

## LESSONS FROM A SYMPOSIUM ON FOODBORNE DISEASE HELD IN THE COLLEGE ON 6 FEBRUARY 1998.\*

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This symposium provided a timely and topical overview of past and present (mainly) bacterial foodborne disease, setting the scene for the proposed 'United Kingdom Food Standards Agency'. While touching only briefly on other topics such as transmissible spongiform encephalopathies, viral and protozoal diseases, the points made generally apply to these agents too. The audience comprised a broad spectrum of expertise including General Practitioners, Physicians, members of the Food Industry, Veterinarians, Epidemiologists, Microbiologists and Public Health Specialists: we are all of course Consumers too!

### CHANGING EPIDEMIOLOGY OF VEROCYTOTOXIGENIC *E. COLI* (VTEC) IN THE UK

'VTEC', especially *E. coli* O157:H7 infection, is generally associated with the consumption of ground beef or 'fast food'. For non-O157 serotypes, whose incidence is unknown, there is no simple laboratory screening test, unlike that afforded by O157:H7 which does not ferment sorbitol. A simple mechanism to detect free verotoxin would be useful as well as the recent improvements in isolation which include the use of cefixime-tellurite-sorbitol-MacConkey agar and immunomagnetic bead separation for *E. coli* O157. England and Wales had an annual incidence of 1.29 cases per 100,000 population between 1992-94, whereas in 1997 the culture-confirmed rate was 8.23 per 100,000. In southern Britain recent rises may partly be due to increased ascertainment, although within Scotland rates seem to be rising in all regions, not just in the Grampian area and Southeast. Recent outbreaks, facilitated by the low infectious dose, environmental persistence and acid tolerance of VTEC, have most often been associated with bovine /dairy sources, water, person-to-person contamination and food processing failure. Most cases appear to be sporadic, occurring in summer and autumn. In a recent case-control study, risks were increased among those handling raw food, contact with a symptomatic case, garden activities, manure and farm association, and at times of increased rainfall. The rate in the Scottish Borders is high at 40 cases per 100,000 population. The reasons for this are not clear.

### LEARNING FROM THE CENTRAL SCOTLAND *E. COLI* O157 OUTBREAK

This outbreak of *E. coli* O157:H7, phage type 2, verotoxin 1 infection highlighted a number of clinical issues about this organism. The infectious dose may be as low as 10 organisms, causing symptoms in 2-7 days with complications arising after 5-8 days. It is associated with a number of clinical findings such as fever (50%), dehydration, bloody stools (35-90%), severe abdominal pain (90%), thrombotic microangiopathy, thrombocytopenia, renal failure and fluctuating neurological deficits. As often seems to happen, events in this outbreak began to declare themselves on a Friday afternoon:

\* A list of speakers and the titles of their papers presented at this symposium is recorded in *Proceedings* Vol. 28, p. 300.

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this one was in late November 1996. By the end of the afternoon the probable source had been identified as a butcher's shop in Wishaw (Lanarkshire). Twelve days later it was evident that this source supplied 90 outlets in Scotland. Five hundred and three cases were identified, 151 were hospitalised and 31 of these developed complications. General practitioners clinically assessed patients, referring those with severe symptoms to the Infectious Diseases Team. With 960 referrals for further assessment, clinical services were severely stretched. Colitis requiring surgery developed in 3% of those admitted, with 24.4% developing thrombotic microangiopathy, 10% acute renal failure and 7.8% other complications, including myocardial infarction. Overall, ten patients died, all of whom were over 70 years of age. No secondary spread was recorded. Older age, the use of an antibiotic in the four weeks prior to onset of symptoms, raised peripheral white cell count, lactate dehydrogenase raised 1.5 times above normal, platelet counts lower than  $150 \times 10^9/l$  and low plasma albumin levels were poor prognostic markers. Interestingly, in patients to whom antibiotics were given after admission fewer complications were identified. In those with haemolytic uraemic syndrome and/or thrombotic thrombocytopenic purpura the expected mortality rate might have been as high as 88%. In this outbreak aggressive support, including plasmapheresis, blood products and corticosteroids, resulted in a mortality rate of 31%.

The lessons learned from the outbreak included the need for close co-operation of the agencies involved in managing such an outbreak and appropriate contingency plans for dealing with such outbreaks. Poor prognostic markers should alert the clinician to possible complications; antibiotics should be used only with care in the treatment of gastroenteritis; food hygiene regulations need to be strengthened. Future research should try to define the risk factors more closely, identify long-term effects in survivors, and study the use of antibiotics and other interventions in case management.

