

Healthy Environment, Healthy Children, and Healthy Future: You Take My Breath Away

William Ted Johnson
Chandler Public Library, USA

.....

Having introduced this three part series on children's health and the environment in my previous column ([EGJ 13, December 2000](#)), this issue will focus on the air we breathe and the impact of environmental agents on the respiratory illnesses of children. My next and final column in this series will focus on environmental hazards, such as pesticides, and the danger they present to children, along with recent efforts to introduce organic agricultural programs in an urban setting, with an emphasis on the educational opportunities these programs present to elementary schools in some of our largest cities.

The more we study, the more we find that we don't understand. This is certainly the case with respiratory diseases, such as asthma, and allergies, which afflict a growing number of individuals in developed as well as developing countries around the world. The list of references included at the end of this column is only the tip of the iceberg, but indicative of the significant research investment that has been made in search of a cure for asthma and allergies over the past 50 years. Yet, many of the questions about allergies remain unanswered. What causes allergies? Why are they more common than ever? Will a cure ever be found?

Grand claims to have found the "answers" to these problems are frequently oversimplifications based on unsubstantiated generalizations. The complexity of these diseases makes finding a cure one of the most daunting tasks facing the medical profession as we step into the 21st century. Asthma alone is influenced by the following factors: age, gender, genetics, pollution, allergies, economics, race, house dust mites, ozone, anxiety, life style, stress, cockroaches, temperature, moisture, smoking, obesity, physical activity, cats, dogs, acid reflux, viral infections, emotions, and pollen. Any suggestion that by addressing only one or two of these factors asthma relief will be forthcoming reflects little understanding and appreciation of reality.

Asthma is the most severe and widespread respiratory disease afflicting today's children. It is becoming more common and it is the leading cause of school absenteeism. Therefore, asthma will be the focus of our discussion and serve to represent environmentally induced respiratory or allergenic

maladies that are especially problematic for children. The scope of the problem has grown to alarming proportions, for reasons that are not well understood ([Table 1](#)). While a single definition of asthma, applicable to all cases, is not available, let us use the following description. Asthma is characterized by an intermittent, reversible airway obstruction, occurring as a result of chronic airway inflammation and hyper responsiveness to a variety of stimuli (Etzel & Balk, 1999). Representative information sources from the news media, scholarly research literature, popular medical books, and Web sites will be examined to shed some light on this growing medical problem.

Asthma Basic Statistics (Asthma in America Survey).

- **Americans with asthma:** 14.6 million
- **Children with asthma:** 4.8 million children under age 18
- **Asthma prevalence:** 5.4% of Americans reported having asthma in 1994, a 75% increase since 1980
- **Asthma prevalence in pre-school children:** 5.8% of children under age 5 had asthma in 1994 (as reported by a family member), a 160% increase since 1980
- **Asthma deaths:** more than 5,000 each year
- **Asthma-related hospitalizations:** 466,000 in 1994
- **Emergency room visits for asthma:** 1.9 million in 1995
- **Healthcare costs for asthma care:** estimated at more than \$6 billion a year
- **Missed schooldays:** more than 10 million a year
- **Loss in productivity by working parents caring for children who miss school due to asthma:** an estimated \$1 billion a year

Table 1.

Making the News

Mark Henle (2001) of the *Arizona Republic* newspaper recently ran a series of street wise articles on the daily struggles faced by asthmatic school children and farm workers in southern Arizona. The interplay and drama of feeding your family and finding affordable medical treatment for asthma between U.S. and Mexican doctors is not something you see in the peer reviewed medical literature. He described long rides to the fields in smoke-filled buses and how school children from the poorer side of town negotiate daily with siblings and school nurses for hits from their inhalers. For some, the cultural and economic traditions of many generations have locked them into a cycle

of asthma attacks, a cycle that won't be broken with a simple trip to a primary care physician or a drug store. The escalating rates of asthma and the most severe cases are more likely to be found among the poor. Confusion, illiteracy, and lack of health insurance trap many children into a life of wheezing and gasping for air when 98% of these symptoms could be controlled with proper medications, education, and life style adjustments. In order to simulate the chore of breathing during an asthmatic episode, hold your nose and breathe through a small cocktail straw. Now bend the straw in half to simulate a severe attack. "Asthma doesn't rank with cancer or car accidents as the killer of kids. Instead, it steals their childhoods." Even the simple task of climbing a flight of stairs could prove to be a huge ordeal under such circumstances, a condition that some of these children face week in and week out.

Popular Medical Books

Parents have a choice in how they manage asthma in their family. They can wait for the symptoms to become severe and utilize the services of a hospital emergency room or they can play a proactive role in keeping the asthma in their family under long-term control. Dr. Michael Welch (2000) edited the *Guide to Your Child's Allergies and Asthma* for the American Academy of Pediatrics and it fits well into the latter management strategy. This small book is an easy read, yet it offers parents solid advice and practical help so their children will "breathe easy" and grow up living more active, healthier lives. It answers questions about asthma at school, adolescence, athletics, infants, and toddlers in a comprehensive manner that will surprise many readers suffering from respiratory illnesses. David Hoffmann (2000) goes a step further by presenting natural remedies to solve our problems with nature. His book *Easy Breathing* begins with an explanation of how we breathe followed by a wide assortment of herbal treatments for asthma, other respiratory problems, and allergies. Hoffmann talks about how to create your own herbal remedies and when you should see a doctor. *Clearing the Air* by the Institute of Medicine, on the other hand, may find itself used more as a doorstop than a family guide to managing asthma in the home. Its treatment of asthma and indoor exposures is among the best available, however, the detail, language, and specialized coverage will be most useful to researchers and medical professionals rather than parents seeking practical help for their gasping children.

