Research / Recherche

A salmonella data bank for routine surveillance and research

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A salmonella data bank has been established in the State of Brandenburg, Germany, with due steps being taken to ensure the protection of personal data. The system of data collection and rapid return of information to the local health and veterinary services have become essential elements in intersectoral cooperation in case investigation, disease prevention, and epidemiological research. A number of issues, particularly those concerning the pathways of infection, characteristics of clusters of cases, and the infection of different population strata can now be examined and monitored. An important feature of the data bank is its accessibility by local as well as central state services using a PC-based program and the wide interdisciplinary circulation of regular reports.

Preliminary results on the data volume, age distribution of cases, and salmonella isolation rates in different population strata are presented. The data bank supports studies on marketing and purchasing patterns of agricultural products representing potential vehicles of infection, and it should encourage investigations to trace the reservoirs of infection and contamination points along the food chain.

The number of officially recorded cases of human salmonellosis has significantly increased over the past two decades in many countries all over the world (1–3, 5). Although different serotypes and phage types of salmonella have been involved (3, 5), this increase has been determined by zoonotic salmonella with major reservoirs in farm animals (4, 6). Particularly in recent years, Salmonella enteritidis has caused a dramatic rise in the recorded rate of human salmonellosis (3, 4).

The incidence and observed pathways of salmonella infections in the State of Brandenburg, Germany, called for an improved surveillance system involving services for health and hygiene in humans, animals, and the environment, as well as food safety. The classical system of data collection, involving over 100,000 human faeces and other specimens examined statewide, was useless for control purposes largely because of the lack of information correlating human cases with the agent-specific reservoirs and pathways of infection.

Methods

Source, scope and processing of data

The newly established salmonella data bank (SDB) in the German State of Brandenburg is based on four major principles: the systematic collection of information from all relevant sectors and services; use of uniform computer software; adequate case and strain description (coded and dissociated from personal identification data); and rapid information exchange every two weeks.

All public health offices in the State of Brandenburg (mainly district health offices) report all cases of human salmonella infection to the Medical Investigation Office (Laboratory) in Frankfurt (Oder). A case is defined as the first salmonella isolation from a person exhibiting disease or found to be positive in compulsory investigations of contact persons or detected in routine examinations of personnel employed in the food industry.

For each case, the records provide information on the individual's sex, age, location (community), date of salmonella isolation, the reason for the investigation (e.g., disease or contact), and clinical observations (e.g., disease, symptomless carrier status, fatality, etc).

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Reprint No. 5452
In the event of a salmonella outbreak, public health officers often submit reports that are stored in the data bank and processed as appropriate. Although salmonella outbreaks have been defined internationally as the occurrence of two or more cases associated by place and time, in routine practice they are reported when five or more cases are observed in one place within a 14-day period. This generally involves large, common-source outbreaks and other clusters having a distinct and coherent pattern.

During the initial phase of the data bank, forms had to be completed and mailed to the state health office. Now, however, standardized software is available for use on personal computers and the data are transferred to the state health office and read into the data bank through a special menu. The introduction of electronic data processing, including access to statewide data by local health offices, has contributed significantly to the acceptance and function of the data bank.

An important consequence of the data bank has been the development of an interface between the public health and veterinary laboratories. In the State of Brandenburg the veterinary laboratories are responsible for examining foodstuffs that are suspected to have been involved in the transmission of salmonella as well as for obtaining data on salmonella in animals, the farming environment, feedstuffs, and at compulsory meat inspections. Intersectoral cooperation is indispensable in salmonellosis control, but is severely lacking in most societies. The medical health office has, therefore, taken the initiative to collect and correlate, as far as possible, salmonella-relevant data from all possible sources in the State of Brandenburg. Currently this system operates satisfactorily, although the formal agreement between the state ministers is still pending. Collaboration between the services involved has been stimulated at both the district office and laboratory levels by the data bank and by the exchange of information.

The information circular

Every 14 days, a statewide report is distributed which, in addition to an analysis of special events, provides the information outlined below.

- An analysis of the territorial distribution of salmonella isolates in the state, with the findings presented using graphs and maps.
- Comparison of the situation in 1992 with that in the preceding year (see Table 1).

### Table 1: Monthly number of human cases of salmonella infection recorded in the Federal State of Brandenburg, Germany, October 1991 to September 1992

<table>
<thead>
<tr>
<th>Month</th>
<th>No. of cases</th>
<th>Monthly incidence (per 100 000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>520</td>
<td>20.5</td>
</tr>
<tr>
<td>November</td>
<td>380</td>
<td>14.9</td>
</tr>
<tr>
<td>December</td>
<td>288</td>
<td>11.3</td>
</tr>
<tr>
<td>January</td>
<td>349</td>
<td>13.7</td>
</tr>
<tr>
<td>February</td>
<td>523</td>
<td>20.6</td>
</tr>
<tr>
<td>March</td>
<td>459</td>
<td>18.1</td>
</tr>
<tr>
<td>April</td>
<td>847</td>
<td>33.4</td>
</tr>
<tr>
<td>May</td>
<td>724</td>
<td>28.6</td>
</tr>
<tr>
<td>June</td>
<td>2 032</td>
<td>80.1</td>
</tr>
<tr>
<td>July</td>
<td>1 771</td>
<td>69.8</td>
</tr>
<tr>
<td>August</td>
<td>1 971</td>
<td>77.7</td>
</tr>
<tr>
<td>September</td>
<td>1 916</td>
<td>75.6</td>
</tr>
<tr>
<td>Total</td>
<td>11 780</td>
<td></td>
</tr>
</tbody>
</table>

### Users of the salmonella data bank

The recipients and users of the data bank and the information circular are currently as follows:

- the Ministry of Food, Agriculture and Forestry of the State of Brandenburg;
- the State Ministry of Labour, Social Affairs, Health, and Women;
- all state health offices;
- the state veterinary investigation offices;
- the State Office of Statistics;
- the Federal Health Office; and
- the state medical journal, which reaches practically all physicians in Brandenburg.

