

النشرة الوبائية السعودية

تصدرها وزارة الصحة

الوكالة المساعدة للطب الوقائي وبرنامج الوبائيات الحقلية

المجلد الخامس - العدد الثاني، إبريل - يونيو ١٩٩٨م

“The Deadly Drain:” Probable hydrogen sulfide poisoning, Unaizah, Al-Qassim region, May 28, 1998

On June 8, 1998, the Field Epidemiology Training Program (FETP) was notified by the King Saud Hospital in Unaizah of two sudden deaths occurring on May 28, 1998, which apparently were caused by exposure to an unidentified chemical in the bathroom of a compound housing 41 furniture workers.

On-site investigation of this incident of probable hydrogen sulfide (H₂S) poisoning began immediately by members of FETP. Surviving workers and involved medical staff at the hospital were interviewed to establish the time sequence and description of the fatal accident. Questionnaires were distributed to all compound residents covering demographic data, treatment of bathrooms, which chemicals were used, observations about the accident site, and medical problems experienced as a result of the accident.

The workers reported that 30 minutes after pouring a solution of 98% H₂SO₄ into 7 of the 8 drains in 8 bathroom stalls, one of the workers returned to bathe in the only untreated stall (Stall #8). After 45 minutes he was found by a co-worker lying immobile on the floor of the stall. This friend also collapsed inside the stall. Two other rescuers collapsed immediately outside the stall. At the hospital 20 minutes later, the first two workers were pronounced dead. The other two recovered completely within 24 hours using only oxygen. No physical or physiologic abnormalities were detected on the two surviving workers at the hospital.

We measured, mapped, and inspected the toilets, drains, and sewage system of the compound. We generated smoke in the sewage line to retrace the pathway followed by gasses generated in the sewage. All eight stalls were 2m³ with a tight fitting door rising 1/2cm above the floor and 1/2m from the ceiling. Drains from the eight stalls joined into a common drain line, then to a 32m holding tank 3m down

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“The Deadly Drain:” Probable hydrogen sulfide poisoning

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line. This system had no vertical venting pipe. Smoke generated in the line near the tank appeared in Stall #8 after less than 1 minute and rapidly rose to 1m high inside the stall (Figure 1). No smoke appeared in any other stall nor from the lid on the sewage tank.

The drains on all the stalls were replaced and the system was equipped with a vertical ventilation pipe.

--Reported by: Mr. Ahmed Al-Salamah, Dr. Mohammed Al-Mazrou, Dr. Robert E. Fontaine, and Dr. Nasser Al-Hamdan (Saudi Arabian Field Epidemiology Training Program).

Editorial note: Hydrogen sulfide (H_2S) is a colorless, heavier than air gas with a toxicity comparable to that of cyanide (1). Hydrogen sulfide can be produced naturally in sewage from the soluble sulfide and hydrosulfide salts and sulfur-containing peptides (such as keratin) which are converted to H_2S by certain strains of bacteria. A common bacteria that produces H_2S from protein is *Proteus vulgaris*. Two genera of anaerobic bacteria, *Desulfovibrio* (5 species) and *Desulfotomaculum* (3 species), can reduce sulfur compounds (e.g. sulfate) to H_2S (2).

Breathing H_2S at concentrations greater than 500ppm of air can be fatal in just a few breaths, causing respiratory arrest. Death is usually preceded by a loss of consciousness after one or more breaths, although loss of consciousness does not necessarily mean that death will follow (3).

Although the hospital medical findings were not conclusive for H_2S , the multiple findings of this investigation, including rapid knockdown and death; the rotten egg smell; eye and throat irritation; and headache reported by survivors, is highly characteristic of H_2S . The temporal association with sewer cleaning also strongly suggests H_2S , which can be released rapidly and unpredictably from

sewage. Finally, the smoke generation test showed that any gas generated in the sewage lines would rapidly appear in Stall #8 and would concentrate in that stall because of the tight fitting door. All of these findings suggest that this incident was due to H_2S poisoning.

