Saudi Epidemiology Bulletin

Department of Preventive Medicine and Field Epidemiology Training Program

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النشرة الوبائية السعودية

تصدرها وزارة الصحة – الرياض

الوكالة المساعدة للطب الوقائي وبرنامج الوبائيات الحقلي

ربع سنوية – المجلد الأول – العدد الأول – ربيع أول ١٤١٤هـ

Surveillance: Information for action

In 1991, the World Health Organization (WHO) designated surveillance as a critical element in the effort to attain the following objectives: the eradication of polio by 2000, the elimination of neonatal tetanus by 1995, and a 90% reduction in the number of measles cases compared with pre-immunization levels.

WHO considers surveillance of these diseases as one of the four critical elements necessary to attain these objectives. Globally, it is estimated that only 1 in 10 cases of acute polio, 1 in 20 measles cases and 1 in 33 neonatal tetanus cases are reported. This means that outbreaks are not being investigated, high-risk areas or groups are not being identified, and risk factors are not being corrected.

WHO recommends several key policy elements to strengthen surveillance. They include:

-- Improving timeliness, completeness and accuracy of reporting
-- Circulating standard case definitions
-- Instituting a system of zero reporting if no cases have been seen
-- Establishing outbreak and case investigation, reporting and response
-- Identifying and focusing on high-risk areas and high-risk groups
-- Developing a system for feedback.

* * *

A message from the Ministry of Health

On behalf of the Ministry of Health, I welcome you to the first issue of *Saudi Epidemiology Bulletin*. The publication of this bulletin is an example of the support that the ministry is giving to the crucial area of preventive medicine.

The objectives of this publication are:

-- To provide a means of communication between the MOH's preventive medicine department and medical staff throughout the Kingdom and to disseminate information about disease and preventive measures to all medical personnel;

-- To offer a forum where both MOH and regional health workers can present surveillance data, giving medical personnel throughout the Kingdom the opportunity to study the patterns of disease; and

-- To publish results of epidemiological investigations done both by the Field Epidemiology Training Program and by others, providing all health workers the opportunity to learn new prevention techniques and to reinforce old ones.

We are sure that this information will be beneficial to the staffs of the medical colleges and other leading health institutes as well as to regional and local health professionals. We invite the participation of all readers to make this publication a success.

Dr. Abdulrahman Al-Suailem
Deputy Minister
Ministry of Health

Hemolytic uremic syndrome, Page 3

C. perfringens food poisoning at Tabuk camp

On July 20 and 21, 1992, 167 Indian workers at an agricultural company developed diarrhea. The company grows and processes vegetables, fruits and grain on 35,000 hectares of land 50 kilometers north of Tabuk city. It employs 1,100 workers of seven different nationalities: Indian, Turkish, Egyptian, Saudi, Thai, Filipino and American. All workers live in barracks or tents. There is one bathroom for every 10 workers.

Food is prepared and supervised by another company, and each nationality has its own chef and assistants. Food poisoning occurred in this camp in 1990 among Filipino workers and in 1992 among Egyptian workers.

We interviewed all Indian laborers to determine which of the 17 food items served on July 19 they had eaten, the exact time their symptoms had begun and the type of symptoms they had reported. We defined a case as any person who ate the Indian meal on July 19, 1992, from 5 p.m. to 9 p.m. and who developed abdominal cramps and/or diarrhea within the following 48 hours. We asked the kitchen workers how they prepared the food.

Of 221 workers who ate the Indian food on July 19, 1992, 167 (79%) fit our case definition. No case had fever and 2 percent reported vomiting. Diarrhea and other symptoms resolved within 12 hours of onset. There were two peaks in the epidemic curve: the first 12 hours after the workers finished the supper July 19 and the second 12 hours after they finished supper July 20 (chart). Kitchen workers who prepared food but did not eat it did not develop diarrhea.

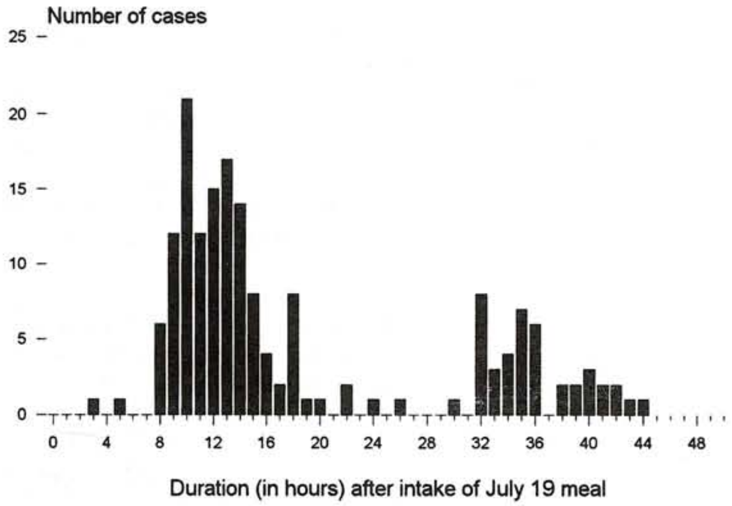
Workers who ate yogurt had an attack rate (cases per 100 exposed) of 99%, compared with 12% for workers who did not eat yogurt (risk ratio = 9.6; 95% confidence interval = 4.5-20.4). No other food eaten on July 19 was associated with illness.

