



VACCINES
BEAT

THE GODMOTHER OF PREGNANCY IMMUNIZATION AND NEWBORN PROTECTION

Dr. Carol Baker's Mission to Protect the Most Vulnerable

July

2025

**“IMMUNIZATION IS A GLOBAL HEALTH AND DEVELOPMENT
SUCCESS STORY SAVING MILLIONS OF LIVES EVERY YEAR”**

WORLD HEALTH ORGANIZATION

The Godmother Of pregnancy immunization and newborn protection

**Dr. Carol Baker’s Mission to
Protect the Most Vulnerable**



Prof. Carol J. Baker is a renowned clinician, researcher, educator, and vaccinologist, internationally recognized for her pioneering contributions to pediatric infectious diseases and vaccine policy. A professor of pediatrics and molecular virology and microbiology at Baylor College of Medicine in Houston, Texas, she led the Section of Infectious Diseases in the Department of Pediatrics for 25 years.

Often referred to as the “Godmother of Group B Strep Prevention,” Prof. Baker’s groundbreaking research established the connection between maternal immunity and neonatal group B streptococcal (GBS) disease. Her early 1990s advocacy was instrumental in the adoption of intrapartum antibiotic prophylaxis, which led to an 80% decline in early-onset GBS infections in U.S. newborns. She remains a leading voice in the development of maternal immunization strategies, with vaccine candidates now in clinical trials.

Prof. Baker is a past chair of the Center for Disease Control and Prevention’s (CDC) Advisory Committee on Immunization Practices (ACIP) and a former president of both the Infectious Diseases Society of America (IDSA) and the National Foundation for Infectious Diseases. Her long-standing involvement with the American Academy of Pediatrics Committee on Infectious Diseases (1998–2012), along with her leadership at the CDC, played a pivotal role in expanding vaccination guidelines for pregnant women and young children.

**VACCINES
BEAT**

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LETTER FROM EDITOR

WELCOME TO OUR 13TH ISSUE OF VACCINES BEAT AND SUBSCRIBE FOR FREE!

In our *Coffee with an Expert* section, we had the distinct honor of speaking with Professor Dr. Carol J. Baker. A renowned infectious diseases clinician, researcher, educator, and vaccinologist, Dr. Baker is internationally recognized for her groundbreaking contributions to pediatric infectious diseases and vaccine policy.

She currently serves as Professor of Pediatrics and of Molecular Virology and Microbiology at Baylor College of Medicine in Houston, Texas, where she previously led the Section of Infectious Diseases in the Department of Pediatrics for 25 years.

Widely celebrated as “the Godmother of Group B Strep Prevention,” Dr. Baker’s pioneering research established the critical link between maternal immunity and neonatal group B streptococcal (GBS) disease. She is the immediate past chair of the CDC’s Advisory Committee on Immunization Practices (ACIP) and has served as president of both the Infectious Diseases Society of America (IDSA) and the National Foundation for Infectious Diseases (NFID).

Dr. Baker’s career exemplifies the power of combining scientific excellence with unwavering advocacy, and her impact on maternal and child health continues to resonate globally.

In our conversation, Dr. Baker shared rich insights on the evolution of vaccine research in the United States and worldwide. She also provided a compelling, in-depth explanation of the discovery of GBS as a cause of neonatal sepsis and discussed the current status and future prospects of GBS vaccination. Emphasizing the critical importance of maternal immunization, she described it as a life-saving intervention that has already protected—and will continue to protect—millions of mothers and newborns around the world.

In this edition’s *Editor’s Corner*, we delve into the evolving global landscape of HIV vaccination—reflecting on past lessons while addressing present challenges and future opportunities.

In our *Best Practice* section, we present a comprehensive overview of current indications and recommendations for the Herpes zoster (shingles) vaccine.

In our *Guest Contributor* section, we are pleased to feature an outstanding editorial by Dr. Maria Jose Diaz-Gutierrez and Dr. Aileen Chang titled “*Guardians of Tomorrow: How Vaccination Leads the Battle Against Tropical Diseases, and Why Adult Women Must Be Considered for Chikungunya Immunization.*”

As always, this issue features carefully curated and up-to-date information on the ‘Latest Scientific Publications’ along with the most recent and important ‘News and Alerts’.

We hope you find this July issue both informative and engaging, and we look forward to continuing this shared commitment to advancing global health and building a healthier planet.



Enrique Chacon-Cruz, M.D., MSc
Chief Editor



Dr. Enrique Chacon-Cruz

Enrique Chacon-Cruz, M.D., MSc, Mexican-born medical doctor with a degree from Guadalajara, Mexico, and further specializations in Pediatrics and Infectious Diseases from institutions in Mexico City and the USA (Eastern Virginia Medical School). He also holds a Master's degree in Vaccinology and Drug Development from the University of Siena, Italy.

He is an Overseas Fellow of the Royal Society of Medicine of the United Kingdom and a member of several international associations in Infectious Diseases. Currently, he is the CEO and Founder of "Think Vaccines" (Research, Education, and Consultancy for Vaccines and Vaccinology) based in Houston, Texas.

With over 140 research items published and/or presented at international meetings and more than 500 international lectures, all focused on vaccines, vaccination, clinical trials, and vaccine-preventable diseases. The latter conducted independently or in association with the Centers for Disease Control and Prevention (CDC), the University of California in San Diego, Eastern Virginia Medical School, and several other institutions.

Additionally, he is a member of the Mexican Committee for the Elimination of Measles, Rubella, and Congenital Rubella, and the Scientific Committee on Health Issues of the Mexican Government in Baja-California. He is also the former Director of the Mexican Active Surveillance Network for Bacterial Meningitis and the former Head of the Pediatric Infectious Diseases Department and the Research Department at the General Hospital of Tijuana, Baja-California, Mexico.

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Coffee with the Expert

THE GODMOTHER OF PREGNANCY IMMUNIZATION AND NEWBORN PROTECTION

Dr. Carol Baker's Mission to Protect the Most Vulnerable

Authors:

Enrique Chacon-Cruz, M.D., MSc

Felicitas Colombo, MPA

Prof. Carol J. Baker is a renowned clinician, researcher, educator, and vaccinologist, internationally recognized for her pioneering contributions to pediatric infectious diseases and vaccine policy. A professor of pediatrics and molecular virology and microbiology at Baylor College of Medicine in Houston, Texas, she led the Section of Infectious Diseases in the Department of Pediatrics for 25 years.

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American Academy of Pediatrics Committee on Infectious Diseases (1998–2012), along with her leadership at the CDC, played a pivotal role in expanding vaccination guidelines for pregnant women and young children.

A prolific author, Prof. Baker has published more than 400 scientific articles, reviews, and book chapters. She also served as associate editor for several editions of the Red Book, a definitive resource in pediatric infectious diseases. Among her many honors are the Distinguished Physician Award and Distinguished Service Award from the Pediatric Infectious Diseases Society, the IDSA Mentor Award and Society Citation, and the Distinguished Alumna Award from Baylor College of Medicine.

Prof. Baker’s career exemplifies the profound impact of uniting rigorous science with unwavering advocacy. Her work continues to shape the future of maternal and child health across the globe.

Origins and inspiration

A lifelong dedication to medicine—specializing in pediatrics, infectious diseases, and ultimately vaccines—led Prof. Baker to groundbreaking discoveries about the link between infant group B streptococcal (GBS) disease and maternal immunity. Her scientific insights, combined with steadfast advocacy for maternal immunization, have transformed neonatal care.

“All I ever wanted to do was to help the most vulnerable in our population: babies,” she reflects.

Group B *Streptococcus* is carried asymptotically by approximately one in four healthy pregnant women. Yet, for newborns, it can result in invasive infections with severe complications, including deafness, blindness, or developmental disabilities caused by meningitis.

Born in Southern California to a physician father and a mother who had been a pre-med student, at a time when women rarely pursued medical careers, Prof. Baker was immersed early in a love of science and medicine. By age six, she had already declared her ambition to become a doctor. For her birthday, she received a toy doctor kit and a kitten, George, her first patient.

“And I never changed my mind,” she shares. “So, what led me to pediatrics? Process of elimination.”

Her path into infectious diseases stemmed from strong clinical training and hands-on experience. In 1965, during a major rubella epidemic that had swept through Houston and much of the South, Prof. Baker was involved in caring for newborns affected by congenital rubella syndrome. One of her responsibilities was performing femoral vein punctures to collect blood samples from these infants, samples that contributed to numerous scientific papers on the syndrome.

“That’s where I learned that the mothers were fine, but that this was something that could be passed to the baby, and we don’t have this disease anymore,” she shares because the Measles/Mumps/Rubella (MMR) vaccine.”