In each issue of the official journal of the state medical association a column is devoted to salmonella information, generally covering the previous 6 weeks.

Results and discussion

A number of basic questions about salmonella epidemiology have yet to be resolved. "Missing links" largely arise because of the lack of appropriate data and intersectoral gaps. Thus very little is known about the pathways of transmission of S. enteritidis. Vehicles of infection are known for only a few outbreaks, and the overwhelming majority of human cases of S. enteritidis occur sporadically. Case-control studies have been used for this purpose (2, 7) and further information has been obtained from sets of incomplete data, particularly from veterinary investigations (5). The data bank provides better answers to many of the open questions concerning salmonella transmission, and once representative negative samples have been defined more accurate comparison of the rates of infection in different population strata will be possible.

The data bank has become a potential information source for research projects that have been initiated in cooperation with the WHO Collaborating Centre for Veterinary Public Health (in Hanover) and the WHO Veterinary Public Health unit (in Geneva). Among the issues being investigated are the following:

- The elucidation of chains of infection and potential sources of infection.
- A search for changes in the severity of clinical symptoms, i.e., the virulence of prevalent strains of S. enteritidis.
- A description and analysis of outbreaks and clusters of cases and detection of biological variants of salmonella during the course of epidemics.
- An investigation of the patterns of retailing potential vehicles of infection (e.g., poultry and eggs) in relation to foci and clusters of infection.
- An analysis of the rates of infection by age, sex and other case parameters for S. enteritidis and other salmonella serotypes.

Age distribution of cases

Comparison of recorded cases of infection caused by S. enteritidis and other salmonella serotypes indicates significant differences in the age distribution of those affected, with children aged 2–5 years being less frequently infected with S. enteritidis than with S. typhimurium (Fig. 1). Determination of the positivity rate (i.e., the proportion of those examined who are positive) would help to clarify these findings, since children with diarrhoea are more frequently examined than juveniles or adults. Such positivity rates are often not provided by disease statistics, and one of the intentions of the data bank is to correct this deficiency, e.g., by establishing a sentinel system. Data on the age, sex, and address of persons found negative are generally retained by the practitioners who code specimens for submission, and are released only when a case has to be officially notified. The totals recorded in the laboratory of the medical investigation office in Frankfurt (Oder) over the past few years reveal an increase in the number of salmonella isolates and a dramatic increase in the proportion of specimens (stool, urine, blood) positive for salmonella, although the total number of specimens examined declined (Fig. 2).

Search for carriers

Compulsory examination of persons living or working with a salmonellosis patient leads to identification of secondary cases not defined by disease but by positive stools. Data on the total number of persons covered by such epidemiological investigations and on those found positive as secondary cases are recorded in the data bank by the official public health services responsible for this case-associated carrier search. The public health services also receive salmonella data from a completely different population stratum — individuals who require a health certificate because of federal regulations (e.g., those

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Footnotes:

b See footnote a, p. 70.


employed in food industries and hospitals). According to the information in the data bank, in the environment of salmonella patients between 15.5% to 31.9% of persons examined were excreting salmonellae, whereas over the same period and in the same geographical area salmonellae were isolated only from 0% to 1.9% of persons examined for occupational health certificates. The relatively high rate of 1.9% arose because some of the occupational examinations were made on individuals who lived in the vicinity of outbreaks or clustered cases. Further analysis of the data should provide greater insight into the transmission of salmonella to different age groups under various conditions.

Résumé

Banque de données sur les salmonelles pour la surveillance et la recherche

Une banque de données sur les salmonelles a été créée dans l’Etat de Brandebourg en Allemagne, en prenant toutes les précautions requises pour assurer la protection des données personnelles. Le système de collecte des données et de rétro-information rapide aux services locaux de santé publique et vétérinaire est devenu un élément essentiel de la coopération intersectorielle pour l’étude des cas, la prévention de la maladie et la recherche épidémiologique. Un certain nombre de questions, notamment celles qui concernent les voies d’infection, les caractéristiques des grappes de cas, et l’infection dans les diverses couches de la population peuvent maintenant être examinées et suivies. Cette banque de données a pour caractéristiques son accessibilité par les services locaux et centraux au moyen d’un programme pour micro-ordinateur, et la diffusion interdisciplinaire très large de rapports périodiques. Des projets de recherche ont été lancés avec l’OMS et son centre collaborateur de Hanovre.

L’article présente des résultats préliminaires sur le volume de données, la répartition des cas selon l’âge, et les taux d’isolement de salmonelles dans différentes couches de la population. La banque de données sert aux études sur les modalités de commercialisation et d’achat de produits agricoles constituant des véhicules potentiels de l’infection, et encouragera les recherches destinées à remonter aux réservoirs de l’infection et aux points de contamination le long de la chaîne alimentaire.

Le programme a été établi pour micro-ordinateur sous MS-DOS (version 3.3 ou plus récente, ou DR-DOS) et est disponible en anglais ou en allemand sur demande adressée à l’auteur.

References