Preparation of yogurt begins at 9 p.m. Dried milk in 50-kilogram plastic sacks is mixed in 82-liter cooking pots with water, leftover yogurt and three tins of concentrated yogurt. The mixture is left at room temperature (40 degrees centigrade) in a non-functioning cold room until 5 p.m. the next day. *Clostridium perfringens* was isolated from yogurt collected on July 20 and from the food table where the yogurt is prepared.

Editor's note: Since Hobbs in 1953 showed that *Clostridium perfringens* caused foodborne disease, this organism ranks with *Salmonella* and *Staphylococcus* as one of the three most common causes of foodborne outbreaks of gastroenteritis. It exists widely in the environment and persists for years as spores. It is a normal inhabitant of the gastrointestinal tract of humans and other mammals, but it does not produce diarrhea unless ingested in large amounts (10^8 organisms per gram of food). The diarrhea is produced by preformed toxins elaborated while the organism is multiplying rapidly in the food.

C. perfringens food poisoning is recognized on epidemiologic and clinical criteria. It always occurs as outbreaks in persons sharing a common food. Patients present with diarrhea and abdominal cramps without fever. Nausea can be present but vomiting is rare. The diarrhea begins 12 hours (range 8 to 16) after eating the contaminated food and lasts about 12 hours (range 6 to 24). These features are clearly distinct from staphylococcal food poisoning and salmonellosis. The diagnosis is confirmed by demonstrating >= 10^5 *C. perfringens* per gram of food. If anaerobic culture facilities are not available, a direct smear of the food will show square-ended, gram-positive bacilli almost exclusively.

In this outbreak yogurt was implicated both epidemiologically and microbiologically. To produce *C. perfringens* food poisoning, one needs to subject the food to anaerobic conditions and temperatures between 20 and 50 degrees centigrade for several hours. The yogurt was kept at 40 degrees centigrade for 21 hours in large containers (i.e. anaerobic conditions); thus all three conditions were ideal. This outbreak presented with a biphasic epidemic curve probably because the yogurt was contaminated on both July 19 and July 20 (proven by culture); leftover yogurt from July 19 used as starter was the contaminant on July 20.



C. perfringens is most commonly found in meats and stews prepared in large amounts. Because spores survive cooking, food cooked in large volumes must be eaten immediately after cooking or cooled rapidly to 4 degrees centigrade. Since *C. perfringens* is widespread on meats, on poultry and in the environment, microbiological testing of the kitchen environment or of food handlers has little value in the prevention or investigation of *C. perfringens* food poisoning. Prevention rests on strict attention to correct storage time and temperature of foods cooked in large volumes.

Reported by Dr. Nasr Tantawi (Preventive Medicine Department, General Directorate for Health Affairs, Tabuk Region), Yahia M.A. Al-Gahtani and Dr. Mohammed Saeed Al-Qahtani (Field Epidemiology Training Program).

Alert: Hemolytic uremic syndrome

In May 1993 the General Directorate for Health Affairs in Tabuk reported four children who developed dysentery followed by hemolytic uremic syndrome (HUS). One child had developed dysentery while in a village in southern Gizan, two while returning to Tabuk by car from Gizan, and one after returning to Tabuk. *Shigella dysentariae* type 1 was isolated from the four children and eight other family members with diarrhea or dysentery. The organism was resistant to cotrimoxizole, chloramphenicol, tetracycline, ampicillin and amoxicillin and was sensitive to nalidixic acid. The family reported that many other persons in their village in Gizan had diarrhea with blood. Health authorities in Gizan reported that they were aware of increasing reports of dysentery with HUS, but that no organism had been isolated.

The Ministry of Health requested all health regions to report new cases of HUS (Circular 1549/19, dated 7 Dhul-Qa'da 1413). Laboratories throughout the Kingdom were asked to report isolations of *S. dysentariae* type 1. Dammam responded with a report of two isolations of *S. dysentariae* type 1 with an identical antibiotic resistance pattern as the Tabuk isolates from a child and his aunt. The child had developed bloody diarrhea while traveling from Najran to Dammam. The family reported that many persons in their home community in Najran had bloody diarrhea. Health authorities in Najran reported that they were aware of 10 cases of dysentery with HUS. Health authorities in Gizan and Najran were advised to use nalidixic acid or oral rehydration alone for the presumptive treatment of dysentery. A team from the Field Epidemiology Training Program traveled to Gizan and Najran to investigate both outbreaks.