#### SALMONELLOSIS IN ENGLAND AND WALES - SUCCESS AND FAILURES

The occurrence of salmonellosis in England and Wales has been well documented since the foundation of the Public Health Laboratory Service (PHLS) in 1944 which allowed systematic surveillance. Currently, the estimated numbers of cases in humans are in excess of 30,000 *per annum*, with an associated mortality rate of 0.5-1%. In the early 1960s pasteurisation of spray-dried and liquid egg products from the USA and China respectively led to control of outbreaks stemming from such sources. Large Christmas turkeys were once *de rigueur*, but with a reduction in the size and more thorough cooking *S. hadar* infections have fallen. *S. enteritidis* phage type 4 is known to spread vertically as well as horizontally in poultry and reached 22,000 notifications in 1993. This strain is invasive in poultry, affecting the heart as well as eggs. Despite much work to eradicate the organism, such cases are on the increase. The start of quinolone use in British calves in 1994 heralded the spread of multiply-resistant *S. typhimurium* DT 104 and rise of quinolone resistance in this strain. This organism is a pathogen in both cattle and poultry. In Scotland when sales of unpasteurised milk stopped in 1983, related foodborne pathogen outbreaks fell. In England and Wales, where there were seven such outbreaks last year, the sale of such unpasteurised products continues, amid much debate. Unusual *Salmonella* species may be picked up by the PHLS and unusual sources tracked down, such as *S. anatum* in Milupa milk from France, *S. napoli* in Italian chocolates and *S. agona* in specialist snacks in Israel. Hospital-related outbreaks such as that at Stanley Royd Hospital with 400 cases of salmonellosis in three days are thankfully uncommon yet, despite the efforts to date, the rise in notifications continues with 30,075 cases in 1996 to 32,124 cases in 1997. The cost to

the nation runs to billions of pounds sterling and requires attention at all points in the food chain. Where salmonellosis causes disease or financial losses in animals, farming interest is raised and interventions to control spread more likely.

#### WHAT'S NEW WITH CAMPYLOBACTER?

*Campylobacter* disease is on the increase too, with the source arising from a wide variety of animals and birds, especially poultry. About 40% of flocks and most birds in those flocks are infected. In Scotland, England and Wales, there were 108 and 95 campylobacter notifications respectively per 100,000 population in 1997. Geographical variation is considerable with a 'hot spot' in Lothian. It may be that the spread of supermarkets has contributed to the rising notifications. Although vehicles such as poultry, beefburgers, milk, water and contact with pets - particularly puppies - have been implicated, 99.5% of cases are apparently sporadic. Perhaps repeated low-level exposure gives some immunity - this could be another area for research.

Typing of isolates remains controversial. Currently typing in the UK is carried out in Scotland and England, with the Advisory Committee on the Microbiological Safety of Food disappointed that this is not carried out in one UK laboratory with a standard method. In Scotland 60% of 5,200 isolates are typed, while in England and Wales only 15% of 50,000 isolates are typed. So far there are few epidemiological typing successes. In the face of increasing numbers of cases we await a utilitarian typing scheme, and thence the tools to link more cases with source(s) of infection. So, there is 'not much new' with *Campylobacter*.

#### VETERINARY ASPECTS OF FOODBORNE DISEASE

Despite the eradication of brucellosis in Scotland, food and stock production is in crisis. There are relentless pressures to cut food costs. Milk is now cheaper than bottled water and soft drinks. The key to safe milk products is pasteurisation, yet the consumer often wants unpasteurised products but is reluctant to tolerate the inherent risks. As agriculture and food production evolve, so the risks change. Restriction of antibiotic use in animals will lead to animal welfare concerns; some bacteria may cause disease in animals but not humans. Society demands luxury meat as a cheap social protein. To meet this demand, intensification of animal husbandry and farming has been found necessary and this can result in increased spread of *Campylobacter* and *Salmonella* species. Rapid processing and evisceration of 10,000 chickens per hour is bound to lead to difficulties of spillage and cross-contamination. Perhaps the answer lies in irradiation of carcasses to reduce infective load. More 'correct' free-range eggs are likely to be soiled by animal manure; free-range pigs are dirty - both may be a greater infection risk than the intensively farmed options. Sheep feeding on roots in autumn will become dirty while faecal contamination of cattle is difficult to prevent. Should hides be directly removed and all meat vacuum-packed, as mincing leads to cross-contamination? Each time a product is handled, the opportunities for cross-infection rise. The tensions in food production demand the attention of all involved. There are animal ethical issues to consider and new problems, as eating practices and the associated risks change. The microbes tend to evolve more quickly than we do!