Group B Streptococcal disease

Prof. Baker’s journey into the world of Group B *Streptococcus* (GBS) began during her pediatric

residency at a large county hospital, where she encountered a severely ill newborn—just three or four weeks old—diagnosed with bacterial meningitis. According to the textbooks, it should have been caused by *E. coli*. But something didn’t sit right. The hospital lab reported that *Enterococcus* grew from the cerebral spinal fluid (CSF).

“I didn’t do very well in microbiology, [so] I went and got my microbiology book from med school and read about,” she recalls. “And I thought, this is not right, so I read more and more, and I thought it must be Group B Streptococcus.”

Confident she had identified the true culprit, Prof. Baker attempted to share her findings with various medical faculty. But as a young resident with limited experience, her concerns were repeatedly dismissed. Frustrated yet undeterred, she began visiting the microbiology lab to retrieve blood agar plates from babies diagnosed with meningitis. She carefully sealed and stored them in her apartment. Eventually, she had collected 13 samples.

“So, I really got annoyed that people in academic medicine, professors, PhDs in microbiology, not so much that they were blowing me off, but I did know the difference between Gram-positive and Gram-negative [bacterial],” she said.

Determined to find answers, she reached out to Dr. Rebecca Lancefield, the legendary microbiologist known for her work in Streptococcal classification at the Rockefeller Institute for Medical Research. To Prof. Baker’s surprise, Lancefield wrote back and requested Baker’s strains.

“I mailed them in the U.S. [Postal] mail. If somebody found out now, they’d probably arrest me. But, you know, statute of limitations has gone on,” recalling her risky venture. “Now, we would say that I discovered an emerging infection. But the thing about it is, I wasn’t interested in research.”

That bold move marked the beginning of a pivotal moment in her career. Dr. Lancefield, who would become one of her earliest and most influential mentors, invited Prof. Baker to spend six weeks at the Rockefeller Institute. Eager to prepare, she bought a book on immunochemistry

and never looked back. Her love for children carried her throughout her prolific career.

“My whole career, even though I did a lot of bench research, teaching and traveling, I always committed at least four months of intense clinical rotations. Because I still wanted to be a doctor who took care of patients and teach younger physicians and students,” she says.

GBS vaccine for pregnant women

In the 1970s and '80s, the only maternal vaccine recommended by the U.S. Public Health Service was for influenza. Although the science and manufacturing capacity to develop a Group B *Streptococcus* (GBS) vaccine existed as early as the 1990s, widespread reluctance to give pregnant women “anything except water” created major barriers. Risk aversion surrounding pregnancy, often summarized as “nothing during pregnancy”, made the idea of maternal immunization difficult to advance.

Despite the challenges, Prof. Baker and her colleagues persisted. In 1992, a turning point came when a young Epidemic Intelligence Service at the Center for Disease Control and Prevention (CDC) officer, approached her (Dr. Anne Schuchat). “Well, Dr. Baker, I’ve read your work,” she said. “And my boss and I think that GBS in young infants is a serious public health problem.” Working with professional organizations in pediatrics and obstetrics, Drs. Schuchat and Baker developed guidelines for pregnant women carrying GBS.

Four years later, in 1996, the CDC issued its first recommendations to prevent early-onset GBS disease in newborns. The guidelines included routine assessment of pregnant women for GBS and in 2002, this becomes culture screening and intrapartum antibiotic prophylaxis with intravenous penicillin—a major public health milestone largely shaped by Prof. Baker’s advocacy and research.

A decade later, in early 2010, the U.S. faced a resurgence of whooping cough (pertussis), due in part to waning immunity from childhood vaccinations. The resulting outbreaks led to the deaths of several young infants and captured national attention, making front-page headlines

and prompting urgent action from the CDC’s ACIP.

“I was ACIP chair,” Prof. Baker recalls. “It was 2011 and, at that time, we had the Tdap vaccine—tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis for use in adolescents. The whole discussion of these outbreaks and a way to prevent them led to use of Tdap in pregnant women.” After much debate centering on the lack of safety data versus the likelihood that vaccinating pregnant women could protect the baby through maternal antibodies, the ACIP recommendation routine Tdap vaccination during pregnancy. “There was no other way to prevent it,” she says. “So, the recommendation became reality.” There outbreaks of pertussis ceased and this recommendation persists continue.

Today, maternal vaccination is a proven, life-saving strategy for influenza, pertussis and COVID. Still, Prof. Baker notes with concern the recent decline in vaccination rates driven largely by the increased perception of risk.

Safety concerns in pregnant women

For decades, there was a pervasive concern that virtually anything introduced during pregnancy might pose a risk. At one point, the FDA explicitly prohibited the inclusion of pregnant women in vaccine trials, driven by a highly risk-averse mindset. However, as more pregnant women and newborns began dying from preventable diseases like influenza, pressure grew to reevaluate this stance, especially regarding the flu vaccine.

“We now have studies in different populations and different countries, different races, different ethnicities,” says Prof. Baker. “Even though there are always side effects following influenza vaccination, one needs to assess these minor risks against huge benefits,” she emphasizes. “We now know that the flu vaccine is safe for pregnant women.”

The 2009 H1N1 pandemic was a pivotal moment. The urgent need for protection pushed flu vaccination in pregnancy into the spotlight. Once it became routinely recommended, systems were in place to collect safety and efficacy data, helping to reinforce public confidence.

Prof. Baker believes that improving education

and communication, and removing political interference, is essential to restoring public trust in vaccines and in healthcare providers.

“I love disease prevention in human beings. It’s a great medical achievement, and I hate to see us going backwards. But that’s what we’re doing right now,” she warns. “We had four routinely recommended maternal vaccines. Now we’re down to three [COVID eliminated] and I just hope we don’t go down the road of eliminating more.”

The scientific consensus is clear: the development of vaccines remains the greatest and most cost-effective medical achievement of the 20th century. But, as Prof. Baker highlights, vaccines alone are not enough. She reminds us that access and trust are vital in the success of this journey. Because science can create remarkable vaccines that could very well sit in a bottle.

“This escalating distrust in science, what spills into the trust we’ve had for decades in the patient, doctor, or nurse relationship. The intrusion of this distrust into the ecosystem of vaccines –every little piece of it– is going to take the progress that we’ve made, and the protection we’ve had, away from us if we let it happen. And it’s happening,” she concludes with a sobering reflection on the erosion of public confidence.



News & Alerts

MOST RELEVANT MONTHLY NEWS ON VACCINATION AND EMERGING DISEASES WITH BIBLIOGRAPHIC ALERTS

A summary of the latest News & Alerts in the fields of vaccinology, vaccines, vaccination, and vaccine-preventable diseases. We curate the latest information on regulatory updates, emerging trends, breakthroughs in vaccine technology, vaccine safety and efficacy, global immunization developments and outbreak alerts, as a resource to keep our community informed.

Global childhood vaccination holds steady, yet over 14 million infants remain unvaccinated – WHO, UNICEF

In 2024, 89% of infants globally – about 115 million – received at least one dose of the diphtheria, tetanus and pertussis (DTP)-containing vaccine, and 85% — roughly 109 million – completed all three doses, according to new national immunization coverage data released today by the World Health Organization (WHO) and UNICEF. Still, nearly 20 million infants missed at least one dose of DTP-containing vaccine last year. This includes 14.3 million “zero-dose” children who never received a single dose of any vaccine – 4 million more than the 2024 target needed to stay on track with Immunization Agenda 2030 goals.

Published: July 15, 2025.

<https://www.unicef.org.uk/press-releases/global-childhood-vaccination-holds-steady-yet-over-14-million-infants-remain-unvaccinated-who-unicef/>

Gavi secures record number of pledges: now the hard work of immunising the world’s children begins.

The Global Summit: Health & Prosperity through Immunisation saw an unprecedented level of donor engagement, with a record number pledging support for Gavi, the Vaccine Alliance.

Published: June 26, 2025.

<https://www.gavi.org/vaccineswork/gavi-secures-record-number-pledges-now-hard-work-immunising-worlds-children-begins>

Global call for access to RSV vaccination for all children worldwide.

In a joint appeal published in *The Lancet*, 44 leading scientific and social organisations from across the globe including The Forum of International Respiratory Societies (FIRS) and its partner organisations, are calling on Gavi, the Vaccine Alliance, to take urgent action to save millions of young lives by protecting them against respiratory syncytial virus (RSV).

Published: June 26, 2025.

<https://firsnet.org/global-call-for-access-to-rsv-vaccination-for-all-children-worldwide/>

WHO position paper on immunization to protect infants against respiratory syncytial virus disease, May 2025.

Published: May 30, 2025.

<https://www.who.int/publications/item/who-wer-10022-193-218>.

WHO Scientific advisory group issues report on origins of COVID-19.