Gizan: Dysentery cases were found in multiple villages in south and central Gizan. Beginning in March 1993, *S. dysentariae* type 1 was isolated from four dysentery cases. Twenty-three cases of dysentery with HUS were identified. The median age was 1 year and the children came from 15 different villages. Seventy-eight percent (18) developed HUS from 2 to 14 days after hospital admission for uncomplicated dysentery. This compares with a hospital admission rate of 27% (40 of 147) control children of the same age with dysentery from the same communities (odds ratio [OR] = 9.6, 95% confidence interval [CI] = 3.1-35).

Rates of development of HUS after hospital admission for dysentery varied among different hospitals in Gizan from 0% to 31%. Hospitals with the highest rates of HUS characteristically used ampicillin for presumptive treatment of dysentery. Treatment of the dysentery with ampicillin preceded onset of HUS in 14 of the 18, compared with 41 of 76 hospitalized dysentery cases that did not develop HUS (OR = 3.0, 95% CI = 0.8-12).

All five children who developed HUS either before or on the day of hospital admission had received oral ampicillin for 5 to 7 days before developing HUS. This compares with two of nine community control children under 18 months old who had dysentery but were not hospitalized (OR = infinite, P value = 0.02, Fisher's exact test).

Najran: Unlike Gizan, the outbreak of dysentery was localized in a community of 7,000 Yemeni refugees (Barshash) and visitors from Gizan. From March until June 1993, 859 people had sought treatment for dysentery at the Barshash primary health care center. All 10 HUS cases developed from 2 to 10 (median 5) days after hospital admission among 44 children (median age 4 years) with uncomplicated dysentery.

Development of HUS in the hospital was associated with treatment with ampicillin or amoxicillin (OR = 5.1, 95% CI = 1.7-16). All analyses were adjusted for body weight and age.

The hospitals in both Najran and Gizan changed their presumptive therapy for dysentery in children to nalidixic acid. No new cases of HUS developed during the summer months.

Editor's note: *Shigella dysentariae* type 1 produces a verotoxin that is known to cause HUS. However, the rates of development of HUS as reported in the literature have been low (under 1% of of dysentery cases). Rates of development of HUS after hospitalization for uncomplicated diarrhea as seen in this outbreak are very high by comparison. The strong association of HUS with presumptive ampicillin treatment of dysentery suggests that treatment with antibiotics to which *S. dysentariae* type 1 was resistant led to the development of HUS. A previous study also showed this same association of HUS with inappropriate antibiotic treatment of *S. dysentariae* type 1 infections.[1] Given these data and the previous experience, physicians should be cautious when treating dysentery with antibiotics unless the causative organism and the resistance pattern have been identified.

Surveillance of HUS and shigellosis is the most important way to detect any spread of this multiply resistant *Shigella* organism in southern Saudi Arabia and to advise clinicians on the antibiotic resistance pattern. Reporting of new HUS cases is required under the directive given in Circular 1549/19. Shigellosis is also notifiable and laboratories are urged to be prepared to type all *Shigella* isolates. These outbreaks illustrate the importance of laboratory support for surveillance of diarrheal diseases. In these outbreaks a dangerous organism was isolated and appropriate control measures for HUS instituted.

Control of shigellosis depends upon improvements in personal hygiene. *Shigella* are easily transmitted from child to child on the hands and from the hands to the mouth. Accordingly, promotion of good handwashing habits is a key control measure. Physicians need to instruct mothers of children with dysentery to improve handwashing habits of the entire family.

Reported by Dr. Nasr Tantawi (Preventive Medicine Department, General Directorate for Health Affairs, Tabuk Region), Salah A. Bubshait (Directorate for Primary Health Care, Eastern Region), Dr. Abdulaziz A.A. bin Saeed, Dr. Sami M. Al-Qarawi, Khalid Al-Shibani and Ahmed A. Al-Zubaidy (Field Epidemiology Training Program).

Reference

1. Butler T, Islam MR, Azad MAK, Jones PK. Risk factors for development of hemolytic uremic syndrome during shigellosis. J Ped 1987;110:814-7.

Reducing measles: The Kingdom's

As part of the communicable disease surveillance system in Saudi Arabia, all medical facilities, both governmental and private, should report new measles cases through local health authorities to the Ministry of Health. For the purpose of surveillance, a clinical case of measles is defined as an illness with a generalized blotchy rash lasting three or more days with fever plus one or more of the following: cough, runny nose, red eyes and Koplik spots. These surveillance reports help to monitor the effect of the compulsory immunization policy that began in 1983.