#### THE CHANGING EPIDEMIOLOGY OF FOODBORNE DISEASES - THE AMERICAN PERSPECTIVE

In the United States of America there are annually an estimated 6.5-80 million cases of foodborne disease with 535-9,000 associated deaths, at a cost of \$8-23 billion per annum. Sequelae include miscarriages, haemolytic uraemic syndrome, reactive arthritis

and Guillan Barré syndrome. *E. coli* O157:H7 has emerged as a significant problem. Prompt action in an outbreak involving 700 people in 1993 prevented some 800 further cases. Outbreaks have risen between 1982 and 1996. Apple juice was identified in 1996 as a vehicle of infection, possibly related to contamination of apples by deer. Yet prior to 1980 *E. coli*-associated verotoxin appears not to have occurred.

Somehow *Salmonella enteritidis* entered poultry flocks - eggs are not cooked thoroughly and the related infections are not yet under control. This is despite a reduction in eastern states of such infections following an industry-driven quality assurance initiative. There is no unified multi-agency approach in the USA to this problem. Drug-resistant enteropathogens are now also of concern. Ciprofloxacin-resistant *Campylobacter*s are on the increase and now multi-drug resistant *Salmonella enterica* serotype *typhimurium* DT104 accounts for 25% of all salmonella isolates in the USA. The latter is resistant to ampicillin, chloramphenicol, streptomycin, sulfonamides and tetracycline. It is also a major cause of illness in humans and animals in the United Kingdom. Here, ciprofloxacin-resistant isolates have risen from 0% to 16% of such isolates. In the USA 0.5% of all poultry receive fluoroquinolones. Such agents are essential for treatment of human extra-intestinal infections which comprise 6% of culture-confirmed cases. It appears that despite widespread fluoroquinolone use in humans, salmonella resistance has not arisen until animal usage has allowed spread of resistant strains between animals and then to humans. This contrasts with the spread of drug resistant *Mycobacterium tuberculosis* and methicillin-resistant *Staphylococcus aureus* (MRSA) where person-to-person spread of organisms is common. Thus use and transmission are necessary for spread of resistance to occur. Disease prevention and more prudent use of antimicrobial agents in farm animals is needed to reduce dissemination of multidrug resistant *S. typhimurium* DT104.

The globalisation of the food industry is illustrated by the spread of *Cyclospora* from imported Guatemalan raspberries to the USA in 1995-7. Industrialised countries have more elderly and immunocompromised individuals, all-year-round imports of produce and increasing tourist travel which lead to changes in foodborne disease. Equally, consumer preferences are changing too. To combat foodborne pathogens appropriate laboratory, typing and surveillance facilities are required at an international level: in simple terms, animal faeces should be removed from the food chain and on farm studies are required to see if interventions lead to disease prevention. In addition, education which is food-, site- and population-specific is needed.

#### SAFE FOOD; THE INDUSTRY'S CHALLENGE

In the UK the food industry accounts for 9% of gross domestic product and needs to provide food for the nation, exports, and employment. It uses diverse technologies and variable raw materials while catering for a fickle consumer who switches between many perishable products with short shelf-lives. The challenge is to produce high-quality safe food giving good value, choice and excitement! Contamination with chemicals, prions and other foodborne pathogens as well as coping with mixed public messages on diet and health are significant hurdles to overcome. This requires research to improve understanding and allow control of hazards, restoring confidence in the food industry. New technologies should be assessed to allow risk reduction to acceptable levels. Shopping habits, a rise in 'eating out', and increased consumer 'grazing' have led to an increase in the importance of consumer hygiene.

Consumer lifestyles have changed. Poor storage, inappropriate re-heating and cooking have all led to outbreaks of foodborne disease. To improve this situation,

better understanding, application of good manufacturing practice and focus on the HACCP (hazard analysis at critical control points) principles at all stages is crucial. Consumers must take appropriate care in food handling and media coverage must be strong, balanced and accurate. Against the background of high public expectations, government should create the right environment to encourage safe and attractive food production. Perhaps in the future bacteria will be eliminated from the food chain, agrochemical use will be reduced and we will have internationally recognised good quality food. Genetically modified crops will be resistant to parasites and robots directed by satellites will spread herbicides! We must accept increased dialogue with those in biotechnology.

#### CONCLUSIONS

The overall lessons of this symposium are that we are all responsible for attempting to reduce the impact of foodborne disease, be it from 'plough to plate', or 'turd to table'. Confusion, conflicting interests and ignorance combine to allow foodborne pathogens to spread alarmingly at great human, animal and economic cost in the face of changing technologies and lifestyles. Lessons should be learned, for example from Northern Ireland and Scandinavia, about controlling foodborne disease, and education of school children and young veterinary and medical colleagues improved. Tensions between industrial and public health interests should be resolved. Many of the issues are now out in the open. Do we have the will to deal with them?