We believe that H_2S generated when H_2SO_4 was added to the sewage system. When the first victim bent over to fill his bucket with water he probably inhaled, filling his lungs with a toxic concentration, and then fell to the floor where he continued breathing a high concentration until he died. When the second worker attempted a rescue, the stall had much more time to accumulate H_2S and he was overcome immediately, as witnessed.

Using a solution of 98% H_2SO_4 to clean drains and sewage lines is a

common practice in Saudi Arabia, and many sewage disposal systems probably have similar designs. We recommend that warnings about using acid drain cleaners in closed sewage systems be circulated to municipal authorities, employers of laborers, and to the general public.

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Figure 1. Smoke arises in Stall #8 after being generated in the sewage line



Salmonella outbreak associated with tiramisu dessert, Riyadh, Dec. 28 - 31, 1997

On Jan. 7, 1998, the Field Epidemiology Training Program received a telephone report from a physician at King Faisal Specialist Hospital and Research Center concerning unacquainted gastroenteritis patients who had eaten at the same restaurant in Riyadh. In addition, one patient stated that similar cases had occurred after a supper hosted by a bank on Dec. 28, 1997 and catered by the same restaurant. We started a retrospective cohort study to determine the size, extent, and possible source of the infection, and to recommend preventive measures to avoid any future foodborne outbreaks.

A case of gastroenteritis was defined as any person who developed diarrhea within 72 hours after eating any food from the restaurant between Dec. 28 and 31, 1997, or after eating food at the bank supper, or also if *Salmonella enterica* group D was isolated from a stool culture. In the community outbreak, all gastroenteritis cases and a random sample gastroenteritis case were reviewed in 5 hospitals and 1 polyclinic from Dec 28, 1997, to Jan 5, 1998, to locate any missing cases. Thirty-seven bank party attendees and the families of nine community cases were asked about the restaurant foods they had eaten and illnesses that followed.

Bank party: Out of 90 party attendees, we interviewed a total of 37. Eighteen met the case definition; the median incubation period was 19 hours (range 5 to 23 hours). The median age for these case patients was 37 years (range 17 to 50 years). Illness ranged from 1 to 10 days. Eight women (44.4%) were hospitalized for 1 to 8 days; 6 women (33.3%) had bloody diarrhea, and 2 women (11 %) had stool samples yielding *S. enterica* group D.

The 26 different dishes were served buffet style from 10 pm until 1 am. Among 14 party attendees who ate tiramisu, 100% developed gastroenteritis compared to 24 % of 17 attendees who did not eat tiramisu (relative

risk [RR] = 4.3, 95% confidence interval [CI] = 1.8 – 10). No common food was found among the four party attendees who developed gastroenteritis but did not eat tiramisu.

Community Outbreak: Of 12 persons in 7 families who shared food from the restaurant, 9 persons developed gastroenteritis. The median age for the cases was 23 years (range 10 to 38 years); 78% were female, 1 (11%) had been hospitalized, and 6 (67%) of the stool samples yielded *S. enterica* group D. The median incubation period was 11 hours (range 9 to 44 hours). Among the 9 patients who ate tiramisu, 100% developed gastroenteritis compared to no gastroenteritis among family members who did not eat tiramisu (RR = infinity, P-value 0.007).

Tiramisu preparation assessment: We used a thermometer to measure the internal temperature at various points in the process. The chef mixed the yolks of four raw eggs, pasteurized cream, butter, sugar and cocoa powder. He then layered this liquid dressing with commercial biscuits that had been immersed in warm coffee. The tiramisu was left at room temperature (about 23°C) for 15 minutes to cool. It was then put in the refrigerator at 5°C. The initial internal temperature of the tiramisu was 24°C; after 10 minutes at room temperature it was 22°C, and after 30 minutes in the refrigerator it reached 14°C. The eggs used were locally laid and were stored unrefrigerated at ambient temperature. Restaurant refrigerators were in good condition and operating under appropriate temperature.