In 1992, 11,229 measles cases were reported in Saudi Arabia. Incidence rates by region ranged from 15 per 100,000 in Najran to 197 per 100,000 in Hafr al-Batin (Figure 1). The proportion of cases in the 1-to-4-year-old age group declined from 28.4% in 1989 to 15% in 1992.

Since compulsory immunization began in 1983 and coverage exceeded 80%, incidence rates have declined more than sixfold (Figure 2). However, from 1989 to 1992 they did not continue the downward trend, ranging from 33 per 100,000 to 82 per 100,000. During these four years, measles cases steadily increased in the 5-to-14 and 15-to-44-year-old groups. They also showed a milder increase in the 1-to-4-year-old age group (Figure 3).

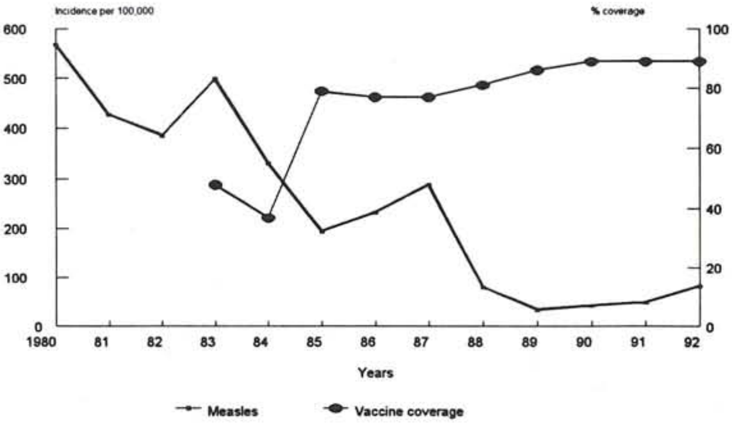


Figure 2: Measles incidence rate and vaccination coverage Saudi Arabia, 1980-1992

Editor's note: The introduction of measles immunization has had a profound effect on the incidence and age distribution of the disease. The target for 1995 is an incidence of less than 40 per 100,000. The World Health Organization Expanded Program for Immunization (EPI) has made the following recommendations to countries participating in EPI:

1. By 1995, reduction by 95% of deaths due to measles and reduction by 90% of measles cases, compared with

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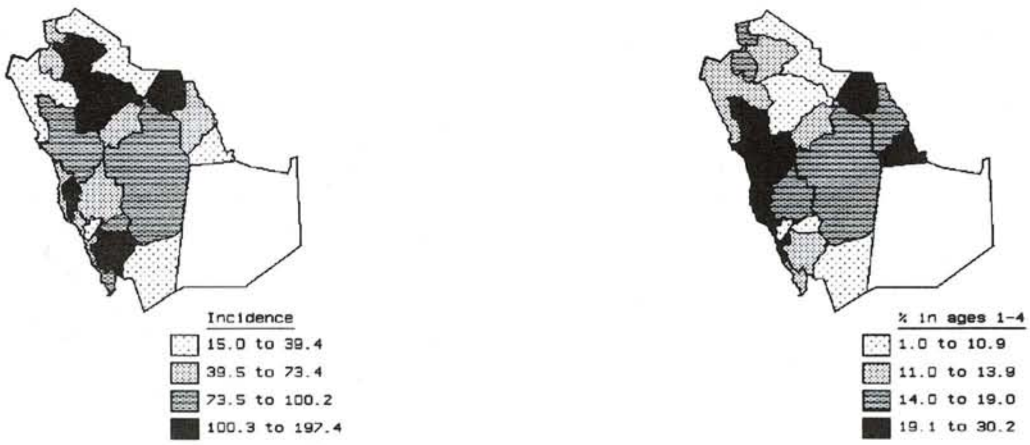

Figure 1: Measles incidence per 100,000 by region (left); percentage of cases in ages 1-4 by region Saudi Arabia, 1992

program

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pre-immunization levels.

2. By 1995, coverage of not less than 95% by 1 year of age at all levels.

3. By 1995, reduction of the case-fatality rate to less than 1%.

The surveillance data indicate that Saudi Arabia has achieved the 1% case-fatality rate and the 95% reduction in measles deaths. Incidence rates and vaccine coverage are nearing the WHO targets. In developing countries before the introduction of measles immunization, 80% of measles cases were in children from 1 to 4 years old. The 15% currently observed in this age group 10 years after initiation of the compulsory vaccination policy attests to the success of this program.

