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INTEGRATED APPROACHES TO THE MANAGEMENT OF FOOD SAFETY THROUGHOUT THE FOOD CHAIN

THE ENTER-NET SURVEILLANCE SYSTEM

SUMMARY

Enter-net is the international network for the surveillance of human gastrointestinal infections, which monitors salmonellosis and Verocytotoxin producing *Escherichia coli* (VTEC) O157. It involves all 15 countries of the European Union, plus Switzerland and Norway and is funded by the European Commission.

International travel and international trade in food play an important role in the occurrence of foodborne infections. Events in one country now have the potential to affect many others. A co-ordinated international response is required to control this threat. Through recognition of outbreaks and investigation, timely exchange of information between experts in different countries can lead to effective international public health action. Exchange of data internationally can help eliminate potential vehicles of infection allowing authorities to concentrate their resources more effectively. For instance, if a rise in infection occurs only in one country it is likely that the source is in that country and not a result of imported goods.

THE ENTER-NET SURVEILLANCE SYSTEM

Discussion Topic: Integrated Approaches to the Management of Food Safety Throughout the Food Chain

OUTLINE

1. Enter-net is the international network for the surveillance of human gastrointestinal infections, which monitors salmonellosis and Verocytotoxin producing *Escherichia coli* (VTEC) O157, including their antimicrobial resistance. When the network began it involved all 15 countries of the European Union (EU), plus Switzerland and Norway. The network is funded by the European Commission (EC) and represents a continuation of the Salm-Net surveillance network (1994-97), which concentrated on harmonisation of salmonella phage-typing and the establishment of a regularly updated international salmonella database. Salm-Net showed, through the recognition of outbreaks and investigation, that the timely exchange of information between experts in different EU countries could lead to effective public health action in Europe and beyond. Enter-net is continuing to extend these benefits to the prevention of *E. coli* O157 infections.

BACKGROUND

Increasing international travel and current manufacturing and distribution practices play important roles in the occurrence of foodborne infections. All parts of the globe are now accessible within 24 hours, less time than the incubation period for most enteric pathogens. Foodstuffs are manufactured or harvested at one place and then distributed within a country or across economic regions (such as the EU), continents, or even worldwide. Events in one country, which previously might not have had implications outside its borders, now have the potential to affect many other countries. Outbreaks of infection may occur far from the source of contamination. Free movement of people and goods between countries can be effective ways of distributing disease internationally. A co-ordinated international response is required to control this threat.

The response that has been created is that of a surveillance network that can react swiftly to international outbreaks of foodborne infections. The participants in Enter-net are - for each country - the microbiologist in charge of the national reference laboratory and the epidemiologist responsible for national surveillance. By involving the key national experts directly, high quality data and information from reliable sources are available readily to those with the experience needed to interpret them.

METHODS

The overall aims of the Enter-net project are to improve understanding of the extent and evolution of antimicrobial resistance in salmonella isolates and of the distribution of VTEC O157 infections in the EU. The objectives selected to achieve this aim are:

- To collect standardised data on the antimicrobial resistance patterns of salmonellas isolated;
- To facilitate the study of resistance mechanisms and their genetic control by arranging the collection of representative strains of multiple drug resistant salmonellas and co-ordinating the required research work between specialised centres, and where available compare the resistances of animal isolates;
- To extend the typing of VTEC for surveillance purposes by:
    - extending the availability of phage typing for *E. coli* O157,

- using poly- and monovalent antisera to identify common non-O157 serogroups;

- To pilot an international quality assessment scheme for laboratory methods used in the identification / typing of VTEC;

- To establish a core set of data items to accompany, where possible, each laboratory typed VTEC isolate;

- To create an international database of VTEC isolates which is updated regularly and is readily available to each participating team;

- To detect clusters of VTEC isolate types in time, place and person and to bring such clusters to the attention of collaborators rapidly;

- To support the above objectives by continuing the existing Salm-net surveillance system consisting of regular, frequent data exchange on salmonellas.

The project involves harmonising parts of the work of national reference laboratories in countries, extending the work where necessary, and pooling the resultant data in a timely way to create an international database. Surveillance of antimicrobial resistance is an important part of Enter-net. It is vital, therefore, that the results of antibiotic resistance testing from national reference laboratories are harmonised. This area is of considerable concern worldwide, and most groups emphasise the importance of being able to compare results between laboratories, by ensuring that the same methods are used. Enter-net has brought its experience of harmonising typing schemes to address this important issue.

Each partner collects basic data on each person for whom a salmonella or VTEC isolate is submitted for further identification and typing. Such data include:

- Sex, age group;
- Travel abroad before the onset of illness;
- Date of receipt of specimen in source laboratory and in reference laboratory;
- Region of source laboratory;
- Specified VTEC serogroup;
- Salmonella serotype;
- Phage-type;
- Results of antimicrobial resistance testing.