On Dec. 27, the chef prepared eight pans of tiramisu equivalent to 80 individual servings (slices). He reserved two pans (20 slices) for sale at the restaurant and six pans (60 slices) for the bank party. On Dec. 28, the restaurant staff loaded all bank party food into a truck at 8:30 pm. The buffet was served from 10 pm to 1 am, approximately 4½ hours of time and temperature abuse. Only 90 of 200

invited guests attended the bank party, leaving much leftover food (including tiramisu). Party attendees observed the restaurant employees returning all leftover food to their truck. The following day the restaurant staff returned a leftover tart to the party organizer. From Dec. 28, 1997, to Jan. 1, 1998, 34 slices of tiramisu were sold in the restaurant. Case patients had eaten tiramisu in the restaurant from Dec 29 to Dec 31, but none had eaten tiramisu on the day of the party.

—Reported by: Dr. Haya S. Al-Eid, Mr. Shaker N. Al-Sagour, Dr. Robert E. Fontaine (Saudi Arabian Field Epidemiology Training Program), Dr. Abdulrahman A. Al-Rajhi (King Faisal Specialist Hospital and Research Center), Dr. Mohammed Z. Al-Julaihi (National Agriculture and Water Research Center), and Mrs. Hind H. Al-Saggaf (The National Commercial Bank).

Editorial note: Since 1985 *Salmonella* serotype enteritidis has been recognized as producing an expanding international pandemic. This emerging infectious organism is capable of infecting the interior (yolk membrane) of intact eggs by transovarian transmission (1). Freshly laid eggs are normally lightly contaminated; unrefrigerated storage of eggs will lead to multiplication of this organism inside the egg (2). *Salmonella* enteritidis phage type 4 (PT4) has increased dramatically in recent years in Saudi Arabia; (it was rarely diagnosed in laying flocks before 1988) and has been isolated from intact eggs locally laid (3, 4). Although serotyping was not available, the *Salmonella* isolated was in the same group (group D) as the serotype enteritidis.

In this outbreak, the implicated food (tiramisu) was prepared from raw egg yolks and served without cooking. The high attack rate, severe illness, and short incubation suggest a high infective dose of *Salmonella* in the

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Mumps outbreak in a highly vaccinated population, Al-Faisaliyah district, Riyadh, March - June, 1998

Saudi Arabia started requiring mumps, measles, rubella (MMR) vaccinations for preschool populations in 1991. Since the introduction of the mandatory vaccination of MMR to the population, the result has been a substantial decrease in reported cases of mumps. From 1991 to 1997, national coverage of infants with the recommended schedule has ranged between 76% and 91%. However, in 1998 an outbreak of mumps occurred in the district of Al-Faisaliyah. This outbreak affected adults as well as vaccinated and unvaccinated children. An epidemiological investigation was initiated to determine the causes of the outbreak and vaccine effectiveness.

We defined an outbreak-associated case of mumps as a case of acute onset of swelling obscuring the angle of the jaw for at least 2 days in a resident of Al-Faisaliyah district from March to June 1998. A retrospective family cohort study was conducted among families with mumps cases. We obtained written vaccination histories of patients and family members, ages 1 to 15, living in the same quarters. Subjects without documented vaccination histories were excluded. Attack rates (AR) and Vaccine Effectiveness (VE) were computed. The VE was computed by comparing mumps AR for different

categories of vaccinated children to the unvaccinated reference category. Sixty-four cases, which met the definition of confirmed mumps cases, were reported. This represents an AR of 6.0 per 1000 persons. The first reported case of mumps occurred in a 12-year-old child. A range of 2 to 8 mumps cases occurred per week between March 1, 1998 and June 30, 1998. The epidemic peaked between May and June with 6 to 8 cases reported weekly (Figure 1). No additional cases of mumps prior to the first reported case were identified through retrospective record review.

