



Probable Locally Acquired Mosquito- Transmitted *Plasmodium vivax* Infection— Suffolk County, New York, 1999

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IN THE UNITED STATES, MALARIA TRANSMISSION was eliminated in the 1940s, and malaria eradication was certified in 1970.¹ Since then, 60 small localized outbreaks of probable mosquito-transmitted malaria have been reported to CDC.²⁻⁶ Before 1995, the number of imported malaria cases reported to the Suffolk County (New York) Department of Health Services ranged from zero to eight per year. Since 1995, seven to 17 cases per year have been reported. In all of these cases, a history of residing in or traveling to an area with endemic malaria outside the United States was confirmed. This report describes the investigation of two cases of *Plasmodium vivax* malaria that occurred in Suffolk County in August 1999; the patients had no history of travel outside of the United States.

Case Reports

Case 1. On August 18, an 11-year-old boy residing in Suffolk County was seen by his physician with a 5-day history of fever, rigors, abdominal pain, arthralgias, and vomiting. Intracellular parasites consistent with *P. vivax* were noted on a complete blood count. The patient was admitted to a local hospital on August 21 with a temperature of 102.0 F (38.9 C), hepatosplenomegaly, and several healing maculopapular bite lesions. Initial laboratory examinations revealed leukopenia (white blood cell count: 2,800/mm³ [normal: 4,500-

13,500/mm³]), anemia (hemoglobin: 9.8 g/dL [normal: 11.5-15.5 g/dL]), and severe thrombocytopenia (platelet count: 21,000/mm³ [normal: 150,000-400,000/mm³]). Serology was negative for Lyme disease and babesiosis. Serum electrolytes and chest radiograph were normal. Urinalysis demonstrated a slightly elevated urobilinogen. Examination of peripheral thick and thin blood smears at the New York State Department of Health (NYSDH) and CDC confirmed *P. vivax* infection. The patient was treated with chloroquine phosphate, quinine, clindamycin, and primaquine and was discharged from the hospital on August 25.

The patient's parents reported he had never traveled to a malarious area or had a history of a blood transfusion or organ transplantation. During August 1-7, the patient spent 1 week at a summer camp 20 miles from his hometown. He slept in a tent and went swimming in the camp pond. After his return home on August 7, the patient attended another camp in Massachusetts for 2 days.

Case 2. On August 22, an 11-year-old boy residing in Suffolk County was seen by his physician for a 12-day history of vomiting, diarrhea, fever, chills, and fatigue. On August 27, a complete blood count showed malarial ring forms; the boy was admitted to a hospital the following day. Physical examination on admission revealed a temperature of 100.0 F (37.8 C), no splenomegaly, and multiple healing maculopapular bite lesions. Initial laboratory examinations revealed leukopenia (white blood cell count: 4,300/mm³), severe anemia (hemoglobin: 8 g/dL), and thrombocytopenia (platelet count: 134,000/mm³). Routine blood and urine cultures were negative. Serology was negative for babesiosis. Urinalysis and chest radiograph were normal. Examination of peripheral thick and thin blood smears at NYSDH and CDC revealed intracellular parasites consistent with *P. vivax* (less than 1% parasitemia). The patient was

treated with chloroquine phosphate and primaquine and was discharged from the hospital on August 29.

His parents reported he had never traveled to a malarious area or had a history of a blood transfusion or organ transplantation. The boy spent the same week at the same summer camp as case 1, which is 15 miles from his hometown. During the week he slept in a tent and participated in numerous outdoor activities. On August 10, he began having fevers ranging from 101.0 F to 104.0 F (38.3 C to 40.0 C) with rigors and sweats.

Epidemiologic Investigation

No other unexplained cases of malaria were reported to NYSDH during July 1-August 31, 1999. To identify potential unreported cases, a field investigation was conducted that included 1155 telephone interviews with boys who attended the camp, members of their families and the camp staff, and interviews with residents living within 1 mile of the camp. Sixty-three of 375 boys who attended the camp and members of their families who were interviewed reported having a fever during the defined time period. Fourteen of these persons had unexplained fevers; however, no malaria parasites were shown on peripheral blood smears on any of these persons. Two of the approximately 150 residents who lived within a 1-mile radius of the camp who were interviewed reported a fever during the specified time period. No malaria parasites were shown on their peripheral blood smears. Of 52 farm workers interviewed who had immigrated from Mexico, Guatemala, Honduras, El Salvador, and Bangladesh and who resided in three farms near the camp, three reported a recent history of fever; their blood smears did not reveal parasites.

