Infection and the Threat to the Food Chain

CRF/RSE Biomedical Research Conference

24-26 September 2003

Report by **Professor Hugh Pennington**

The Conference "Infection and the Threat to the Food Chain" was held on 24-26 September 2003 at the Royal Society of Edinburgh. It was organised by the RSE in association with the Caledonian Research Foundation (CRF) and was sponsored by the CRF and Food Standards Agency.

It opened with "Lessons Learned" and two speakers who considered foot and mouth disease, in particular the 2001 outbreak. Professor Sir Brian Follett (University of Oxford) chaired the Royal Society's inquiry for the Government and he discussed its primary recommendation, that mass vaccination should be employed in future as a control measure. He said that this would be neither simple nor straightforward. Vaccine supply and manufacture was complex and uncertain. Rapid outbreak control might still need slaughter, dependent on circumstances. And there were uncertainties about the acceptability of meat and milk from vaccinated animals. Brigadier Alex Birtwistle considered crisis management and disease control. When drafted in to Cumbria on 22 March, he was faced with the disposal of 100,000 carcasses, 100,000 animals awaiting slaughter, and 750,000 likely to follow. He described how an order-of-magnitude improvement in the interval between diagnosis and destruction was achieved. This was by setting up the right management structures at all levels, by identifying, owning, and managing risks (using facts to make decisions); by constantly revisiting decisions (because they are the new facts); and by using the media. It was crucial, in his words, to "believe that any disease can be controlled at a price, because it has no soul and no mind".

Two classic Scottish outbreaks were covered by Professor T H Pennington (University of Aberdeen) (the 1996 Central Scotland *E.coli* O157 outbreak, 500 cases with 17 deaths) and Dr David Smith (University of Aberdeen) (the 1964 Aberdeen typhoid outbreak). The Aberdeen outbreak hospitalised over 500 people and was caused by corned beef contaminated by unchlorinated cooling water during manufacture in Argentina. The infection spread to other meats at a supermarket through implements, surfaces and hands. The Ministry of Health and MAFF were aware that suspect meat was in circulation. Dr Smith argued that the ineffectiveness of the action on canning hygiene before 1964, and on general hygiene after 1964, stemmed from a civil service culture which allowed economic and political factors to take priority over health risks. Professor Pennington pointed out that the Aberdeen failings (most cases arose from cross-contamination) were replicated in Wishaw in 1996. Lessons had not been learned – or if they had, remembered. *E.coli* O157 and other VTEC remained a threat – the incidence of infection in Scotland, while low in absolute terms, was still the highest in the world. The "Lessons Learned" sessions concluded with a vigorous discussion led by

Professor Michael Lean (University of Glasgow) on possible relationships between nutrition and infection in Scotland. No clear links emerged.

"New Threats and Old Ones" opened with an account by Dr John Wood (NIBSC, Potters Bar) of recent experiences with new influenza viruses. H5NI (1997 and 2003) was highly pathogenic for chickens and caused human fatalities; traditional vaccine production methods were found wanting but reverse genetics provided a way forward. Clinical evaluations are still in progress. Professor Jennifer Mordue Luntz (University of Aberdeen) discussed the recent northward extension of infections with the ruminant virus, bluetongue, and its *Culicoides* vector *C. imicola*, together with the results of taxonomic research showing the occurrence in the UK of possible vectors related to *C. obsoletus* and *C. pulicans*. She emphasised the importance of vector research. The session closed with a presentation on "The Threat of a Biological Terrorist Attack on the Food Supply: The CDC Perspective" by Dr Jeremy Sobel (CDC Atlanta). Deliberate contamination of food with biological agents has happened already in the USA. The start of an outbreak caused this way could either be slow and initially unremarkable, or explosive. Preparedness requires the augmentation of the traditional public health infrastructure to enhance disease surveillance, accelerate laboratory detection capacity, and rapidly investigate and control outbreaks, as well as developing capacity for responding to mass-casualty disasters.

"Where Are We Now?" opened with *Campylobacter*. Dr John Cowden (SCIEH, Glasgow) pointed out that although a common cause of gastrointestinal disease, its source was almost always unknown, despite much epidemiological and microbiological research. A reliable and generally available typing scheme remains elusive, hindering this work. Dr L J Allison (Western General Hospital, Edinburgh) considered verocytotoxin-producing *E.coli*, and emphasised that although the food-borne route was important, so was contact with animals and their faeces. New serogroups other than O157 were being detected in Scotland; O26, O103, O113, O118, O162 and O19. Professor Tom Humphrey (University of Bristol) completed coverage of the currently active triumvirate of zoonotic food-borne pathogens by emphasising the phenotypic and genotypic adaptability of *Salmonella*.

