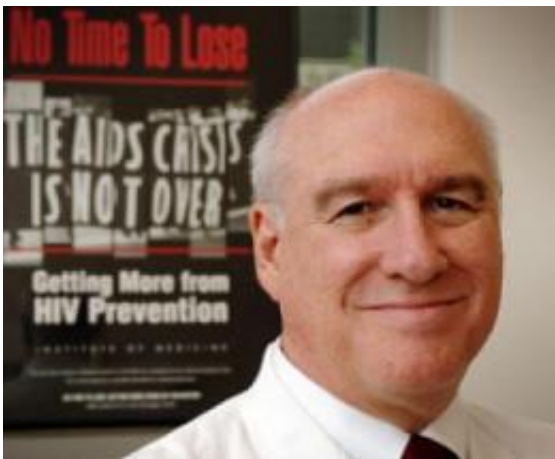


# HIV prevention research named scientific breakthrough of the year by Science

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The HIV Prevention Trials Network 052 study, led by Myron S. Cohen, M.D. of the University of North Carolina at Chapel Hill, has been named the 2011 Breakthrough of the Year by the journal *Science*. Credit: UNC Institute for Global Health & Infectious Diseases

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HPTN 052 evaluated whether [antiretroviral drugs](#) can prevent sexual [transmission of HIV](#) among couples in which one partner has HIV and the other does not. The research found that early treatment with antiretroviral therapy reduced [HIV transmission](#) in couples by at least 96

percent.

The study was funded by the National Institute of Allergy and Infectious Diseases, part of the National Institutes of Health.

The complete list of top 10 scientific breakthroughs of the year was published online today.

The editors at *Science*, the flagship publication of the American Academy for the Advancement of Science, said in their announcement that "In combination with other promising clinical trials, the results have galvanized efforts to end the world's [AIDS epidemic](#) in a way that would be inconceivable even a year ago. 'The goal of an AIDS-free generation is ambitious, but it is possible,' U.S. Secretary of State Hillary Clinton told scientists last month."

The HPTN 052 study is proof of a concept more than 20 years in the making. "From the time the first [AIDS drugs](#) were developed in the mid-1990s, our UNC team of virologists, pharmacologists, and physicians has been working on the idea that antiretrovirals might make people less contagious," said Cohen, who is Distinguished Professor of Medicine, Microbiology and Epidemiology at UNC. "By 2000, the UNC study team thought the idea was strong enough to try to prove it. "This idea eventually became HPTN 052," Cohen said.

It would be another five years before researchers from the HIV [Prevention Trials](#) Network started enrolling people in the study, eventually nearly 2000 couples at 13 sites in nine countries . In May of this year, four years before the study's scheduled completion, an outside monitoring board requested that the results be released immediately, because they were so overwhelmingly positive.

"Prevention of HIV-1 Infection with Early Antiretroviral Therapy" was

published August 11, 2011 in the *New England Journal of Medicine*.

Jon Cohen, a writer for *Science*, said in an article about the breakthrough, "HPTN 052 has made imaginations race about the what-ifs like never before, spotlighting the scientifically probable rather than the possible."

UNC-Chapel Hill Chancellor Holden Thorp said, "We're proud that *Science* magazine has recognized Mike Cohen and his colleagues for such inspiring leadership in the global fight against AIDS. They are wonderful examples of how Carolina's faculty conduct research that saves lives."

Since their release, the study results have been reverberating throughout the policy community. U.S. and international organizations such as the World Health Organization, the President's Emergency Plan for AIDS Relief, and the Joint United Nations Programme on HIV/AIDS, have incorporated or soon will incorporate "treatment as prevention"—the strategy proved by HPTN 052—into their policy guidelines for battling the AIDS epidemic.

"While I am obviously thrilled to have this research recognized as the *Science* breakthrough of the year," Cohen said, "witnessing the translation of this scientific discovery on a global scale truly is the best reward."

***Science's* list of nine other groundbreaking scientific achievements from 2011 follows.**

**The Hayabusa Mission:** After some near-disastrous technical difficulties and a stunningly successful recovery, Japan's Hayabusa spacecraft returned to Earth with dust from the surface of a large, S-type asteroid. This asteroid dust represented the first direct sampling of a planetary body in 35 years, and analysis of the grains confirmed that the

most common meteorites found on Earth, known as ordinary chondrules, are born from these much larger, S-type asteroids.

**Unraveling Human Origins:** Studying the genetic code of both ancient and modern human beings, researchers discovered that many humans still carry DNA variants inherited from archaic humans, such as the mysterious Denisovans in Asia and still-unidentified ancestors in Africa. One study this year revealed how archaic humans likely shaped our modern immune systems, and an analysis of *Australopithecus sediba* fossils in South Africa showed that the ancient hominin possessed both primitive and Homo-like traits.

**Capturing a Photosynthetic Protein:** In vivid detail, researchers in Japan have mapped the structure of the Photosystem II, or PSII, protein that plants use to split water into hydrogen and oxygen atoms. The crystal-clear image shows off the protein's catalytic core and reveals the specific orientation of atoms within. Now, scientists have access to this catalytic structure that is essential for life on Earth — one that may also hold the key to a powerful source of clean energy.

**Pristine Gas in Space:** Astronomers using the Keck telescope in Hawaii to probe the faraway universe wound up discovering two clouds of hydrogen gas that seem to have maintained their original chemistry for two billion years after the big bang. Other researchers identified a star that is almost completely devoid of metals, just as the universe's earliest stars must have been, but that formed much later. The discoveries show that pockets of matter persisted unscathed amid eons of cosmic violence.

**Getting to Know the Microbiome:** Research into the countless microbes that dwell in the human gut demonstrated that everyone has a dominant bacterium leading the gang in their digestive tract: *Bacteroides*, *Prevotella* or *Ruminococcus*. Follow-up studies revealed

that one of these bacteria thrives on a high-protein diet while another prefers vegetarian fare. These findings and more helped to clarify the interplay between diet and microbes in nutrition and disease.

**A Promising Malaria Vaccine:** Early results of the clinical trial of a malaria vaccine, known as RTS,S, provided a shot in the arm to malaria vaccine research. The ongoing trial, which has enrolled more than 15,000 children from seven African countries, reassured malaria researchers, who are used to bitter disappointment, that discovering a malaria vaccine remains possible.

**Strange Solar Systems:** This year, astronomers got their first good views of several distant planetary systems and discovered that things are pretty weird out there. First, NASA's Kepler observatory helped identify a star system with planets orbiting in ways that today's models cannot explain. Then, researchers discovered a gas giant caught in a rare "retrograde" orbit, a planet circling a binary star system and 10 planets that seem to be freely floating in space — all unlike anything found in our own solar system.

**Designer Zeolites:** Zeolites are porous minerals that are used as catalysts and molecular sieves to convert oil into gasoline, purify water, filter air and produce laundry detergents (to name a few uses). This year, chemists really showed off their creativity by designing a range of new zeolites that are cheaper, thinner and better equipped to process larger organic molecules.

**Clearing Senescent Cells:** Experiments revealed that clearing senescent cells, or those that have stopped dividing, from the bodies of mice can delay the onset of age-related symptoms, such as cataracts and muscle weakness. Mice whose bodies were cleared of these loitering cells didn't live longer than their untreated cage-mates — but they did seem to live better, which provided researchers with some hope that banishing

senescent cells might also prolong our golden years.

Provided by University of North Carolina School of Medicine

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