

INTERIM RESULTS – NOT FOR PUBLICATION

ACM/510

ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD

The microbiological safety and status of ready-to-eat fruit and vegetables

1. In June 2000, the Public Laboratory Service (PHLS) presented a paper (ACM/476) to the ACMSF exploring whether there was a significant risk to human illness associated with the consumption of ready-to-eat fruit and vegetables. The Committee concluded that there was no cause for serious concern but asked the PHLS to keep the matter under review and to provide the Committee with a progress report in 2001.
2. Dr Bob Mitchell and Dr Bob Adak from PHLS will introduce paper ACM/510 which updates ACM/476.
3. Members should note that the data in ACM/510 are provisional and are not for publication at this stage.
4. Also attached as part of ACM/510 is a PHLS/LACOTS report of the microbiological examination of ready-to-eat organic vegetables from retail establishments in the United Kingdom.

**Secretariat
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THE MICROBIOLOGICAL SAFETY AND STATUS OF READY TO EAT FRUIT AND VEGETABLES

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INTRODUCTION

This paper is an update on one presented to the ACMSF in June 2000. It examines the role of Ready to Eat (RTE) fruit and vegetables in infectious intestinal disease in terms of epidemiological investigations and microbiological analysis both in the UK and abroad. The expression "Ready To Eat" is used to describe those foods that are eaten raw, i.e. without cooking. It includes products that are eaten with or without washing or peeling.

The paper is presented in three sections:

Section 1. **Update on foodborne general outbreaks associated with salad, fruit and vegetables, England & Wales, 2000.**

Section 2. **Update on the microbiological status of RTE fruit and vegetables.**

Section 3. **Additional conclusions and areas requiring further work**

The epidemiological and microbiological information available for interpretation can be subject to the following limitations:

1. In some instances it is possible that the food was the vehicle of infection rather than the source *per se*. It is not always possible to discriminate between these two possibilities based on the information available.
2. The number of reports associated with a particular country can be as much a reflection of the extensiveness of their surveillance systems and the frequency with which they publicise their data.
3. Reports will tend to be skewed towards those organisms that are responsible for outbreaks that can be readily identified. Organisms that cause severe illness, e.g. Enterovirulent *E. coli* are more likely to feature in reports than organisms that do not. On the other hand, organisms that cause sporadic cases, e.g. *Campylobacter*, are less likely to feature than those that cause well-defined outbreaks.
4. Any foodborne pathogen is potentially capable of being transmitted by RTE fruit and vegetables. The extent to which the information received to date reflects surveillance and reporting systems as opposed to relating to the properties of the organisms themselves remains to be seen.

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SECTION 1. UPDATE ON FOODBORNE GENERAL OUTBREAKS ASSOCIATED WITH SALAD, FRUIT AND VEGETABLES, ENGLAND & WALES, 2000.

In 2000 six of 95 (6%) foodborne general outbreaks of infectious intestinal disease (i.e. those affecting more than one household) reported to the PHLS Communicable Disease Surveillance Centre were associated with consumption of salad, fruit and vegetables. Details of these outbreaks are shown in Table 1.

Two notable outbreaks linked with the consumption of lettuce occurred in 2000 and are summarised below:-

- In August an increase in infection caused by *S. Typhimurium* DT 104 resistant to ampicillin, chloramphenicol, streptomycin, sulphonamides, spectinomycin, and tetracycline occurred. One hundred and seventy four people infected with the outbreak strain were identified, most of whom were young adults and lived in the West Midlands NHS region and adjacent parts of the North West NHS region. Illness was severe with approximately 40% of cases requiring hospital admission and one man died. A national, unmatched case-control study was performed and infection was associated with the consumption of lettuce in food items bought from fast food outlets (Adjusted odds ratio = 7.28; 95% CI 2.25, 23.57; $p = 0.0006$). Environmental investigations of local clusters support the hypothesis that lettuce prepared in fast food restaurants was the likely source of infection. Fast food outlets associated with clusters of cases were found to have common suppliers of salad vegetables. Unfortunately, the complexity of the food supply chain and the lack of identifying markers on salad stuffs made it extremely difficult to track salad vegetables back to the original supplier. Also, due to the short shelf life of salad vegetables, it proved impossible to acquire any suspect foods for microbiological analysis.
- In September an increase in infection caused by a strain of *S. Typhimurium* DT 204b was identified. The strain was resistant to ampicillin, chloramphenicol, gentamycin, kanamycin, neomycin, streptomycin, sulphonamides, spectinomycin, tetracycline, trimethoprim, nalidixic acid and ciprofloxacin (low level). One hundred and twenty four cases were identified; most were young adults living in the Northern and Yorkshire NHS region. A simultaneous outbreak in Iceland, affecting 183 people. A small restaurant outbreak within this national outbreak was investigated using a case-control study and was linked to consumption of imported lettuce (OR = 40.8; 95% CI 2.7 to 3175; $p = 0.005$). Enter-net collaborators in Scotland, the Netherlands and Germany also identified cases of infection caused by this *S. Typhimurium* strain. As with the previous outbreak it proved impossible to trace the source of the implicated batches of lettuce because of the complexity of the supply chain.