Entomologic and Environmental Investigation

Routine mosquito trapping by the Suffolk County health department for east-



ern equine encephalitis during early August (the time these cases would have been transmitted) from sites 7 miles from the summer camp yielded *Anopheles quadrimaculatus* and *An. punctipennis*. Trapping from the campsite in eastern Long Island from August 24 to 31 yielded primarily *An. quadrimaculatus* and a few *An. punctipennis*. No mosquitoes (222 of 248 were tested) from the campsite or the boys' hometowns tested positive for *Plasmodium* species. Mosquito control measures to kill larvae and adults were performed at the camp. The adjacent state park was closed temporarily by the health department until surveillance indicated low numbers of mosquitoes.

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CDC Editorial Note: The two cases presented in this report represent the third episode of possible mosquito-borne malaria in New York during the preceding 7 years^{4,5,7} and the 24th episode in the United States since 1985. The possibility of autochthonous (i.e., locally acquired) mosquito-borne malaria transmission in the United States remains a concern because of the frequency of international travel, the presence of gametocytic persons (i.e., persons with malaria parasites in the blood stream that can infect mosquitoes) in the United States, the presence of competent mosquito vectors, and the occurrence of environmental conditions that favor transmission. This investigation confirmed two epidemiologically linked cases of *P. vivax* infection in children residing and camping in Suffolk County, who probably acquired their infections in eastern Long Island through the bite of one or more locally infected *Anopheles* mosquitoes, a competent vector for malaria.

Neither patient had risk factors for the acquisition of malaria infection, such as travel to a disease-endemic area or history of intravenous drug use. Neither had ever had a blood transfusion or organ transplantation. Other potential sources of infective mosquitoes, such as international airports, were too distant from the presumed site of infection. However, *Anopheles* mosquitoes were identified in the recreational area that both patients had visited during the month of August 1999. In addition, potentially gametocytic persons were living near this recreational area, and environmental conditions were suitable for the development of the parasite in the mosquito (sporogonic cycle) and larvae into adult mosquitoes. Although case finding and contact tracing activities did not identify persons with malaria who might have been the source of the infection, this does not preclude local transmission, which may have occurred weeks before the investigation.

Suffolk County is one of the most heavily mosquito-infested areas in the northeast. In 1999, the northeastern United States experienced one of the warmest and driest summers in history.⁸ However, heavy rainfall shortly before the two boys arrived at the camp may have resulted in a large population of adult female mosquitoes. Dry weather followed by heavy rains, in addition to resulting in conditions conducive for mosquito breeding, could have reduced the mosquito predator population.

Gametocytic persons still may be present in the community and constitute a potential reservoir for future episodes of mosquito-borne malaria. Thousands of travelers return to the United States each year from areas where malaria is endemic, and many fail to take adequate chemoprophylaxis. Reintroducing malaria transmission on a small scale in selected areas in the United States is possible. This cluster underscores the need for ongoing surveillance for vector-borne diseases, including malaria. Prompt recognition and adequate treatment of malaria, including improved access to diagnosis and

treatment for migrant populations, rapid reporting of malaria cases to public health authorities, and implementation of appropriate control measures, are indicated. Finally, malaria should be considered in the differential diagnosis of illness in any patient with unexplained fevers, regardless of travel history.

During the summer months, persons should follow personal protective measures that reduce contact with potentially infective mosquitoes. These include the use of protective clothing and insect repellants, and sleeping in screened or air-conditioned enclosures. Repellent products containing N,N-diethylmetatoluamide (DEET) are more effective than other compounds.

REFERENCES

8 available

Illnesses Associated With Use of Automatic Insecticide Dispenser Units—Selected States and United States, 1986-1999

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TO CONTROL INDOOR FLYING INSECTS, restaurants and other businesses commonly use pyrethrin and pyrethroid insecticides sprayed from automatic dispensing units. Usually placed near entrances, these units are designed to kill flying insects in food service or work areas. On May 18, 1999, the Florida Department of Health (FDH) was notified by the Florida Department of Business and Professional Regulation (DBPR) that during May 12-17, three persons developed pesticide-related illnesses associated with improperly placed automatic insecticide dispensers. After FDH conducted a follow-up



investigation and notified CDC's National Institute for Occupational Safety and Health (NIOSH) of this event, surveillance data were reviewed to identify additional cases of pesticide-related illnesses associated with automatic insecticide dispensers. Data were provided by the Toxic Exposure Surveillance System (TESS), the California Department of Pesticide Regulation (CDPR), the Montana Department of Agriculture (MDA), the National Pesticide Telecommunications Network (NPTN), and the Washington State Department of Health (WSDH).^{*} This report describes cases, summarizes surveillance data for pesticide-related illnesses associated with automatic insecticide dispensers, and provides recommendations for safe dispenser use.