Data are collected and transferred regularly by electronic link to the central databases. Surveillance reports based on analysis of these data are issued within and outside the network on behalf of all the participants, each of whom has full access rights to the database. All unusual multinational events are brought to the attention of all partners immediately. An annual workshop is held to agree protocols and priorities, review progress, and discuss results. An annual report comparing trends between countries and summarising the results of outbreak investigations is issued following discussion at the workshops.

MICROBIOLOGICAL ACHIEVEMENTS

Harmonisation of salmonella phage-typing

All participants have access to common phage typing schemes for *Salmonella typhimurium*, *S. virchow* and *S. dublin*. Progress has been made in harmonising the phage typing of *S. enteritidis*. Most countries now use and report results using the enhanced phage typing scheme developed by the Public Health Laboratory Service (PHLS) Laboratory of Enteric Pathogens in London. This enhanced scheme is a result of the harmonisation work that took place during the Salm-Net collaboration.

Surveillance of antimicrobial resistance

A pilot study into the surveillance of antimicrobial resistance testing results has been conducted between 18 national salmonella reference laboratories[1]. The study showed significant concordance between results from national laboratories and has highlighted areas that still require development. This exercise has shown that valuable surveillance of antimicrobial resistance can be achieved successfully on an international basis. Consequently data on antimicrobial resistance testing has been incorporated into the salmonella and VTEC databases.

EPIDEMIOLOGICAL ACHIEVEMENTS

International databases

Dynamic international databases have been created. The salmonella data base has been in existence for several years with data from 13 countries from 1995 and 16 countries from 1998. The database for VTEC infections was set up in January 1999, and data from 1995 onwards were included retrospectively, where available. The data requested are simple enough for all participants to supply, but sufficient to allow a high sensitivity for outbreak detection. Data are sent to the central databases each month. As the infrastructure develops the frequency of reporting will increase, first to twice a month, but with the aim of weekly reporting, thus allowing events to be analysed as they occur. The database is being made available to participants on- line as part of the EC project, “Interchange of Data between Administrations - Health Surveillance System for Communicable Diseases”. The creation of these databases provides an opportunity for the incidence of these diseases to be monitored.

Trend and outbreak recognition and investigation

The twin objectives of surveillance are to monitor long term trends and identify unusual short term events.

International outbreaks can be recognised in two ways. One country may recognise an outbreak and inform the network, members of which recognise a similar occurrence in their countries. Alternatively, outbreaks may be identified by analysing pooled, international databases for unusually high levels of infection.

Individual countries that identify apparently isolated incidents can now feed this information into the network, receive replies from other participating countries, and quickly learn whether the incident is

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[1] E John Threlfall, Ian ST Fisher, Linda R Ward, Helmut Tschäpe and Peter Gerner-Smidt. Harmonisation of antibiotic susceptibility testing for *Salmonella* - results of a study by 18 national reference laboratories within the European Union-funded Enter-net group. *Microb Drug Resist* 1999; **5**: 195-200.

confined to their country or if it is part of a wider international event. The knowledge that a problem is confined to one country helps to eliminate potential vehicles of infection, thus allowing public health authorities to concentrate their resources more effectively.

The application of software written by the PHLS facilitates the recognition of clusters of infection of international importance that would not be ascertained by national surveillance alone. This software compares current levels of infection with those expected in the light of historical data. The unusual event report flags up any serotypes that are above expected levels in more than one country. In the past Enter-net has identified outbreaks belonging to the first category but an outbreak of *S. livingstone* was identified by the international pooling of data alone.

Data and information dissemination

The surveillance loop is completed by feeding back information to participants in various ways. The unusual event report is run monthly and reported back to all participants if any anomalies are detected. A quarterly report is prepared and shared within the network five to six weeks after the end of each quarter. A public domain version of this report is also made available on the world wide web (http:// www. Enter-net.org.uk). Reports of the investigation of international outbreaks of foodborne infections are circulated within the network and published in scientific journals.

CONCLUSIONS AND LESSONS LEARNED

The future of Enter-net lies in several directions: expansion of the network to include other countries, improvement of data quality in both timeliness and completeness, universal implementation of harmonised typing schemes and standard setting for primary laboratories. Australia, Canada, Japan and South Africa are now full participants in the network.

Lessons learned include:

- A surveillance network requires a clearly defined set of rules by which to work[2].
- Consistent quality of data is important, common standards are therefore needed;
- Global movement of people and goods means that a co-ordinated international response is required to control threats;

Acknowledgements

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[2] **IST Fisher** and **ON Gill** on behalf of the Enter-net participants. International surveillance networks and principles of collaboration. *Eurosurv* 2001; **6**: p 17-21.