In response to these two large outbreaks the PHLS Environmental Surveillance Unit organised a national survey of ready-to-eat salad items in collaboration with the Local Authority Co-ordinating Body on Food and Trading Standards (LACOTS) in the summer of 2001.

Table 1: Foodborne general outbreaks associated with salad, fruit and vegetables, England & Wales, 2000

Outbreak	Number Affected	Number Hospitalised	Number Died	Premises type	Pathogen	Vehicle 1	Vehicle 2	Vehicle 3	Evidence	Food handling faults
1	11	0	0	Scout camp	Unknown – suspected viral	Brussel sprouts	-	-	Co	O ⁱ
2	18	0	0	Restaurant	Campylobacter	Lettuce	-	-	D [§]	C
3	140	18	0	Community	S. Typhimurium DT 204b	Lettuce	-	-	D	C
4	361	7	1	Community	S. Typhimurium DT 104	Lettuce	-	-	Cc ⁱ	-
5	37	2	-	Pub/bar	S. Typhimurium DT 170	Beef	Lettuce	-	M	F, H, C
6	11	0	0	Restaurant	Unknown – suspected viral	Mixed side salad	-	-	D	-

Source: GSURV – accessed 15/11/01

Footnotes:

Evidence

*, more than one form of evidence can be provided for any given outbreak

†, Cohort study

‡, Microbiological evidence

§, Descriptive epidemiology

ⁱ, Case-control study

Food handling faults

*, more than one fault can be provided for any given outbreak

F†, Infected food handler

H‡, Inadequate heat treatment

C§, Cross contamination

Oⁱ, Other fault

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SECTION 2. THE MICROBIOLOGICAL STATUS OF READY TO EAT FRUIT AND VEGETABLES.

To the best of our knowledge, the only studies of the microbiological status of ready to eat fruit and vegetables in the UK in the last two years have been conducted by the Public Health Laboratory Service (PHLS) and the Local Authorities Co-ordinating Body on Food and Trading Standards.

LACOTS/PHLS studies are designed to maximise the gains from routine EHO sampling by ensuring that samples are taken and examined in a coordinated fashion according to a predetermined protocol. These studies are not formal structured surveys in that Local Authorities can choose whether or not to participate and the sampling is not random. Nevertheless they are a useful adjunct to formal structured surveys in that they are easy and quick to set up, use resources that are already in place, are published quickly in peer reviewed journals and can provide useful pointers for the design of more structured formal surveys. Two such surveys are normally carried out each year.

The general objectives of PHLS/LACOTS studies are:

- To identify the microbiological quality of uncooked ready to eat organic vegetables from a range of retail outlets.
- To use this information in support of the PHLS Microbiological Guidelines for Ready to Eat Foods.
- To provide information and make appropriate recommendations to enforcement officers to assist them with their task of ensuring food safety.
- To use the information and experience gained in order to determine the requirements for further studies into this product area.

2.1. LACOTS/PHLS Study of Ready to Eat Organic Fruit and Vegetables

In late 1999 the PHLS received repeated requests from the media for information on the microbial pathogens carried by organic foods. No such information existed. In view of this, and in response to a number of requests from LACOTS/PHLS Food Liaison Groups around the country, a study was designed in consultation with EHOs and the Soil Association. The final report of the study has been published in the Letters of Applied Microbiology. A copy is attached.