Scholarly Research

The complexity of asthma and allergies has led to some contradictory conclusions as researches have sought to understand these

diseases. Brunekreef (2000) found a very close relationship between pollen counts and deaths due to cardiovascular disease, chronic obstructive pulmonary disease, and pneumonia in the Netherlands. Sears (1997), on the other hand, had little to say about pollen in his article on the epidemiology of childhood asthma. He pointed out that:

Despite several carefully worded statements during the past decade, we do not have a definition of asthma that is applicable in all cases, even in childhood. This difficulty reflects not only the lack of a single biological marker or clinical test for asthma but also the variable expression of symptoms.

Careful research has also called into question some commonly held beliefs. For example, allergens such as pollen or house dust mites are often implicated as causing asthma. Yet, Jarvis (1998) has pointed out that as allergies increased in Britain, grass pollen counts declined over a 20-year period. Additionally, Kitch, Chew, and Burge (2000), and Lau (2000) raise doubts about the relationship between allergens and asthma. Barrett's article, "Socioeconomic predictors of high allergen levels in homes in the greater Boston area" states that:

Some researchers have postulated that increased burden of asthma experienced by inner-city and low-income groups is at least partly attributable to a greater burden of allergen exposure among poor inner-city minority populations. Although this may still prove true, our study showed that not all allergen levels are higher in the high poverty areas.

Lau (2000) concluded that her data did not support the hypothesis that exposure to environmental allergens caused asthma in childhood. What role does genetics play in all this? This too, is unclear. Ono (2000) establishes the important influence of genetics on the development of allergies. However, Jarvis (1998) states that it is unlikely that "the increase in allergic disease over the past few decades can be explained by genetic factors." Brown (1997) echoes this sentiment.

Web sites

The National Library of Medicine produces a variety of helpful resources for those who find breathing, at times, quite a chore. However, one of the more captivating resources they have produced is the Web site *Breath of Life*. Here you will find some unexpected fellow sufferers who have overcome asthma. Their success stories are sure to inspire anyone suffering from this disease. The site needs work with regard to basic navigation and editing, but the content and graphical elements of the site make it worth a

visit. The history of asthma is presented along with a discussion of contemporary issues. The personal struggles presented do an excellent job of putting a human face on this electronic interface.

The Asthma and Allergy Foundation of America (AAFA) is a patient organization seeking to improve the quality of life for the millions of individuals suffering from asthma and allergies across the United States. Founded in 1953, the AAFA has funneled \$12 million into asthma research during the past 15 years and offers members educational resources and support groups distributed throughout 13 local chapters. Their Web site boasts a kid's zone where you can test yourself on asthma knowledge with a colorful, interactive game. Questions may be submitted to an allergist and a section is available for the health care professional. Consumers will find helpful information on asthma, patient care issues, research highlights, news, and features such as a special report on how much asthma costs the U.S. Some parts of the Web site are also available in Spanish.

Hot spots of asthma activity, such as Arizona, offer new, localized information resources from the perspective of a good neighbor. If the area in which you live is home to many who suffer from respiratory diseases, chances are that local hospitals and support groups are equipped to help manage the disease. Arizona, once thought to offer relief for asthma sufferers, now ranks fourth in the nation in the number of asthmatics who live in the state. The Arizona Asthma Coalition's Web site is quite well done, yet several sections remain undeveloped. The vision of the Coalition is to eliminate deaths from asthma in Arizona. Their Web site will certainly contribute to this vision, offering practical help on controlling common causes, and organizing support groups and asthma camps, plus providing information about the Breathmobile from Phoenix Children's Hospital.

In spite of the significant amount of research work that has been done on asthma and allergies over the past 50 years the disease is spreading and getting worse, especially among children and the poor. A reasonable explanation for these trends has not been forthcoming but increasing urbanization and a decline in environmental quality are probable factors. A solid solution to such complex problems has eluded science, thus far. Either science needs more time or the answers lie beyond the scientific community. Will science come up with a solution in this generation? Don't hold your breath. You will surely need it.