The WHO Scientific Advisory Group for the Origins of Novel Pathogens (SAGO), a panel of 27 independent, international, multidisciplinary experts, today published its report on the origins of SARS-CoV-2, the virus responsible for the COVID-19 pandemic. SAGO has advanced the understanding of the origins of COVID-19, but as they say in their report, much of the information needed to evaluate fully all hypotheses has not been provided.

Published: June 27, 2025.

<https://www.who.int/news/item/27-06->

[2025-who-scientific-advisory-group-issues-report-on-origins-of-covid-19.](#)

WHO: Vaccinating at every age is key to unlocking the full potential of immunization.

The world's population is rapidly ageing. For the first time in history, adults over 65 now outnumber children under five. By 2030, nearly 1 billion people will be in this age group. Yet, while childhood immunization programmes have saved millions of lives, vaccination of adults remains an overlooked tool—especially in low- and middle-income countries, where efforts have historically focused on reaching children, adolescents, and women of reproductive age.

Published: June 5, 2025.

<https://www.who.int/news/item/05-06-2025-vaccinating-at-every-age-is-key-to-unlocking-the-full-potential-of-immunization#:~:text=Vaccinating%20at%20every%20age%20is%20key%20to%20unlocking%20the%20full%20potential%20of%20immunization,-5%20June%202025&text=The%20world's%20population%20is%20rapidly,be%20in%20this%20age%20group>

Millions of children at risk as vaccine uptake stalls.

Progress in vaccinating children against a variety of life-threatening diseases has stalled in the past two decades. The situation has been made worse by the Covid pandemic, leaving millions of children unprotected from diseases such as measles, tuberculosis and polio. The researchers are calling for a concerted effort to provide better and more equal access to vaccines.

Published: June 25, 2025.

<https://www.bbc.com/news/articles/c1ljv2mvr000>

Explore UNICEF's Global Immunization Budget Database.

Published: June 20, 2025.

<https://immunizationeconomics.org/recent-activity/2025/6/20/explore-unicef-global-immunization-budget-database/>

WHO guidelines for clinical management of arboviral diseases: dengue, chikungunya, Zika and yellow fever.

The World Health Organization (WHO) has just released the Integrated Guidelines on the Clinical Management of Arboviral Diseases — a crucial step toward strengthening care for the millions of people affected by these viruses each year. Arboviral diseases, primarily transmitted by Aedes mosquitoes, pose an increasing threat

to global health, particularly in the context of climate change, urbanization, and growing human mobility. With over 5.6 billion people worldwide at risk of arboviral infection, it is essential that healthcare professionals have access to evidence-based recommendations to effectively manage these infections in patients. The new WHO guidelines provide clinical management recommendations for four of the most widespread arboviruses affecting humans: dengue, chikungunya, Zika, and yellow fever.

Published: July 4, 2025.

<https://www.who.int/publications/i/item/9789240111110>

Statement from the American Head and Neck Society in Support of Continued HPV Vaccination.

The American Head and Neck Society (AHNS) strongly supports the continued and widespread use of the human papillomavirus (HPV) vaccine as a vital public health measure to prevent HPV-associated cancers, including oropharyngeal cancers—the most rapidly rising HPV-related malignancy in the United States.

Published: July 3, 2025.

<https://www.ahns.info/statement-from-the-american-head-and-neck-society-in-support-of-continued-hpv-vaccination/>

WHO position paper on herpes zoster vaccines.

This position paper focuses on HZ vaccination, supersedes the 2014 vaccine position paper on varicella and HZ vaccines. It reviews the evidence on the recombinant HZ vaccine and provides recommendations on its use. The paper contains off-label recommendations.

Published: July 4, 2025.

<https://www.who.int/publications/i/item/WER10027-28-265-284>

Africa CDC.

<https://africacdc.org/>

INclusive, Sustainable, Prosperous and RESilient (INSPIRE) Health Systems in Asia and the Pacific Health Forum

Published: July 2, 2025.

<https://www.adb.org/news/events/inclusive-sustainable-prosperous-resilient-inspire-health-systems-asia-pacific>

Epidemiological Update - Measles in the Americas Region - 1 July 2025

In 2025, between epidemiological week (EW) 1 and EW 24, in the Americas Region, 7,132

measles cases have been confirmed, including 13 deaths, in Argentina (n= 34), Belize (n= 34), the Plurinational State of Bolivia (n= 60), Brazil (n= 5), Canada (n= 3,170, including one death), Costa Rica (n= 1 case), Mexico (n= 2,597 cases, including nine deaths), Peru (n= 4 cases), and the United States of America (n= 1,227, including three deaths). According to the information available from confirmed cases, the age group with the highest proportion of cases corresponds to the 10–19 years old group (24%), the 1–4 year old group (22%), and the 20–29 year old group (19%).

PAHO: Pertussis Documents

<https://www.paho.org/en/documents/topics/pertussis>

WHO: A Global Health Strategy for 2025–2028 advancing equity and resilience in a turbulent world Fourteenth General Programme of Work
<https://iris.who.int/handle/10665/380456>

Meeting highlights from the Pharmacovigilance Risk Assessment Committee (PRAC) 7 – 10 July 2025. 11 July 2025. Ixchiq: temporary restriction on vaccinating people 65 years and older to be lifted.

EMA's safety committee (PRAC) has completed its review of Ixchiq, a live attenuated chikungunya vaccine, following reports of serious side effects. The temporary restriction on vaccinating people aged 65 years and above, which was put in place during the review, will now be lifted. However, PRAC concluded that, for people of all ages, the vaccine should only be given when there is a significant risk of chikungunya infection and after a careful consideration of the benefits and risks.

<https://www.ema.europa.eu/en/news/meeting-highlights-pharmacovigilance-risk-assessment-committee-prac-7-10-july-2025>

How Gavi support for RSV immunisation will advance health equity.

Published: July 12, 2025.

[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(25\)01117-1/fulltext?dgcid=raven_jbs_etoc_email](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(25)01117-1/fulltext?dgcid=raven_jbs_etoc_email)

CEPI: New vaccine set for human trials in Nipah outbreak hotspot.

A promising vaccine candidate against one

of the world's most deadly viruses, Nipah, is ready for testing in mid-stage human trials in Bangladesh, where people now die almost every year in Nipah disease outbreaks. When the trial launches in early 2026, the vaccine (PHV02)—developed by the U.S.-based biotech company Public Health Vaccines (PHV)—will be among the first Nipah vaccine candidates to reach this stage of testing in people.

Published: July 10, 2025.

<https://cepi.net/new-vaccine-set-human-trials-nipah-outbreak-hotspot>

Lassa fever reported in Guinea.

On June 14, the World Health Organization (WHO) was informed of the laboratory confirmation of a Lassa fever case in Guéckédou prefecture, Nzérékoré region.

Published: July 13, 2025.

<https://outbreaknewstoday.substack.com/p/lassa-fever-reported-in-guinea>

U.S. measles cases hit highest level in 33 years, CDC reports

The U.S. has reported 1,288 measles cases this year — the highest number in 33 years, according to the latest figures from the Centers for Disease Control and Prevention. The last time the U.S. saw more measles cases was in 1992, eight years before the disease was declared eliminated in the country.

Published: July 9, 2025.

<https://www.npr.org/sections/shots-health-news/2025/07/09/nx-s1-5461155/measles-outbreak-cdc-vaccination-health>

Immunization in the Americas shows progress, but over 1.4 million children missed routine vaccines in 2024.

Childhood immunization in the Americas has shown encouraging signs of recovery in 2024, but significant gaps remain. According to new data released today by the World Health Organization (WHO) and UNICEF, over 1.4 million children in the Americas did not receive a single dose of the diphtheria, tetanus, and pertussis (DTP)-containing vaccine, marking an increase in so-called “zero-dose” children.

Published: July 15, 2025.

<https://www.paho.org/en/news/15-7-2025-immunization-americas-shows-progress-over-14-million-children-missed-routine#>

Latest Relevant Publications

LATEST PUBLISHED PAPERS AND COMMENTARIES FROM THE CHIEF EDITOR

Latest impactful scientific publications that stand out for their potential bearing on healthcare. We introduce groundbreaking research findings, innovative treatment modalities, results from phase 1 to 3 vaccine clinical trials, or paradigm-shifting discoveries that redefine our understanding of infectious diseases and therapeutic approaches for all vaccine-preventable diseases.