Case Reports

Cases 1-3. A 42-year-old cook working at a Florida restaurant developed a sore throat, dyspnea, headache, and dizziness on May 12, 1999, after a several-hour exposure to mist released from insecticide dispensers in the food preparation area. The insecticide dispensers had been installed on May 10, but it is unknown on what day the cook was first exposed. The cook removed the dispensers on May 12 and noted relief of his symptoms. However, the restaurant management reinstalled the dispensers on May 14, and on May 15, a 40-year-old male customer developed headache and shortness of breath within 1 hour of entering the restaurant. These symptoms lasted approximately 4 hours. On May 17, approximately 45 minutes after leaving this restaurant, a 47-year-old male customer experienced a sharp burning sensation in his left eye and noted swelling, redness, and irritation of the eyelid that persisted approximately 24 hours. The implicated pesticide dispenser was within 6 feet of the booth where this customer had been sitting, and it faced his left eye. This person reported his symptoms to DBPR on May 18. None of the three persons sought medical attention for their symptoms. The active ingredients released

by these dispensers were pyrethrin and piperonyl butoxide.

Case 4. On August 20, 1995, a 17-year-old male restaurant employee in California was changing the cartridge of an automatic insecticide dispenser. When he closed the dispenser panel, the firing mechanism was activated and discharged a pyrethrin-containing mist into his right eye. The employee immediately experienced burning in the eye and promptly sought medical attention at the emergency department of a local hospital. He was diagnosed with chemical conjunctivitis and treated symptomatically.

Surveillance Data

TESS is maintained by the American Association of Poison Control Centers and collects poisoning reports submitted by approximately 85% of U.S. poison control centers.¹ A review of TESS data from 1993 through 1996, the most recent years for which data are available, identified 54 cases of pesticide-related illnesses associated with automatic insecticide dispensers; suicides and intentional misuse/abuse were excluded. Among the 42 cases for which specific age information was available, the median age was 22.5 years (range: 3-73 years). Among the 53 cases for which sex was known, 27 (50%) were male. Twenty (37%) cases were work-related. In all cases, pyrethrin/piperonyl butoxide was the responsible insecticide.

During 1986-1999, 43 cases of acute pesticide-related illnesses associated with automatic insecticide dispensers were reported to CDPR (32 cases), MDA (four cases), FDH (three cases), NPTN (two cases), and WSDH (two cases). Age, sex, and state of occurrence for these cases were compared with those from the TESS database, and no overlap with TESS data was found. Thirty-five (81%) of these cases were in persons exposed while at work, including seven whose exposure occurred during dispenser cartridge replacement or attempts to service faulty dispensers. Seven (16%) cases were in persons exposed while they were customers in restaurants, and one was a movie theater customer. For the 27

with age data available, the median age was 40 years (range: 17-68 years); for the 38 with information on sex, 23 (61%) were women. Resmethrin, a pyrethroid insecticide, was implicated in three cases; the remaining 40 were exposed to pyrethrin/piperonyl butoxide. Most insecticide dispenser-related illnesses identified in the non-TESS data† occurred when the dispensers were improperly placed too close (i.e., less than 12 feet) to food handling, dining, or work areas; were placed where ventilation currents entrained the mist to such areas; and/or were serviced by persons unfamiliar with proper maintenance of these units.

Among the 94 pyrethrin/piperonyl butoxide-exposed cases in the combined surveillance data, signs and symptoms for 36 (38%) involved the eye; 34 (36%), the neurologic system; 26 (28%), the respiratory system; 23 (24%), the gastrointestinal system; 20 (21%), the nose and throat; 10 (11%), the skin; and eight (9%), the cardiovascular system. Some persons experienced signs and symptoms in more than one system. Among the three resmethrin-exposed cases, reported signs and symptoms included pruritus, throat irritation, nausea, vomiting, diarrhea, headache, burning sensation in the lungs, and cough.

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CDC Editorial Note: This report is the first to document pesticide-related illnesses attributable to automatic insecticide dispensers. Automatic insecticide dispensers are registered by the U.S. Environmental Protection Agency (EPA) for use in the restaurant industry and in other public settings, including schools, hotels, offices, supermarkets, hospitals, day-care centers, and long-term-care facilities (e.g., nursing homes). When used properly, automatic insecticide dispensers reduce the



number of flying insects. However, given the dispensers' widespread use and potential for malfunction and/or improper use or maintenance, these units may pose a public health hazard.