The median age of mumps cases was 12 years (range: 9 months to 33 years). Of the 64 cases, children 10 to 14 years of age had the highest incidence rate of mumps with an AR of 31 per 1000 population. A family study was carried out and 230 children (including 46 mumps cases) were involved. Ninety-one percent of these children did have the mumps containing vaccine (MCV). Twenty-one children (out of 230) did not receive an MCV (9%) and 7 developed mumps for an AR of 33%. In contrast, 39 of 209 children who were vaccinated developed mumps for an AR of 19% and a VE of 44% (95% confidence interval [CI] - 9, 71). In addition, among 76 children who received MCV during the 4 years previ-

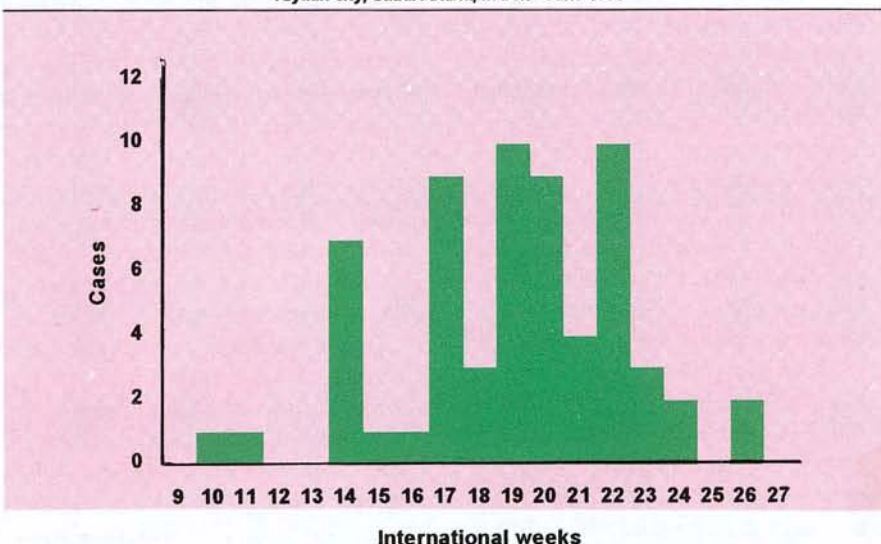
ous to the outbreak, 7 developed mumps for an AR of 9% and VE of 72% (95% CI 30, 89). Out of 133 children vaccinated more than 4 years before, the AR was 24% and the VE was 28% (95% CI - 42, 63). Age at vaccination, type of vaccine, and place of vaccination were not found to be a risk factor for contracting mumps disease.

--Reported by: Dr. Ahmed BaOmar and Dr. Robert E. Fontaine (Saudi Arabian Field Epidemiology Training Program).

Editorial note: Mumps outbreaks in highly vaccinated populations have been noted by several reports; the occurrence of these outbreaks has established that mumps vaccine-failure plays a role in the continued mumps outbreaks in those populations (1, 2, 3). The MCV should produce a protective antibody in over 95% of vaccinated persons and protection should last for 15 years (4). However, this mumps outbreak propagated in a highly vaccinated population in primary and intermediate schools. During this outbreak, our results indicated that the vaccine gave protection to 44% of the vaccinated group and maximum protection to the children who received MCV during the previous 4 years. The attack rate of mumps among females was lower than that among males. Three factors could probably explain this: the MMR vaccine is given to girls at age 12 for rubella control, the girls attended an intermediate school in a nearby district, and the girls in the primary school were exposed 9 weeks after the boys' schools. Accordingly, both primary and secondary MCV failure allowed this outbreak to occur. We recommend a serosurvey for antibody against mumps in representative areas unaffected by the recent mumps outbreak. Training of medical personnel at both the district and the sector level is essential in order to detect and compact further outbreaks.