Although natural factors such as population density can explain part of the observed age distribution of measles, vaccination should have a profound effect. According to policy, all 1-to-4-year-old children in Saudi Arabia should be vaccinated. Higher proportions of total cases in this age group indicate the need for more in-depth evaluation of vaccine coverage and efficacy in the respective areas. The kingdom-wide increase in measles case in the 5-to-14-year-old age group also needs close inspection. Each year the entrance of vaccinated 5-year-old children into this group and the departure of unvaccinated 15-year-old children from this group should increase the vaccine coverage of the entire group by about 10%. Thus, this age group should have the greatest decline in measles cases.

Recommendations for control:

1. Maintain high coverage by: (a) screening and immunizing all children visiting a health center for any reason; (b) ensuring that all children registering for primary school receive a dose of MMR vaccine before school entry; (c) immunizing all children upon admission to a hospital or as soon as their condition allows; (d) minimizing the drop rate between the third DPT vaccine and the measles dose.

2. Improve the health information system by using information in immunization coverage and disease trends to identify high-risk groups and high-risk areas and take action accordingly.

3. Develop the capacity for prompt and aggressive outbreak investigation and control.

4. Enhance case management (diagnosis, clinical assessment, classification and treatment) to reduce the case-fatality rate to below 1%.

Reported by the Infectious Disease Department, Ministry of Health.

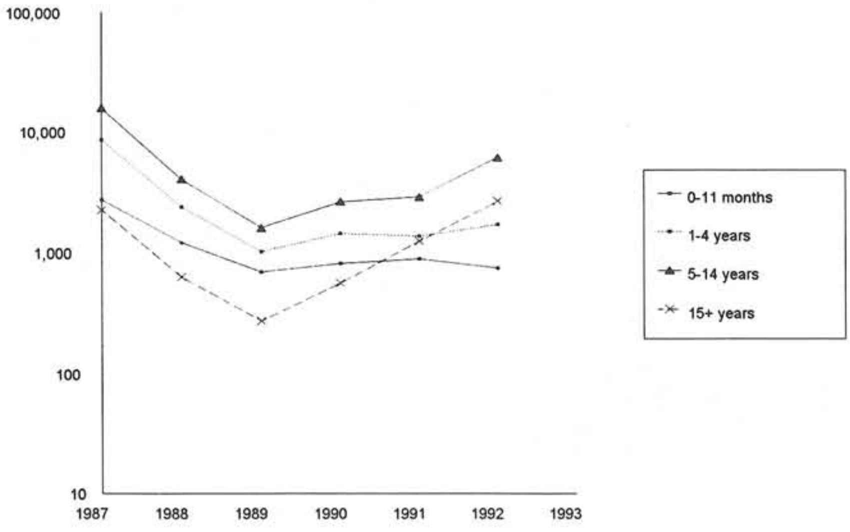

Figure 3: Measles cases in Saudi Arabia, 1987-1992

How Qatif responds to outbreaks

The Qatif Primary Health Care (PHC) Department is one of 12 districts that report notifiable diseases to the General Directorate for Primary Health Care in the Eastern Province. The Qatif district includes 26 primary health care centers, Qatif Central Hospital, Qatif General Hospital, one private hospital and 12 private dispensaries; all are required to report to the Qatif PHC Department. Patients may also seek treatment in nearby cities, such as Dammam or Khobar, or at Aramco. Qatif has a population of about 230,000 Saudis and 12,000 non-Saudis.

Each week the epidemiologist uses the computer to produce a graph of weekly incidence for each communicable disease (both suspect and confirmed cases) on the computer screen. These may be immediately compared with the pattern during previous years. When the epidemiologist notes any suspicious increase in incidence of any disease, he uses the computer to do a more detailed review by age, sex, nationality or residence. This weekly data review requires less than 30 minutes.

The speed of this system allows the epidemiologist to begin community-wide investigation without delay. Since both suspect and confirmed cases are entered, the epidemiologist is alerted to problems at a very early stage. For final reports to higher authorities it is a simple matter to restrict the data output to confirmed cases with complete investigations.

Several examples of outbreak investigations follow to illustrate prompt community-wide action in Qatif.

In late 1991, one Qatif PHC reported 35 measles cases among Mahri immigrants living in one house. The epidemiologic investigation identified 16 other houses with 700 Mahri in Qatif. None had previous measles vaccination and because of their previous isolation in remote areas of the Empty Quarter many had never been exposed to measles. The action was to vaccinate all Mahri in Qatif. No more measles occurred in the Mahri after the vaccination

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Qatif outbreaks

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effort.

In early 1992 measles again appeared in Qatif (Chart 1). Prompt action identified a failure of vaccination policy in schools covered by a neighboring school district. We vaccinated all other children without written proof of vaccination in families with a case.