01

Wahid M, Mandal RK, Sikander M, Khan MR, Haque S, Nagda N, Ahmad F, Rodriguez-Morales AJ. **Safety and Efficacy of Repurposed Smallpox Vaccines Against Mpx: A Critical Review of ACAM2000, JYNNEOS, and LC16.** *J Epidemiol Glob Health.* 2025 Jun 24;15(1):88.
doi: <https://doi.org/10.1007/s44197-025-00432-8>

Editorial comment: This study evaluates the safety and efficacy of three key vaccines—ACAM2000, JYNNEOS, and LC16—originally developed for smallpox and now repurposed for the prevention of Mpx (monkeypox). ACAM2000, a replication-competent vaccinia virus vaccine, has demonstrated high effectiveness but is associated with serious adverse events, including myocarditis and progressive vaccinia. JYNNEOS, a non-replicating modified vaccinia Ankara (MVA) vaccine, shows a more favorable safety profile with significantly fewer severe side effects and has demonstrated 82% vaccine effectiveness in preventing Mpx. LC16, a live attenuated smallpox vaccine, exhibits strong protective efficacy in animal models and excellent safety in human trials, although real-world data remain limited. Based on the current evidence, JYNNEOS emerges as the most promising candidate for widespread use, offering a strong balance of effectiveness and safety among the three options.

02

Salvato RS. **Re-emergence of Oropouche virus as a novel global threat.** *Curr Res Microb Sci.* 2025 May 19;8:100406.
doi: <https://doi.org/10.1016/j.crmicr.2025.100406>

Editorial comment: An excellent review highlighting the growing significance of Oropouche virus as a cause of vector-borne disease outbreaks, with important implications for hospitalizations, expansion into non-endemic regions, Guillain-Barre Syndrome, vertical transmission, congenital anomalies, and the potential need for vaccine development.

03

Naylor NR, Hasso-Agopsowicz M, Kim C, Ma Y, Frost I, Abbas K, Aguilar G, Fuller N, Robotham JV, Jit M. **The global economic burden of antibiotic-resistant infections and the potential impact of bacterial vaccines: a modelling study.** *BMJ Glob Health.* 2025 Jun 19;10(6):e016249.
doi: <https://doi.org/10.1136/bmjgh-2024-016249>

Editorial comment: This study assesses the impact of antibacterial resistance (ABR) and underscores the urgent need for vaccine development as part of the global response. The economic burden of ABR—driven by increased hospital bed-days, rising healthcare expenditures, and losses in labor productivity—is substantial and should remain a priority on both national and international policy agendas.

Vaccines targeting *Staphylococcus aureus*, *Escherichia coli*, and *Klebsiella pneumoniae* have the potential to significantly reduce this burden. However, more robust, context-specific data—particularly from low-income countries—are needed to better quantify hospital costs directly associated with and attributable to ABR.

04

Taha S, Terrade A, Doucoure O, Deghmane AE, Taha MK. **Troubled Times, Changing Tides: A Seroprevalence Study on Meningococcal Immunity in France Between 2016 and 2024.** *Vaccines*. 2025 Jun 16;13(6):647.

doi: <https://doi.org/10.3390/vaccines13060647>

Editorial comment: In France, the implementation of non-pharmaceutical interventions (NPIs) to control COVID-19 was associated with a marked decline in invasive meningococcal disease (IMD) cases. To evaluate the impact on population immunity, the authors conducted a retrospective seroepidemiological study analyzing 166 serum samples collected between 2016 and 2024.

Anti-*Neisseria meningitidis* IgG levels were quantified using ELISA with purified capsular polysaccharides for serogroups B, C, W, Y, and X. Samples were categorized into three periods: pre-NPIs (n = 72), during NPIs (n = 33), and post-NPIs (n = 61). Key findings include: A significant decline in anti-serogroup B IgG levels following the lifting of NPIs (p < 0.0001), consistent with reduced transmission. A gradual increase in anti-serogroup C IgG levels (p = 0.0003), particularly among children aged 1–4 years, likely reflecting improved catch-up vaccination coverage. Anti-serogroup W IgG levels remained stable, though with a demographic shift toward younger children post-NPI, possibly due to genotypic changes in circulating strains. Anti-serogroup Y IgG levels showed a transient but significant increase during the NPI period (p < 0.0001), followed by a decline post-NPI. Anti-serogroup X IgG levels remained consistently low, in line with its low circulation and absence of targeted vaccination.

05

Do LAH, Mulholland K. **Measles 2025.** *N Engl J Med*. 2025 Jun 25.

doi: <https://doi.org/10.1056/NEJMra2504516>

Editorial comment: An excellent review covering the epidemiology, clinical presentation, diagnosis, and treatment of measles—highlighting the urgent need to scale up vaccination efforts amid the current multi-country outbreak.

06

Heidecker B, Libby P, Vassiliou VS, Roubille F, Vardeny O, Hassager C, Gatzoulis MA, Mamas MA, Cooper LT, Schoenrath F, Metra M, Amir O, Solomon SD, Landmesser U, Lüscher TF. **Vaccination as a new form of cardiovascular prevention: a European Society of Cardiology clinical consensus statement.** *Eur Heart J*. 2025 Jun 30:ehaf384.

doi: <https://doi.org/10.1093/eurheartj/ehaf384>

Editorial comment: This clinical consensus statement reviews the current literature and available evidence, providing practical guidance on vaccination timing and target populations—particularly in complex clinical scenarios involving cardiovascular conditions. It outlines recommendations for vaccinating vulnerable groups, including immunosuppressed individuals, patients with congenital heart disease, and pregnant women, while also addressing safety considerations and potential complications.

07

Agarwal R, Chang J, Côrtes FH, Ha C, Villalpando J, Castillo IN, Gálvez RI, Grifoni A, Sette A, Romero-Vivas CM, Heise MT, Premkumar L, Falconar AK, Weiskopf D. **Chikungunya virus-specific CD4+ T cells are associated with chronic chikungunya viral arthritic disease in humans.** *Cell Rep Med*. 2025 May 20;6(5):102134.

doi: <https://doi.org/10.1016/j.xcrm.2025.102134>

Editorial comment: This excellent study explores the immunologic mechanisms by which chronic chikungunya may develop, highlighting the role of CD4+ T cell activation. Notably, middle-aged women appear to be at highest risk for chronic CHIKV-related arthritis—an important consideration for prioritizing this group in future vaccination strategies.

08

Guinat C, Fourtune L, Lambert S, Martin E, Gerbier G, Pellicer AJ, Guérin JL, Vergne T. **Promising Effects of Duck Vaccination against Highly Pathogenic Avian Influenza, France, 2023–2024.** *Emerg Infect Dis.* 2025 Jul;31(7):1468–1471.

doi: <https://doi.org/10.3201/eid3107.241445>

Editorial comment: Highly pathogenic avian influenza causes substantial poultry losses and zoonotic concerns globally. Duck vaccination against highly pathogenic avian influenza began in France in October 2023. The authors' assessment predicted that 314–756 outbreaks were averted in 2023–2024, representing a 96%–99% reduction in epizootic size, likely attributable to vaccination.

09

Parums DV. **Editorial: The 2025 World Health Assembly Pandemic Agreement and the 2024 Amendments to the International Health Regulations Combine for Pandemic Preparedness and Response.** *Med Sci Monit.* 2025 Jul 1;31:e950411.

doi: <https://doi.org/10.12659/MSM.950411>

Editorial comment: This editorial aims to highlight the timeliness of the 2025 WHO Pandemic Agreement and the 2024 amendments to the International Health Regulations, as well as the need for improved pandemic preparedness and response at this time.

10

Violán C, Quirant-Sánchez B, Palau-Antoja M, Palacin D, Pradenas E, Trigueros M, Pera G, Molist G, Fernández-Rivas G, Boigués M, et al. **Immune Durability and Breakthrough Infections 15 Months After SARS-CoV-2 Boosters in People over 65: The IMMERSION Study.** *Vaccines.* 2025; 13(7):738.

doi: <https://doi.org/10.3390/vaccines13070738>

Editorial comment: In this study, authors found that in older adults, a booster COVID-19 vaccination induces durable immune responses, with hybrid immunity offering enhanced protection. A fourth dose boosts antibody levels and reduces infection risk, supporting its use in this high-risk group. Continued monitoring is needed to determine the long-term effectiveness of boosters, particularly against emerging variants.

11

Abu-Raya B, Giles ML, Kollmann T. **Co-administration of vaccines in pregnancy: unique challenges and knowledge gaps.** *Vaccine.* 2025 Jul 11;60:127309.

doi: <https://doi.org/10.1016/j.vaccine.2025.127309>

Editorial comment: Most recommendations for administration of vaccines in pregnancy are based on studies that investigate one vaccine at a time. Largely lacking are data on the impact of co-administration including spacing and timing of the multiple vaccines during pregnancy on safety, efficacy and immunogenicity. This review here places what is known into the context co-administration of vaccines with focus on the mother as well as the infant.

