

The Promise of Research

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AMERICAN LUNG ASSOCIATION®
Improving Life, One Breath at a Time

FROM OUR MEDICAL DIRECTOR



Dr. Norm H. Edelman
 American Lung Association
 Chief Medical Officer

Vaccines are one of the greatest achievements of biomedical research and have revolutionized public health by turning back infectious diseases that had run rampant through America.

Consider that in 1906, many thousands of children were dying of infectious diseases. By the late 1990s, cases of the nine diseases with vaccines recommended had decreased by 95 to 100 percent. These dramatic changes not only transformed childhood health but also drastically decreased costs, as disease prevention is far less expensive than treatment.

The success story of immunization spanning the last 100 years is a reflection of great scientific innovation made reality through a commitment to medical research. Our new Promise Of Research feature, "Then & Now", takes you through the twists and turns of vaccine innovation and development. Learn how children are saved through vaccination and about infectious diseases' impact on the lung.

Today, researchers are delving more deeply into the human immune system, studying protein molecules and specific cells, to create and test new types of vaccines—better vaccines for influenza, for example, and vaccines to prevent HIV and cancers. Surely, these scientists' creativity and determination promise to transform American health again over the coming decades.

Throughout this newsletter, we introduce you to an American Lung Association researcher working on the cutting edge of immunologic study, and several everyday Americans whose stories illustrate the need for annual influenza vaccination—highlighted through our Faces Of Influenza campaign.

THEN & NOW:

VACCINATION & INNOVATION

Medical research has triumphed perhaps no more dramatically than in the realm of vaccination and infectious diseases.

Just 100 years ago—a blink in time—American children commonly died of a range of infectious diseases. Today, these diseases are nearly non-existent in industrialized nations. Vaccination has led to the eradication of smallpox; elimination of polio in the Americas; and control of measles, rubella, tetanus, diphtheria, *Haemophilus influenzae* type b, and other infectious diseases in the U.S. and other parts of the world.¹

How did we get here, and how has research contributed so enormously to saving lives? The history of polio and measles, both of which involve lung disease, illustrates how dramatic advances in immunization can act as metamorphoses for a population's health.

Older Americans can remember panics of the polio epidemic into the 1950s, when it was one of the most feared diseases. Polio killed up to a half million people,² primarily children, and paralyzed many more. Fear gripped the nation each summer. Large gatherings, including Fourth of July celebrations, were cancelled. Public swimming pools were closed, and wild rumors about the cause of the disease—from ice cream cones to electrical disturbances—swirled throughout communities.³ Polio struck fast and became life-threatening when affecting the respiratory muscles, forcing patients to live inside iron lungs.

The development of the polio vaccine in 1955 was considered miraculous—a result of more than 17 years of research. Dr. Jonas Salk developed the inactivated polio vaccine, given by injection and using "dead" polio virus to "trick" the immune system into producing antibodies against the real polio virus. Building on that work, Dr. Albert Sabin engineered the live attenuated polio vaccine, which became available in 1961. Administered orally, the Sabin vaccine contained live viruses of a polio strain that does not produce the diseases but does cause the body to produce antibodies against it. The success of the Sabin vaccine also led to "herd immunity" as a critical mass of children developed antibodies against polio, which resulted in the entire population's becoming less likely to get polio.

In 1963, the first measles vaccine was licensed in the U.S. This usually-benign infectious respiratory disease becomes life-threatening if it causes encephalitis or pneumonia. Before the vaccine, getting the measles was an expected life event. Each year there were approximately three to four million U.S. cases and an average of 450 deaths, with epidemic cycles every two to three years. Ninety percent of Americans had measles by the time they were 15. After the vaccine became available, the number of measles cases dropped by 98 percent, and the epidemic cycles drastically diminished.⁴

Today, most American children are immunized against 11 childhood diseases, thanks to the innovation of scientists worldwide. Researchers are delving more deeply into the intricacies of human genetics and immunology to create the next vaccine revolution—perhaps designing smarter versions and delivery systems of existing vaccines, and new immunizations for diseases that can ravage a population, like cancer, HIV, and tuberculosis.