Later in 1992 an increase in typhoid fever was noted (Chart 2). The investigation revealed that typhoid was affecting Qatif residents who had visited Syria. It also eliminated the possibility that infection had been acquired in Qatif or during the travel to Syria or returning from Syria. However, a common source of typhoid in Syria was ruled out by the investigation. Waterborne typhoid remains the most likely, but unproven, cause. As action, PHC and hospital doctors were alerted to suspect typhoid fever in persons presenting with febrile illness after returning from Syria. Typhoid fever vaccine was recommended to Qatif residents going to Syria.

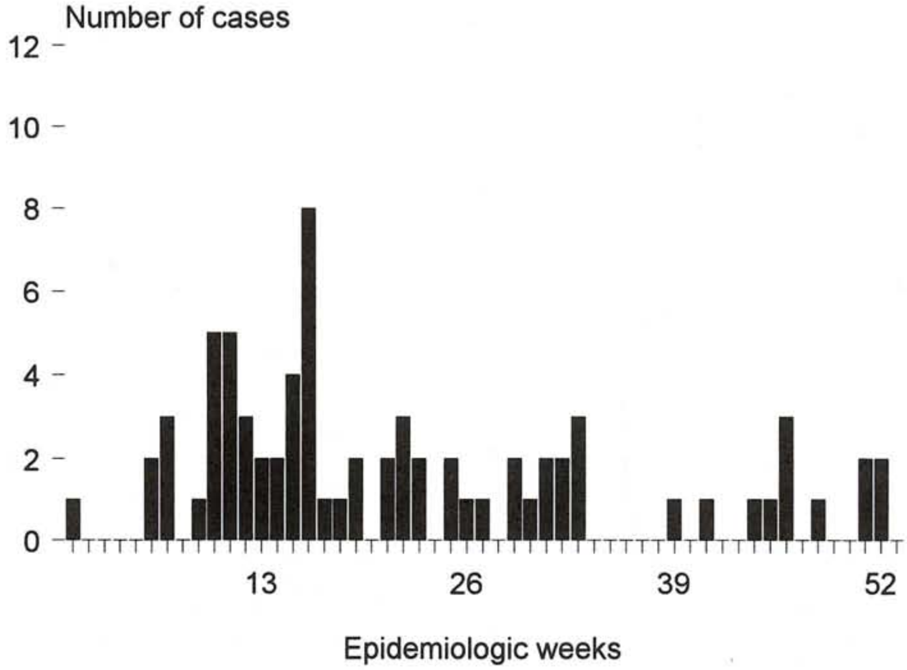

Chart 1: Measles cases in Qatif, 1992

Editor's note: Surveillance can be defined as information for action. Action for communicable diseases is often taken by the health inspector who visits patients and applies preventive measures to their contacts. However, many communicable diseases can have sources that are community-wide and do not involve contacts or person-to-person spread. This system illustrates how efficient handling of suspect cases using the computer can detect and trigger action directed to prevent community-wide spread of communicable disease.

The program for the Qatif surveillance system was developed on EpiInfo software. EpiInfo is available from the Field Epidemiology Training Program. Send two high-density diskettes or four double-density diskettes and your return address. The data entry format for the surveillance system will be provided.

Regions interested in developing computerized surveillance for rapid epidemiologic action and efficient management of surveillance data may contact the Field Epidemiology Training Program, Ministry of Health, for additional information and discussion.

Reported by Dr. Hashim A. Abulrahi (Field Epidemiology Training Program).