Figure 1. Reported cases of mumps in Al Faisaliyah district

Riyadh city, Saudi Arabia, March - June 1998



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Letters to the Editor

Dear Editor:

Just a note to thank you very much for the recent copy of the Saudi Epidemiology Bulletin. I enjoyed reading it. It has become a very informative publication and sometimes I use examples from the Bulletin during my teaching.

I wish you and your colleagues perseverance in moving ahead with the important mission of developing epidemiology programs in the Kingdom.

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To the Editor:

I have read the report on "Infection Control in MOH Dental Clinics" which appeared in the Saudi Epidemiology Bulletin, 4 (3-4): 21 & 28, 1997.

For some time I have been critical of such surveys which appear regularly in the dental and medical literature. My reasons for this attitude are that these investigations have nothing to do with infection control but rather are concerned with behavioral modification. If they were related to infection control, it would be necessary to

know the following for the clinic which is being surveyed:

- which infectious diseases are being transmitted;
- how and when do the transmissions occur;
- what theoretical methods are available for controlling the transmissions;
- are those methods clinically practical, safe, and cost effective?

Only after such facts are assembled is it possible to state if the modifications in behavior have obtained acceptable results.

Interestingly, there are no well-controlled studies on nosocomial infections of dental origin, and so the value of wearing protective gear is pure conjecture. It is also exceptionally expensive. For example, to comply with all mandatory regulations on infection control, American dentists spent \$5.4 billion in 1994. From this, I have calculated that the cost for each Canadian dentist is \$Can. 30,000 – 40,000 per year.

Apart from these comments, my major criticism of those investigations is that they fail to understand the significance of handwashing. For example, your bulletin report does not record when and how handwashing was performed.

I remain convinced that simple, cheap, and effective dental infection control requires only four factors.

1. Appropriate vaccinations of clinical staff.
2. Handwashing before and after intraoral procedures.
3. Confirmed sterilization of invasive surgical instruments.
4. Maintenance of a tidy, clean working environment.

With kind regards,

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Salmonella outbreak

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tiramisu. Three factors probably contributed: eggs were stored at ambient temperature in the restaurant, the egg yolks were blended together for 80 servings, and the tiramisu was left at ambient temperature for more than 4½ hours. *Salmonella* will multiply in eggs and in food at temperatures above 10°C (2). The lack of illness among restaurant customers on Dec. 28 suggests that the 20 servings for the restaurant prepared together with the 60 servings for the party were not subjected to temperature abuse in the restaurant. We suspect that after these 20 servings were sold, the restaurant began using tiramisu left over from the 60 party servings. These were subsequently responsible for the restaurant cases in customers from Dec. 29 through 31. Because *S. enteritidis* is likely to contaminate eggs, institutions such as restaurants, hospitals, nursing homes and commercial food processors should use pasteurized eggs and pasteurized egg products (5). For the family or individual, fresh eggs should be purchased refrigerated and stored refrigerated (<10°C) at all times. Thereafter, eggs and foods made with raw eggs should be well cooked (6).

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ملخص باللغة العربية

التسمم بغاز كبريتيد الهيدروجين - القصيم
١٩٩٨م

في ٨ يونيو ١٩٩٨م تلقى برنامج الربائيات الحقلية بلاغا من مستشفى الملك سعود في عنيزة بحدوث حادثي وفاة في ٢٨ مايو ١٩٩٨ بعد تنظيف دورات مياه لسكن يضم ٤١ عاملا. قام الفريق بالاستقصاء الربائي لتحديد سبب الوفاة. صرح العمال الناجون انه بغرض التنظيف تم سكب حمض الكبريتيك بتركيز ٩٨% في ٧ من دورات المياه الثمانية مع ترك واحدة للاستخدام. بعد ذلك ذهب أحد العمال للاستحمام فيها وبعد تأخره تبعه أحد زملائه للبحث عنه ولاحقا وجدا مغمى عليهما داخلها. أيضا أغمي على عاملان آخران خارجها، وفي المستشفى تبينت وفاة العاملين الأولين أما العاملان الآخران فقد تماثلا للشفاء بعد معالجتهم بالأكسجين. بعد معاينة موقع الحادث وجدنا أن مساحة كل دورة متران مكعبان بمسافة نصف متر بين باب الدوارة والسقف و نصف سم ارتفاع الباب عن الأرض ومرتبطة بصرف صحي يؤدي إلى بيلوة خارجية بدون أنبوب تهوية عمودي. تم عمل تجربة بإحراق أوراق في خط المجاري لتتبع مسلك الدخان. لاحظنا أن الدخان يتصاعد في دورة المياه رقم ٨ فقط بارتفاع يصل لمتر. وهي التي حدثت فيها وفاة العاملين.

