

## SUMMING-UP AND OVERVIEW OF FOODBORNE DISEASE \*

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In summarising the presentations in this symposium, it would be good to be encouraging. However, although all the speakers have been splendid and their papers were excellent, the facts presented are depressing. In the last half-century, to my certain knowledge, microbiologists, infectious disease physicians, veterinary colleagues, epidemiologists, public health specialists and environmental health officers have been voices crying in the wilderness - and all apparently to no avail over these many years.

Is there light at the end of the tunnel? There have been some improvements and many developments, but the infective agents associated with foodborne disease have largely run ahead of us. The results have at times been catastrophic for one family, or for many families. Today's speakers endorse this. There has not been an adequate development of our defences in terms of food safety in parallel with our changing methods of food production and catering practices.

This symposium has again reminded us that responsibility for the presently unsatisfactory situation rests not with one section of the food industry but with everyone involved - from bulk-catering to the kitchen sink, from intensive animal husbandry to high-volume food preparation, from the farm to the factory, and from the canteen or restaurant to the high street outlets, the corner shops and the kitchens in our homes.

The likely pathogens include many old enemies and several others that are more recently recognised. There have been changes in the quality and quantity of the challenges. The standard teaching was once that a booster stage in food was the general rule, when a contaminating dose of an organism was allowed to multiply under suitable conditions that then produced a potentially infective dose in terms of numbers of organisms or amounts of enterotoxin produced in the food. This concept is still valid for some models, but many foodborne pathogens are now known to be able to strike with low doses. With regard to specific pathogens, we were slow to discover what the *Campylobacters* could do, and *Cryptosporidium* came up on the blind side of our laboratory awareness.

Dr John Coia and Dr Andrew Todd have clearly shown today how dramatically the verocytotoxigenic *E. coli* (VTEC) menace has struck with special virulence in Scotland in recent years. Salmonellae are, of course, a continuing worry. Here I have to thank Dr Clark Sharp for his expert briefing for my job today... and we all in Scotland owe a debt of gratitude to him and his colleagues in the Centre for Infection and Environmental Health at Ruchill for so much vigilance over the years. The work of the Scottish Salmonella Reference Laboratory at Stobhill and the Scottish *E. coli* Reference Laboratory at Aberdeen is abundantly acknowledged in terms of their surveillance and constant help. Our indebtedness extends south to Dr Bernard Rowe and his colleagues at the Central Public Health Laboratory at Colindale for all that they do to keep us informed and for today's stimulating update.

Professor Hugh Pennington and others have stressed, however, that our surveillance

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and lines of communication and action are still not good enough, even in the UK, where we pride ourselves on being up with the front-runners. There are justified calls for much-needed legal reforms, for inter-professional co-operation and for less bureaucratic bungling or, perhaps more politely, for less official delay. Dr Todd showed how quickly the wheels were made to turn at the beginning of the Lanarkshire *E. coli* O157 outbreak. The amount of organisation and work involved for the hospital workers and the laboratory workers was enormous, and those responsible for this deserve much credit. The difficulty was that it took almost two weeks to appreciate the number of outlets served by the shop that was first identified as the primary source and to become aware of the size of the virtual factory operation associated with the shop. Our systems for the surveillance and monitoring of food production and distribution are not set up properly.

This was only one example of several reviews today showing how badly we are performing in preventing and controlling incidents and outbreaks of foodborne disease. Scotland's record seems to be very poor, but we should bear in mind that the better the surveillance and laboratory work, the worse the plot. Are things apparently getting worse? Note that notifications are only the tip of an ominous iceberg, because it is well known that many affected individuals do not seek medical help, and many cases are not subjected to laboratory investigation. However, the trends discussed today suggest that things are indeed worse and that increased ascertainment and awareness, which may be part of the story, are not the full explanation:

The annual rate of notifications of foodborne disease in Scotland was at about 90 per 100,000 population in 1986 and, in 1996, the rate was over 200 per 100,000. In 1996-97 Scotland beat England and Wales, and N. Ireland for *Salmonella* infections. And, of course, we were supreme league leaders for *E. coli* O157 increasingly throughout the 1990s, with 3.2 cases per 100,000 in 1990, 9.9 per 100,000 in 1996 (506 cases) and 8.23 in 1997 (422 cases). These data amount to a lot of serious and dangerous illness.