Selected References

1. Annesi, I., & Strachan, D. (1995). Antenatal and perinatal risk factors for childhood asthma: the NCDS study. *American Journal of Respiratory and Critical Care Medicine*, 151, A468.
2. Arlian, L.G., et al. (1992). Prevalence of dust mites in the homes of people with asthma living in eight different geographic areas of the United states. *Journal of Allergy and Clinical Immunology*, 90, 292-300.
3. American Academy of Allergy, Asthma, and Immunology. [Web site]. Accessed January 3, 2001, on the World Wide Web: <http://www.aaaai.org/aadmc/default.htm>
4. American Academy of Pediatrics. [Web site]. Accessed November 25, 2001, on the World Wide Web: <http://www.aap.org/>
5. American College of Allergy, Asthma, and Immunology. [Web site]. Accessed January 3, 2001, on the World Wide Web: <http://allergy.mcg.edu>
6. American Lung Association. [Web site]. Accessed April 18, 2001, on the World Wide Web: <http://www.lungusa.org/>
7. American Lung Association Asthma Advisory Group. (1997). *American Lung Association family guide to asthma and allergies*. Boston, MA: Little, Brown.
8. American Medical Association. (1998). *American Medical Association essential guide to asthma*. New York: Simon and Schuster.
9. Anderson, H. R., Bland, J. M., & Peckham, C. S. (1987). Risk factors for asthma up to 16 years of age: Evidence from a national cohort study. *Chest*, 91, 127-130S.

10. Anderson, H. R. (1998). Air pollution, pollens, and daily admissions for asthma in London 1987-92. *Thorax*, 53(10), 842-848.
11. Arizona Asthma Coalition. [Web site]. Accessed April 18, 2001, on the World Wide Web: <http://www.azasthma.org/>
12. Asher, M. I., et al. (1995). International study of asthma and allergies in childhood: rationale and methods. *European Respiratory Journal*, 8, 483-491.
13. Asthma and Allergy Foundation of America. [Web site]. Accessed February 26, 2001, on the World Wide Web: <http://www.aafa.org/>
14. Asthma in America Survey. [Web site]. Accessed April 19, 2001, on the World Wide Web: <http://www.asthmainamerica.com/statistics.htm>
15. *Asthma Management Model System*. [Web site]. Accessed February 20, 2001, on the World Wide Web: <http://www.nhlbisupport.com/asthma/>
16. Banken, R., & Comtois, R. (1992). Concentration of ragweed pollen and prevalence of allergic rhinitis in two municipalities in the Laurentides. *Allergie et Immunologie*, 24, 91-94.
17. Barber, K., Mussin, E., & Taylor, D. K. (1996). Fetal exposure to involuntary maternal smoking and childhood respiratory disease. *Annals of Allergy, Asthma, and Immunology*, 76, 427-430.
18. Bascom, R., et al. (1991). Upper respiratory tract environmental tobacco smoke sensitivity. *American Review of Respiratory Disease*, 143, 1304-1311.
19. Bates, D. V. (1995). The effects of air pollution on children. *Environmental Health Perspectives*, 103 (Suppl. 6), 49-53.
20. Behrendt, H., et al. (1997). Air pollution and allergy: experimental studies on modulation of allergen release from pollen by air pollutants. *International Archives of Allergy & Applied Immunology*, 113(1-3), 69-74.
21. Berger, W. E. (2000). *Allergies and asthma for dummies*. Foster City, CA: IDG Books.

22. Bessot, J. C., de Blay, F., & Pauli, G. (1994). From allergen sources to reduction of allergen exposure. *European Respiratory Journal*, 7(2), 392-397.
23. Blair, H. (1979). Natural history of wheezing in childhood. *Journal of the Royal Society of Medicine*, 72, 42-48.
24. Braun-Fahrlander C., et al. (1997). Respiratory health and long-term exposure to air pollutants in Swiss schoolchildren. SCARPOL Team. Swiss Study on Childhood Allergy and Respiratory Symptoms with Respect to Air Pollution, Climate and Pollen. *American Journal of Respiratory & Critical Care Medicine*, 155(3),1042-1049.
25. Brink, S. (1999, November 29). Children's asthma can be deadly, even when it's mild. *U.S. News and World Report*. Retrieved April 10, 2001, from the World Wide Web: <http://bigchalk.com>
26. Brown, C. M., et al. (1997). Asthma: The states' challenge. *Public Health Reports*, 112(3), 198-216.
27. Brunekreef, B. (2000, April 29). Relation between airborne pollen concentrations and daily cardiovascular and respiratory disease mortality. *Lancet*. Retrieved January 3, 2001, from the World Wide Web: http://www.findarticles.com/cf_0/m0833/9214_355/6180299/print.jhtml
28. Buckman, R. (1999). *What you really need to know about caring for a child with asthma*. New York: Lehar-Friedman Books.
29. Busquets, R. M., et al. (1996). Prevalence of asthma-related symptoms and bronchial responsiveness to exercise in children aged 13-14 years in Barcelona, Spain. *European Respiratory Journal*, 9, 2094-2098.
30. Call, R. S., et al. (1992). Risk factors for asthma in inner city children. *Journal of Pediatrics*, 121, 862-866.
31. Capital City Press. (2001, March 22). Study: Pollen count rise cuts worker productivity. *Baton Rouge Advocate*. Retrieved April 10, 2001, from the World Wide Web: <http://bigchalk.com>
32. Carey, O. J., et al. (1996). The effect of lifestyle on wheeze, atopy, and bronchial hyperreactivity in Asian and white children. *American Journal of Respiratory and Critical Care Medicine*, 154, 537-540.

