

June 23, 1997

NON-CIRCULATING

98-376

The A, B, Seeds of an Outbreak of Foodborne Illness

The expansion of the global market is often noted as a major causative factor in emerging infectious diseases. However, this highly cooperative public health effort to identify and stop an outbreak demonstrated that emerging diseases are not always infectious.

Also known as soursop in many parts of the world, Guanabana (*Annona muricata* L.) is a small evergreen tree about the size of a peach tree. Its native range extends from southern Mexico to Brazil and the West Indies.¹ The very juicy fruit has an irregular ovoid shape and a leathery green skin studded with spines. Although many Americans find the flavor unpalatable, guanabana juice is a popular beverage globally. Guanabana fruit contains numerous black oblong seeds about 1.5 cm in length. The hard seeds are usually strained out during juice production. However, if the seeds are inadvertently crushed during processing, they are difficult to remove.²

People in many countries prize guanabana for its medicinal value. Throughout its native habitat, the plant is used to treat a variety of ailments including asthma, insomnia, anxiety, and hypertension. It is also used to relieve kidney and gallbladder problems. In Jamaica it is given to children nine mornings in a row followed by castor oil to purge intestinal worms. In Trinidad the fruit pulp is applied as a poultice on ringworm, and the odor of the crushed leaf is inhaled to prevent fainting.²

Unfortunately, not all the effects of guanabana are beneficial. In late January 1990, children in an Arlington after-school program and a youth center in Ft. Worth began vomiting shortly after consuming guanabana juice during snack time.³ In Dallas, a flustered nursery school teacher herded 12 children onto the playground when they all began vomiting profusely after drinking guanabana juice. They had to stay outside for over an hour. A woman in Burleson fell ill shortly after ingesting some guanabana juice from a food bank. The woman reported that the drink "tasted like a can."⁴

The Texas Department of Health (TDH) investigated the reported incidents and confirmed the association between the illnesses and consumption of a single brand of guanabana juice. In total, more than 80 children and adults became ill during this outbreak. The juice distributor had donated more than 11,000 cases of the guanabana drink to 7 food banks. TDH detained the product at the distribution sites and requested that the food banks notify juice recipients not to serve this product pending further investigation.

The rapid onset of illness led investigators to believe they were looking for a preformed toxin or chemical. However, samples of the juice tested negative for microorganisms, *Staphylococcus aureus* enterotoxin, pesticide and sulfite residues, and for heavy metal residues. The pH of the drink was normal, and the cans were not damaged in any way.⁵

Investigators were mystified until they consulted medicinal plant experts who provided insightful clues. Julia F. Morton DSc, FLS, formerly of the University of Miami, hypothesized that guanabana seeds were responsible for the outbreak. She pointed out that the seeds contained an as of yet, unidentified toxin. According to Dr. Morton, in several countries the ground-up seeds are used as

Continued ☞

Also in this issue:

Endemic Arboviral Activity

both an insecticide and a fish poison. Seed oil, used to kill head lice, causes severe eye irritation. Moreover, a tincture of powdered seed and bay rum is used as an emetic.

The FDA confirmed the seed hypothesis by microscopically examining aliquots of outbreak-associated and nonoutbreak-associated juice. The only difference between the samples was the presence of seed cells in the outbreak-associated specimens. FDA officials concluded that some of the toxic material was somehow incorporated into the finished product, most likely during the manufacturing process.⁵

Following FDA laboratory identification of the seeds in the juice, the distributors recalled all guanabana drink that had been donated to the food banks. The FDA then placed the product on automatic detention to prevent future importation of the juice.

The outbreak could have been much more widespread without the swift action of public health officials. Another factor that probably helped keep the case total and severity of symptoms lower than they might have been is the fact that many people disliked the taste of the juice and took only a few sips.

Since this outbreak, researchers have elucidated both the toxic compounds contained in the seeds and their mechanism of action. *A. muricata* L. seed oil contains annonaceous acetogenins which have toxic, insecticidal, and anticancer

properties. The acetogenins inhibit mitochondrial electron transport and thus suppress ATP and energy production.⁶

For further information contact Frank Borden, MEd, Field Director, TDH Manufactured Food Division, at (512) 719-0243.



Prepared by Meredith Barad, Student Intern, Infectious Disease Epidemiology and Surveillance Division

Acknowledgments

The author would like to thank laboratorian Brenda Cox of the TDH Southwest Regional Office, and Dr. Joseph Betz of the US Food and Drug Division of Natural Products for their valuable assistance in preparing this article.