من المحتمل أن الوفاة كانت بسبب استنشاق غاز كبريتيد الهيدروجين وهو غاز عديم اللون وأثقل من الهواء ينتج عن تفاعل حمض الكبريتيك المركز مع الفضلات العضوية الموجودة في الصرف الصحي. إن استنشاق الغاز بتركيز أكثر من ٥٠٠ جزء من المليون يؤدي للوفاة بعد مدة وجيزة بسبب منع نظام الأكسدة في الخلايا. إن الوفاة السريعة لعاملين

والعلامات التي ذكرها الناجون وهي رائحة البيض الفاسد وصعوبة التنفس والسعال مع تهيج العينين للناجين كلها ترجح التسمم بغاز كبريتيد الهيدروجين. أن استخدام حمض الكبريتيك بتركيز ٩٨% أمر شائع في المملكة العربية السعودية لتنظيف دورات المياه لذا يجب توعية المجتمع بخطورة استخدام الأحماض المركزة في نظافة أو فتح الصرف الصحي.

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فاشية النكاف في قطاع الفيصلية الرياض ١٩٩٨م

منذ أن بدأت المملكة العربية السعودية عام ١٩٩١ التحصين بالثلاثي الفيروسي، أدى هذا لتناقص حالات النكاف. مع ذلك في سنة ١٩٩٨ حدثت فاشية للنكاف في حي الفيصلية في مدينة الرياض شملت المحصنين وغير المحصنين. لذا قمنا بالاستقصاء الربائي لتحديد سبب هذه الفاشية وفعالية التطعيم. عرفنا حالة النكاف بأثما: أي ورم فجائي يحجب زاوية الفك يومين على الأقل في الفترة بين شهري مارس إلى يونيو ١٩٩٨. تمت مراجعة تاريخ التطعيم للمرضى والمخالطين لهم من عمر سنة إلى ١٥ سنة. وجدنا ٦٤ حالة نكاف بمعدل إصابة ٦ حالات لكل ١٠٠٠ شخص.

بلغت ذروة فاشية النكاف في الأشهر من مايو إلى يونيو بمعدل ٦-٨ حالات أسبوعيا. كان متوسط العمر للحالات ١٢ سنة (بمدى ٩ شهور - ٣٣ سنة). وقد كان الأطفال من ١٠ - ١٤ سنة الأعلى في نسبة الإصابة بمعدل ٣١ حالة لكل ١٠٠٠ شخص. شملت الدراسة العائلية