The study was conducted in May-June 2000. In total 3,200 samples were collected. In order to be included in the study, products had to be:

- On sale in England, Wales, Scotland or Northern Ireland
- Labelled or recognised as organic
- Not preserved or include spices
- Not frozen
- Ready to eat, i.e. eaten without cooking (including washed or peeled products)

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Results

No pathogens were detected. The majority (3185 of 3200; 99.5%) of samples were found to be of satisfactory/acceptable microbiological quality whilst only 15 (0.5%) were of unsatisfactory microbiological quality. Unsatisfactory results were due to *Escherichia coli* and *Listeria* spp. (not *L. monocytogenes*) levels in excess of 10^2 c.f.u. g⁻¹.

Conclusion

The absence of pathogens (*L. monocytogenes*, *Salmonella*, *Campylobacter*, and *E. coli* O157) and the low incidence (1.5%) of *E. coli* and *Listeria* spp. associated with these organic vegetables indicates that overall agricultural, hygiene, harvesting, and production practices were good.

2.2. LACOTS/PHLS Retail Prepared Prepacked Ready-to-Eat Salad Vegetables

This study was carried out in May - June 2001.

In order to be included in the study, products had to be:

- pre-packed before delivery to the premises sampled from;
- contained in the pre-packed bag/container at the time of sampling such that the packaging can remain unopened during sampling and subsequent transport /delivery to the laboratory;
- ready-to-eat without any cooking or further preparation by the consumer; i.e. to be removed from its packaging and placed in an appropriate dish prior to consumption.
- made up of single or mixed salad vegetables;
- not cooked.
- not mayonnaise based, e.g. coleslaw, pasta, or potato salads etc.
- not based on rice, nuts, raisins or fruits, e.g. Waldorf salad.
- not dressed or seasoned, i.e. those treated with vinegar/oil/spice dressings;
- cold or at ambient (room) temperature.
- not frozen.

Results

The results and supplementary information are currently being analysed. In summary:

- 3,851 samples were collected
- No *E.coli* O157 was detected
- No *Campylobacter* spp. were detected
- *L.monocytogenes* was detected in one sample at <100 c.f.u.g⁻¹ and in 952 (25%) samples at <20 c.f.u.g⁻¹.
- *Salmonella* spp. were detected in 5 samples. In each case the retailer and the FSA were immediately informed and remedial action was taken.

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2 .3. LACOTS/PHLS Open Prepared Ready-to-Eat Salad Vegetables from Catering & Retail Premises.

This study was carried out in September - October 2001.

In order to be included in the study, products had to be:

- exposed or have been exposed as open food at the premises sampled from
- ready-to-eat without any cooking or further washing due to be undertaken: i.e. it could be placed in an appropriate dish prior to consumption;
- made up of single or mixed salad vegetables;
- not cooked;
- not mayonnaise based, e.g. coleslaw, pasta, or potato salads etc.;
- not based on rice, nuts, raisins or fruits, e.g. Waldorf salad;
- not dressed or seasoned salads, i.e. those treated with vinegar/oil/spice dressings;
- chilled or at ambient (room) temperature;
- not frozen.

Results

The information from this study is still being collected and collated. Around 4,000 samples have been analysed. No pathogens have been detected.

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SECTION 3 ADDITIONAL CONCLUSIONS AND AREAS REQUIRING FURTHER WORK

1. Available information suggests that RTE fruit and vegetables account for a very small proportion (5%) of outbreaks of infectious intestinal disease in England and Wales.
2. In the two large salmonella outbreaks associated with lettuce in 2000 the complexity of the food supply chain and the lack of identifying markers on salad stuffs made it extremely difficult to track salad vegetables back to the original supplier. In some cases, the supply chain was traced through five stages before reaching a firm that imported the salad items from a wholesale market on the European mainland. Labelling of fresh salad produce is not of sufficient detail to allow tracing of products. This has implications for public health since food hazard warnings and product withdrawal are contingent on accurate identification of the suspect product.
3. Information on the microbiological status of RTE fruit and vegetables is still relatively sparse. There is a need to gather further information on the microbiological status of a wide range of RTE fruit and vegetables, particularly with respect to pathogens such as Enterovirulent *E.coli*.

The microbiological examination of ready-to-eat organic vegetables from retail establishments in the United Kingdom

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See pdf file ACM/510a