33. Chan-Yeung, M., et al. (1995). House dust mite allergen levels in two cities in Canada: Effects of season, humidity, city, and home characteristics. *Clinical and Experimental Allergy*, 25, 240-246.
34. Chaprin, D., et al. (1993). Seasonal allergic symptoms and their relation to pollen exposure in southeast France. *Clinical and Experimental Allergy*, 23, 435-439.
35. Chen, P. C. (1998). Adverse effect of air pollution on respiratory health of primary school children in Taiwan. *Environmental Health Perspectives*, 106(6), 331-335.
36. Chew, G. L., et al. (1998). Limitations of a home characteristics questionnaire as a predictor of indoor allergen levels: Clinical and epidemiological implications. *American Journal of Respiratory and Critical Care Medicine*, 157, 1536-1541.
37. Chilmonczyk, B. A., et al. (1993). Association between exposure to environmental tobacco smoke and exacerbations of asthma in children. *New England Journal of Medicine*, 328, 1665-1669.
38. Corren, J. (1999, March). Connecting hay fever to bronchial asthma. *Discover*. Retrieved January 3, 2001, from the World Wide Web: http://www.findarticles.com/cf_0/m1511/3_20/54359927/print.jhtml
39. Crane, J. (1989). Symptoms of asthma, methacholine airway responsiveness and atopy in migrant Tokelauan children. *New Zealand Medical Journal*, 102, 36-38.
40. Crimi P., et al. (1999). Differences in prevalence of allergic sensitization in urban and rural school children. *Annals of Allergy, Asthma, & Immunology*, 83(3), 252-256.
41. D'Amato, G. (1999). Outdoor air pollution in urban areas and allergic respiratory diseases. *Monaldi Archives for Chest Disease*, 54(6), 470-474.
42. D'Amato G. (2000). Urban air pollution and plant-derived respiratory allergy. *Clinical & Experimental Allergy*, 30(5), 628-636.
43. D'Amato, G., Liccardi, G., & Cazzola, M. (1994). Environment and development of respiratory allergy: I. Outdoors. *Monaldi Archives for Chest Disease*, 49(5), 406-411.

44. Davies, R. J., Rusznak, C., & Devalia, J. L. (1998). Why is allergy increasing-environmental factors? *Clinical & Experimental Allergy*, 28(Suppl. 6), 8-14.
45. Environmental Services, Maricopa County, Arizona. [Web site]. Accessed February 26, 2001, on the World Wide Web: <http://www.maricopa.gov/envsvc/AIR/airday.asp>
46. Etzel, R. A., & Balk, S. J. (1999). *Handbook of pediatric environmental health*. Elk Grove Village, IL: American Academy of Pediatrics.
47. Evans, R., et al. (1987). National trends in morbidity and mortality of asthma in the United States. *Chest*, 91, 65S-74S.
48. Evans, R. (1992). Asthma among minority children: A growing problem. *Chest*, 101(6), 368S-371S.
49. Focus. (1999, June 1). Combating the growing problem of asthma in the United States. *Prevention Report*, 14. Retrieved February 20, 2001, from the World Wide Web: <http://odphp.osophs.dhhs.gov/pubs/prevrpt/99springpr/spr99foc.html>
50. Ford, R. M. (1983). Etiology of asthma: A continuing review-8071 cases seen from 1970-1980. *Annals of Allergy*, 50(1), 47-50.
51. Gelber, L. E., et al. (1993). Sensitization and exposure to indoor allergens as risk factors for asthma among patients presenting to hospital. *American Review of Respiratory Disease*, 147, 573-578.
52. Gergen, P.,J., Mullally, D. I., & Evans, R. (1988). National survey of prevalence of asthma among children in the United States, 1976 to 1980. *Pediatrics*, 81, 1-7.
53. George, R. B., & Owens, M. W. (1991). Bronchial asthma. *Disease-A-Month*, 37(3), 137-196.
54. Gerritsen, J., et al. (1989). Prognosis of asthma from childhood to adulthood. *American Review of Respiratory Disease*, 140, 1325-1330.
55. Gerritsen, J., et al. (1990). Allergy in subjects with asthma from childhood to adulthood. *Journal Allergy Clinical Immunology*, 85, 116-125.