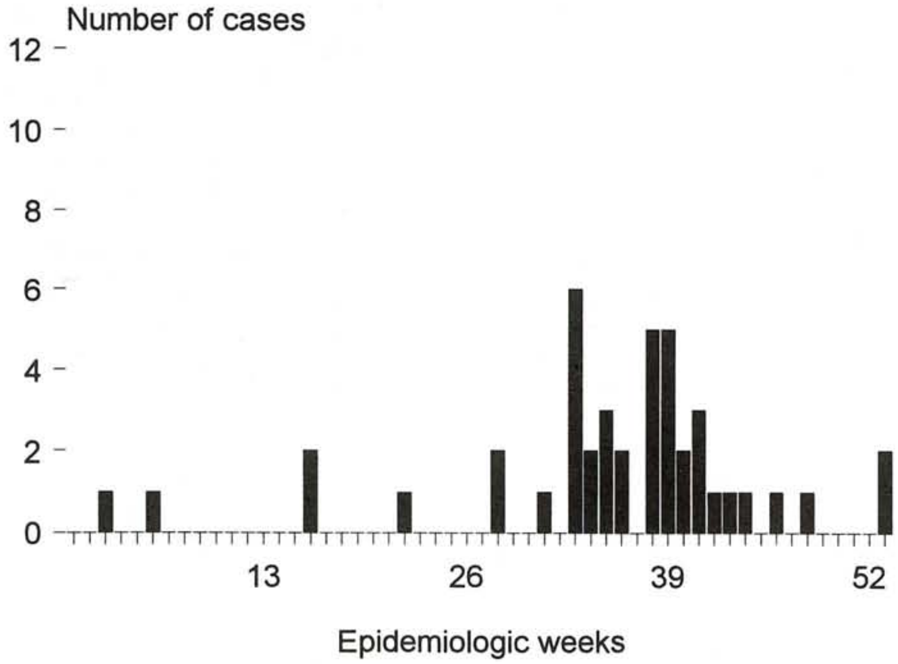

Chart 2: Typhoid and paratyphoid cases in Qatif, 1992

A plan to eradicate polio by 2000

In October 1977, after an 11-year campaign aimed at its global eradication, the variola virus caused the last naturally acquired case of smallpox. In 1988, the 41st World Health Assembly, meeting in Geneva, committed the international community to the global eradication of a second disease, poliomyelitis.

That same year His Excellency the Minister of Health endorsed the Kingdom's plan for the eradication of poliomyelitis from Saudi Arabia by 2000. The broad objectives of the plan are achievement of zero poliomyelitis cases associated with the wild poliovirus and the absence of wild poliovirus in all clinical and environmental samples obtained throughout the Kingdom.

There are three strategies: (1) commitment at all levels of the community to ensure the personnel and financial resources essential to achieving this goal; (2) delivery of polio vaccine in the manner most effective in interrupting transmission of the wild poliovirus and eradicating it from the Kingdom; and (3) effective surveillance to detect every case of poliomyelitis associated with wild poliovirus and any circulating wild poliovirus.

These strategies will be implemented by activities in seven major areas: immunization coverage, surveillance, laboratory services and vaccine quality control, training, health education, rehabilitation services and research and development.

The first line of offense in battling poliomyelitis must come from clinicians. They should report to public health officials within 24 hours any patient they see with acute flaccid paralysis (AFP). At the same time, they should ensure that two fecal samples from the patient are properly collected and sent to the central laboratory in Riyadh for analysis. They should consider any case of AFP in a child under 15 to be poliomyelitis until complete clinical and laboratory evaluation proves otherwise. Doctors who have experience with poliomyelitis should act as consultants in examining AFP cases and should promote the poliomyelitis eradication plan. Pediatricians should screen all children under the age of 5 to verify vaccination with fully potent oral polio vaccine.

At the regional level, the program supervisor will act as a liaison between the health personnel in his region and the Ministry of Health. He will ensure the prompt reports of all cases of AFP from all health units in his area. He also will notify the director of health or the general director in his region and officials at the Ministry of Health of any new poliomyelitis cases and make sure that they are properly investigated.

Finally, the director of health will provide financial, technical and administrative support. He will form a technical committee for the eradication of poliomyelitis at the regional levels as well as committees in each hospital. He will also receive reports of all AFP cases and ensure that a proper investigation of each case is done, noting especially whether the regional committee submits a report on each case within 60 days of the first report of symptoms.

Reported by the Infectious Disease Department, Ministry of Health.

Mark your calendar . . .

In the Kingdom

Nov. 29-Dec. 3, 1993 -- Second national symposium on control of hospital infection. Sponsored by the General Directorate of Health Affairs, Qassim region. Organized by the Central Committee for Control of Hospital Infection -- Ministry of Health and the Medical Education and Research Center, King Fahad Specialist Hospital, Buraidah.

Jan. 17-20, 1994 -- Symposium on public health. Sponsored by the Directorate of Health Affairs, Jeddah region. Topics include hospital and health management, environmental health, health education, maternal and child health, and epidemiology and infectious diseases.

Outside the Kingdom

Jan. 23-28, 1994 -- INCLEN XII in Chiang Mai, Thailand. Sponsored by the International Clinical Epidemiology Network (INCLEN), the U.S. Centers for Disease Control Field Epidemiology Training Programs, the International Epidemiology Association, the Thai Clinical Epidemiology Research & Training Complex and Chiang Mai University.

October 1994 -- "Eastern Mediterranean Region: Heading Toward the 21st Century." Sponsored by the International Epidemiology Association, the World Health Organization, ministries of health and other international organizations.

What is the FETP?

The Field Epidemiology Training Program (FETP) is a two-year teaching program in applied epidemiology for physicians and other health professionals. Five residents are accepted for training each year.

The program was started in 1988 in Saudi Arabia through a cooperative agreement between the Ministry of Health and the United States Centers for Disease Control (CDC). There are now six other FETPs worldwide (Taiwan, Philippines, Mexico, Indonesia, Peru, and Thailand).