Listeria infections in the UK have been reduced since the major alarms of the 1980s, but Mr Bill Reilly asked us to note that our present use of silage is still a risk factor on farms. *Campylobacter* infections showed a sustained increase from 1986 to 1997, as Dr John Cowden explained; in Scotland we had more than 100 cases per 100,000 population in 1997, and *Campylobacter* infections can be most unpleasant. Typing and subtyping of *Campylobacters* is most important if we are to gain insight into the epizootology and epidemiology of this difficult organism. At present, many infections seem to be sporadic, but links can sometimes be found if specific strains can be accurately identified by advanced techniques. The 1983 ban on the sale in Scotland of untreated milk for direct consumption was a significant advance, but beware of problems that still occur with pasteurisation plant failures or with post-treatment contamination, as Dr Rowe and Mr Reilly reminded us. The speakers were uniformly astonished that England was being so slow to ban the sale of untreated milk and they seemed to agree with my remark that anyone recommending the drinking of unpasteurised milk in this day and age seriously deserves to be certified. I went on to point out that it has been known since the early 1950s that *Clostridium perfringens* can multiply in cooked meat foods if several cardinal rules of food handling are broken. It is a disgrace that *C. perfringens* food poisoning still occurs in the UK, but it does, and it is still a significant cause of general outbreaks. Dr Rowe frightened us with the most recent *Salmonella* data. The overall situation in England and Wales was recently summarised in a parliamentary paper as representing a large risk, with food poisoning of all forms now affecting almost 100,000 people each year. (This again relates only to notified cases;

remember the iceberg).

Are our bacterial pathogens now more virulent? In some cases certainly, yes. We know that worldwide we have a pool of antibiotic resistance genes in our bacteria nowadays and this has severe consequences in several ways. Drug-resistance genes are sometimes linked to others that influence such properties as virulence and colonisation factors. So it seems that we have increasingly dangerous stores of trouble in our farm animals and poultry, our soil and our rivers, and sometimes our water supplies - especially any private untreated supplies. Moreover, it is known that bacteria of different species and sometimes of different genera can exchange genetic information by acquiring nucleic acid by conjugation or by phage action. In some cases, this means that an organism can gain the information needed to make a toxin or to survive attack by host defences or by antibiotics.

Mrs Ann Foster, speaking for the consumers, 'took us to the cleaners'. What are doctors, public health officials and microbiologists doing about this sorry state of affairs in the food industry? Why are we sitting complacently with our academic heads in the air? Is it just that the public are slack and sloppy, and do the farmers, the food producers and the distributors, and the caterers have nothing to do with this? Her implications and accusations were well-rehearsed and they hit home, as she drew attention to the many difficulties that lie ahead. She clearly combined justified criticisms with an appreciation of the complexities of the scenario, and certainly she could not be optimistic about the future. Professor Philip James joined forces in saying that we need to ensure that the producers and consumers are separately represented and respected, and we need to battle against scientific conservatism in challenging certain established concepts and practices.

Mr Reilly carefully summarised veterinary considerations in relation to foodborne disease and he did his best to defend veterinary colleagues against implied criticisms that were levelled at them by various speakers. He drew attention to the pressures on producers to produce cheap food, for example comparing the profit margins on a packet of potato crisps or a bottle of fizzy drink compared with an oven-ready chicken or a litre of good milk. He considered the size of the problem of controlling disease in farmed animals and pointed out the difficulties of contamination in the field, in transit, and in the factories and distribution points. In this context, he had a few disturbing thoughts on safety aspects of organic farming in relation to the increasingly recognised hazard of animal (and poultry) manure as a source of foodborne pathogens such as *E. coli*, salmonellae, campylobacters and *Cryptosporidium*. Our veterinary colleagues need more support if we are to make full use of their expertise. His plea for the wider use and acceptance of irradiation as an antimicrobial procedure to enhance the safety of certain suitable foodstuffs was balanced and persuasive.