12

Bhatia D, Crowcroft N, Antoni S, Danovaro-Holliday MC, Bose AS, Minta A, Masresha B, Ferrari MJ. **Prediction of subnational-level vaccination coverage estimates using routine surveillance data and survey data.** *Vaccine.* 2025 Jul 11;60:127277.

doi: <https://doi.org/10.1016/j.vaccine.2025.127277>

Editorial comment: This study, using data from 18 countries in the Africa region, found that each of the three surveillance-based indicators (mean age of suspected measles cases, proportion of vaccinated suspected cases, and proportion of IgM-negative suspected cases) were more strongly correlated with Demographic and Health Surveys (DHS)-based survey coverage than administrative estimates.

13

Cavalcante LRL, Lós DB, Fiorenza NG, Kehdi RC, Silva MFS, Viana MDS, Leite IB, Carvalho FHC, Vasconcelos GS, Miyajima F, Miyajima V, Fonseca MHG, Russo RC, Macedo DS. **Maternal Immunization Against SARS-CoV-2 and Infant Immunity Persistence in a Brazilian Cohort.** *Pediatr Infect Dis J.* 2025 Apr 9;44(7):e242–e246.

doi: <https://doi.org/10.1097/INF.0000000000004817>

Editorial comment: In this Brazilian cohort, anti-S IgG titers remained positive in maternal, cord and 6-month infant samples, especially when vaccination occurred closer to delivery. Most pregnant women tested negative for anti-N IgG, indicating no prior infection. However, a subset of unvaccinated PCR+/anti-S IgG+ samples pointed to possible reinfection. Mothers infected at recruitment likely had insufficient time to mount a robust anti-S IgG response, given that seroconversion typically begins 12–14 days post symptoms and peaks around 28 days.

14

Kwon E, Blank G, Starkey S, Chapman C, Lategan C, Shulha H, Kitchin V, Silverberg S, Sauvé L, Sadarangani M. **Child Transmission of SARS-CoV-2 Throughout the Pandemic: An Updated Systematic Review and Meta-analysis.** *Pediatr Infect Dis J.* 2025 Jan 28;44(7):696–706.

doi: <https://doi.org/10.1097/INF.0000000000004733>

Editorial comment: This is a systematic review conducted from April 1, 2021, to December 15, 2023, to estimate secondary attack rates (SARs) and secondary infections per index case (case rate) from index cases between children, up to age 20 years. Eighty-six studies were included, representing 33,674 index cases. The total pooled SAR was 0.11 (95% CI: 0.07–0.16); 0.05 (95% CI: 0.03–0.10) for child-to-child transmission and 0.15 (95% CI: 0.07–0.30) for child-to-adult transmission. Pooled SAR in households was 0.28 (95% CI: 0.24–0.34) and was 0.02 (95% CI: 0.01–0.04) in schools. The role of children in SARS-CoV-2 transmission is small, particularly in schools. This work can help inform policies that effectively reduce transmission while minimizing adverse effects on children.

15

Okoli GN, Cowling BJ. **Improved Methods for Vaccine Effectiveness Studies.** *J Infect Dis.* 2025 Jul 11;231(6):1367–1370.

doi: <https://doi.org/10.1093/infdis/jiae510>

Editorial comment: Evaluating the impact of public health investments in vaccination programs is crucial for ensuring their efficiency and effectiveness. Here the authors summarize recent findings that (1) highlight the need to address correlated vaccination behaviors when estimating VE, (2) suggest using negative control variables to reduce confounding, and (3) recommend accounting for infection history in VE studies to improve accuracy and reliability. These insights are important for refining VE estimation methods.

16

Bartsch SM, Chin KL, Strych U, John DC, Shah TD, Bottazzi ME, O’Shea KJ, Robertson M, Weatherwax C, Heneghan J, Martinez MF, Ciciriello A, Kulkarni S, Velmurugan K, Dibbs A, Scannell SA, Shen Y, Nash D, Hotez PJ, Lee BY. **The Current and Future Burden of Long COVID in the United States.** *J Infect Dis.* 2025 Jul 11;231(6):1581–1590.

doi: <https://doi.org/10.1093/infdis/jiaf030>

Editorial comment: This study summarizes the current health and economic burden of long COVID in the USA, which may already exceed that of a number of other chronic diseases and will continue to grow each year as COVID-19 cases increase. This could be a significant drain on businesses, third-party payers, the healthcare system, and society.

17

Gouveia AS, Gomes MFDC, de Almeida IF, Lana RM, Bastos LS, Bianchi LM, Oliveira SS, Araujo EC, Ferreira DADC, Oliveira DMB, Godinho VB, Vacaro LB, Riback TIS, Cruz OG, Coelho FC, Codeço CT. **Unraveling regional variability in Dengue outbreaks in Brazil: leveraging the Moving Epidemics Method (MEM) and climate data to optimize vector control strategies.** *PLoS Negl Trop Dis.* 2025 Jun 23;19(6):e0013175.

doi: <https://doi.org/10.1371/journal.pntd.0013175>

Editorial comment: This Brazilian study highlights a territory based method on epidemiological and climate data to determine the optimal time to guide preventive and control strategies against Dengue. The proposed methodology also holds potential for application in controlling other mosquito-transmitted viral diseases, expanding its public health impact.



Editor's Corner

HIV VACCINATION: PAST ACHIEVEMENTS, PRESENT STRATEGIES, AND FUTURE DIRECTIONS

**Introduction:**

HIV-1/AIDS remains one of the most pressing global health challenges. Despite significant advances in prevention and treatment, the epidemic continues to affect millions worldwide. As of 2023, an estimated 40 million people were living with HIV-1. Although new infections have declined by more than half since their peak in 1995, more than one million new cases were still reported in 2023.

Since the beginning of the epidemic, approximately 88.4 million people have been

infected with HIV-1, and 42.3 million have died from AIDS-related illnesses—including 630,000 deaths in 2023 alone. These figures underscore the ongoing need for sustained global efforts in prevention, treatment, and research.

Antiretroviral therapy (ART) has dramatically improved both the quality of life and life expectancy for individuals living with HIV-1. However, it is not a cure. ART typically involves a combination of two to four medications that target different stages of the HIV-1 life cycle. This approach enables patients to

maintain undetectable viral loads and preserve healthy CD4+ T cell levels. Importantly, ART also significantly reduces the risk of HIV-1 transmission between individuals.

Despite its proven effectiveness and growing global availability, substantial barriers to accessing ART remain—particularly in low- and middle-income countries. Moreover, lifelong adherence is required, and long-term use can lead to drug-related toxicity and an increased risk of comorbidities.

These challenges highlight the urgent need for a preventive HIV vaccine—one that could reduce transmission, lower the incidence of new infections, and contribute to long-term control and eventual eradication of the virus.

The HIV Vaccine Journey: A Story of Limited Success and Ongoing Challenges:

The first HIV-1 vaccine Phase I clinical trial began in 1987, but early candidates, such as the gp160 subunit vaccine, showed no significant efficacy.

In 1998, the first large-scale, randomized, double-blind, placebo-controlled HIV-1 vaccine trial—VAX004—was launched in the United States and Europe. This Phase 3 trial evaluated the AIDSVAX B/B vaccine, which consisted of two recombinant gp120 envelope (Env) proteins derived from subtype B isolates MN and GNE8. Unfortunately, upon its conclusion in 2003, the study demonstrated no efficacy in preventing HIV-1 infection or reducing plasma viremia levels.

A parallel Phase 3 trial, VAX003, was conducted in Thailand using a different formulation: AIDSVAX B/E, which combined gp120 Env proteins from clade B (MN) and clade E (A244). Like VAX004, this trial also failed to show any significant protection against HIV-1 infection.

Similar failed results were found with the STEP and Phambili trials with a vaccine developed by Merck.

The first ray of hope in the decades-long HIV-1 vaccine effort came with the RV144 trial, also known as the “Thai Trial.” This Phase 3 study, conducted in Thailand beginning in 2003, enrolled over 16,000 volunteers and tested a prime-boost regimen combining two vaccines: ALVAC-HIV (a canarypox vector encoding HIV-

1 *env*, *gag*, and *pol*) and AIDSVAX B/E (a gp120 subunit vaccine). When results were announced in 2009, they were groundbreaking—the vaccine regimen demonstrated a modest 31.2% reduction in HIV-1 infection compared to placebo. Although the level of efficacy was not sufficient for licensure, RV144 marked the first time any HIV-1 vaccine had shown protective effects in humans. This modest success rekindled hope and provided crucial insights into the immune responses that might be required for protection.

Building on RV144, the HVTN 702 (Uhambo) trial was launched in South Africa to test a modified version of the regimen adapted to clade C viruses. Unfortunately, the trial was stopped early after interim analysis showed no efficacy in preventing HIV-1 infection.

