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Dengue Transmission

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In “Dengue Reborn: Widespread Resurgence of a Resilient Vector,” Phillips (2008) highlighted the relevant message to alert people involved in dengue and chikungunya control programs, as well as researchers. As a scientist in vector control in India and abroad for the past three decades, I would like to add valuable information.

Because the biology and behavior of *Aedes aegypti* and *Aedes albopictus* have been understood for several decades, national programs of affected countries need to adopt feasible and practical approaches to reduce indigenous transmission of dengue and chikungunya. The vectors have been well established in different geographical regions for more than two centuries because of commercial activities (Mariappan et al. 2008; Schliessmann and Calheiros 1974).

I have observed adult *Aedes* mosquitoes inside houses, in bathrooms, and kitchens; around trash; in rooms containing fiberglass water tanks; under staircases; on furniture, curtains, and hanging clothes; on ornamental and decorative objects in verandas and halls; and in garages. In Jeddah, Kingdom of Saudi Arabia, 300-year-old buildings with two- to three-floor flats and wooden-shuttered windows provide dark, cool, humid microclimatic situations ideal for *Aedes*; these buildings may house six to eight families. These occupants are often ethnic heterogeneous populations including Egyptians, Filipinos, Pakistanis, Bangladeshis, Indians, Indonesians, Sri Lankans, Yemenis, and Africans.

People living in endemic belts of dengue and chikungunya frequently visit their countries and return infected with dengue, acting as potential sources for local transmission because of the high density of *Aedes* adults. Each infected *Aedes* completes its lifecycle within one apartment by taking blood from a host and depositing eggs in suitable habitats. Because of the intermittent supply of piped water (25–35 days), residents must store water in 20–40 drums holding 20–200 L each; drums are usually dark blue, black, or green to prevent growth of algae. These containers are obtained from markets or from shops that sell drums and barrels previously used for storing other materials. *Aedes* breeding has been reported in water stored in this type of recycled drums (Mariappan 2008). In addition, people from various continents who partici-

pate in the Islamic Hajj pilgrimage (visiting Mecca and Madinah) may also spend time in Jeddah, thus facilitating indigenous transmission of dengue (Fakeeh and Zaki 2003).

I fully agree with Phillips (2008) that changes in global warming lead to an increase in different vector-borne diseases. Cumulative factors are involved in the increase of dengue, including air travel, where infected individuals travel quickly from continent to continent. The risk of travelers being bitten by *Aedes* during transit is common.

Singapore, which has continued to fight against dengue for several decades, has been unable to become free from both dengue and chikungunya because of enormous natural and manmade habitats. In many cities (e.g., Rio de Janeiro, Brazil; Bangkok, Thailand; Jakarta, Indonesia; New Delhi, India), monsoons facilitate a high density of *Aedes* adults, therefore maintaining dengue transmission. In India, as many as 38 people have died from dengue, and > 2,800 have been affected (Dhar 2008).

In Jeddah, dengue cases are reported throughout the year, when there is no rainfall and during periods of occasional rain in December. Jeddah remains warm in winter, with temperatures ranging from 15°C (59°F) at midnight to 25°C (77°F) in the afternoon. Summer temperatures are considered very hot, breaking the 40°C (104°F) mark in the afternoon and dropping to 30°C (86°F) in the evening (Mariappan 2008).

Increasing awareness of improved water-storage practices among affected populations could drastically reduce the density of *Aedes* adults. Training student volunteers to control *Aedes* populations (both immature and adult) by adopting “practical hand-in-hand training” procedures in field operation has resulted in a decrease in the number of dengue cases (Mariappan 2008). Training on *Aedes* control measures using 2–3 day “train the trainers” courses has been highlighted by the European Centre for Disease Prevention and Control (Senior 2008).

Phillips (2008) illustrated the disease of poverty and reported on methods of curbing dengue’s expansion. Together, the movement of infected persons and the diurnal biting habits of vectors increase the infected vector populations, making local transmission easier. Each infected adult mosquito could infect many people in a given area before its death. In addition, eggs deposited by *Aedes* could survive > 6–8 months in adverse conditions within areas of human habitation, and those

dormant eggs deposited in objects/containers may be transported to various areas through the sale and use of recycled containers used for water storage.

The increase of dengue (and dengue hemorrhagic fever) worldwide is everyone’s responsibility. Therefore, we should initiate control measures (especially in reducing sources) against vectors until a successful vaccination can be produced.

