potential of cross-contamination in retail stores.

Table 1: The numbers of samples in which bacteria were detected.

	<i>E.coli</i>	<i>Salmonella</i>	<i>Campylobacter</i>
Trolleys (60)	2 (3.3%)	ND	ND
Baskets (60)	3 (5%)	ND	ND
Checkouts (60)	2 (3.3%)	ND	ND
Total 180 Samples	7 (3.9%)	ND	ND

ND = Not Detected

## Conclusion

- The low level of microorganisms on conveyor belt surfaces (as measured by surface swab sampling for APC) was surprising and may suggest residual sanitiser (Quaternary Ammonium Compounds) levels were inhibiting microbial growth, along with an environment which is sufficiently dry for extended periods to prevent growth. All checkouts sampled had been operating for a period of at least 3 hours, but no longer than 4 hours. Further sampling over a longer operating period would be needed to confirm that microbial numbers remain low throughout the day. The scope of the current study did not extend to investigation of the efficacy of the sampling methods used.
- Analysis of total organic content indicated by ATP detection revealed a high level of organic matter on checkout surfaces that was not removed by cleaning procedures.
- Although viable cell counts were low, this residue of organic matter has the potential to lead to biofilm build-up that could harbour potentially harmful organisms, but only if surfaces remain moist for extended periods.
- There was no recovery of either *Salmonella* or *Campylobacter* from the supermarkets sampled in this study, suggesting that there is little risk of cross contamination of these pathogenic organisms from trolleys, baskets or checkout surfaces. There was, however, a low level of *E. coli* detected, which is expected on surfaces exposed to a high level of human contact.

<sup>1</sup> Institute of Environmental Science and Research Limited, Notifiable and Other Diseases in New Zealand: Annual Report 2007, Wellington: Institute of Environmental Science and research Limited; 2008, URL: [http://www.surveillance.cri.nz/PDF\\_surveillance/AnnSunRpt/2007AnnualSunRpt.pdf](http://www.surveillance.cri.nz/PDF_surveillance/AnnSunRpt/2007AnnualSunRpt.pdf)

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<sup>3</sup> Jorgensen, F. R. Bailey, et al. (2002), "Prevalence and numbers of *Salmonella* and *Campylobacter* spp. on raw, whole chickens in relation to sampling methods," *Int J Food Microbiol* 76(1-2): 151-64.

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<sup>5</sup> Ghaffar, Y. B. China, et al. (2007), "A seven-year survey of *Campylobacter* contamination in meat at different production stages in Belgium," *Int J Food Microbiol* 116(1): 111-20.

<sup>6</sup> Tokumaru, M., H. Konuma, et al. (1991), "Rates of detection of *Salmonella* and *Campylobacter* in meats in response to the sample size and the infection level of each species," *Int J Food Microbiol* 13(1): 41-6.

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