Insecticide dispensers of the type described in this report are typically calibrated to spray automatically a fine mist of 50-100 mg of insecticide (consisting of approximately 0.5%-1.85% pyrethrin or resmethrin, along with other active and inert ingredients) every 15 minutes, 24 hours per day. Pyrethrins are insecticides derived from the oleoresin extract of dried chrysanthemum flowers (pyrethrum).² Piperonyl butoxide (either alone or combined with n-octyl bicycloheptene dicarboximide) often is added to pyrethrin products to inhibit microsomal enzymes that detoxify pyrethrins.² Although pyrethrins (classified by EPA as acute toxicity category III compounds[†]) have little systemic toxicity in mammals, they possess irritant and/or sensitizing properties that can induce contact dermatitis, conjunctivitis, and asthma.^{2,3} Anaphylactic reactions² and gastrointestinal symptoms⁴ related to inhalation of and cutaneous exposure to pyrethrin also have been reported; however, no previously published reports were identified associating pyrethrin exposure with reported cardiovascular (i.e., tachycardia, chest pain, and palpitations) or neurologic (i.e., headache, dizziness, malaise, altered taste, and lip numbness/burning) signs and symptoms. Resmethrin is a pyrethroid, a class of synthetic insecticides chemically similar to natural pyrethrins² and is classified in acute toxicity category III. Pyrethroids are reported to induce abnormal skin sensation, dizziness, salivation, headache, fatigue, vomiting, diarrhea, irritability to sound and touch, and other central nervous system effects.^{2,5}

The findings in this report are subject to at least two limitations. First, the surveillance systems that identified cases are passive and may have missed some acute pesticide-related illnesses. Second, lack of detailed information on incidents recorded in the surveillance data may have precluded identifica-

tion of additional risk factors for insecticide dispenser-related illnesses.

Effective flying insect control can be achieved through nonchemical integrated pest management practices (e.g., proper sanitation practices by employees and installation of air curtains and screens). However, if automatic insecticide dispensers are used, they should be installed according to manufacturer labeling instructions. Warning stickers on dispensers should be considered, installation near supplied-air ducts should be avoided, and timers should be set to dispense insecticide during nonbusiness hours.⁶ Dispensers used in locations frequented by the public should be installed and serviced by commercial pest control operators. Although they are not required by EPA, persons servicing these devices should use personal protective equipment (i.e., chemical-resistant gloves and goggles designed to provide splash protection).

REFERENCES

6 available

Publication of Surgeon General's Report on Oral Health

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ON MAY 25, 2000, THE SURGEON GENERAL issued *Oral Health in America: A Report of the Surgeon General*. The report identifies the essential role of oral health in overall health and well-being. Although oral health has improved since 1950, disparities in oral health status and access to care affect many persons, including those with low income and members of racial/ethnic minority groups. Safe and effective measures for preventing oral disease such as the use of fluoridated water or dental sealants are underutilized. Actions called for by the report include increasing awareness of the importance of oral health as part of general health; accelerating the build-

ing of the science base and applying it more effectively to improve oral health; strengthening the local, state, and federal capacity to perform core public health functions; removing barriers between people and receipt of oral health services; and using public-private partnerships to improve the oral health of those who still suffer disproportionately from oral diseases.

Additional information, a copy of the report, and ordering information are available on the World-Wide Web at <http://www.surgeongeneral.gov>. Additional information is available on the Web at <http://www.cdc.gov/nccdphp/oh/>, or by telephone at (887) 232-2020.

Federal Register Notice on Draft Public Health Action Plan to Combat Antimicrobial Resistance

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THE DRAFT PUBLIC HEALTH ACTION PLAN to Combat Antimicrobial Resistance became available for public comment on June 22, 2000. Comments must be submitted in writing by August 4, 2000, to the Office of Health Communication, National Center for Infectious Diseases, CDC, Mailstop C-14, 1600 Clifton Rd., N.E., Atlanta, GA 30333; fax, (404) 371-5489; e-mail, aractionplan@cdc.gov; or the World-Wide Web, <http://www.cdc.gov/drugresistance/actionplan/>.

Requests for copies of the plan should be submitted to the Office of Health Communication, National Center for Infectious Diseases, CDC, Mailstop C-14, 1600 Clifton Rd., N.E., Atlanta, GA 30333; fax, (404) 371-5489; e-mail, ncid@cdc.gov; or the Web, <http://www.cdc.gov/drugresistance/actionplan/>. Copies can be downloaded from the Web site.