Similarly, the Imbokodo and Mosaico trials (2021–2023), which evaluated mosaic immunogen-based vaccines developed by Janssen to target a broad range of HIV-1 strains, also failed to demonstrate protective efficacy.

Despite these setbacks, each of these trials has contributed significantly to our understanding of HIV-1 vaccine science. They have clarified that binding antibodies and traditional cellular immune responses alone are insufficient for robust protection. Instead, the field now recognizes that eliciting broadly neutralizing antibodies (bNAbs)—capable of neutralizing diverse HIV-1 strains across clades—will likely be critical for achieving effective and durable immunity.

One of the major obstacles in developing an effective HIV-1 vaccine is the virus’s extraordinary genetic diversity. Multiple subtypes and strains circulate globally, posing a significant challenge for vaccine design. This diversity stems from HIV-1’s high mutation rate—estimated at approximately 3.4×10^{-5} mutations per base per replication cycle—driven by the error-prone nature of reverse transcriptase, which lacks proofreading capability. As a result, millions of variants of the Env protein can emerge within a single infected individual in just one day, enabling the virus to rapidly escape immune pressure and hindering the development of broadly protective vaccines.

Another key obstacle in HIV-1 vaccine development is the incomplete understanding

of correlates of protection. This gap stems largely from the lack of a successful clinical trial from which to derive meaningful immunological insights—a void that persisted until the RV144 study. Even then, the correlates identified were modest and not definitive.

Complicating matters further, individuals infected with HIV-1 may generate antibodies or exhibit CD4+ T cell activation without achieving protective immunity, making it difficult to define clear physiological benchmarks for protection. Adding to the challenge, the generation of effective primary antibody responses and cytotoxic T cell responses requires assistance of CD4+ T cells. However, HIV-1 specifically targets and downregulates CD4 expression on these helper T cells, impairing their function. Moreover, we currently lack reliable biomarkers to accurately measure the supportive role of CD4+ T cells in coordinating immune responses during HIV-1 infection or vaccination.

Future direction for vaccine development:

1. Immunization with SOSIP Trimers

The introduction of an artificial disulfide bond linking the gp120 and gp41 subunits (referred to as SOS), combined with the I559P (IP) mutation, has enabled detailed structural characterization of soluble gp140 (sgp140) trimers. These SOSIP trimers closely mimic the native conformation of the HIV-1 Env trimer, a critical feature for eliciting bNAbs. Through computational and structure-guided design, multiple additional stabilizing mutations have been incorporated to enhance trimer stability and lock it into a closed, native-like state.

2. Germline-Targeting (GT) Immunization

One of the most promising new strategies, heavily reliant on SOSIP technology, is germline-targeting (GT) immunization. Broadly speaking, successful GT immunization involves administering a series of immunogens designed first to recruit naïve B cells into germinal centers (GCs), followed by sequential booster immunizations that guide these B cells to mature and produce bNAbs.

3. mRNA-Based Vaccines

Unlike traditional vaccines, which often use weakened or inactivated viruses to stimulate

an immune response, mRNA vaccines deliver a small piece of the virus's genetic material. This mRNA instructs cells to produce a viral protein that triggers the immune system, priming the body to recognize and combat the pathogen upon exposure.

The application of mRNA technology to HIV-1 vaccine development is especially promising for several reasons:

1. **Rapid development and adaptability:** mRNA vaccines can be designed and manufactured much faster than traditional vaccines. This agility is critical for addressing the genetic diversity and rapid mutation rate of HIV-1. Researchers can quickly update the mRNA sequence to match emerging HIV-1 strains, potentially improving efficacy while maintaining safety.
2. **Robust immune response:** mRNA vaccines elicit strong cellular and humoral immunity by enabling direct antigen production within host cells, outperforming many protein- or peptide-based vaccines. For HIV-1, this means enhanced stimulation of antibody production and T cell responses targeting the virus. Early-stage clinical trials of mRNA HIV-1 vaccines have demonstrated encouraging immune activation, including cytotoxic T cell activity, paving the way for further development.
3. **Induction of broadly neutralizing antibodies (bNAbs):** A key goal in HIV-1 vaccine research is to induce bNAbs that can neutralize a wide array of viral strains. mRNA vaccines can be engineered to express specific HIV-1 proteins known to elicit these potent antibodies, potentially offering broad and durable protection.

Currently, several mRNA-based HIV-1 vaccine candidates are in various stages of clinical evaluation, reflecting the promise of this innovative approach.

4. Nanoparticle Vaccines

Nanoparticle vaccines employ tiny particles—often composed of proteins, lipids, or other materials—to deliver multiple antigens or nucleic acids to the immune system. By mimicking the structural features of viruses, these nanoparticles enhance immune activation

by presenting genetic material in a manner that closely resembles natural infection. Their versatility is reflected in the diverse types of nanoparticles used, including inorganic particles, lipid nanoparticles (LNPs), biopolymer particles, virus-like particles (VLPs), and recombinant antigens. Importantly, nanoparticles provide a safe and effective alternative to live-attenuated viruses, which are generally considered too risky for use in HIV-1 vaccine development.

5. Gene Therapy in HIV-1

Gene therapy, which involves delivering therapeutic genetic material (such as DNA or RNA) to cells or tissues, has achieved remarkable progress in cancer treatment. One promising application for HIV-1 is chimeric antigen receptor T (CAR T) cell therapy, offering a highly adaptable strategy for HIV-1 immunotherapy. CAR T cells can be engineered to recognize and bind the gp120 envelope protein expressed on the surface of HIV-1-infected cells. By targeting gp120, these modified T cells

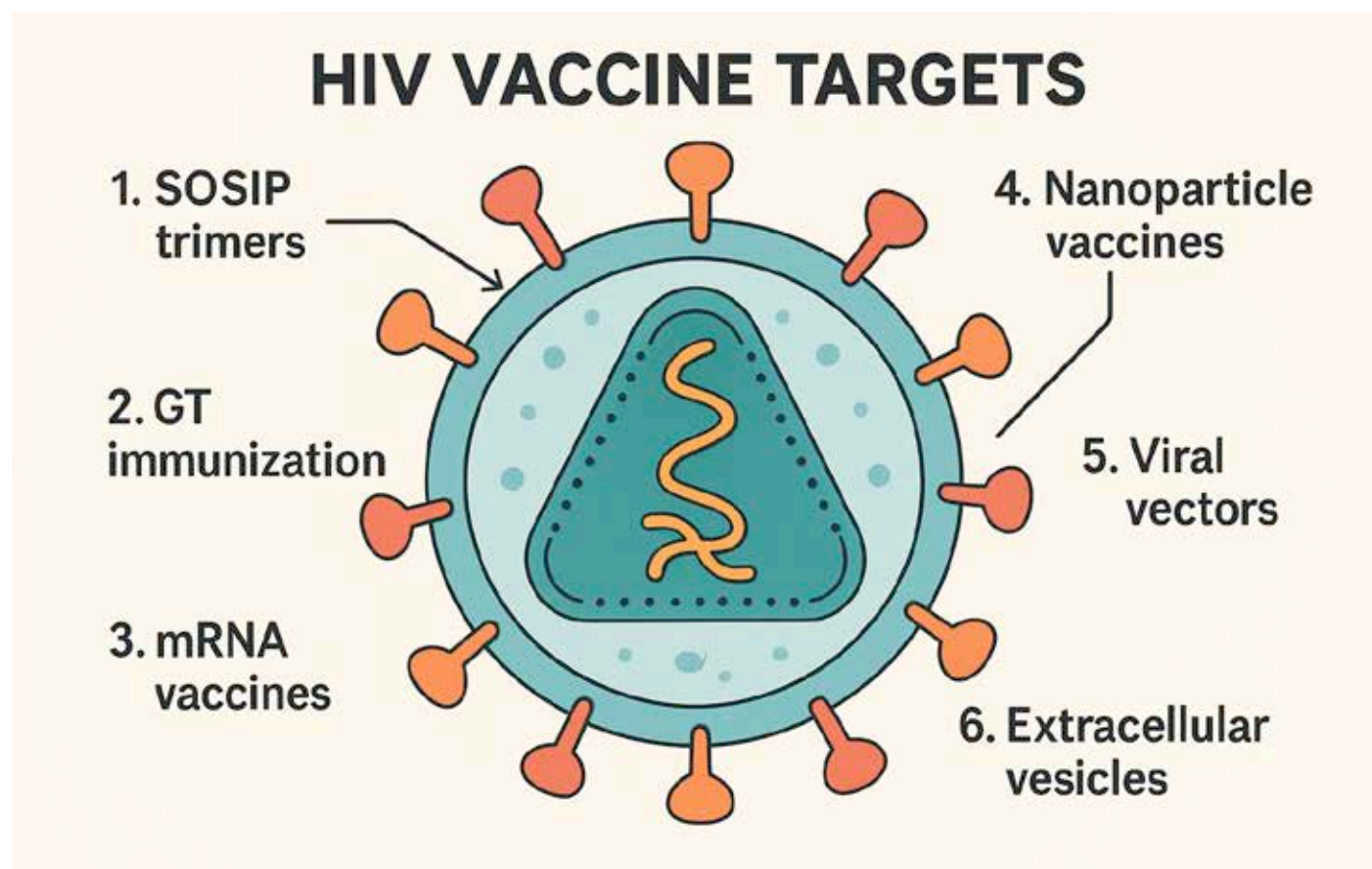
are designed to direct the immune system to specifically identify, attack, and eliminate HIV-1-infected cells, providing a targeted approach to control or potentially eradicate the virus.