56. Gerritsen, J., et al. (1991). Airway responsiveness in childhood as a predictor of the outcome of asthma in adulthood. *American Review of Respiratory Disease*, 143, 1468-1469.
57. Godfrey, S. (1985). What is asthma? *Archives of Disease in Childhood*, 60, 997-1000.
58. Gold, D. R., et al. (1999). Predictors of repeated wheeze in the first year of life: The relative roles of cockroach, birth weight, acute lower respiratory illness, and maternal smoking. *American Journal of Respiratory and Critical Care Medicine*, 160(1), 227-236.
59. Goldman, L. R. (1995). Case studies of environmental risks to children. *Future Child*, 5(2), 27-33.
60. Gustafsson, D., et al. (1996). Significance of indoor environment for the development of allergic symptoms in children followed up at 18 months of age. *Allergy*, 51, 789-795.
61. Halcken, S., et al. (1995). Passive smoking as a risk factor for development of obstructive respiratory disease and allergic sensitization. *Allergy*, 50, 97-105.
62. Harris, J. R. (1997). No evidence for the effects of family environment on asthma: a retrospective study of Norwegian twins. *American Journal of Respiratory and Critical Care Medicine*, 156, 43-49.
63. Henle, Marke. (2001, February 26). Bad air, poverty inflame asthma. *Arizona Republic*. Retrieved February 26, 2001, from the World Wide Web: Online. Available: <http://www.arizonarepublic.com/cgi-bin/print.php3>
64. Hodge, L., et al. (1996). Consumption of oily fish and childhood asthma risk. *Medical Journal of Australia*, 164, 137-140.
65. Hoffmann, D. (2000). *Easy breathing: natural treatments for asthma, colds, flu, coughs, allergies, sinusitis*. Pownal, VT: Storey Books.
66. Hoover, G.E., & Platts-Mills, T. A. (1995). What the pulmonologist needs to know about allergy. *Clinics in Chest Medicine*, 16(4), 603-620.
67. Hyde, H. A. (1973). Atmospheric pollen grains and spores in relation to allergy. *Clinical and Experimental Allergy*, 3(2), 109-126.

68. Infant-Rivard, C. (1995). Young maternal age: A risk factor for childhood asthma? *Epidemiology*, 6, 178-180.
69. Institute of Medicine, Committee on the Assessment of Asthma and Indoor Air, Division of Health Promotion and Disease Prevention. (2000). *Clearing the air: Asthma and indoor air exposures*. Washington, DC: National Academy Press.
70. Jarvis, D. (1998, February 21). The epidemiology of allergic disease-ABC of allergies. *British Medical Journal*. Retrieved January 3, 2001, from the World Wide Web:
http://www.findarticles.com/cf_0/m0999/n7131_v316/20394348/print.jhtml
71. Jedrychowski W., & Flak, E. (1998). Effects of air quality on chronic respiratory symptoms adjusted for allergy among preadolescent children. *European Respiratory Journal*, 11(6), 1312-1318.
72. Jenkins, M. A., et al. (1994). Factors in childhood as predictors of asthma in adult life. *British Medical Journal*, 309, 90-93.
73. Johns Hopkins University Hospital. [Web site]. Accessed November 25, 2001, on the World Wide Web: <http://www.hopkinsmedicine.org/>
74. Johnstone, D. E. (1977). The natural history of allergic disease in children. *Annals of Allergy*, 38(6), 387-393.
75. Joint Council of Allergy, Asthma, and Immunology. [Web site]. Accessed January 3, 2001, on the World Wide Web: <http://www.jcaai.org>
76. Kang, B. C., Johnson, J., & Veres-Thorner, C. (1993). Atopic profile of inner-city asthma with a comparative analysis on the cockroach sensitive and ragweed sensitive subgroups. *Journal of Allergy and Clinical Immunology*, 92, 802-811.
77. Kishikawa, R. (1990). Pollinosis and airborne pollen in Fukuo City, Arerugi Japan. *Allergol*, 39, 684-695.
78. Kitch, B. T., Chew, G., & Burge, H.A. (2000). Socioeconomic predictors of high allergen levels in homes in the greater Boston area. *Environmental Health Perspectives*, 108(4), 301-307.

79. Korsgaard, H. H., & Dahl, J. (1993). House dust mites and associated environmental conditions in Danish homes. *Allergy*, *48*, 106-109.
80. Kuehr, J., et al. (1995). Sensitization to mite allergens is a risk factor for early and late onset of asthma and for persistence of asthmatic signs in children. *Journal of Allergy and Clinical Immunology*, *95*, 655-662.
81. Lahiri, T., et al. (2000). Air pollution in Calcutta elicits adverse pulmonary reaction in children. *Indian Journal of Medical Research*, *112*, 21-26.
82. Landrigan, P. J. (1999). Risk assessment for children and other sensitive populations. *Annals of the New York Academy of Sciences*, *895*, 1-9.
83. Lau, S. (2000, October 21). Early exposure to house-dust mite and cat allergens and development of childhood asthma: A cohort study. *Lancet*. Retrieved January 3, 2001, from the World Wide Web: http://www.findarticles.com/cf_0/m0833/9239_356/66274644/print.jhtm
!
84. Lewis, S., et al. (1995). Prospective study of risk factors for early and persistent wheezing in childhood. *European Respiratory Journal*, *8*, 349-356.
85. Lieberman, P. (1999). *Understanding asthma*. Jackson, MS: University Press of Mississippi.
86. Liccardi, G., D'Amato, M., & D'Amato, G. (1996). Oleaceae pollinosis: A review. *International Archives of Allergy & Applied Immunology*, *111*(3), 210-217.
87. Luoma, R., Koivikko, A., & Viander, M. (1983). Development of asthma, allergic rhinitis and atopic dermatitis by the age of five years, a prospective study of 543 newborns. *Allergy*, *38*, 339-346.
88. Marder, D., et al. (1992). Effect of racial and socioeconomic factors on asthma mortality in Chicago. *Chest*, *101*(6), 426S-429S.
89. Marsh, D. G., Ober, C., & Bleeker, E. (1997). A genome-wide search for asthma susceptibility loci in ethnically diverse populations, a collaborative study on the genetics of asthma (CSGA). *Nature Genetics*, *15*, 389-392.