(1) U.S. Department of Health & Human Services, Centers for Disease Control & Promotion. Morbidity and Mortality Weekly Report, April 2, 1999, vol. 48 No. 12.
 (2) WHO, UNICEF, www.unicef.org/immunization/index_polio.html (3) Smithsonian, v 36, no 1, April 2005 (4) <http://www.cdc.gov/nip/diseases/measles/history.htm>

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PATIENT PROFILES

FACES OF INFLUENZA

Faces of Influenza is an American Lung Association educational initiative designed to put a face on influenza in the U.S. and show Americans firsthand the seriousness of this potentially deadly infectious disease—and the importance of annual immunization. *The project is made possible through a collaboration with sanofi pasteur.*

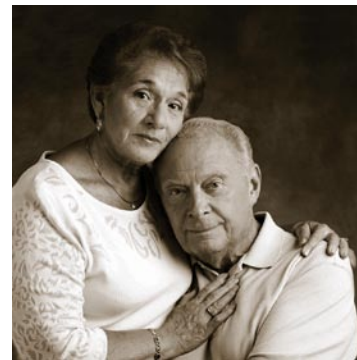
Brandon Williams and Dimitri Aston; BROTHERS LIVING WITH ASTHMA



Brothers Brandon (11) and Dimitri (6), have asthma. Their mother Lakisha says this chronic respiratory condition is a looming threat for her sons, but never more than during influenza season. Lakisha has learned this the hard way. “As a parent, I’m

really scared. Asthma can kill a child. When Dimitri and Brandon got influenza, their asthma got much worse.” For children with asthma who haven’t been vaccinated, influenza can worsen symptoms of asthma like wheezing, and make breathing even more difficult. While rates of influenza are highest among children, those with asthma, in particular, face increased risks from influenza infections, yet approximately 70 percent are not immunized and go unprotected each year. These children are 5 times more likely than healthy children of the same age to be hospitalized with influenza-related illnesses. Lakisha is amazed at how many parents fail to immunize their children. “I recently had a friend—who has three kids with asthma—who said the influenza vaccine was just for older people. Everyone needs to know how important the vaccine is for children and to get their kids vaccinated, whether they have asthma or not.”

Ray and Stella Ross; HUSBAND WITH COPD, AND HIS WIFE



Ray Ross, 75, has emphysema, a progressive chronic obstructive pulmonary disease (COPD). Ray has difficulty breathing because the disease has blocked airflow to his lungs. While he tries to maintain an active lifestyle, his emphysema can make simple chores physically challenging. In 2004, 11.4 million US adults (aged 18 and over) were estimated to have COPD, and nearly 24 million US adults have evidence of impaired lung function, indicating an underdiagnosis of COPD. Smoking is the primary risk factor for COPD, with approximately 80 to 90 percent of COPD deaths being caused by smoking. Smokers are 12–13 times more likely to die from COPD than people who have never smoked. “COPD sufferers cannot risk getting influenza,” said Ray. As a result of his emphysema, Ray is at increased risk of developing complications from influenza, such as bacterial pneumonia, which would make it even more difficult for him to breathe. Influenza vaccination should be given annually to anyone who has COPD. It’s also important for anyone who is a household contact to get immunized every year. Ray’s wife, Stella, gets immunized every year, not only to protect her own health (as she’s over 65), but also to help ensure she does not bring the virus home to her husband. For Ray and Stella, family is everything. “We have four grown children and seven grandchildren, and we will do whatever is necessary to maintain our health so that we can enjoy the family we’ve raised.” While COPD has gotten in the way, Stella and Ray get immunized to make sure influenza does not.

For the complete
Faces Of Influenza gallery, visit
www.facesofinfluenza.org.

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RESEARCHER PROFILE

USING THE BODY'S OWN DEFENSES TO BUILD A BETTER FLU VACCINE



Linda Cauley, PhD
(Photo courtesy of ALA-CT)

How can a semi-dormant group of potentially flu-fighting white cells be transformed into a powerful tool for better vaccines? That is the question researcher Linda Cauley, PhD is chipping away at, through her ground-level immunologic work. A peek inside Dr. Cauley's study is a glimpse into the intricacy—and promise—of the body's immune system and how researchers' knowledge of it may soon make an enormous impact on disease prevention.