6. Viral Vector-Based Expression of broadly neutralizing antibodies (bNAbs)

The concept of using viral vectors to express bNAbs originated from the success of passive immunization in controlling HIV-1 replication. To build on this approach, researchers developed recombinant adeno-associated viral (rAAV) vectors capable of delivering genes that enable persistent, long-term expression of bNAbs and other HIV-1 inhibitors. This strategy has demonstrated promising results in both preclinical models and early clinical trials.

7. Extracellular Vesicles

The use of extracellular vesicles (EVs) in HIV-1 therapy and vaccine development represents a rapidly advancing area of research with



significant potential. EVs are phospholipid-bound organelles released from cell surfaces that play a crucial role in cell-to-cell communication by safely packaging and delivering biological cargo—such as proteins, DNA, and RNA—to target cells and tissues. Leveraging these unique properties, researchers are exploring EVs as tools to reactivate and eliminate latent HIV-1 reservoirs through a “shock-and-kill” strategy. By engineering EVs to specifically target HIV-1-infected CD4+ T cells and deliver key activating molecules, this approach aims to awaken dormant virus reservoirs, making them susceptible to immune clearance.

Conclusions

In summary, recent advancements in HIV-1 vaccine and treatment strategies offer significant promise in the ongoing battle against the virus. Continued research and clinical trials are essential to refine these approaches and to integrate emerging and future technologies. Furthermore, stronger global collaborations and partnerships are crucial to increasing investment in combating this persistent and ever-evolving disease, which affects populations worldwide—particularly in low- and middle-income countries where the burden remains greatest.

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Best Practice

SHINGLES PREVENTION IN HIGH-RISK ADULTS: A CRITICAL HEALTHCARE PRIORITY



Introduction:

Herpes zoster (HZ), commonly known as shingles, is a painful neurocutaneous condition caused by the reactivation of the varicella-zoster virus (VZV) within the dorsal root ganglia. It typically presents as a unilateral, blistering rash accompanied by radicular pain lasting 2–4 weeks. The pain can be severe and debilitating, often leading to depression, social isolation, and a significant reduction in quality of life. Beyond its impact on individual patients, HZ also imposes a substantial burden on caregivers, healthcare systems, and employers.

A significant portion of the healthcare burden associated with herpes zoster (HZ) stems from its complications, with **post-herpetic neuralgia (PHN)** being the most common. PHN is a chronic neuropathic pain that persists after the resolution of the acute vesicular rash and affects approximately **one in five** individuals with HZ. When the varicella-zoster virus (VZV) reactivates in certain cranial nerves, it can lead to ophthalmic herpes zoster, a potentially severe condition that may result in conjunctivitis, keratitis, iritis, uveitis, and even vision loss. Other serious complications include disseminated HZ (defined as a rash involving three or more dermatomes), as well as neurological, visceral, or vascular events, such as stroke and even myocardial infarction.

Between 20% and 30% of the population are expected to develop HZ in their lifetime. An estimated 14.9 million cases of HZ occurred globally in 2020 in individuals aged over 50 years, and this is predicted to increase to up to 19.1 million cases by 2030. The risk and severity of HZ increases with age, particularly after the age of 50 years, due to age-related decline in immunity (immunosenescence). Patients with immunosuppression and other severe comorbidities are also at higher risk of developing HZ than immunocompetent individuals of any age, and they are more likely to suffer from severe disease or HZ-associated complications.

The recombinant zoster vaccine (RZV):

The recombinant zoster vaccine (RZV or Shingrix) is now the only HZ vaccine available in many countries and has been the only vaccine recommended for moderately and

severely immunocompromised patients.

The recombinant zoster vaccine (RZV) is composed of a single viral surface protein—glycoprotein E (gE)—combined with the AS01_B adjuvant system. Glycoprotein E is essential for varicella-zoster virus (VZV) replication and is highly expressed in infected cells. It serves as the primary target for both humoral and cellular immune responses during VZV infection and can be efficiently produced using recombinant technology.

The AS01_B adjuvant system includes monophosphoryl lipid A (MPL), a toll-like receptor 4 (TLR4) agonist, and QS-21, a saponin, both encapsulated within a liposomal formulation. Following intramuscular administration, RZV rapidly drains to the axillary lymph nodes, where it activates a broad cascade of immune cells and cytokines, ultimately promoting robust anti-gE antibody production and T-cell responses. The adjuvant plays a critical role in driving the vaccine's high immunogenicity and clinical efficacy.

Two large randomized, placebo-controlled phase 3 trials, the Zoster Efficacy Study in Adults 50 Years of Age or Older (ZOE-50) and Zoster Efficacy Study in Adults 70 Years of Age or Older (ZOE-70), were conducted in 29,300 immunocompetent adults to determine efficacy of RZV in preventing HZ and PHN.

Follow-up of the ZOE-50 and ZOE-70 studies demonstrated that the recombinant zoster vaccine (RZV) maintains long-term efficacy against herpes zoster (HZ) exceeding 82%. In pooled analyses from these trials, RZV showed 91% efficacy against post-herpetic neuralgia (PHN) in adults aged ≥50 years, and 89% efficacy in those aged ≥70 years.

RZV is associated with both local and systemic reactogenicity, particularly within the first seven days following vaccination. Injection site reactions were significantly more common among RZV recipients compared to placebo (82% vs. 12%), with pain at the injection site reported by 79% of vaccine recipients. Systemic reactions, such as myalgia and fatigue, were also more frequent in the vaccine

group (66% vs. 30%). Notably, the intensity of reactogenicity decreased with advancing age.

Despite higher reactogenicity, the incidence of serious adverse events (10.1% for RZV vs. 10.4% for placebo) and mortality rates (4.3% vs. 4.6%) were comparable between groups, suggesting these outcomes are attributable to the underlying aging population rather than to the vaccine itself.

RZV has a favorable safety profile and maintains comparable immunogenicity when co-administered with other vaccines, including unadjuvanted inactivated seasonal influenza, pneumococcal polysaccharide (PPV23), COVID-19 mRNA, and diphtheria-tetanus-pertussis (DTaP) vaccines.

The immunogenicity, safety, reactogenicity, and/or efficacy of the recombinant zoster vaccine (RZV) in moderately to severely immunocompromised patients has been evaluated in five phase 2 and 3 clinical trials.

In these studies, two doses of RZV were administered one to two months apart, with follow-up 12 months later in patient cohorts including those undergoing autologous hematopoietic stem cell transplantation (HSCT), solid organ transplantation (SOT), those with hematologic malignancies, or solid tumors receiving chemotherapy.

Among patients with hematological malignancies—including chronic lymphocytic leukemia, Hodgkin's disease, non-Hodgkin's lymphoma, and multiple myeloma—RZV was administered during or after chemotherapy in individuals aged ≥ 18 years (73% were over age 50). Following vaccination, T-cell responses increased in 84%, and gE antibody responses in 60% of participants. A post hoc analysis estimated vaccine efficacy (VE) against herpes zoster (HZ) at 87%.

The largest phase 3 trial included 1,846 patients who received RZV 50 to 70 days after autologous HSCT for conditions such as acute myeloid leukemia, Hodgkin's and non-Hodgkin's lymphoma, or multiple myeloma. Immune responses were strong: 89% showed a significant T-cell response, and 71% had increased gE antibody levels. VE was 68% against HZ, 89% against post-herpetic neuralgia (PHN), 78% against other complications,

and 85% against HZ-related hospitalization. Notably, patients treated with rituximab for B-cell lymphomas or chronic lymphocytic leukemia had comparable vaccine efficacy.

In a recent meta-analysis including 33 eligible publications, the efficacy of the RZV against herpes zoster (HZ) in immunocompetent populations ranged from 90% to 97%, while real-world effectiveness ranged from 71% to 86%. Notably, protection remained above 70% for at least 10 years, with no significant differences observed across age groups or ethnicities.

As an additional benefit, the RZV has been associated with a lesser risk of dementia.