90. Martinez, F. D., et al. (1995). Asthma and wheezing in the first six years of life. *New England Journal of Medicine*, 332, 133-138.
91. Medscape Respiratory Care. [Web site]. Accessed January 3, 2001, on the World Wide Web: <http://respiratorycare.medscape.com>
92. Mellis, C. M. (1994). Childhood asthma is increasing: but how good is the evidence? *Journal of Paediatrics and Child Health*, 30, 387-388.
93. Milne, C. (2000, May 15). Peanuts and pollen: asthma is spreading, but allergy misdiagnoses are raising needless alarm. *Maclean's*, 58.
94. Munir, A. K., Einarsson, R., & Dreborg, S. K. (1993). Vacuum cleaning decreases the levels of mite allergens in house dust. *Pediatric Allergy and Immunology*, 4, 136-143.
95. Murray, A. B., & Morrison, B. J. (1990). It is children with atopic dermatitis who develop asthma more frequently if the mother smokes. *Journal of Allergy and Clinical Immunology*, 86, 732-733.
96. *National Allergy Bureau, Pollen Spore Counts*. (2000). Milwaukee, WI: American Academy of Allergy, Asthma, and Immunology. Retrieved November 25, 2001, from the World Wide Web: <http://www.aaaai.org/nab/pollen.stm>
97. National Center for Environmental Health. [Web site]. Accessed November 25, 2001, on the World Wide Web: <http://www.cdc.gov/nceh/ncehome.htm>
98. National Center for Environmental Health, Air Pollution and Respiratory Health Branch. [Web site]. Accessed February 26, 2001, on the World Wide Web: <http://www.cdc.gov/nceh/asthma/default.htm>
99. National Center for Health Statistics. (2001). *Healthy people 2010*. Retrieved February 20, 2001, from the World Wide Web: <http://www.cdc.gov/nchs/about/otheract/hpdata2010/2010fa28.htm>
100. National Institute of Allergy and Infectious Diseases, National Institutes of Health. [Web site]. Accessed February 20, 2001, on the World Wide Web: <http://www.niaid.nih.gov/default.htm>
101. National Institutes of Health. (1995). *Global initiative for asthma* (National Heart Lung Blood Institute Publication #95-3659). Bethesda, MD: National Heart Lung Blood Institute.

102. National Jewish Medical and Research Center. [Web site]. Accessed April 19, 2001, on the World Wide Web:
<http://www.nationaljewish.org/main.html>
103. National Library of Medicine. (2001). *Breath of Life* (An exhibition that examines the history of asthma, the experiences of people with asthma, and contemporary efforts to understand the disease). Retrieved February 26, 2001, from the World Wide Web:
<http://www.nlm.nih.gov/hmd/breath/breathhome.html>
104. Neuspiel, D. R., et al. (1989). Parental smoking and post-infancy wheezing in children: A prospective cohort study. *American Journal of Public Health, 79*, 168-171.
105. Nicolai T. (1999). Air pollution and respiratory disease in children: What is the clinically relevant impact? *Pediatric Pulmonology, 18*(Suppl.), 9-13.
106. Nicolai T. (1999). Environmental air pollution and lung disease in children. *Monaldi Archives for Chest Disease, 54*(6), 475-478.
107. Ninan, T. K., & Russell, G. (1992). Respiratory symptoms and atopy in Aberdeen schoolchildren: Evidence from two surveys 25 years apart. *British Medical Journal, 304*, 873-875.
108. Ober, C., et al. (1998). Genome-wide search for asthma susceptibility loci in a founder population, a collaborative study on the genetics of asthma. *Human Molecular Genetics, 7*, 1393-1398.
109. Obtulowicz, K. (1993). Air pollution and pollen allergy. *Folia Medica Cracoviensia, 34*(1-4), 121-128.
110. Ogren, Thomas Leo. (2000). *Allergy-free gardening: The revolutionary guide to healthy landscaping*. Berkeley, CA: Ten Speed Press.
111. Oliveti, J. F., Kercksmar, C. M., & Redline, S. (1996). Pre and perinatal risk factors for asthma in inner city African American children. *American Journal of Epidemiology, 143*, 570-577.
112. Ono, S. J. (2000). Molecular genetics of allergic diseases. *Annual Review of Immunology, 18*, 347-366.
113. Oswald, H., et al. (1997). Childhood asthma and lung function in mid-adult life. *Pediatric Pulmonology, 23*, 14-20.

