Malaria – continued

country in 1976 (130) was reported from India and comprised 32% of all cases. Of the imported cases, a large number were acquired in Nigeria (29), Nicaragua (26), and El Salvador (19).

The states with the largest number of malaria cases in 1976 were California (128), New York (62), Florida (20), Texas (19), Pennsylvania (18), Illinois (15), and Maryland (15). In 1976, as in 1975, the seasonal distribution of malaria showed a distinct pattern, with cases peaking in the summer months. This pattern is probably due to an increase in travel by Americans during the summer months.

As in previous years, for cases in which the exact date of arrival and the date of onset were available, clinical malaria developed within 30 days after arrival in the United States in 75.6% of persons with *P. falciparum* infection and in 34.8% of those with *P. vivax* infection. Within 6 months after arrival, 97% of patients with *P. falciparum* malaria and 71% of those with *P. vivax* malaria had developed clinical symptoms. Only 8 patients (3.6%) with *P. vivax* malaria became ill more than 1 year after the last possible exposure to malaria abroad.

Reported by Parasitic Diseases Div, Bur of Epidemiology, CDC.

▲ A copy of the report from which these data were derived is available on request from the Center for Disease Control, Attn: Malaria Surveillance, Parasitic Diseases Div, Bureau of Epidemiology, Atlanta, Georgia 30333.

Epidemiologic Notes and Reports

Death in a Farm Worker Associated with Toxic Gases From a Liquid Manure System — Wisconsin

A 16-year-old farm worker collapsed and died on December 8, 1977, while steam cleaning gutters inside a calf barn in Eau Claire, Wisconsin. The apparent cause of his death was the inhalation of toxic gases, with hydrogen sulfide (H_2S) the probable active agent. The source of the gases was decomposing liquid manure that had been agitating for 30-60 minutes in a 100,000-gallon tank beneath the barn. The boy had been working inside the barn approximately 30 feet from the tank for about 10 minutes when he was overcome by gases. While trying to rescue him, 2 other workers experienced syncopal episodes but recovered. No animals died during the incident; however, no calves were in the affected area of the barn at the time of exposure.

The farm worker had been in good health. He had no chronic illnesses, took no medications, and had no history of drug abuse. Autopsy findings were consistent with inhalation of a toxic gas resulting in emesis and aspiration. H_2S was implicated as the causative agent by air tests done under similar conditions 2 days after the incident. The tests showed that H_2S concentrations at the site of death after 8 minutes of manure agitation were >60 ppm. (By comparison, NIOSH recommends a maximum exposure concentration of no more than 10 ppm over a 10-minute period; when concentrations reach >50 ppm, evacuation is recommended [*1*].) Other gases, such as nitric oxide, nitrogen dioxide, and sulfur dioxide, which have been associated with deaths in silos, were not detected. Carbon monoxide was ruled out at autopsy by blood tests, methane was thought not to have been present since 2 open-flame heaters were in use, and ammonia was considered unlikely to have existed in high concentrations because its odor and irritation properties act as excellent warning signals.

Reported by D Farmer, MPH, H Aitken, MD, Eau Claire City-County Health Dept; M Woodbury, RN, MCH, K Rentmeester, MPH, Wisconsin State Dept of Health and Social Services; R Berry, E Shortt, Occupational Safety and Health Admin; Hazard Evaluation and Technical Assistance Br, Industrial Hygiene Sect, Environmental Investigations Br, Appalachian Lab for Occupational Safety and Health, NIOSH, Special Studies Br, Chronic Diseases Div, Bur of Epidemiology, CDC.

Editorial Note: The number of liquid manure systems in the United States is increasing as farms modernize and become more concerned with the efficient recycling of energy-rich waste. Numerous deaths in swine, beef, and dairy animals have been associated with these systems (*2-4*). Furthermore, several farm workers have died after entering recently emptied liquid manure tanks or have drowned after falling into full tanks (*4,5*). This death is one of the first to occur from the dispersion of gases outside the storage tank.

Several factors appear to have contributed to the hazardous conditions present at the time of the incident. For example, the manure tank was full and the contents had been agitating longer than usual before pumping began. The barn was inadequately ventilated that day. Only 1 of its 5 fans was in use and then only intermittently, and a westerly wind blew through the only open door. In addition, the calves' high protein diet made the formation of H_2S more likely.