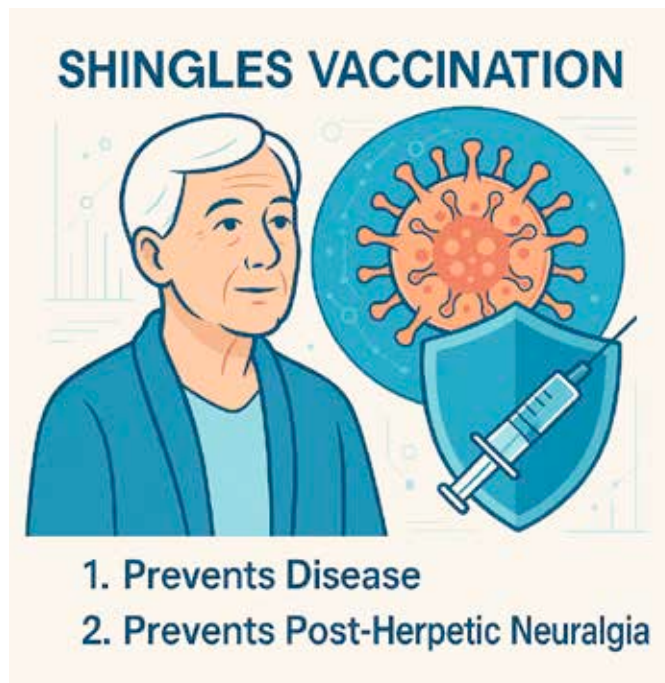
Furthermore, numerous studies have demonstrated the cost-effectiveness (CE) of RZV across all age groups evaluated. In immunocompromised populations, RZV has also been shown to be cost-saving in several analyses.

RZV recommendations:

1. In its latest position paper, the Strategic Advisory Group of Experts (SAGE) on Immunization at the World Health Organization (WHO) states the following: "Due to the unknown burden of HZ in most countries and insufficient data concerning the use of this relatively new vaccine, WHO does not offer any recommendation concerning the routine use of HZ vaccine at this time. Currently, data on the duration of protection provided by HZ vaccination are insufficient and there is initial evidence of waning of protection over time, as well as uncertainty regarding the optimal age for vaccination and the potential role of a booster dose. However, countries, especially those with an aging population and demographic shift towards older ages, may decide to introduce routine HZ vaccination if they have an important burden of disease and consider the programme beneficial. For those countries deciding to proceed with a HZ vaccination programme, the optimal age and dosing schedule of HZ vaccination should take into consideration the age-dependent burden of disease, vaccine effectiveness, duration of protection, and cost-effectiveness".
2. The USA-Centers for Disease Control and Prevention (CDC) CDC recommends 2 doses

of recombinant zoster vaccine (RZV) to prevent shingles and related complications in adults aged ≥ 50 years and 2 doses of RZV for adults aged ≥ 19 years who are or will be immunodeficient or immunosuppressed.

3. The European Medicines Agency (EMA) recommends the recombinant zoster vaccine (RZV) for adults aged 50 years and older to protect against herpes zoster (HZ) and post-herpetic neuralgia (PHN). It also advises vaccination for adults aged 18 years and older who are at increased risk of HZ.
4. **Dosing:** The vaccination course consists of 2 injections given 2 months apart. If necessary, the second dose can be given later but within 6 months after the first dose. People whose immune system does not work properly and who would benefit from a shorter vaccination schedule can have the second dose one to two months after the first dose.



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Guest Contributors

GUARDIANS OF TOMORROW: HOW VACCINATION LEADS THE BATTLE AGAINST TROPICAL DISEASES, AND WHY ADULT WOMEN MUST BE CONSIDERED FOR CHIKUNGUNYA IMMUNIZATION

by Maria Jose Diaz-Gutierrez, MD and Aileen Chang, MD

In a world where infectious threats evolve faster than our responses, the greatest strength of modern medicine may not lie in high-tech treatments, but in the simple and powerful act of prevention. Vector-borne diseases like Chikungunya remind us that sometimes the best defense is not to wait for the battle to begin, but to make sure it never does.

With this in mind, it is urgent to reconsider the role of prevention as a cornerstone of public health. Instead of focusing only on treating diseases and their complications, we need to strengthen actions that stop them from happening in the first place. Tropical infections like Chikungunya are no exception. This virus, spread by mosquitoes, is one of the most common vector-borne diseases worldwide. Around 5 million cases are reported every year, and three-quarters of the global population live in areas at risk of infection¹. On top of that, there is no specific antiviral treatment, which makes its control even harder. Because of this, non-pharmacological strategies like community education are key to preventing its spread.

However, prevention should not be limited to education or environmental measures. Scientific progress has brought new hope with the development of vaccines, which are a powerful tool to reduce the impact of these diseases. Currently, the chikungunya vaccine is recommended for

people traveling to or taking residence in endemic areas. One of the most affected groups that should be focused on for vaccination is women.

A special focus on women for vaccination, especially those of childbearing age who want to become pregnant, would be a smart and effective move. Mother-to-child transmission can happen in any trimester of pregnancy, but when it occurs around the time of birth, it can lead to serious outcomes like neonatal death or long-term neuro-disabilities requiring intensive care².

Some studies have reported that the risk of vertical transmission of Chikungunya virus is around 50% when the mother has a high viral load at the onset of labor. Neither delaying vaginal delivery nor performing a cesarean section appears to reduce the risk of fetal infection³.

The currently approved vaccines have shown an acceptable safety profile and strong immune response in participants under age sixty-five, which supports its use as part of prevention strategies for women before conception⁴. This is why education and vaccination (our guardians of tomorrow) must stand at the front line, not only protecting lives, but shaping a future where tropical diseases are no longer a threat, but a lesson from the past.

Furthermore, women are also at higher risk of developing chronic chikungunya arthritis.

Multiple studies consistently report a higher prevalence of chronic Chikungunya arthritis among women. In a Thai cohort study, 78% of patients with persistent arthritis beyond three months were female, and female sex was an independent predictor of chronic disease (OR 4.17, 95% CI 1.05–16.7)⁵. Similarly, a cohort study from Martinique found that female sex significantly associated with chronic arthritis at 12 months ($p = 0.04$)⁶. In a Colombian cohort, 89% of the those with chronic arthritis were female⁷Colombia who were clinically diagnosed as having chikungunya virus during the 2014–2015 epidemic was conducted. Baseline symptoms and follow-up symptoms at 20 months were evaluated in serologically confirmed cases. RESULTS: Among the 500 patients enrolled, 485 had serologically confirmed chikungunya virus and reported joint pain status. Patients were predominantly adults (mean \pm SD age 49 ± 16 years. These findings are further supported by a systematic review which consistently identified female sex as a key risk factor for chronic chikungunya arthritis alongside older age and severe acute disease⁸reviews and studies with a follow-up shorter than 6 weeks were excluded. RESULTS: In total, 37 studies were included; with follow-up periods ranging from 1.5 to 72 months. Most studies were questionnaire-based studies only, in which clinical diagnoses such as arthritis, alopecia and depression

were mostly recorded without professional verification. Persisting arthralgia/arthritis (arthralgia/joint stiffness plus joint swelling).

Collectively, these data indicate a clear gender disparity in the burden of chronic Chikungunya arthritis, suggesting a potential role for sex-based differences in immune response or hormonal regulation. Clinicians should be aware of this gender bias when counseling patients in the chronic arthritis risk and vaccination as a prevention tool.

Vaccination is not merely a tool—it is a transformative force in the prevention of tropical diseases like Chikungunya. As we face rising case numbers and expanding transmission zones, especially in the context of climate change, prioritizing prevention becomes not just wise, but necessary. Focusing on women—who bear a disproportionate burden of both acute and chronic disease—offers a strategic and ethical path forward. By integrating vaccination into reproductive health planning and emphasizing education in high-risk regions, we can empower communities and protect future generations. In doing so, we reaffirm that the true guardians of tomorrow are not only the scientists and clinicians developing these tools, but the individuals and families who choose prevention, safeguarding health before illness takes hold.

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1. Dr. Maria Jose Diaz-Gutierrez, MD, is a Colombian physician and co-investigator in clinical trials in infectious diseases, cardiology, and vaccines. She has worked on studies involving emerging infections and vaccine-preventable diseases. Her main interests include tackling health disparities across Latin America through research in infectious and chronic diseases. She is passionate about linking clinical care with research to improve outcomes in underserved populations and contribute to global health efforts.
 2. Dr. Aileen Chang, MD, MSPH received her MD from Columbia University and trained in Internal Medicine and Public Health at the University of Miami. She is an Associate Professor of Medicine and Microbiology at George Washington University and a clinical translational arboviral researcher.

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