114. Panhuysen, C., et al. (1995). The genetics of asthma and atopy. *Allergy*, 50, 863-869.
115. Papageorgiou, P. S. (1999). Particularities of pollen allergies in Greece. *Pediatric Pulmonology*, 18(Suppl.), 168-171.
116. Pearce, N., Douwes, J., & Beasley, R. (2000). Is allergen exposure the major primary cause of asthma? *Thorax*, 55, 424-431.
117. Peat, J. K., Tovey, E. R., & Toelle, B. G. (1996). House-dust mite allergens: a major risk factor for childhood asthma in Australia. *American Journal of Respiratory and Critical Care Medicine*, 153, 141-146.
118. Pedersen, P. A., & Weeke, E. R. (1984). Seasonal variation of asthma and allergic rhinitis. Consultation pattern in general practice related to pollen and spore counts and to five indicators of air pollution. *Allergy*, 39(3), 165-170.
119. Platts-Mills, T. A., et al. (1992). Dust mite allergens and asthma: Report of a second international workshop. *Journal of Allergy and Clinical Immunology*, 89, 1046-1060.
120. Pope, C. A. (1999). Mortality and air pollution: associations persist with continued advances in research methodology. *Environmental Health Perspectives*, 107, 613-614.
121. Postma, D. S., et al. (1995). Genetic susceptibility to asthma-bronchial hyperresponsiveness coinherited with a major gene for atopy. *New England Journal of Medicine*, 333, 894-900.
122. Raizenne M., Dales, R., & Burnett, R. (1998). Air pollution exposures and children's health. *Canadian Journal of Public Health*, 89(Suppl. 1), S43-S48, S47-S53.
123. Richards, S., et al. (1992). How many people have hay fever and what they do about it. *British Journal of General Practice*, 42, 284-286.
124. Rosenstreich, D. L., et al. (1997). The role of cockroach allergy and exposure to cockroach allergen in causing morbidity among inner-city children with asthma. *New England Journal of Medicine*, 336, 1356-1363.
125. Rusznak, Csaba. (1998, February 28). Diagnosing allergy-ABC of allergies. *British Medical Journal*. Retrieved January 3, 2001, from the World Wide Web:

http://www.findarticles.com/cf_0/m0999/7132_316/53499437/print.jhtml
!

126. Sandford, A., Weit, T., & Pare, P. (1996). The genetics of asthma. *American Journal of Respiratory and Critical Care Medicine*, 153, 1749-1765.
127. Sarpong, S. B. (1996). Socioeconomic status and race as risk factors for cockroach allergen exposure and sensitization in children with asthma. *Journal of Allergy and Clinical Immunology*, 97, 1393-1401.
128. Schaubel, D., et al. (1996). Neonatal characteristics as risk factors for preschool asthma. *Journal of Asthma*, 33, 255-264.
129. Sears, M. R., et al. (1989). The relative risks of sensitivity to grass pollen, house dust mite, and cat dander in the development of childhood asthma. *Clinical and Experimental Allergy*, 19, 419-424.
130. Sears, M. R., et al. (1993). Atopy in childhood I: Gender related risks for development of hay fever and asthma. *Clinical and Experimental Allergy*, 23, 941-948.
131. Sears, M. R., et al. (1993). Atopy in childhood II: Relationship to airway responsiveness, hay fever, and asthma. *Clinical and Experimental Allergy*, 23, 949-956.
132. Sears, M. R., et al. (1993). Atopy in childhood III: Relationship with pulmonary function and airway responsiveness. *Clinical and Experimental Allergy*, 23, 957-963.
133. Sears, M. R. (1994). Growing up with asthma: The two thirds with milder symptoms should grow out of asthma. *British Medical Journal*, 309, 72-73.
134. Sears, M. R., et al. (1996). Parental and neonatal risk factors for atopy, airway hyperresponsiveness, and asthma. *Archives of Disease in Childhood*, 75, 392-398.
135. Sears, M. R. (1997, October 4). Epidemiology of childhood asthma. *Lancet*. Retrieved January 3, 2001, from the World Wide Web: http://www.findarticles.com/cf_0/m0833/n9083_v350/19958521/print.jhtml

136. Seaton, A., et al. (1995). Particulate air pollution and acute health effects. *Lancet*, 345, 176-178.
137. Seidman, D. S., et al. (1991). Is low birth weight a risk factor for asthma during adolescence? *Archives of Disease in Childhood*, 66, 584-587.
138. Shaheen, S. O. (1999). Obesity and asthma. *Clinical and Experimental Allergy*, 29, 291-293.
139. Sherrill, D. L., et al. (1992). Longitudinal effects of passive smoking on pulmonary function in New Zealand children. *American Review of Respiratory Disease*, 145, 1136-1141.
140. Sibbald, B., et al. (1980). Genetic factors in childhood asthma. *Thorax*, 35, 671-674.
141. Smith, S. E. (1999, July-August). Asthma information on the Web, part II. *Information Today*. Retrieved January 3, 2001, from the World Wide Web:
http://www.findarticles.com/cf_0/m3336/7_16/55122225/print.jhtml
142. Southern California Environmental Health Sciences Center, Keck School of Medicine of the University of Southern California. [Web site]. Accessed November 25, 2001, on the World Wide Web:
<http://www.usc.edu/medicine/scehsc>
143. Spinaci, S., et al. (1985). The effects of air pollution on the respiratory health of children: A cross-sectional study. *Pediatric Pulmonology*, 1(5), 262-266.
144. Sporik, R., et al. (1990). Exposure to house dust mite allergen (Der p I) and the development of asthma in childhood. *New England Journal of Medicine*, 323, 502-507.
145. Sporik, R., Chapman, M. D., & Platts-Mills, T. A. E. (1992). House dust mite exposure as a cause of asthma. *Clinical and Experimental Allergy*, 22, 897-906.
146. Stick, S. M., et al. (1996). Effects of maternal smoking during pregnancy and a family history of asthma on respiratory function in new born infants. *Lancet*, 348, 1060-1064.

