



Yesterday

- Asthma was a poorly understood disease. Patients complained of not being able to breathe but there were no effective treatments and severe episodes frequently led to death.
- People with asthma were often unable to pursue life's normal activities. Asthma was especially difficult for children, who often had to forego routine playtime, and participation in sports or other rigorous events was often impossible.
- Scientists gained their first understanding of asthma physiology in the 1950s when they discovered that the difficulties patients experienced in breathing were due to smooth muscle constriction in the airway of the lungs.
- Researchers also learned that the airways of asthma sufferers were thousands of times more sensitive to a variety of environmental factors than the airways of people without asthma.
- Gradually, the pivotal role of the immune system in asthma was discovered and asthma was rightfully classified as an inflammatory disease.
- The first successful treatments—bronchodilators to ease airway constriction and corticosteroids to suppress airway inflammation— were developed and remain in use to this day.

Today

- The prevalence of asthma in the United States has increased since the 1980s. In 2009, 23 million people had asthma; nearly 7 million of them were children.
- Treatment of asthma has dramatically improved. The National Asthma Education and Prevention Program (NAEPP) (<http://www.nhlbi.nih.gov/about/naepp/>) was initiated by the NIH in 1989 to (1) raise awareness of patients, health professionals, and the public that asthma is a serious chronic disease, (2) ensure the recognition of symptoms of asthma by patients, families, and the public and the appropriate diagnosis by health professionals, (3) ensure effective control of

asthma by translating research discoveries about therapies into evidence-based clinical practice guidelines, and (4) encourage a partnership among patients, physicians, and other health professionals to improve asthma management.

- Education programs, such as the NAEPP, revolutionized the way patients live with their asthma. The programs successfully encourage patients to take an active role in managing their asthma by helping them control asthma and prevent symptoms day-to-day by taking medication and avoiding conditions and environmental factors, such as allergens and irritants, that make their asthma worse, by recognizing the warning signs of an asthma attack, and by taking steps to treat it promptly to keep it from becoming severe and requiring an emergency department visit or hospitalization.
- Researchers established that secondhand smoke can trigger asthma episodes and increase the severity of attacks. Secondhand smoke is also a risk factor for the emergence of asthma in preschool aged children who never before exhibited asthma symptoms.
- Through asthma clinical research networks, NIH-funded investigators are making progress in increasing our understanding of asthma and improving its treatment. Asthma network trials evaluated asthma treatment options, including newer bronchodilators known as long-acting β agonists and leukotriene receptor antagonists and immunomodulators. Thanks to the networks, we now have better information on treatments for different levels of asthma severity. The networks have also discovered important individual asthma characteristics, called phenotypes, that predict response to treatment or progression to more severe disease.
- The NIH funded the National Cooperative Inner-City Asthma Study in 1991, and has since funded the Inner City Asthma Study (<http://www.icasweb.org/>) and the Inner City Asthma Consortium 1 (ICAC1). Researchers developed an effective intervention program focused on six major classes of allergens commonly found in urban environments that trigger asthma symptoms:

dust mites, cockroaches, rodents, pet dander, passive smoking, and mold. The NIH is now funding ICAC2 at eight clinical centers and two basic research sites nationwide. Investigators in ICAC2 are evaluating promising new therapies to prevent asthma or reduce its severity.

- The Asthma and Allergic Diseases Cooperative Research Centers conduct basic and clinical research on the mechanisms, diagnosis, treatment, and prevention of asthma. Currently, the NIH supports 15 Centers. The broad research agenda at the Centers includes the role of viral infections or environmental factors in asthma exacerbation, mechanisms of airway inflammation, and genetics. Multiple clinical investigations at the Centers are underway to identify ways to improve treatment of patients with asthma.
- Studies supported by the NIH continue to elucidate the genetic factors influencing asthma and its treatment. For example, studies are examining specific genetic variations to see if they might predict how a patient will respond to different asthma medications and which patients are more susceptible to having severe exacerbations.
- Recent studies of the complex interplay of genetic and environmental factors that lead to allergic response and asthma are focusing on the role of immune cells, specifically those known as Th2 cells, in enhancing allergic sensitization and contributing to the development of asthma in early childhood.
- In 2010, the NIH collaborated with the Agency for Healthcare Research and Quality to develop standardized definitions and methodologies for asthma outcome measures that can be broadly used by clinical researchers. Similarly, as part of the Asthma Phenotypes Task Force, the NIH joined with professional societies to develop standardized descriptions of several major clinical asthma phenotypes that will enhance the scientific community's ability to assess research findings, promote appropriate comparisons among studies, and identify future research needs.

Tomorrow

- Advances in asthma prevention and therapy are expected to follow anticipated findings from ongoing research funded by the NIH, such as the Centers for Reducing Asthma Disparities, ICAC2, programs to

expand exposure assessment and monitoring, asthma clinical research networks, collaborations on the early origins of disease and development of innate immunity, and asthma genomics and metabolomics research.

- Physicians will have tools to select the medications most likely to help, based on a patient's phenotype and genotype.
- Innovative educational approaches and information technology tools will be available for physicians and patients to increase adoption of evidence-based clinical practice guidelines and ensure that scientific advances reach all asthma patients.
- Interventions will be available to prevent the onset of asthma.
- Genetic variations and risk profiles will be examined to determine an infant's susceptibility to developing asthma in response to certain environmental agents and take measures to alter the environment and, ultimately, the immune system.
- Vaccines will be available to reverse the progression of asthma in children who have early signs of sensitization to allergens.
- Disparities in asthma outcomes that are experienced by minority populations and people living in poverty will be reduced by using findings from genetics research on ethnic/racial variation in asthma susceptibility and severity and from epidemiological research on the psychosocial determinants of asthma.

For additional information:

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