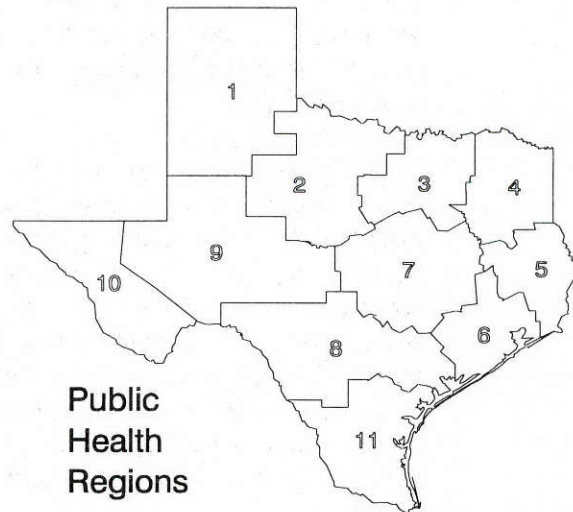
References

1. Bailey, LH. *The Standard Encyclopedia of Horticulture*, 20th. New York: The McMillan Company, 1963.
2. Morton, JF. *Atlas of Medicinal Plants of Middle America: Bahamas to Yucatan*. Springfield: Charles C. Thomas Publisher, 1981:223-225.
3. Thompson, LM. *Investigation of Reported Illness After Drinking Rain Drop Guanabana Drink*. Memorandum of 14 February, 1990 to FDA.
4. Brink, TE. *Special Investigation of Guanabana Drink*. Memorandum of 15 February, 1990 to FDA.
5. Brown, DE. *Guanabana Drink*, DI 90-603-844, et al. Memorandum of 7 March, 1990 to Acting Director Investigation Branch.
6. Wagstaff, DJ. *Toxicity of Guanabana Seeds*. Memorandum of 9 November, 1995 to Jack Geltman (HFS-306).

Endemic Arboviral Activity




The arboviruses, a group of viruses transmitted by arthropods (usually mosquitoes), are known to produce clinical and subclinical illnesses in humans. Illness can range in severity from acute, benign fevers of short duration, to mild aseptic meningitis, to encephalitis with coma and death. Arboviral activity in Texas is usually limited to five diseases: California encephalitis (CE), St. Louis encephalitis (SLE), eastern equine encephalomyelitis (EEE), Western equine encephalomyelitis (WEE), and dengue fever. In Texas these diseases occur during the warmer months of the year.

From June through November of each year, Texas health departments administer statewide arboviral encephalitis surveillance programs to detect virus activity in birds and mosquitoes before the viruses are transmitted to humans. Mosquitoes are routinely collected in Brazoria, Cameron, Dallas, El Paso, Galveston, Harris, Hidalgo, Jefferson, Lubbock, and Nueces Counties. Collection of mosquitoes also takes place



in other counties as conditions warrant. Additionally, sentinel flocks of chickens are maintained in the Lubbock and the Dallas/Ft. Worth areas. TDH also monitors arboviral infections in animal species that the Texas Veterinary Medical Diagnostic Laboratory discovers during routine screening.

Figure 1. Endemic Arboviral Activity: By Region, 1996 Summary

PHR			
1	NONE	SLE, WEE	
2	N/A	N/A	
3	NONE	WEE	
4	N/A	N/A	
5	NONE	N/A	
6	SLE	N/A	SLE
7	N/A	N/A	
8	N/A	N/A	
9	N/A	N/A	CE
10	NONE	N/A	
11	CE, WEE	N/A	

PHR = Public Health Region; CE = California Encephalitis; SLE = St. Louis Encephalitis; WEE = Western Equine Encephalitis
 NONE = No activity detected through routine surveillance
 N/A = No surveillance activities conducted

The number of cases of SLE, the most common arboviral disease reported in Texas, varies greatly from year to year. For the past 10 years, the annual number of reported SLE cases ranged from 0 to 42. In 1996 only 2 cases of SLE and 1 case of CE were reported. There were no deaths. The most recent outbreak of dengue fever, which occurs occasionally in Texas, was in 1995. There were 29 dengue cases (7 endemic) associated with this outbreak.

Last summer, DPN began publishing a chart summarizing endemic arboviral activity for the previous year. Figure 1 provides a summary of arboviral activity by region for 1996; Figure 2 illustrates the most current data for calendar year 1997. A TDH Internet web page for up-to-date data on arboviral activity in Texas is currently under construction. Access instructions will be published in DPN as soon as this web site is completed.

For further information contact Jeff Taylor or Julie Rawlings of the TDH Infectious Disease Epidemiology and Surveillance Division at (512) 458-7676.



The electronic versions of *Disease Prevention News* are available at the following locations:
<http://www.tdh.state.tx.us/phpep/dpnhome.htm>
 TDH Healthy Texans BBS: (800) 858-5833

Walter D. Wilkerson, Jr., MD
 Chair, Texas Board of Health

Patti J. Patterson, MD, MPH
 Commissioner of Health

Diane Simpson, PhD, MD
 State Epidemiologist, Associate Commissioner for
 Disease Control and Prevention

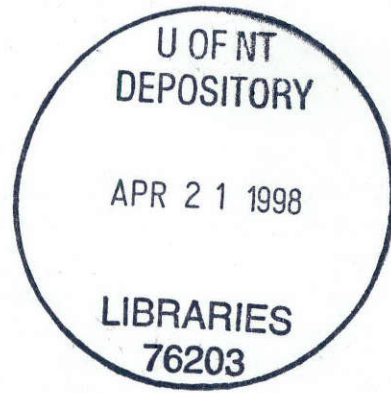
Michael Kelley, MD, MPH
 Chief, Bureau of Communicable Disease Control

Kate Hendricks, MD, MPH&TM
 Medical Editor



Mark Gregg, MA
 Director, Public Health Professional Education

Susan Hammack, MEd
 Managing Editor

Susan Hurst
 Production Assistant



**Figure 2. Endemic Arboviral Activity:
 By Region, 1997 Year-to-Date**

PHR		
1	NONE	SLE, WEE
2	N/A	N/A
3	CE	NONE
4	N/A	N/A
5	NONE	N/A
6	NONE	N/A
7	N/A	N/A
8	N/A	N/A
9	N/A	N/A
10	NONE	N/A
11	NONE	N/A

PHR = Public Health Region; CE = California Encephalitis
 SLE = St. Louis Encephalitis; WEE = Western Equine Encephalitis
 NONE = No activity detected through routine surveillance
 N/A = No surveillance activities conducted