147. Stoddard, J. J., & Miller, I. (1995). Impact of paternal smoking on the prevalence of wheezing respiratory illness in children. *American Journal of Epidemiology*, *141*, 96-102.
148. Strachan, D., & Gerritsen, J. (1996). Long-term outcome of early childhood wheezing: population data. *European Respiratory Journal*, *9*, 42-47.
149. *Strategy for research on environmental risks to children*. (2000). Washington, DC: U.S. Environmental Protection Agency, Office of Research and Development. Retrieved November 20, 2000, from the World Wide Web:
<http://www.epa.gov/nceawww1/risk2kids.htm>
150. Thomas, N. S., Wilkinson, J., & Holgate, S. T. (1997). The candidate region approach to the genetics of asthma and allergy. *American Journal of Respiratory and Critical Care Medicine*, *156*, S144-151.
151. Toelle, B. G., et al. (1992). Toward a definition of asthma for epidemiology. *American Review of Respiratory Disease*, *146*, 633-637.
152. *Trends in asthma morbidity and mortality*. New York: American Lung Association, Epidemiology and Statistics Unit. Retrieved November 20, 2000, from the World Wide Web:
http://www.lungusa.org/data/asthma/asthma_700.pdf
153. Ulrik, C. S., et al. (1995). Extrinsic and intrinsic asthma from childhood to adult age: A 10-year follow-up. *Respiratory Medicine*, *89*, 574-654.
154. Ulrik, C. S., et al. (1996). Risk factors for development of asthma in children and adolescents: Findings from a longitudinal population study. *Respiratory Medicine*, *90*, 623-630.
155. University of Iowa Healthcare Resources. [Web site]. Accessed November 25, 2000, on the World Wide Web:
<http://www.uiowa.edu/homepage/health/index.html>
156. University of Michigan, Ann Arbor. [Web site]. Accessed November 25, 2000, on the World Wide Web:
<http://www.med.umich.edu/1welcome/index1.htm>
157. Von Mutius, E., et al. (1994). Prevalence of asthma and atopy in two areas of West and East Germany. *American Journal of Respiratory and Critical Care Medicine*, *149*, 358-364.

158. Von Mutius, E., et al. (1994). Relation of indoor heating with asthma allergic sensitization and bronchial responsiveness: survey of children in South Bavaria. *British Medical Journal*, 312, 1448-1450.
159. Wahn, U., et al. (1997). Indoor allergen exposure is a risk factor for sensitization during the first three years of life. *Journal of Allergy and Clinical Immunology*, 99, 763-769.
160. Warner, A. M. (1996). Childhood asthma and exposure to indoor allergens: low mite levels are associated with sensitivity. *Pediatric Allergy and Immunology*, 7, 61-67.
161. Weiss, K. B., & Wagener, D. K. (1990). Changing patterns of asthma mortality: Identifying target populations at high risk. *Journal of the American Medical Association*, 264, 1683-1687.
162. Weiss, K. B., et al. (1992). An economic evaluation of asthma in the U.S. *New England Journal of Medicine*, 326, 862-866.
163. Welch, M. J. (2000). *American Academy of Pediatrics guide to your child's allergies and asthma: breathing easy and bringing up healthy active children*. New York: Villard Books.
164. White, M. (2000, October 24). Asthma prevalence increasing in inner cities. *American College of Chest Physicians*. Retrieved October 28, 2000, from the World Wide Web:
<http://www.newswise.com/articles/2000/10/CITIES.CCP.HTML>
165. Wickman, M., et al. (1991). House dust mite sensitization in children and residential characteristics in a temperate region. *Journal of Allergy and Clinical Immunology*, 88, 89-95.
166. Wilkinson, J., & Holgate, S. T. (1996). Candidate gene loci in asthmatic and allergic inflammation. *Thorax*, 51, 3-8.
167. Wilkinson, J., et al. (1999). Candidate gene and mutational analysis in asthma and atopy. *International Archives of Allergy and Immunology*, 118, 265-267.
168. Woolcock, A. J. (1996). Asthma: a disease of a modern lifestyle. *Medical Journal of Australia*, 165, 358-359.

169. Wright, A. L., et al. (1996). Recurrent cough in childhood and its relation to asthma. *American Journal of Respiratory and Critical Care Medicine*, 153, 1259-1265.

170. Yunginger, J., et al. (1992). A community-based study of the epidemiology of asthma: Incidence rates 1964-1983. *American Review of Respiratory Disease*, 146, 88-894.

.....

William Ted Johnson <ted.johnson@ci.chandler.az.us>, Reference Librarian,
Chandler Public Library, Mail Stop 601, PO BOX 4008, Chandler, AZ 85244-
4008 USA. TEL: 1-480-782-2239. Fax: 1-480-782-2823.