Professor Peter Smith (London School of Hygiene and Tropical Diseases) considered the current status of the epidemics of BSE and vCJD. The Food Standards Agency has assessed that the current control measures in the UK have a cost which is now disproportionate to their benefit and some relaxation of controls is under consideration. Less than 150 persons, globally, have been diagnosed with variant Creutzfeldt-Jakob disease (vCJD), but there are many uncertainties about the future course of the epidemic because of the long and variable incubation period. Food risks of BSE infection should now be very low but better control measures are necessary to guard against the possibility of iatrogenic transmission, through blood transfusion or contaminated surgical instruments. These will require sensitive diagnostic tests and improved decontamination methods. Professor James Ironside (University of Edinburgh) concluded coverage of this subject. He reviewed the control of routes of transmission of TSEs. The session concluded with a lively discussion led by Professor Peter Borriello (HPA, Colindale) who

provoked by proposing that in general, lessons were not learned from history. The importance of a robust public health infrastructure and regular reviews of policy were emphasised by several discussants.

Professor Mark Pallen (University of Birmingham) opened the session "Techniques/Ways Forward" by illustrating the routes from genome sequence to consequence. About a dozen genome sequences for *E. coli* and *Salmonella enteritica* have been or are close to completion, with two for *Campylobacter jejuni*; much more sequencing and analysis will be needed to answer the many outstanding questions concerning gene function and virulence. Professor Gordon Dougan (Imperial College, London) considered vaccines. Many cases of food poisoning are never defined in microbiological terms. Thus, market drivers for many potential vaccines designed to protect the human consumer are often not attractive for commercial development. Consequently human vaccines against *Salmonella* gastroenteritis, *Campylobacter* and other food-associated agents are not under active development, other than as travellers vaccines or as components for general diarrhoeal vaccine targeting third world populations. Potentially, the more attractive target is the consumed animal, although even here some of the commercial drivers motivating vaccine development are complicated and sometimes disputed if the agent (such as *E. coli* O157) does not cause a serious disease in the animal reservoir. We may have to be inventive in how we encourage vaccine uptake on the supply farms. Professor Mark Woolhouse (University of Edinburgh) gave four reasons why a wider understanding and acceptance of mathematical modelling was important in his presentation "Computer Models in the Real World". First, the more those with relevant expertise contribute to the model-building process the better the models will be. Second, the process of model development often indicates which crucial data are missing. Third, the better the general understanding of models the more likely they will be used wisely by policy makers. Finally, there is no real alternative if we aspire to the evidence-based design of disease control programmes; major disease outbreaks are singular events and experience and intuition alone will often be poor guides to decision-making. Dr Michael Klass (Illinois) illustrated recent applications of an ELISA (Enzyme Linked Immunosorbent Assay) format to TSE testing in his presentation "Testing for TSE: Mad Cows, Scrapie Sheep and Wasted Deer and Elk." The session concluded with a presentation by Nick Higham, Arts and Media Correspondent of the BBC. He used familiar stories to illustrate good practice and pitfalls, reviewed the progress of the Food Standards Agency towards getting the right balance between simply responding to food scares and actively promoting good nutrition and hygiene (good progress to date). He also emphasised the importance of improving communication between the media, scientists and policy makers.

Professor Geoff Sim (SAC, Edinburgh) moved the emphasis from pathogen to host in his presentation "Selective Breeding". After a general review he focused on the National Scrapie Plan. He concluded that while selection for the desired genotype looks simple at first sight; there remain important unanswered questions – including the impact on other traits of economic importance, the impact on genetic variability and optimal approaches to

breeding for resistance in populations of different size and with different PrP allele frequencies.

Two general presentations came at the end of the Conference, “From Control to Commitment” by Dr Patrick Wall (Member, European Food Safety Authority), and a final overview by Professor Douglas Georgala (Chair, ACMSF). Dr Wall said that food safety is not rocket science, but improving the safety of food can only been achieved when all the stakeholders play their part. The solution is simple, sequential incremental risk reduction along the food chain with communication of any unavoidable residual risk to consumers with clear instructions on how to manage it. While pathogen specific control programs are required and more research and surveillance needed to understand the epidemiology of the different agents, simply increasing hygiene standards across the food chain will have the effect of reducing food-borne disease.

Professor Georgala concluded the Conference. He said that public health authorities have a key role in maintaining and improving surveillance systems to monitor trends, and to ensure that the emergence of a ‘new’ food pathogen is detected early. Local enforcement needs to be effective and consistent. Training of all food handlers needs much greater attention. Larger food companies have been successful in adopting the full HACCP approach. The challenge is to bring the HACCP approach to smaller operations, to catering and fast food outlets, *and* to the farming sector. There was general agreement with his final words “that there is no real alternative.”

Eighty delegates attended the Conference. Discussions were vigorous and high quality. The intention of the organisers (Professor Hugh Pennington and Sir John Arbuthnott) was to bring together a very broad range of experts to categorise old and new threats to the food chain and propose new solutions and assess the success – or otherwise – of old ones. They did not disappoint. At the Discussion Supper on “Trust and the Public Health”, Baroness Onora O’Neill put these topics into philosophical context. In her view, the current audit culture distorts accountability and marginalises professionalism. Medical ethics has swung the balance very much towards individual patients and individual practitioners. There is now a need to anchor public health ethics in political philosophy – issues of truth and justice.