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Thirupathi Mariappan

Vector Control Research Centre
Indian Council of Medical Research
Pondicherry, India
E-mail: tmappan@gmail.com

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World Trade Center Disaster and Asthma Type

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As a practicing occupational health physician both in prevention and clinical care, I deeply appreciate the information provided by *EHP*. The article “Respiratory and Other Health Effects Reported in Children Exposed to the World Trade Center Disaster of 11 September 2001” (Thomas et al. 2008), published in the October 2008 issue of *EHP*, is consistent with current knowledge about adult consequences of the disaster. My concern is that the term “asthma” can be used to describe two clinical conditions that are not similar in either causation or treatment.

Allergic asthma, usually IgE mediated, is a separate entity clinically from irritant-induced “asthma.” The latter is often referred to as reactive airway disease because it is induced by exposure to irritants that may or may not be particulate, and irritant avoidance is an important component of treatment. Allergic asthma responds much better to bronchodilators than reactive airway disease. The latter

has been described as having a nitric oxide/peroxynitrite vicious cycle perpetuating biochemical mechanism. Irritant propellants used for treatment of allergic asthma often exacerbate reactive airway disease, and even relatively nonirritating bronchodilators such as albuterol, which help allergic asthma, do not help reactive airway disease.

I believe that it would be useful for Thomas et al. to clarify which condition they are describing: Given the exposure, irritant-asthma (also called reactive airway disease) appears to be the entity under study.

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Grace Ziem

Occupational and Environmental Health
Emmitsburg, Maryland
Website: chemicalinjury.net

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World Trade Center Disaster and Asthma Type: Thomas et al. Respond

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We appreciate the question raised by Ziem regarding the type of asthma reported in children exposed to the World Trade Center (WTC) disaster of 11 September 2001 (9/11) (Thomas et al. 2008). In our study we found an increase in age-specific asthma prevalence among children < 12 years of age, and a new diagnosis of asthma was strongly correlated with a report of exposure to the dust and debris cloud that occurred as buildings collapsed on 9/11. Among children < 5 years of age, we observed an increased prevalence in asthma diagnosis even among those not exposed to the dust cloud.

We cannot confirm or disprove Ziem's very reasonable suggestion that the asthma seen here was irritant rather than allergen induced. The data on asthma diagnoses were reported by parents or other guardians of the children, using a very simple standardized question. We asked whether a medical provider had ever said the child had asthma, and if yes, whether this occurred before or

after 9/11. We did not collect information on severity, treatment, or duration, and did not review medical records. A follow-up survey of the children is under way and includes questions to characterize the asthma illness, but those data are not yet available.

In small children, in addition to airborne irritants and atopy, respiratory viruses may also play a role in initiation or exacerbation of asthma (Schwarze and Gelfand 2000). It is difficult or impossible in a general pediatric setting to differentiate the type of asthma in children, and many pediatricians use the term "reactive airway disease" in children with recurrent wheezing whether or not there appears to be an allergic component.

The airborne contaminants immediately following the 9/11 attacks included a highly alkaline mixture of gypsum, concrete, and synthetic vitreous fibers, further contaminated by metals, organochlorine compounds such as polychlorinated biphenyls and dioxins, and polycyclic aromatic hydrocarbons. Later on, settled dust in indoor environments, including residences where many children lived, was found to consist of both fine, coarse, and "supercoarse" (> 10 µm in diameter) particulate matter (Lioy et al. 2006); thus, there was a clear potential for exposure to biologic or allergenic substances. Also, as the cleanup for homes, as well as public areas, was prolonged and difficult, molds could have occurred in some environments and contributed to allergic reactions.

Based on earlier studies, Landrigan et al. (2004) noted that "high alkalinity of WTC dust produced bronchial hyperreactivity, persistent cough, and increased risk of asthma." Increased asthma was subsequently reported in evaluations of 68,444 adults enrolled in the WTC Health Registry (Farfel et al. 2008). Wheeler et al. (2007) found a dose response with increased exposure to the 16-acre "pile" of debris associated with the buildings' collapse and burning. In an overview of health effects in other adults, Farfel et al. (2008) found an association of asthma with exposure to the initial dust cloud generated by the collapse of the twin towers.

We agree with Ziem that, in both children and adults, the exposures observed are more likely related to particulates and other irritants. Further work that includes more detailed histories accompanied by pulmonary function testing is needed to better characterize the pulmonary illness in these individuals.

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Pauline A. Thomas
New Jersey Medical School–UMDNJ
Newark, New Jersey
E-mail: Thomasp1@umdnj.edu

Robert Brackbill
Agency for Toxic Substances and
Disease Registry
U.S. Department Health and
Human Services
Atlanta, Georgia

Lisa Thalji
Sharon Campolucci
RTI International
Chicago, Illinois

Laura DiGrande
Lorna Thorpe
Steven D. Stellman
New York City Department of Health and
Mental Hygiene
New York, New York

Kelly Henning
Bloomberg Foundation
New York, New York

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