المرجعية ٢٣٠ طفلا، ٩١% منهم تلقوا لقاح النكاف. بين ٢١ (٩٩%) طفل لم يتلقوا أي لقاح للنكاف أصيب سبعة منهم بالنكاف بمعدل إصابة ٣٣%. وبالمقابل أصيب ٣٩ طفلا محصنا بالنكاف بمعدل إصابة ١٩% وفعالية تطعيم ٤٤% (نسبة التأكد ٩٥% من ٩ إلى ٧١). بين ٧٦ طفل تلقوا لقاح للنكاف خلال الأربع سنوات الماضية أصيب ٧ أطفال. كان معدل الإصابة ٩% بفعالية تحصين ٧٢% (نسبة التأكد ٩٥% من ٣٠-٨٩). من بين ١٣٣ طفلا محصنا لأكثر من أربع سنوات كان معدل الإصابة ٢٤% وفعالية تطعيم ٢٨% (نسبة التأكد ٩٥% - ٤٢ إلى ٦٣). لوحظ في عدة تقارير حدوث فاشية النكاف في مجموعة الأطفال عالية التحصين وكان لفشل لقاح النكاف دورا في حدوثها. ومع أي التطعيم بلقاح النكاف مناعة في ٩٥% من الأشخاص المطعمين لمدة ١٥ سنة إلا أن هذه الفاشية تنقلت في مجموعة عالية التحصين في المدارس الابتدائية والمتوسطة. خلال هذه الفاشية نتائجا تشير إلى أن فعالية التطعيم كانت ٤٤% في المجموعة المطعمه وزادت فعالية التطعيم بين الذين تلقوا لقاح النكاف خلال الأربع السنوات الماضية إلى ٧٢%. لوحظ أن الإناث كن أقل في معدل الإصابة من الذكور لان اللقاح ثلاثي الفيروسي يعطى للبنات عند سن ١٢ سنة للحماية من الحصبة الألمانية. مما تقدم نرى أن الفشل الأولي والثاني للقاح النكاف قد أدى إلى حدوث فاشية النكاف وعليه نقترح عمل مسح لوجود الأجسام المضادة للنكاف في المناطق غير المتأثرة بالفاشية.

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Notice to Contributors

The *Saudi Epidemiology Bulletin* is published quarterly by the Department of Preventive Medicine and the Field Epidemiology Training Program.

This publication provides feedback between the Department of Preventive Medicine and medical staff in the Kingdom. The scope is public health in general and epidemiology of infectious and non-infectious diseases in particular, with emphasis on surveillance, outbreak investigation, applied research, hospital infection and innovative approaches. All medical personnel may contribute. Papers fulfilling the following requirements will be considered:

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Inside the Kingdom

Mar. 1-3, 1999: Fourth Scientific Conference of the Saudi Society of Family and Community Medicine, Early Detection and Periodic Health Assessment, Scientific Committee, Makkah Office, Saudi Society of Family and Community Medicine, PO Box 9195, Makkah, Saudi Arabia. Tel: 966-2-548-053/ Fax and Tel: 966-2-542-0542.

Nov. 27- Dec. 3, 1999: First Regional Symposium and Workshop on Ethical and Genetic Counselling Issues. King Saud University, Riyadh. Postgraduate Center, College of Medicine, PO Box 2925, Riyadh 11461, Saudi Arabia. Tel: 966-1-467-0831/467-1551. Fax: 966-1-467-2575/481-1853.

Outside the Kingdom

Aug. 31-Sep. 4, 1999: XV International Scientific Meeting of the International Epidemiological Association, Epidemiology for Sustainable Health. Florence, Italy. Contact: Organising Secretariat, IEA Florence 99. c/o SINEDRION, Via G. Marconi, 27, 50131 Firenze-Italy. Tel: +39-55-570502. Fax: +39-55-575679.

Mumps outbreak

(Continued from page 12)

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Selected notifiable diseases by region, April - June 1998