Mr Robin Southgate underlined the difficult challenges for industry: bulk food production, intensive animal rearing and mechanisation, and the need for clean animals at source - all introduce special problems of monitoring and control. More than a billion pounds are spent per week on food in the UK. The diversity and complexity of the technologies concerned make it extremely difficult to generalise. He concentrated mainly on the quality of raw materials, process-control strategies, and staff selection and training as major points relating to food safety. There is considerable confusion in the minds of the public and in the press about diet and health, and many advertisements, radio and TV programmes, and magazine features add considerably to the confusion.

It was good to have the wider perspective of Dr Fred Angulo's paper on foodborne disease and food safety in the USA. He drew attention to the wider morbidity associated

with foodborne infection and he focused on newly recognised pathogens, evolving problems with invasive *Salmonellae*, the continuing dangers of undercooked eggs, and multidrug resistance in enteric pathogens. The prospect for invasive human *Campylobacter* infection is alarming, and the writing is on the wall for quinolone resistance in *Salmonellae* (including resistance to ciprofloxacin).

Professor James analysed the human problems associated with foodborne disease in the UK and in Europe. Then he outlined plans for the setting up of a Food Standards Agency in the UK that would take account of the complex, presently unaligned, agencies already in the field, and also embrace interests and control systems not yet officially recognised or represented. He carefully explained the plans that have been put forward in a current White Paper, and he made an appeal that all of us with an interest in these matters should read this official document and write constructively in support of those sections that we could commend. The plans are at a critical stage and the initiative needs our active involvement.

In my overview, I noted that time had not allowed us to mention typhoid and cholera in relation to food. Bacillary dysentery was, on occasion, foodborne, and we had not considered the roles of many other pathogens such as *Giardia*, *Helicobacter*, *Cytophaga*, the mycotoxins, the enteropathogenic viruses, and other ominous agents, such as the prions of BSE.

Mr Southgate had referred to the unmitigated disaster of BSE. I said that the extent of the possible human toll of BSE cannot yet be predicted with any confidence. The outbreak in cattle seems to be under control, after very strenuous efforts over the decade since BSE struck our cows in 1985-86. The possible involvement of sheep by back-transmission of the agent from cows is uncertain. The numbers of human nvCJD cases (26 in the UK by mid-1998) are presumably still rising. I theorised on how the prions of BSE may be transmitted to man by ingestion, but I added the cautionary note that a non-UK case of nvCJD may have a non-dietary explanation. I paid tribute to the work of Edinburgh teams, at the Moredun Research Institute, at the Neuropathology Unit and at the CJD Surveillance Unit, for their remarkable contributions to research and surveillance.

It was generally agreed that the food safety situation in Scotland and the UK demands positive action. Why, for example, has Sweden been able to control the salmonella menace in eggs while we still have such problems here? The hope was expressed that Professor James might obtain the necessary co-operation and resources to build a Food Standards Agency that might combine worthy aims with practical common sense, that might re-gear the priorities to unite biomedical science with commercially viable and nutritionally acceptable principles, to foster consumer understanding and producer co-operation, and to set guidelines and strict rules with penalties that could significantly discourage the careless and dangerous practices that are still daily occurrences.

#### FURTHER READING

- Mayro S. Regulation has not reduced food poisoning in Britain *BMJ* 1997; 315:1114.  
Border P, Norton M. *Safer eating: microbiological food poisoning and its prevention* Parliamentary Office of Science & Technology. October 1997. 75 Pages. POST, 7 Millbank, London SW1P 3JA.  
Sharp JCM. *Escherichia coli* O 157 infections: the Scottish experience. *Hospital Medicine* 1998; 59:98-9.  
The Pennington Group. Report on the circumstances leading to the 1996 outbreak of infection with *E. coli* O 157 in Central Scotland. The implications for food safety and the lessons to be learned. Edinburgh: The Stationery Office, 1997.