While the long-term promise of Dr. Cauley's immunologic study is to use T cells to immunize against influenza, her current work is one piece of a complex scientific puzzle. T cells are small white blood cells that are generated randomly to recognize and attack an enormous spectrum of viruses and bacteria, yet only the appropriate cells multiply and acquire properties that help them kill a virus. The activated T cells not only kill cells that are making a new virus, but they also produce signals to communicate with other parts of the immune system and recruit them to join the fight against the infection. Once the virus has been eliminated, a small percentage of the activated cells survive to become long-term memory T cells, which remain partially activated and can quickly respond to a new infection.

"It is these memory cells that we hope to mimic during vaccination. Our primary focus is to understand the mechanisms that appear to help memory T cells stay where they're most useful," explained Dr. Cauley, Assistant Professor of Immunology at the University of Connecticut Health Center. "If you are infected with influenza, your body manufactures virus-specific T cells, but they won't necessarily protect you from another infection unless they live right at the spot where the new virus would begin."

With the American Lung Association grant as her foundation, Dr. Cauley's T cell research has already expanded through National Institutes of Health funding as well.

"This work has relevance for live attenuated vaccines, which are more effective at making a T cell response than the other types of vaccines. Live viruses aren't suitable vaccines for all, particularly small children who don't have pre-existing immunity," she said. "There is still work to do before this becomes generally applicable, but it certainly shows promise."

LUNG RESEARCH NEWS BRIEFS

Test May Detect Lung Cancer Early... An experimental blood test may someday be able to detect lung cancer in its early stages, according to a *Wall Street Journal* report. A recent small study suggested the test, which identifies proteins in the blood associated with lung cancer, could detect the disease several years before it would be picked up by a CT scan. If further validation of the test through larger studies proves it effective, it would not take the place of CT scans. Those who tested positive with the blood screen would need an imaging procedure to identify the size and location of any tumors.

Black Lung 'Hot Spots' Identified... National Institute for Occupational Safety and Health (NIOSH) research suggests that coal miners in some Appalachian counties are getting black lung at a younger age and higher rate than other mining regions, despite government efforts to control coal dust levels and eliminate the disease. Researchers identified 22 counties in four states as "hot spots" for rapidly progressive black lung and found that some miners in these counties were experiencing rapidly progressing black lung even while in their 30s and 40s, at least 10 years earlier than these cases have been observed in the past. Mine safety experts said the new cases may indicate a lack of thorough inspections.

Corticosteroids Fight Chronic Lung Disease... A new study reported in *HealthDay* finds inhaled use of a drug containing an inhaled steroid and long-acting beta 2 agonist can significantly reduce the death risk for patients with chronic obstructive pulmonary disease (COPD). The study, which included nearly 5,000 COPD patients who were followed from 90 days to a year after being discharged from the hospital, found an overall 25 percent reduced risk of death among those who took inhaled corticosteroids. The study also found that the use of inhaled corticosteroids along with bronchodilators was associated with a 23 percent reduced risk of death in patients 65 and older.

Asthma May Prompt Sickle Cell Pain in Children... Researchers are investigating a possible temporal link between painful episodes in children with sickle cell disease (SCD) and respiratory symptoms, as published in the *Journal of Pediatric Hematology and Oncology*. In SCD, normally round blood cells take on a disc-like shape, which interferes with normal circulation and can cause a variety of serious health problems. While previous studies have established a link between asthma and an increased rate of painful SCD episodes, researchers investigated a possible temporal link, researchers analyzed 94 painful episodes experienced by 74 children, 36 of whom had asthma. Fifty-four percent of the painful episodes occurred in children with asthma, and those children were also more likely to have respiratory symptoms concurrent with painful episodes.

Lung Patients See a New Era of Transplants... Recent changes to the way lung transplant recipients are selected is saving the lives of people who, just two years ago, would have died on the waiting list, according to a *New York Times* report. Since May 2005, waits have shortened, lists have shrunk, and the number of lung transplants has increased. Further improvements are expected this year. The new rules, established by the United Network for Organ Sharing, put people who would soon die without a transplant, but who have a good chance of surviving after one, at the top of the list. Other major factors affecting lung transplantation rates are that more lungs from cadavers have become available as more people are communicating their wishes to become organ donors, and that doctors have created procedures save lungs that previously would have been considered unusable.