A number of toxic gases are released from decomposing manure, but H_2S, carbon dioxide, methane, and ammonia are of principal concern (*2*). H_2S, the most toxic of these, can cause headache, irritation of the mucous membranes and respiratory tract, nausea, and dizziness at low concentrations (10-50 ppm). These symptoms usually accompany a rotten egg or sickeningly sweet odor; however, sense of smell is not always a reliable indicator because of the rapid extinction of olfactory sensation with increasing concentrations (>100 ppm). Syncope and death following respiratory paralysis can occur at high concentrations (>1,000 ppm) with little or no advance warning.

Several preventive measures may be taken to reduce farm workers' risk of toxic gas exposure from liquid manure systems. These steps include improving ventilation and developing contingency plans for evacuating animals and workers from enclosed farm buildings while the manure is agitating. Additionally, agricultural authorities have recommended that workers who must enter a closed space containing a manure tank should wear self-contained air packs and safety harnesses, and that reserve workers should be stationed outside (*6,7*).

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Influenza – Worldwide

Colorado: Two H1N1 viruses resembling A/USSR/90/77 have been recovered from cadets at the U.S. Air Force Academy in Colorado Springs. An outbreak of influenza-like disease began there on January 29, and since then 60.5% of the approximately 4,200 cadets have reported illness. No other isolates of this strain have been recovered from personnel permanently stationed at the Academy or from civilians in the community. Two H1N1 viruses similar to A/USSR/90/77 have been isolated during a current outbreak of influenza at Lowry Air Force Base near Denver.

Wyoming: Since last week's report (*1*), 4 additional influenza isolates have been recovered from the outbreak at the University of Wyoming in Laramie. Three of the isolates resemble A/USSR/90/77 (H1N1), and 1 resembles A/Texas/1/77. In Cheyenne, during a recent outbreak of influenza at Francis Warren Air Force Base, 1 virus similar to A/USSR/90/77 (H1N1) and 1 similar to A/Texas/1/77 were recovered. In general, influenza outbreaks throughout Wyoming have been decreasing, as indicated by declines in school absenteeism and the number of visits to physicians.

Michigan: Specimens collected during an influenza outbreak in Tecumseh, where A/Texas/1/77-like viruses had previously been recovered, have yielded 1 isolate that resembles A/USSR/90/77 in preliminary tests. The specimens were obtained from a 20-year-old resident who was ill in mid-January. A similar H1N1 virus was isolated from a student at Michigan State University in East Lansing who became ill in late January.

Elsewhere in the United States: Based on reports sent to CDC from 121 U.S. cities for the week ending February 4, pneumonia and influenza deaths are again elevated above the epidemic threshold (Figure 2).

Elsewhere in the world: On January 24, Japan notified the World Health Organization that H1N1 strains resembling A/USSR/90/77 had been recovered from patients during outbreaks (*2*). Until then, only A/Texas/1/77-like viruses had been reported. Viruses resembling A/USSR/90/77 have also been isolated in Hungary, Bulgaria, and Czechoslovakia during localized outbreaks. In Bath, England, during an outbreak of influenza at a boarding school, 5 viruses resembling A/USSR/90/77 and 6 resembling A/Victoria/3/75 were recovered.

Reported by Col GD Lathrop, MD, R Slemons, DVM, Brooks Air Force Base; G Miekeljohn, MD, University of Colorado Medical Center; A Monto, MD, University of Michigan School of Public Health; Appropriate State and Territorial Epidemiologists and State Laboratory Directors; WHO Collaboratoring Laboratory for Influenza, Respiratory Virology Br, Virology Div, Bur of Laboratories, Surveillance and Assessment Br, Immunization Div, Bur of State Services, National Morbidity and Mortality Statistical Activity, Bur of Epidemiology, CDC.

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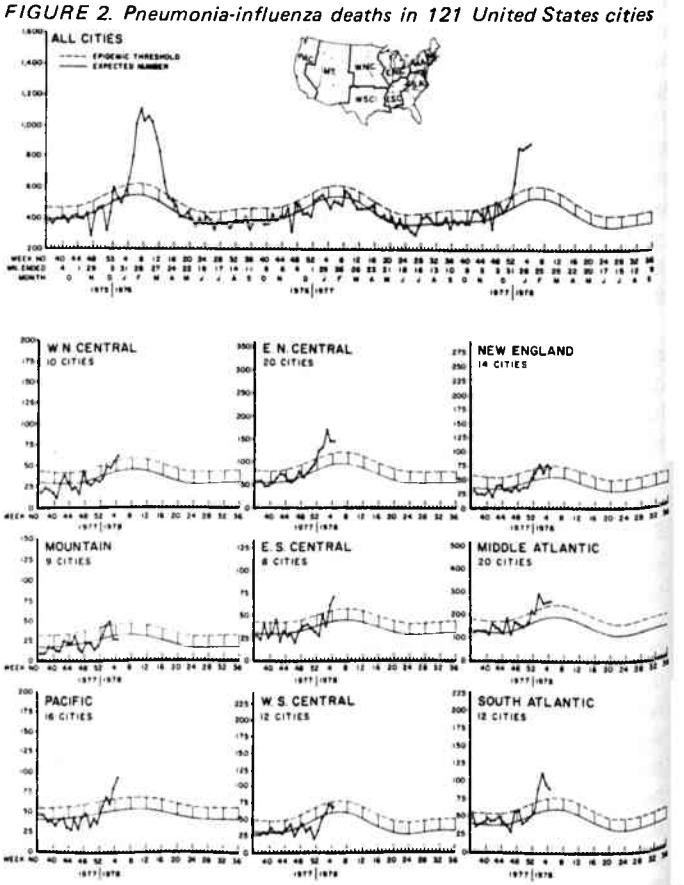
FIGURE 2. Pneumonia-influenza deaths in 121 United States cities