	Riyadh	Makkah	Jeddah	Taif	Madinah	Qassim	Eastern	Hasa	Hafr Al Batin	Asir	Bisha	Tabouk	Hail	Al Shamal	Jizan	Najran	Baha	Al Jouf	Goriat	Gonfuda	Total
Measles	257	138	135	466	184	54	22	7	29	205	91	53	6	46	102	18	86	2	0	48	1949
Mumps	128	54	352	48	105	29	39	5	17	44	6	30	4	5	28	14	77	5	6	7	1003
Rubella	9	14	26	11	15	6	16	2	0	6	0	14	2	1	1	0	0	0	0	0	123
Varicella	863	454	527	239	544	830	1893	611	215	424	160	223	47	69	63	97	32	45	31	29	7396
Brucellosis	263	50	17	70	61	582	81	42	118	431	177	44	401	20	60	48	78	56	13	5	2617
Meningitis, mening	0	0	3	0	6	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	11
Meningitis, other	61	5	10	0	13	7	4	4	6	4	1	3	0	3	5	1	0	0	1	0	128
Hepatitis A	120	38	44	4	50	237	57	10	56	93	47	30	14	40	48	134	3	18	12	0	1055
Hepatitis B	167	77	166	4	32	17	207	7	8	66	9	29	9	5	9	5	53	4	3	1	878
Hepatitis C	55	83	97	0	10	10	55	5	3	0	0	22	3	1	0	2	21	0	0	0	367
Hepatitis unspecified	2	69	25	0	10	0	2	11	0	54	1	21	73	6	91	5	0	0	0	0	370
Typhoid & paratyphoid	10	7	2	0	7	0	10	3	0	3	11	8	0	6	2	0	6	0	0	0	75
Shigellosis	28	1	7	5	2	2	28	1	16	0	0	19	0	1	0	19	4	0	0	0	133
Salmonellosis	300	17	22	0	0	10	300	18	18	6	0	33	0	1	0	25	5	0	0	0	755
Amoebic dysentery	10	66	163	22	4	67	10	5	0	236	24	61	90	0	14	13	0	0	1	0	786
Syphilis	19	2	24	0	0	0	19	4	0	2	0	0	0	0	0	0	0	0	1	0	71
VD, other	12	9	21	0	0	0	12	31	0	7	1	7	0	0	6	0	0	0	10	0	116

Comparisons of selected notifiable diseases, 1997-1998

DISEASE	Apr-Jun 1998	Apr-Jun 1997	Change %	Apr-Jun 1998	Jan-Dec 1997	DISEASE	Apr-Jun 1998	Apr-Jun 1997	Change %	Apr-Jun 1998	Jan-Dec 1997
Diphtheria	0	0	0.00	0	1	Meningitis, other	128	101	26.70	128	437
Pertussis	39	18	116.67	39	80	Hepatitis A	1055	1512	-30.00	1055	4524
Tetanus, neonatal	1	6	-83.33	1	26	Hepatitis B	878	638	37.60	878	2967
Tetanus, other	4	9	-55.56	4	18	Hepatitis C	367			367	1167
Poliomyelitis	0	0	0.00	0	0	Hepatitis, unspec.	370	476	-22.00	370	1542
Measles	1949	1792	8.76	1949	3978	Typhoid/paratyph.	75	82	-8.50	75	299
Mumps	1003	644	55.75	1003	2414	Shigellosis	133	153	-13.00	133	819
Rubella	123	124	-0.81	123	373	Salmonellosis	755	474	59.30	755	2379
Varicella	7396	16368	-54.81	7396	41315	Amoebic dysentery	786	1293	-39.00	786	5309
Brucellosis	2617	1839	42.31	2617	5781	Syphilis	71	58	22.40	71	219
Meningitis, mening.	11	12	-8.33	11	108	VD, other	116	181	-36.00	116	664

Diseases of low frequency, April - June 1998

Yellow fever, plague, diphtheria, polio, rabies, viral encephalitis, haemolytic uremic syndrome, transverse myelitis: No cases
 Pertussis: 39 (Riyadh 6, Makkah 4, Madinah 7, Eastern 8, Nejrán 6, Goriat 3, Asir 3, Tabouk 1, Hail 1)
 Neonatal tetanus: 1 (Makkah 1)
 Other tetanus: 4 (Makkah 2, Asir 2)
 Guillain-Barre syndrome: 7 (Jeddah 2, Asir 2, Hasa 2, Hail 1)
 Echinococcosis: 1 (Asir 1)
 Purpural Sepsis: 2 (Jeddah 1, Asir 1)