FETP residents are assigned work in disease surveillance, outbreak investigations, and long-term projects on selected diseases of public health importance. Most residents will continue their careers in public health with the government when they have finished their training.

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Saudi Epidemiology Bulletin will present the results of recent work by the residents as well as by other contributors. Persons interested in contributing to *Saudi Epidemiology Bulletin*, seeking epidemiologic assistance, or applying to the training program should contact Dr. Nasser Al-Hamdan, technical supervisor of the FETP, or Dr. Robert Fontaine, consultant to the FETP (phone and fax 479-0726 or 478-1424). Correspondence should be addressed to:

Field Epidemiology Training Program
Ministry of Health
P.O. Box 6344
Riyadh 11442, Saudi Arabia

Reports of notifiable diseases

Each issue of *Saudi Epidemiology Bulletin* will contain information on the number and distribution of cases of notifiable diseases, as defined by the Ministry of Health. The Ministry provides the information based on the figures it receives from its regional offices.

The first table (right) compares the figures from January-March 1993 with the same period in 1992, and also provides a yearly total. The second table (below) shows the distribution of diseases by region for the period January-March 1993.

Diseases that usually are reported in minimal numbers on a yearly basis are not listed on the regional chart. The reported number of cases of these diseases for January-March 1993 are:

Yellow fever, plague, cholera, poliomyelitis, leprosy and rabies: No cases

Diphtheria: 3 (1 Jeddah, 2 Eastern)

Pertussis: 4 (4 Asir)

Tetanus, neonatal: 2 (1 Jeddah, 1 Asir)

Tetanus, other: 7 (4 Jeddah, 3 Makkah)

Viral encephalitis: 2 (2 Hafr al-Batin)

Reported by the Ministry of Health.

	Jan-Mar 1993	Jan-Mar 1992	Total 1993	Total 1992
Diphtheria	3	1	3	2
Pertussis	4	7	4	94
Tetanus, neonatal	2	4	2	15
Tetanus, other	7	3	7	15
Poliomyelitis	0	0	0	2
Measles	862	4312	862	11299
Mumps	922	1166	922	5054
Rubella	209	1190	209	3725
Varicella	7804	37730	7804	93199
Brucellosis	1658	1630	1658	7184
Meningitis, mening.	9	13	9	88
Meningitis, other	89	45	89	411
Hepatitis A	850	914	850	3292
Hepatitis B	931	667	931	2989
Hepatitis, unspecified	440	389	440	1684
Typhoid & paratyphoid	192	221	192	1201
Shigellosis	181	175	181	806
Salmonellosis	170	172	170	1226
Amoebic dysentery	864	1284	864	5645
Syphilis	94	230	94	576
VD, other	160	196	160	910

	Riyadh	Jeddah	Makkah	Madinah	Taif	Asir	Gizan	Najran	Al Baha	Eastern	Al Ahsa	Tabuk	Al Jouf	Goriat	Arar	Hail	Qassim	Hafr al-Batin	Bisha
Measles	90	42	22	10	3	397	210	6	2	25	9	2	1	0	0	3	20	15	5
Mumps	255	108	114	89	125	50	13	7	3	54	20	4	0	3	9	6	21	29	12
Rubella	33	22	21	5	7	60	8	1	2	20	7	2	1	0	1	0	10	7	2
Varicella	1125	494	213	402	528	1936	167	194	248	987	520	56	32	205	109	107	227	132	122
Brucellosis	237	25	32	49	99	202	50	76	71	21	0	1	73	2	24	99	249	191	202
Meningitis, mening.	2	2	0	1	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0
Meningitis, other	21	29	2	4	0	16	15	0	1	0	0	0	0	0	0	0	0	1	0
Hepatitis A	53	47	26	47	27	222	4	9	82	47	69	9	61	18	41	5	51	15	17
Hepatitis B	48	221	81	39	6	51	1	91	7	184	16	3	0	0	8	0	24	113	8
Hepatitis, unspecified	8	92	119	13	0	71	46	1	18	52	0	0	0	0	6	4	2	0	8
Typhoid & paratyphoid	27	12	18	6	2	36	4	0	8	52	5	3	6	2	0	1	3	5	2
Shigellosis	23	19	0	1	2	9	5	0	3	109	4	0	0	0	0	0	2	4	0
Salmonellosis	69	32	0	1	0	9	0	0	1	52	3	0	0	0	0	0	0	3	0
Amoebic dysentery	45	57	7	0	135	308	81	0	10	119	14	18	34	1	0	17	3	3	12
Syphilis	3	32	3	0	0	5	0	1	1	24	8	0	0	0	0	0	0	0	17
VD, other	4	12	0	0	0	12	17	0	5	66	44	0	0	0	0	0	0	0	0