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Epidemiologic Notes and Reports

Measles — Michigan

The first reported school-based outbreak of measles in Michigan for the 1977-78 school year occurred in September in Lake City. The first case developed on September 11, and by November 30, a total of 27 had been reported. Ages of the ill children ranged from 15 months to 16 years, with 20 children (74%) between 5 and 14 years. Twenty-five children had a typical measles prodrome and rash illness. Two others, however, ages 11 and 12, with known exposures to typical measles cases, had febrile illnesses, cough, and an atypical rash limited primarily to the extremities. Both children had received 1 dose of an unknown type of measles vaccine in 1966, before age 1. Two children, 1 with typical measles and 1 with atypical measles, required hospitalization.

Laboratory results were available on 7 children. One child with atypical disease and 5 children with typical measles were found to have 4-fold or greater rises in hemagglutination-inhibition (HI) antibody titers. The other child with atypical measles had an HI titer of 1:1280 on a single serum specimen drawn 7 weeks after the acute illness.

Measles vaccination history was elicited for all 27 children: 11 had never been vaccinated, 9 had been vaccinated before age 1, and 7 had been vaccinated after age 14 months. The reasons given for the lack of vaccination in the 11 children varied. Two children had a history of egg allergy. The families of 6 others had moved at about the time the children were to be vaccinated or said they "just hadn't gotten around to it." One 15-month-old child was to have been vaccinated the week after she had onset of measles, one 3-year-old girl had had a mild "cold" at age 1 when she was to have been vaccinated, and 1 child's parents had refused vaccine on religious grounds.

None of the parents of the 9 children who had been vaccinated before age 1 were aware of the need for revaccination. These children had received their vaccinations from private physicians or from local health department clinics. Because of insufficient data, no accurate vaccine efficacy rate could be calculated. A complete review of school immunization records, with institution of control measures, has been undertaken by the local health department with the assistance of the Michigan Department of Public Health.

Reported by R Reynolds, PHN, Missaukee County Health Office; T Cardinal, MD, Michigan District Health Officer, N Hayner, MD, State Epidemiologist, Michigan Dept of Public Health; Immunization Div, Bur of State Services, Field Services Div, Bur of Epidemiology, CDC.

Editorial Note: Vaccine efficacy studies have demonstrated that measles vaccine is highly effective when appropriately stored and administered (*1*). Consistent with these findings, most of the measles cases reported in the United States in recent years have occurred in children who have never been vaccinated or who were initially vaccinated when they were less than 1 year of age and were not revaccinated (*2*). Histories of egg allergy or minor respiratory infections are not contraindications to the administration of measles vaccine (*3*).

As illustrated here, epidemiologic investigations of measles outbreaks can provide useful information for identifying who is at high risk of contracting disease and why. The answers can then be used to modify measles control programs to reach those high-risk groups. Particularly troublesome is the fact that none of the parents of children who had been vaccinated at less than 1 year of age were aware of the need for revaccination. The establishment, maintenance, and periodic review of immunization records by all responsible parties are key elements in measles control.

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Current Trends

Malaria in the United States — 1976

Four hundred and six cases of malaria with onset in the United States and Puerto Rico were reported to CDC in 1976. This total represents a 9.2% decrease over the similar period in 1975 when 447 cases were reported.

As in 1975, most of the reported cases were in civilians. Although civilian cases decreased from 430 in 1975 to 401 in 1976, they comprised 99% of all cases diagnosed in this country. Declining cases of malaria among military personnel, a trend first noticed in 1971, continued with the figure falling from 17 in 1975 to 5 in 1976 and reaching